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DESIGNING ACCESSIBLE PUBLIC INFORMATION SYSTEMS
- AN INTERACTIVE TOURISM OFFICE

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Abstract

Public information systems face unique design challenges that sometimes arise from the need to support a diverse range of users, e.g. tourists, senior users, passers-by, children and teenagers. This case study presents a design approach towards the development of a fully interactive tourism information office. More effort should be put into how we can more effectively work collaboratively with stakeholders in order to better define the interaction design aspects of this kind of projects. In this context, we argue that human work interaction design can be a solid, useful approach to better support the diversity of public information systems' users.

Keywords: Interactive Installations, Guidelines, Case Study, User Interfaces, Human Work Interaction Design.

1. Introduction

Designing interactive installations for diverse venues and different contexts has become increasingly popular [Liu 2007]. Science centers wish to exploit the interactive, often surprising, element to bring more visitors and to explain difficult scientific concepts in a more appealing way. Museums wish to attract visitors from all ages and promote collaborations between them. Retail stores and shops have also started to embrace interactive installations as a way to improve their relationship with existing clients as well as capture the attention and interest of new segments, exploiting installations featuring the so-called "wow!" effect. Moreover, the speedy evolution in computing power available, as well as the decreasing cost in display technologies, such as projectors and LCD displays, has also led to an increased level of interest from retailers wishing to improve their stores' attractiveness, museum curators wishing they had a nicer way to display the rich-ness of cultural heritage, science centers' managers who are simply technology enthusiasts and thrive with the idea of refurnishing their centers with the latest innovations.

In this paper, we start out by arguing that in the past three years, people's expectations regarding technologies have never been set to a higher bar than they are set today. This leads to increased pressure over interaction designers, since their work is more focused at the frontier between humans and machines. And, as we all know, whenever the expectations are raised too high, the larger is the amount of risk faced by the project team. Adding to this risk is the fact that most software development

companies don't have the necessary budget for having dedicated interaction designers. Therefore, software engineers, who sometimes don't have the needed skills to come up with sound designs, frequently conceive user interfaces.

On the other hand, we also argue that the rapid technological evolution in interactive installations, coupled with the flexibility of technology, provides the perfect opportunity to adopt Human-Work Interaction Design [Katre 2010] (HWID) as a design field. HWID as a field, coupled with a sound work analysis approach, interactive installations for Public Information Systems can be developed in a more quick and effective way.

The remaining of our paper is organized as follows: Section 2, "Diversity of Users in a Public Tourism Office", explains the approach, rationale used as well as the case study. Section 3 presents a set of guidelines we found useful when designing frontline interactions for Public Information Systems. Finally, Section 4 discusses our conclusions and outlines new avenues of research in this field.

2. Diversity of Users in a Public Tourism Office

It has been argued that the identification of breakthrough ideas at the very forefront of the innovation process is a key factor towards the creation of substantial innovation [He 2008]. However, innovation always comes with a price, and if the final user interface is too innovative, or was designed without taking contextual factors into account, its usability could be harnessed.

In the particular case of designing a Public Tourism Office, we were interested in devising a sound picture about what really matters to users and how the office actually worked, in order to come up with a set of interactive installations that could support the tourists' tasks and information requests, while at the same time entertaining them and making them feel their valuable time was not being wasted.

We will describe in this section both the HWID design approach we took as well as the solution that was installed. The main challenge we faced was clearly the diversity of users in terms of culture, age, nationality, behavior patterns and context.

2.1. A Human Work Interaction Design Approach

Human work analysis is very critical in the design of public information systems and has been the topic of recent research in the area [Katre et al. 2010]. It has been stated that the interaction design of PIS and e-Government systems needs to simultaneously address the user experience.

In today's proficient landscape of methods and techniques, HWID is an emerging approach that essentially promotes a better understanding of the relationship between work-domain based empirical studies and the iterative design of prototypes and new technologies [Katre et al. 2010]. HWID's goal is to encourage empirical studies and conceptualizations of the interaction among humans, their variegated social contexts and the technology they use both within and across these contexts.

To achieve this, HWID promotes the use of knowledge, concepts, methods and techniques that enable user studies to procure a better apprehension of the complex interplay between individual, social and organizational contexts and thereby a better understanding of how and why people work in the ways they do. Therefore, one of the main characteristics of HWID as an interaction design approach is to focus the analysis on the *how's* and *why's* of people's work. HWID also tries to promote a better understanding of the relationship between work-domain based empirical studies and iterative design of prototypes and new technologies [Katre et al. 2010]. HWID's

roots lie in Cognitive Work Analysis (CWA) [Vicente 1995; Rasmussen et al. 1994]. Cognitive Work Analysis (CWA) is a multidisciplinary framework for the analysis, design, and evaluation of human work developed by Rasmussen, and colleagues [Rasmussen et al. 1994]. Its purpose is to guide the design of technology for use in the work place. CWA helps an analyst identify the activities and agents that are needed for a system to effectively fulfill its functional purpose. CWA can also be regarded as a formative process that focuses on an ever-increasing number of dynamic constraints that systems present nowadays, rather than prescriptive methods of working.

Given this context, HWID is particularly adequate as a design aid when we deal with sophisticated or difficult work domains, e.g. air traffic control systems, ambulance and hospital schedulers, etc. It should not come as a surprise, then, our adoption of HWID as a design approach for supporting diverse users in a public information system of a tourism office.

Our HWID approach has its roots in CWA, and therefore we analyzed, during a one-month study, the context of human activities regarding finding and browsing through touristic information. In this sense, we tried to understand:

- The work actors (tourists) do;
- Their information behavior;
- The context in which they act, and
- The reasons (the *why's*) for their actions.

In a collaborative effort between two researchers and two practitioners, we undertook this study in real context, with the goal of determining the items mentioned, studying with particular care the relation between work, product, client and project.

Out of many relevant observations, we concluded that the main challenge would be related to conceiving a design that could work well for a diverse range of visitors, each with significant differences in terms of age, gender, digital proficiency, attitude, behavior patterns and specific concerns.

Our study also comprised a set of semi-structured interviews, which were undertaken during the six-month observational study in an industrial context of design and installation of several interactive systems for different projects.

First of all, we asked practitioners about the design and development processes. Results show these were always a collaborative effort between the design and development team and a user groups that varied from project to project. One of the most difficult issues was to give priority to customer's satisfaction through early and continuous delivery of software where changes are appreciated. One of the engineers stated that "*Change was constant - and communication was a true challenge, since it was difficult for them to communicate us the whole point of a given interactive installation. And when we moved from the laptop to an actual kiosk or projection, we noticed how different their opinion was regarding every aspect of the design and development.*" This issue was present in other answers and clearly demonstrates the need for better tools that could enhance the relationship with the customer and especially improve the way interactive installations are planned.

We also asked about means of communication (e.g. tools that were employed solely in order to better communicate design and development issues among the team and with customers). Another interesting and recurrent remark was, e.g.: "*They [the clients] were completely focused on the MS PowerPoint model - they thought kiosks and interactive installations had to be designed as if they were PowerPoint presentations*". This is another factor that suggests the high expectations clients put in

these projects, since the perception of the difficulty level in implementing digital applications is sometimes different from the reality.

2.2. A Case Study

This work was conducted at the Regional Tourism Direction, which has an office especially devoted to attending tourists, with staff specialized in working with tourists in a variety of contexts: these range from providing very simple information (e.g. what is this monument famous for?, or where can I find the cable car?) to handling very complicated processes (e.g. a tourists that lost his wallet and needs documentation for flying back the next day).

We were interested in designing and developing a set of interactive installations that could act as an enhancement for the office, since sometimes tourists need to wait in line as there is not enough staff at peak times to handle all users simultaneously.

Figure 1. The final result of the design approach: the virtual book kiosk (top) and the interactive walkway (bottom).

The final resulting installation, shown in Figure 1, was comprised of a virtual book for tourists to access all the necessary information, which included: nearby conveniences, services, restaurants and bars; touristic sights, walks and monuments; maps and geographical/historical info and other time-specific information like events, shows, organized walks and tours. The virtual book could be browsed through page-flipping gestures performed in mid-air, which was the favorite interaction style according to

children and teenagers. Senior tourists, however, preferred to browse the information through touching the screen. Allowing *both* interaction styles was crucial to support the array of diverse users we were facing.

The final installation was complemented by an innovative way to provide public access to information: an interactive walkway that displayed multimedia contents according to the tourists' and citizen's gestures and steps (bottom photo, Figure 1). Since part of the design idea was to recreate the environment, and since that idea influenced the design process, the team added the true sounds of the forest's bird species, and even added a "scent projector" that spread the scents and aromas of the forest as well. This way, the visitor could really immerse herself into the scenery, in a multi-sensorial experience. This was important as a way to accomplish the design goal of keeping the tourists happy while they consulted the information they needed at the PIS. Time is money, and that is especially the case for tourists, who don't want to waste their precious vacation time. The role of this multi-sensorial experience was crucial in the sense that tourists got a feeling of what the forest looked like, smells like and feels like, before or after they visit it.

3. Guidelines

The guidelines we identify on the basis of our experience are our own way to deal with the difficulties, risks and opportunities that come up in this field. They could prove useful for other interaction designers, business managers, and even clients, as a way to design, develop and install better PIS. These guidelines include, but are not limited, to the following:

- **Making the Vision Stand Out.** This guideline is based on the story of the bricklayers who were asked what they were doing. The first one said he was laying bricks. The second said he was building a wall. And the third said he was building a cathedral. To remind practitioners that they are "building a cathedral" it is a good idea to hang exhibition posters that featured interactive installations, photos of the visitors, and, for instance, give away free tickets, whenever applicable, so that engineers and designers can experience the installations the exact same way clients and users do.
- **Know the customer from the client.** Interactive installations are meant to be fun, enriching, and enticing to everyday customers. A successful installation will attract more customers and more business, therefore making your client happy. The focus should be on your client's customers and not on your clients. A good defence mechanism to support design decisions is to *convincingly* and *accurately* document the customers' satisfaction and deliver that documentation to your client with a partnership attitude. Collecting evidence such as happy customers' photos, videos of people inter-acting with the installations, even surveys or informal interviews, can be useful to convince your client, especially if cross-checked with sales or other business figures. Please your client's clients.
- **Carefully manage client expectations.** A possible way to achieve this is to present the client with architectural designs of how the interactive installation will look at the end of the project. If we provide the client with a visual scale and 3-D layout, the idea can be conveyed in a way that gives all stakeholders a feel of how the physical space will be used for the installations, just like in architectural programs.

- **Make the Interaction Model easy to grasp.** One of the most interesting conclusions drawn from our experience is the importance of the interaction model and how it is learned and reapplied. If there is too much innovation put on a given interactive product, then that product could be difficult to learn at first hand. This implies that innovation comes at a price and this issue should be considered taking into account the real needs of users, at least in what concerns interactive installations. There is, naturally, a dichotomy between usability and innovation degree of any given interactive product. However, if the team is explicitly focused on making the interaction model easy to grasp, this dichotomy will not become too harmful for the product's usability. Additionally, in order to support a diverse range of users, redundancy of interaction styles is advised: The virtual book could be browsed through page-flipping gestures performed in mid-air, which was the favourite interaction style according to children and teenagers. Senior tourists, however, preferred to browse the information through touching the screen. Allowing both interaction styles was crucial to support the array of diverse users we were facing.

4. Conclusions

Because of today's diversity of possible technological combinations for any interactive installation, the solution space has become too large. And this is one of the reasons why it is surprisingly easy to create bad designs. Imagine for a second that you have to conceive fifteen interactive installations for a public space. If you think about it, there are literally hundreds of different ways you can conceive, design and develop the installations: using infrared motion-sensors gives you dozens of different ways to control and interact with digital contents, from page-flipping gestures performed with hands, to slowly triggering multimedia contents in large displays according to the users' steps. Camera-based interaction and augmented reality systems provide another large set of possible design solutions. Combining different technologies opens up an even larger design space (3D displays, touch-screens, multi-touch surfaces, the list goes on and on). In other words, today's technology is so flexible, that it becomes difficult not only to design and decide, but also to present alternatives to clients.

The solution space has become too large because of the diversity of possible technological combinations for any interactive installation. This, we argue, is an issue that contributes to increasing risks in interactive installations' development. And it's one of the reasons why it is surprisingly easy to create bad designs.

The problem with frontline interaction design is that it's fairly easy to debate or discuss the final results of an installation: People's tastes are highly subjective and vary a lot. Requirements engineering as a discipline has many principles, techniques, and methods devoted to traditional software development. However, in terms of validating interaction design requirements, research literature is somewhat scarce. More effort should be put into how we can more effectively work collaboratively with stakeholders in order to better define the interaction design aspects of any given project's requirements.

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taking into account the real needs of users. There is, naturally, a dichotomy between usability and innovation degree of an interactive product – but only in one direction, i.e. the an interactive product with a high innovation degree can hurt it's usability degree.

HWID is well positioned to achieve this goal. By showing explicitly the interconnection between the different design artifacts, HWID can be developed further to address requirements engineering tasks for public information systems that are targeted at interactive installations, especially when dealing with novel interaction paradigms and supporting a diverse user base. We argue that e-Government, public information systems, diverse users, etc. all provide a fertile ground for expanding the current HWID frameworks and ultimately turn it into a mainstream design approach.

Further work could include whether HWID is exclusively a design approach or can be also regarded as a work analysis approach. Additionally, researchers should also look for explanations or arguments as to why public information systems provide a fertile ground for expanding the current HWID frameworks.

Acknowledgements. This work has been supported by FCT (the Portuguese Foundation for Science and Technology) through grant PTDC/EIA-EIA/116070/2009 and through

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