

ROBOTICS AND AUTOMATION IN MODERN WORKPLACES

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ABSTRACT

In this paper, I will describe the experiences of employees working in automated environments and express my concern on developing machine/technology dependency.

Keywords

Automation, robotics, co-experience design.

1. INTRODUCTION

Many people are fascinated by technologies and the opportunities they give us in our daily life. The aim of this paper is to warn designers of the possible consequences of implementing technologies in every sphere of our life. The paper describes findings of the design specialization course "Exploring co-experience". The work is done by three IT Product Design Students at the University of Southern Denmark. The paper contains author's personal point of view in relation to findings.

2. CO-EXPERIENCE DESIGN

In January 2012 I took part in a design specialization course called "Exploring co-experience". This project is a part of "Sterilcentral Project" which is done in collaboration with five public hospitals in Denmark, Xperience Design Group of the University of Southern Denmark and Robocluster - a Danish innovation network within robotics and automation. We focused on the sterile ward of the Sønderborg Hospital. One of our aims was to explore how staff at the sterilization ward would experience future automation and robots at their working place. In order to get a better understanding of what happens when automation and robots "come to power", our group visited two Danish factories. One of them was Hartmann, which is a producer of egg-boxes and another one was Sauer-Danfoss, which produces steering units. Both companies are highly automatized and also use robots in their production.

In general, both positive and negative reactions were expressed in relation to automation and implementation of robots at all working places. At the factories, attitudes of the interviewees can be described as more positive. However, it needs to be taken into consideration that interviewees at the factories were selected by the management of these factories, who favor automation.

From the employer's point of view automation is a positive phenomenon, since it reduces both the costs of production and of the final product. When machines and robots are in use, an employer does not need so many workers anymore, so by firing them, costs can be diminished. As the production in both Hartman and Sauer-Danfoss got more automatized, a lot of employees got fired. Sønderborg Municipality would like to introduce more automation at hospitals for the same reason: they would like to cut down their costs.

For factory employees who "survived" the automation, physical working conditions became better, because the amount of physical work was considerably reduced. These employees also found the new conditions more challenging and interesting, because their job changed to troubleshooting machine failures instead of just "pressing a button" on a machine.

However, there is also a downside of automation and employing robots in modern workplaces. For instance, a senior factory worker we interviewed said that there used to be more communication between employees when there were more of them and they were located not far from each other. He feels frustration because now they have fewer workers, more working press and less time for communication.

During our first visit of the serialization ward, we had made an attempt to understand the whole process of sterilization. This was done by using both interview with the chief nurse and by our observations. We've also mapped out the touch points of nurses in different areas. We got a lot of impressions from this visit, that could be used for achieving another goal we had set for us: to explore what kind of mock-ups are possible in early stages of designing co-experience. Our impressions were transformed into a mock-up that can be called guillotine.



Figure 1. Mock-up "guillotine"

This mock-up helped us to explore some ideas we had gotten during our observation of the whole sterilization process. We wondered what kind of feedback – visual, sound or tactile - would be the most appropriate when one nurse is about to receive instruments, for example, at the conveyor-belt.



Figure 2. A nurse is receiving a package at the conveyor belt.

We chose the "guillotine" mock-up, because it can be adjusted to show only hands of a nurse or only her head or both. We used the mock-up in our workshop with four nurses of the sterilization ward.

3. WORKSHOP AT THE STERILE WARD

A workshop we conducted consisted of the staff from the Sønderborg Hospital's sterile ward. This workshop was based on a future scenario which takes part in the "Stericentral Project", provided by PhD student Jesper Legaard Jensen and also briefly described below. We were aiming at finding out how the staff of the sterilization ward would feel like, when the process of serialization becomes more automated than now. Another aim for the workshop was the co-design of the working space.

The workshop was conducted by three students of the University of Southern Denmark. To create the workshop, we presented Jesper Legaard Jensen's concept of the star-shaped packaging station and a map of the future scenario that we also explained to the personnel during the workshop. We used different cards when creating a mood-board of the future scenario and a simple sketch of the conveyor belt – this way we designed an ideal work station placement.

In order to understand future scenario, one needs to know about the present process of the serialization. Currently there are about twelve sterilizing nurses doing the job of sorting the tools out, setting them into the washing machine, checking, packing and setting tools into autoclave. During our visit to the serialization ward, we observed that at some points of this process they needed to communicate to each other or get a possibility for small-talk.

In the future scenario, the first person in the process - porter - can be eliminated, because there would be an automated delivery system. So, the tools are delivered automatically to the pre-wash area where they are sorted out and inspected by nurse. The next steps - receiving the tools after wash, inspecting and assembling and packaging - can be all done by one person that is separated from the first person in the pre-wash area by a glass wall. The last step - autoclave - would be fully automated in the new scenario. The map of the new scenario can be seen here.

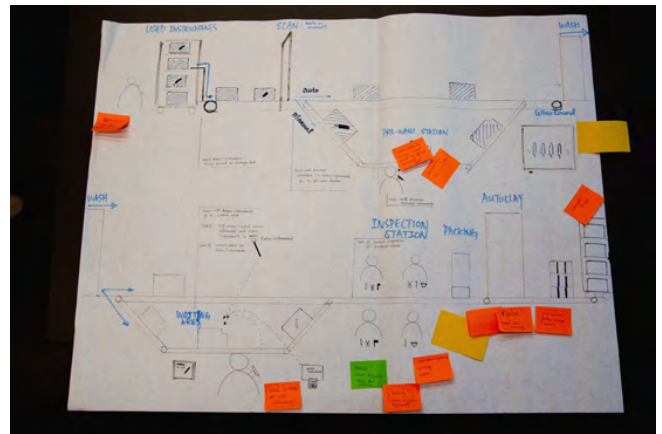


Figure 3. Future scenario map with comments of the personnel

Presented to this scenario, the staff expressed their fear towards the possibility of being fired. Indeed, about ten nurses would lose their job with the use of this new scenario.

Another concern was that if machinery takes over too many of their tasks, their job can become boring and not motivating.

Staff also said that they would miss the face-to-face communication, and that they would feel lonely. On the other hand, the staff was positive about the improved ergonomics at their working place, because the movements they would have to make during work would be taken to a minimum.

Currently, the sterilization ward at Sønderborg Hospital has a half-automated system, including software where staff can register a tool and track it throughout sterilization process. However, during our visit to the sterilization ward, the chief nurse said they had a failure of the system once and as a result of this failure all the work had to be stopped. In the proposed future scenario, the situation would not be improved: there would be a huge dependency on the system, which would mean that work cannot be done when the system is down.

I think that designers have to be very careful when designing systems like this. Ideally, the sterilization-process should be possible even if the system is down, because we are talking about the instruments that are used for operating patients.

In general, I think that any kind of technological development creates a society that is dependable on the machines and technology. We need to be very careful and think of the implications of the things we design, including ethic significance.

I have attempted to find some academic articles related to design of co-experience and the experiences with automation and robots.

I could not find any information with the discussion of the downsides of the automation and implementation of robots.

A striking example is the article "Robovie- IV: A robot enhances experience", where the authors discuss what characteristics a perfect robot should possess. It should be like a human, being able to remember people and express emotions. The authors have been aiming at creating an ubiquitous medium that gives some information about a particular experience just as web, newspapers

and TV do. However, the authors do not give any account about the feelings of people who have interacted with the robot.

In the *Robotica* magazine, some articles about robots used in the health care can be found. For example, Issue 2, 2010 is a special edition, titled *surgical Robotics: System Development, Application Study & Performance Analysis*.

In addition, an article on the similar topic is freely available online and called *Development of robotics for rehabilitation therapy: The Palo Alto VA/Stanford experience*. Neither this or one of the articles in *Robotica* give any account on what patients and health care personnel are feeling when concerning the use of robots and how they experience the use of technology. For example, it would be very interesting to find out, how the patients would react to finding out that they would be operated by a robot.

All in all, I think that many designers nowadays create more dependency on the new technologies without thinking carefully about the implications of their designs. I think we need to discuss

the downsides of the new technologies along with their positive sides.

4. REFERENCES

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