Using Virtual Prototype for Cross-Cultural Visual Design

This paper presents an Automated Teller Machine (ATM) virtual prototype for cross-cultural design. The goal was to demonstrate a study of user's preferences for a visual language, and at the same time to test virtual prototype as a tool for this kind of approach. The method was a task-based usability test. The results demonstrate that the cultural context affects user's perception, and therefore influences his or her mental models, They also prove that the virtual prototype is an effective tool.

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INTRODUCTION

The paper describes the use of virtual prototype in testing interfaces in a different culture and language. The idea to develop the study was based on an experience of two designers, living in a foreign country. In this context they had to interact with some devices (artefacts) which they normally had used in their native country, but now them being not so simple to use. Despite having the experience of using these artefacts, the context had changed, and the process to interact with these artefacts became a new experience for them.

We developed a language-based virtual prototype of an Automated Teller Machine (ATM). While developing it one of our aims was to propose a dialog across boundaries (geographical and time) to improve the artefact's design.

As Niemeyer [7] states, the artefact, beyond its practical, aesthetic and useful function, has a special and important function: It has to be significant and provide an easy interaction. The artefact spreads out specific characteristics and cultural values in the scope that it reaches. And in this context the designer, with his abilities, has the function of an articulator.

The artefact will always communicate something to somebody. In this context, as Niemeyer [7] explains, designers need to analyze how the interaction will happen between a user and an artefact. Understanding better the users, theirs values and theirs culture can make possible to meet the artefacts requirements. One good example of a project that integrates visual design to organize information, that is to have an efficient communication with users, came from a Cyber Tracker for functional illiteracy users [1]. They made limited use of words and heavy use of images.

The increasing incorporation of new information technologies on people's day-to-day life has made the producing market more extensive increasing the market. While banks are adding new features to ATM trying to respond to the range of users' needs, they increase its complexity. Thus creating a demand for further investigation of needs, abilities, and limitations of the users.

The users seek products that interact with them. Today, the appearance or the functionality are no longer most important elements; the users search for a product that acts as their accomplice. This results from the materializing of intelligence and expression of culture and artefacts are not only his/her server. By Jagne et al [5], users prefer products developed according to their cultural characteristics, and so users may show resistance and sometimes reject products with western metaphors.

In view of this fact, designers face a challenge: how to present concepts, values and contents in technological resources in a way that they meet the expectative (expectations) of market and users culture in an efficient and effective manner?

In this paper, we explore one possible tool for cross-cultural design, virtual prototyping. Powerful web-based tools and techniques make it possible to formulate and test ideas concerning interfaces across the globe. As shown in other studies [3][6], the use of virtual prototype helps to overcome the boundaries of space and time; with this tool we can root cultural difference in the users' country. At the same time we are trying to use this pilot prototype to test if ATM users' prefer a visual language to help them during the interaction process.

According to Dray et al [4] many of the basic interfaces require some grasp of written language. Thinking in a global economy where it is possible to sell products to any part of the world, it could be profitable to reach illiterate communities. UNESCO estimates that 16 percent of the world's population will be illiterate in 2010 [12]. Thinking about computer's and high tech artefacts' literacy, the quantity of people could increase considerably.

VIRTUAL PROTOTYPE IN CROSS-CULTURAL VISUAL DESIGN

Virtual prototype is a process of using software made prototype intending to test and evaluate a product. One of its important characteristics is that it can be sent by electronic mail to the users [3]. Because the prototype can be geographically distributed, and the designer has an efficient tool for cross-cultural communication and collaboration. Using Virtual Prototype the designer can produce a large number of consecutive prototype versions quickly [10], and in each new version is possible to incorporate users' cultural aspects not integrated before.

As Säde [9] defines "there are many kinds of envisioning techniques for imagining, communicating, and evaluating the use of technology. These are needed because of its complex and multidimensional nature. In addition to technical specifications, tangible representations of the use of emerging products are needed in order to allow the participation of the variety of stakeholders."

In particular, prototyping is a good tool to assure the usability and, as consequence, the acceptance of the product. One can say the communication is a natural function of any prototype, in other words, while the designer develops a prototype, sends a "piece" of information that will be measured by the receptor model (user). The users frequently need the prototypes as they do not understand the technical specifications and the diagrams that try to represent the product idea. Software prototypes can be very realistic, considering the look and behaviour.

METHODS

We developed the virtual prototype, using the Macromedia™ Flash MX 2004. The complited prototype was sent to Brazil by e-mail. The prototype was tested in a personal computer (?).

There were two research assistants with more than a year long experience in doing usability tests. They were responsible for selecting the users and observing them during the test. The assistants received instructions how to act before and during the test. In order to prevent technical disorders the assistants pilot the prototype prior to each test,

The prototype was tested by 12 Brazilian people, aged between 21 and 50 (Figure 1). Design undergraduate students represented half of the test group. They were expected to be more comfortable with the technology used in the test, and probably more interested, patient and motivated towards testing the interface. The users with different backgrounds and ages to compare their results with the designers' results and trying to understand some skills, abilities and some cultural aspects that could affect future steps of the research.

Age	*Education*	*Career*	*Computer experience*	*ATM experience*	*Understand other language than Portuguese*
25	U	Designer	S	S	English/Italian
23	U	Designer	S	D	English/Spanish
24	U	Software engineer	S	S	English
37	U	Designer	S	S	English/Spanish
25	U	Designer	S	D	
26	U	Designer	S	S	English/Spanish
23	U	Student	D	D	English
52	U	Retired	D	S	Spanish
22	U	Public relations	S	S	English
29	M	Designer	S	S	English/Spanish
49	PHD	doctor	S	S	English/Spanish French
28	G	Public relations	S	S	English

Figure 1 – Users' data (U= college undergraduate; G= college graduate; M=Master degree / S = satisfactory; D = Difficulties).

The users received one identification form and instructions, before the test started They were also informed that we were testing the interface, not their skills or abilities. They did not have any time limit. The test was divided in two parts.

First we told the partakers a story (Figure 2) to describe the situation and asked them to do a task. The task was to supply the user chip card with 2 euros. To do this they had to follow the right steps (Figure 3).

During first part of the test the users were asked to think out loud while the research assistants were recording the situation on video. The video was used to capture the computer screen I order to see the cursor movement, count the number of clicks and the quantity of errors. At the same time, the research assistants took notes about error messages and appeared doubts of the users.

You are on vacation in Finland and you are housed in a shelter, however all of your clothes are dirty and you need to wash them. So, you decided to ask to the staff how/where you can wash your clothes. And they had shown you a "self-service" laundry. They said that to use the laundries machines is necessary to insert euros in your credit card. Also, they had said that for this, you have to go to an ATM and there you can transfer the amount from your credit card to the chip in your card.

Now, you are going to interact with the Otto interface and you are going to try to supply your chip card with 2 euros. The value will be debited, automatically, from your credit card.

Figure 2 – The scenario story told to all testers

After the test the users could see the interface translated into Portuguese, and they could interact with it. The users were given time to think about interface problems and start to think about suggestions to improve it.

In the second part of the test a blank paper size A4 and a pencil were given to each of the partakers, and research assistants requested them to draw solutions to the ATM interface. Only two out of twelve users wanted to do sketches, the others choosed to write down the suggestions. They were informed we did not want obvious solutions like "translate the interface to English".

When the users had finished, the research assistants collected the material, digitalized papers and the video. Afterwards the data was sent to Finland via e-mail.

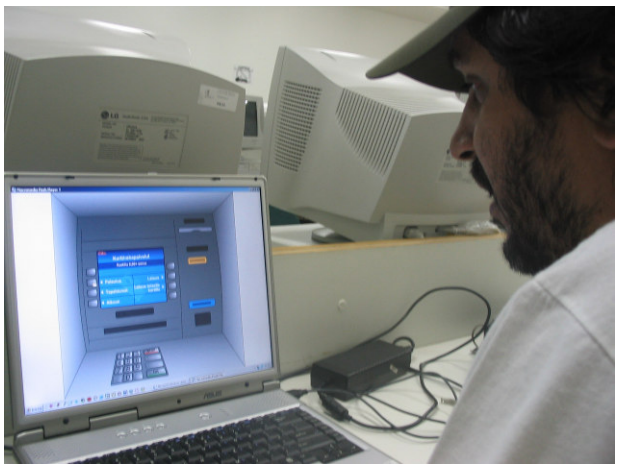

Figure 3 - User interacting with the prototype

The video tape helps to correct the tendency (?)of seeing what one wants to see or what one thinks of having seen [11]. The researchers were in Helsinki, so it was possible to analyze the interaction between users and the prototype. The video was transcribed and the comments regarding the prototype and the visual language were isolated.

RESULTS

The data systematization relative to users' characteristics could help us to understand how it can influence the using of interface and building metaphors. For instance, the user who lives abroad and speaks four languages fluently suggested some solutions more related to other cultures and not considering only the local situation.

It was interesting to see the cultural aspects related to the users' procedures and the artefacts used in the situation. For example, one user asked: "*what is it? I need a card to pay laundry?... They do not use money?*"; And other user did not understand the chip card function: "*Here we use this chip only as a security function… how can we insert euros here*?".

Another thing we found was that the users were unanimous in suggesting that icons and colours could be a very good way to improve the system. It is corroborated by Parikh et al [8] once the users had "much more successful in associating ideas and action with highly representational icons".

For example, one participant said:

> "Maybe if we have a specific colour to guide us during the process… it could be easier!! Something like: if you want to load your card, follow the blue buttons… and if you want to take money use the yellow buttons".

Even using the solution proposed by the user, the prototype based on colors menu, we could see the users were still confused: the first page menu could not communicate which feature they must follow. So, they suggested the use of icons to represent each function.

When we implemented the users' solutions again and submitted those to the users, "flaws in the artefact development could be recognized and eliminated as early as possible in the production cycle" [2]; it helps to minimize cost, time and possible redesign. With the virtual prototype the team could understand the process in a holistic approach.

50% of users are from a graphic design university, so they have similar background that could explain the building of the same representation of symbols. Nevertheless, even having the same representation, when we analyzed the sketches we could found different shapes and forms to the same idea, e.g. the metaphor used to symbolize "password" was a key, however the key was draw using different shapes. The idea to represent the chip was very different (Figure 4). Our hypothesis is that when the sketches are shown to new users they will have different understanding of these metaphors.

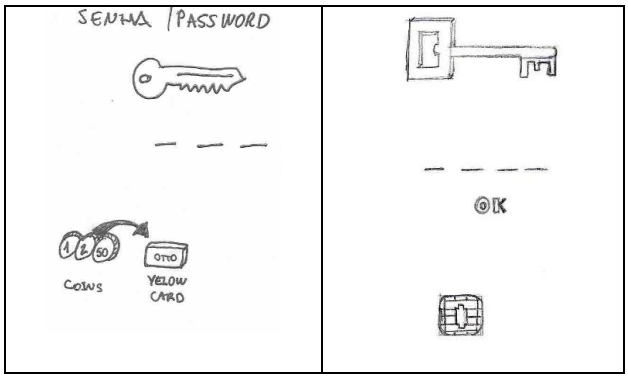

Figure 4 - Two different sketches to represent the same ideas. Above are the password metaphors, below the chip loading's metaphor.

VIRTUAL PROTOTYPES AS RESEARCH TOOLS

Based on the study the virtual prototype turned out to be a good solution to evaluate an interface even the users are 13000 km away. Researchers in different countries (at same time) could built together a knowledge about the interface, reduce costs and time to do this evaluation. With the virtual prototype we could built a tangible representation about user's need. Futhermore the users felt comfortable interacting with the "product" and talking about it.

Some disadvantages of using a virtual prototype appeared in our study, but as demonstrated below, they do not harm the reliability of our findings. The results obtained from the usability tests could stress a list of possible errors. "Creating a fundamental source of inputs for each subsequent optimising stage in the development of a product, what make easy to integrate the necessary issues to be addressed."[2].

1) 3 users tried to type their password using the computer's keyboard, instead to use the graphical representation of the keyboard. They did it, because in the real situation they used to type in a keyboard, with 3d shape, something that they could have pressure feedback. During the video analysis we could hear the users saying for the assistants that it's not a problem in their perception because they always have to learning how to use an artefact at the first time. For us it was an interesting data we have opinions about the first interaction with an artefact.

2) 1 user understood that he must click over an image showed in the prototype's screen. In a real situation it will not happen because it is possible to see that the screen is a glass and it is not possible to insert nothing. Despite we have some good graphical representations; we do not have some colours and shapes that could transmit the glass's idea.

3) Other problem is that the user does not operate the model with the stress of the real situation i.e. a line in an ATM could be very stressful if you image that someone is waiting to use. One of the users told that was very shame to be so slow and said "imagine if there is a line behind me! What a shame!"

4) The use context of a virtual prototype and a real product are different. Users said if they were in real situation, they will ask for someone's help. "... Mr. Please, could you come here? I want some help, please! … could you help-

me please? I can't do this, sorry! … Mr. could you come around, please? Anybody has any clue how it works?"

5) Finally, the stakes are different. All users said that if it was in real situation they will not try to complete the task, because they could lose money with their mistakes.

These examples above stand out because we could perceive the differences of perceptions, attitudes, and actions from the users. These examples are an illustrative explanation to perceive that, time is precious and if you stay in a place more time than the expected, people start to do a "social control". The user who lived abroad, said that in his opinion he could asked for help, but most of the users not fell comfortable to ask for help because the country's security situation.

CONCLUSION

Our study illustrates the value of virtual prototype as a tool to explain the relationship between users and cultural dimensions: 1) how users understand and respond to the artefact and 2) the cultural dimensions involved in it. Prototype is a technique to communicate the use of technology [9]. Because of it, it is a powerful tool to demonstrate how the cultural context can affect users' interaction with the artefact. Also it increases the understanding of which components of the culture have to be integrated in order to motivate the users.

During the study the importance of the images in a global world, they have an important space to communicate (?) as reinforced. We started to think the complexity of deciding what kind of images one can use in oreder to have same representation from the users. We can not anticipate what a person will see in their "mind", but in a cross-cultural approach we can clarify what kind of visual image will not transfer well from culture to culture.

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