CUBITS: CREATING FOCUS IN THE WORKPLACE

Physical Computing & Interaction Design Studio

Reflective Report

Hocus Focus

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Abstract

Businesses are always on the lookout for strategies to improve their output. One particular aspect is how tasks are managed, delegated, and progressed as a group. There are three ways in workplaces can improve task management: making goal monitoring public and part of the work environment, utilising emotional design to send visceral messages to employees to get work done and encourage more collaboration and communication between employees. Cubits is a device in which individual cubes divide tasks up into manageable parts. A shelf holds all the tasks for completion. Employees take cubes off the shelf to work on them as they please. An accompanying live feed is used to keep track of the location and status of each cube. Evaluations of Cubits revealed that users reacted very strongly to the emotional design techniques incorporated such as personification. Users felt that the displaying of all their goals motivated them to complete their tasks and find more to achieve. Evaluations did not confirm that public goal monitoring increased the level of collaboration and communication between users.

Introduction

Physical Computing & Interaction Design Studio (DECO3850) is a final year Information Technology course at The University of Queensland. DECO3850's aim is to as a group, explore the space of physical computing and to develop a product utilising physical computing and interaction techniques that solved a real-world problem. Physical computing devices go beyond the traditional keyboard and mouse-based interactions and provide a more natural means of interacting with technology. Cubits is a device with the goal of creating focus in the workplace. It aims to encourage employees to practice good work culture and work habits to achieve a better work output. The device is placed in a central area at an office environment that small teams of employees that work on the same product or service will use. Cubits use CSCW, emotional design, and goal monitoring techniques to ensure that employees stay on task, are more aware of the progress of the team and are more inclined to assist other employees. Cubits would augment the task management delegation and selection process as well as influencing employees to produce better outcomes.

The research question is this: "How can we motivate employees to complete their tasks more effectively and efficiently?"

This report will cover the relevant literature such as physical computing, goal monitoring, emotional design and Agile development. I will explore techniques to increase productivity and outline how Cubits employed such techniques. I will then review my contributions to the development of the device. I will describe the evaluation methods I used to validate the success of the product and provide a judgement on how the product addressed the underlying research questions.

Background Survey

GOAL MONITORING

There is a proven direct correlation in a team between goal monitoring and productivity. A meta-analysis of 138 studies by Harkin et al. (2016) ranging from fitness to education confirmed that goal monitoring helps people to achieve their goals. The more goal monitoring that took place, the higher the chances were of success. The benefits of goal monitoring are increased when goal monitoring is made public to peers. A public monitoring system means enhanced accountability for all team members, which in turn increases motivation to complete the task.

At the forefront of Cubits is public goal monitoring. The main idea of Cubits is to make all work public to encourage employees to better understand the workings of the team and to better contribute to the overall group output.

PERSUASIVE TECHNOLOGIES

Influencing behaviour using computers requires an exploration into the research area of persuasive technologies. Design a persuasive technology comes with a larger set of problems that needed to be accounted for and addressed.

Xu et al. (2018) explores strategies in which to account for long known issues when designing for persuasive technology. The first of which is to ensure compatibility with current technologies. Secondly, ensure that specialised and individual needs are met. Finally, ensure the design captures the full scope of the user's lifestyle. Cubits harness emotional design to influence employees to be more mindful of deadlines.

Plass et al. (2014) explored the relationship between emotional design and education. They discovered two things: designing for emotional design can induce positive emotions and in turn facilitate comprehension and learning, and that round face-like objects and warm colours induced positive emotions, either independently or combined.
These findings are further explored in Cubits to see if those finding can be applied to a work-based environment, rather than an education environment.

OFFICE WORK

Cubits aims to solve problems that have long been issues in the workplace. A study from Salesforce found that 89% of employees and CEOs cited lack of collaboration and ineffective communication as the source of workplace failures (Stein, 2012). When team members do not communicate with each other, the unspoken issues become larger and larger problems. Lack of communication has been the source of many teamwork failures.

Cubits also needs to be mindful of the environment it is placed into. If Cubits does not account for the subtleties of teamwork and work culture, it would lack a suitable adoption rate from the industry. Treude (2009) explored how software developer utilise tagging as a way to communicate informally with other team members: “While there are many formal processes in place for technical artefacts, managing social

artefacts is only supported by informal processes" (Treude, 2009). Therefore, open-ended interactions are key to enhancing the adoption rate of Cubits.

Individual Contributions

This section outlines my personal contribution to the group output.

DESIGN

It was required that very group member participate in weekly brainstorming sessions. We would come up with new ideas to solve our underlying problems. This would happen weekly to respond to changes in user feedback or development issues. In the design phase, I had the idea to make the interactions open-ended by drawing on the cubes with a whiteboard marker to account for information methods of communication. I also had the idea to have an automatic timer to track the progress of each task. These ideas were incorporated into the final product.

I conducted an ethnographic study in my own work environment. This involved taking a notebook to work meetings and my desk to take notes of any observations I make with regards to task allocation, task negotiation, and goal monitoring. I found that tasks are generally decided upon in advance, and that the assignment of tasks are agreed upon based on skill level. These observations were taken into consideration in the design of Cubits.

I constructed a handful of survey questions to allow for 3rd parties to participate in the designing process. It was important that the sounds, colours, and faces of the cubes were constructed so that maximum productivity ensues. I gave the task of conducting the usability tests to other people, as this was not my main focus as a group member.

DEVELOPMENT

One of the issues encountered when developing the idea was accounting for the changing locations of each cube. If someone takes a cube away, there would be no way in which other team members would know where the cube has gone. They may not even know which exact cube is gone, nor the assignment to which person. There needed to be a way in which users can track the status of cubes beyond the shelf.

As the team member with the most experience in web development, creating a web-based live feed which tracks the task name, statuses, and locations for each cube

was my primary task. I developed the live feed as one single web page with hard-coded task names as placeholders for real cube tasks. Cubes would cycle through various stages, such as when the user takes a cube off the platform, and when a user completes a task on the cube. These stages would cycle through with the help of key presses for simplicity of development and debugging.

The live feed requires communication from the cubes and RFID readers to function correctly. I utilised the TCP protocol to send signals from the cube to the live feed with any status updates, and from the RFID readers to the live feed of any new assignments to particular cubes. The live feed updates accordingly to synchronise with the displays of each cube.

When a user places a cube on a platform, there needs to be a way in which the cube becomes assigned to them. We had at our disposal several RFID readers named 'PhidgetRFID' and accompanying circular tags which the RFID readers read and uniquely identify. I took PhidgetRFID's control panel which displays which tag is being read and modified it such that when it reads a particular tag, it connects to the live feed as a client via the TCP protocol and sends a predefined string identifying which the placement of which cube and what platform is reading it. The PC running the live feed reads these messages and translates them into key presses. These key presses provide the relevant feedback for the user's interaction with the cubes.

As the only member of the group which has worked with embedded computer systems, I helped program the cubes to work with the screens, the platforms, and the colour LEDs. Choosing hardware, managing the hardware budget, and wiring the hardware together was left up to other group members. It was my sole job to ensure that all of the hardware accessories worked together and was up to standard for the exhibit.

CRAFTING

I provided some assistance with the crafting of the cubes, shelf, and platforms. I worked with another group member to devise strategies for constructing each part of the system.

I personally selected a pre-built shelf that would be the basis of how the product looks and operates. I adjusted the live feed UI to match the dimensions of the shelf. To implement the feature of a cube updating its status based on if it is placed on the shelf or not. I suggested that we have exposed wires at the bottom of the cube

which the circuit completes when placed on a platform. This was a novel way of checking for a cube's status, which gave us time to focus on other areas.

Evaluation

After we developed the product, we needed a way in which to measure how the product manages to address the underlying research questions.

The UQ Interaction Design Exhibit served as a way to showcase Cubits to a broader audience. The trouble with the Interaction Design Exhibit is that the environment is not suitable as a representation of the typical context Cubits would be placed. A work environment is quiet, calm, and formal. It requires that employees build professional relationships to ensure a healthy working environment. An exhibit environment is loud, energetic and mostly informal. Most exhibit visitors will use the product for a short period before moving on to the next installation. A useful aspect of the exhibit is that many visitors are those who work on industry projects, so their insights on the problem space were very intriguing.

There were two ways in which feedback was collected. One is through hand-written observations. I used hand-written observations to get a holistic view of the performance of the product. To learn about the performance of specific metrics, we handed out survey forms for those who are interested in the product can fill in.

Cubits received positive informal comments by those passing by. Comments ranged from being "innovative" to "useful for daughter". One visitor even encouraged to look into production costs to mass producing Cubits for real use. Reactions were positive for the emotional design incorporated into the product. Visitors said that they were "cute" and was "a better way to tell the time limit". Others said that it was satisfying to see the cubes go to sleep once users complete more tasks.

Visitors were inclined to do a task to see how they fare when up against a time limit to complete their work. Participants ranged from kids right up to leaders of software companies. Visitors reacted strongly when their task cube colours turned orange to red. The time limit and the social cues meant that users were more inclined to complete the task and become more efficient with their workflow.

Survey feedback collected in the exhibit ended up being superficial. Because most visitors only had around one to two minutes to spare, they felt that it was cumbersome to fill out a form. Short attention spans were coupled with the fact that the

feedback form required that you complete one of the other tasks before filling in the survey with their overall impressions. We collected four fully completed feedback forms in total. All four of them stated that cubits helped them to become more productive. Only two of the four reported that they collaborated with others to get their work done faster.

Conclusion

Results from the exhibit were mixed. Users responded positively to the way that the sounds, colours, and faces influenced the way in which they viewed their tasks. I attribute this to the surveys conducted early on in the design process. What was less successful was how the product encourages users to work together to complete the task. I feel that the strategies to increase collaboration and communication were too subtle. There needed to be more explicit ways to foster more interplay between employees, as working alone on tasks has become engrained in our work ethics for so long.

But I would still consider the product a success based on the fact the goal of the product was not to enforce collaboration or communication but to increase productivity in the workforce. Collaboration and communication are merely strategies to take to elicit more motivation in employees. The success of the emotional design techniques and the public monitoring of goals proves that current task management software like Trello and Visual Studio Team Services have much more potential to motivate users to do better work. The most significant issue to the success of the product would be to convince workplaces to overhaul their current workflows and try something new. Solving these issues would need further exploration of work environments and perhaps would need to be done on a case-by-case basis.

As a tool for increasing work output, Cubits have succeeded.

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