Considering Context: Integrative Design of Graphical User Interfaces

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ABSTRACT

This paper presents a method of working holistically with the design of a graphical interface by studying the physical environment and the social interaction that takes place within it. After an introduction that describes the case project and approach, a conceptual model that has been applied during the project is presented. It is shown how this framework assisted the designers throughout the project and affected the outcome. Thereafter the benefits of integrative design thinking and associated challenges are discussed. The conclusion reflects on the result of the case project, when the use of the method can be motivated and also points to changes in technology and society that may promote a more holistic approach in interface design.

Keywords

Design, Methodology, Integrative, Holistic, Graphical User Interface, Police, Dispatch

1. INTRODUCTION

The total experience of a graphical user interface (GUI) is not limited to the screen - the environment and social situation in which the screen is situated is equally important. Cognitive powers are largely created by the environments in which these same powers are exercised, yet the impact of these environments is rarely studied[3]. Insights such as this, coming from social and cognitive science, should be taken into better consideration when thinking about interactive systems. Integrative or integrated design is a method used in the design of buildings that emphazises holistic thinking[10]. This paper describes a project where the designers studied interaction on multiple levels and tried to apply a system approach, similar to the thoughts behind integrative design, to a very information dense environment.

The project, ”Efficient information and resource visualization in a Police Communication Center”, was carried out in the first semester of the Interaction Design MA program at Umeå Institute of Design, Sweden, in corporation with the Umeå Police. It was completed over a five week period where the first three weeks were used for research and the last two for developing concepts.

From visits to the Command and Communication Center (Figure 1) it was evident that the work depends on collaboration between the dispatchers, to a large extent through the data system but also face-to-face, in the room. The group of which the author was a member formed out of a common interest in studying the interface (Figure 2) as one part in a cooperative environment. While the goal of this project was the redesign of the GUI, the belief was that a hard focus on the GUI would mean ignoring how dependent the efficiency of the interface is on its context.

Figure 1. The Command and Communication Center in Umeå, Sweden

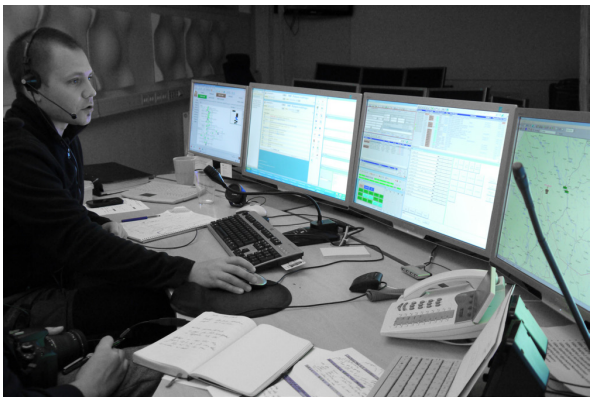

Figure 2. Current work station and interface

2. METHOD DESCRIPTION

The approach was to not see the screen as a sovereign unit but rather as one part in an information eco system encompassing people, artefacts and information. Important discussion topics throughout the project were:

- How can the room environment best support the information flow of the GUI and vice versa?
- What physical consequences does the current GUI have?
- How does the GUI affect inter-human interactions?

In order to better grasp the scope of the chosen problem area it was necessary to break it down and look at its components one by one. The representation shown in Figure 3 was created.

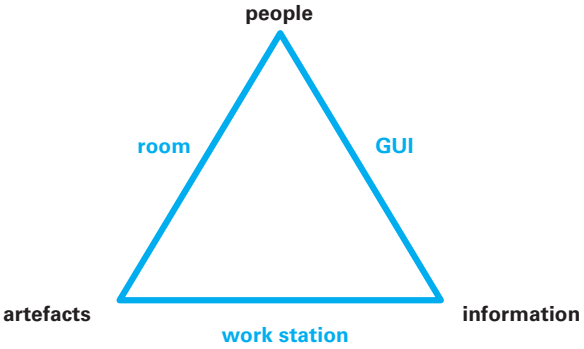

Figure 3. Representation of the Command and Communication Center

The corners of the triangle represent the three parts that the Command and Communication Center is made up of. As the graphical user interface has been the focus, ”People” refers primarily to the dispatchers and duty officers within the control room (leaving out the officers in the field, who are frequently communicating with the center). ”Artifacts” are all physical objects within the control room environment. ”Information” refers to all incoming, outgoing and static data that is accessible from the control room environment (including all means of accessing it, whether this is by searching a database or walking over to the wall to read a posted note).

A similar approach and conceptual model can be found in the Tilava research project[5], where the control room is divided according to spacial qualities and their combinations create room metaphors (Interactive-, Intuitive- and Boundless control room). For the purpose of rapidly prototyping a new Command and Communication Center it was however more relevant to have the three links represent distinct, ”designable” levels of the system. The three combinations of People, Artifacts and Information thus form the different levels in the information ecology - room, work station and screen interface(Figure 3). It can also be represented as a zoom in (Figure 4) that describes a process where the design of each level is dependent on the other two.

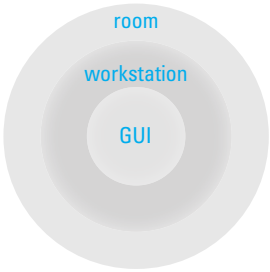

Figure 4.

3. METHOD CONSEQUENCES

Moving away from a GUI centered approach affected the design process as well as the final result.

3.1 Problem setting

The problems encountered in this project are dependent on multiple, interdependent factors and can be defined as wicked[6]. As every wicked problem can be considered the symptom of another problem, zooming out it essential for understanding what causes it. The designer needs use his/her peripheral vision to see the role of components in the greater whole. In this project, zooming out allowed the designers to frame problems so that they could be understood as contextually dependent instead of as belonging to a specific component or product.

When trying to solve a problem, there is a need for being specific and detail oriented or as Schön notes, technically rational[8]. Problem setting on the other hand requires a ”non-technical process of framing”. The framing process converts a problematic situation into a problem. It is not enough to just get the design right, we must above all make sure we are designing the right thing[1]. Unless context is considered and the problem framed correctly, the symptoms can by mistake be treated instead of the problem that is causing them.

Here, the framing of the problem was accomplished by creating a conceptual representation of the environment. This was used to sort the research material gathered during the visits to the center and to narrow down on problems relevant for the group to work on.

3.2 Problem solving

The way in which the problems were defined made for an open start of the sketch process where any combination of system parts could be considered for solving a problem. Although something at first presented itself as a room problem, it could prove to be more easily solved in the interface or the other way around.

Keeping the structure of the problem framing proved useful in order to make sure all aspects were covered in the ideation sketching. Since the focus was to create a system where the room layout, work station and user interface supported each other, all three elements needed to be visualized together during sketching. The interface was for example sketched in full scale directly onto a crude work station model.

3.3 Final result

An effect of the holistic process was that existing functions changed platform to better suit the needs of the dispatchers. The problem of knowing who is busy resulted in the status of the dispatchers (now a list in the GUI) being moved onto the wall projection area (Figure 5). This allows for a bigger, graphical representation that can be read from anywhere in the room, not only from behind the screens.

The informal collaboration method of the dispatchers listening in on each others calls to help others out was turned into a GUI function (Figure 6). In case an operator does not have time to assign a patrol, she can ask for help by tapping an icon.

Figure 5. Room with groups of work stations

Another important consequence of the work method was that it allowed the exploring of a richer spectrum of possible interaction methods. The potential of alternatives that could provide more direct manipulation of data was thereby recognized. An example is the ”Communication Puck”, a tangible interface (Figure 7). The traditional WIMP-style interface is mainly dependent on cognitive skills. The purpose of tangible interfaces is to engage the user in a richer interaction with computers that incorporates a wider range of human skills (cognitive, emotional, perceptual-motor)[2].

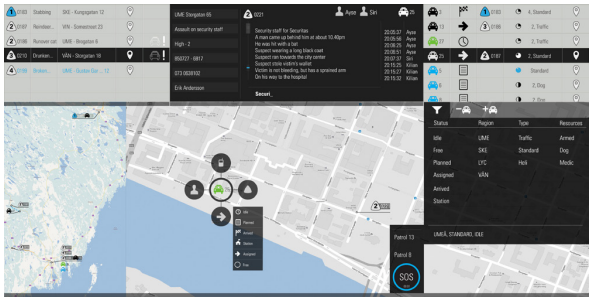

Figure 6. Screenshot of the graphical user interface

With the puck, physical and virtual parts belonging to the same system have been integrated. It is an extension of what happens on the screen, a physical object that ”fills” with virtual content that can then be directly manipulated.

Figure 7. Work station with touchscreen, keyboard and puck

4. CHALLENGES FOR INTEGRATIVE DESIGN

To reach more holistic solutions, the common design approach of focusing on tasks and goals may need to be replaced by one that is more directed towards context[9]. Wilkens states that ”When it comes to designing for the total experience, the activities that have little to do with the system you are designing are often just as important as those that are central to it”. This suggests a more complex task for designers and that the process needs to change and become more context and behavior oriented.

Frameworks have been developed to help designers understand total system design. One example is activity theory, which provides a framework for describing structure, development, and context of computer-supported activities. It focuses on the environment’s structure and the dynamics of interaction between internal and external components of activity[4]. However, it is argued that existing frameworks are too academic to be applicable for designers in their work[7].

Another issue is that companies most often are not set up to deliver holistic solutions. Coordination and cross-functional teams in the organization is needed. Also, designers may not be asked to participate in the early problem setting stage.

5. CONCLUSIONS

Focusing on context instead of immediate goals made the project different both in execution and presentation. Because of the nature of this project (school setting) the designers could to some degree set their own deliverables. In a situation with responsibilities towards clients other priorities often have to be made. However, it can be argued that considering context is the truly responsible approach in any project.

Approaching interaction design problems contextually with a GUI design to deliver in short time can at first seem intimidating, but has in this project proved to enrich the design concepts. An important insight from this project is that a tight schedule is not a restriction for working holistically. Retakes can be avoided by an initial contextual analysis.

By zooming out, the designers found solutions that considered important contexual aspects. The method can therefore be recommended in the development of similar professional/ cognitively demanding products and environments. This kind of process can be motivated in any case where structures are complex and efficiency vital.

In some time, tangible interactions and customized solutions will become more affordable and customers will demand more. In a future with more display surfaces in all our environments we are likely to place greater demands on their integration and context awareness. Seamlessness will be asked for and it is only by considering both environment and social factors that it will be possible to design borderless interfaces where both the physical and virtual assists people's interactions in the best possible way.

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