Experience design for forklift e-learning tool

Abstract
Experience-driven design is a product design approach that takes a specific experience as the basis for design. We used this approach on a 9-week master’s level course where metal industry companies gave exercises for students of industrial design. In this paper, we report one of these exercises that focused on an e-learning tool for beginner forklift truck drivers. We describe the process of setting user experience targets, the features invented to address the targets, and the challenges faced in evaluating a paper prototype of the e-learning application against the user experience targets.

Author Keywords
Experience design, user experience, UX target, industrial context, e-learning, forklift truck

Introduction
According to Hekkert et al., experience design takes an intended user experience (UX) as the primary objective of a design process, focusing on the experiential rather than utilitarian aspects of the product or service being designed [4]. Experience design has recently raised interest [1],[2],[7], but examples of design cases in which an experience would have been taken as a starting point of design are still rare. In this paper, we describe a case study of applying experience-driven
design in designing an e-learning tool, Driver’s Academy (DA), for those who need to learn driving a forklift truck.

**Design approach**
Experience-driven design involves at least two important challenges. According to Desmet and Schifferstein, the first is to determine what experience to aim for, and the second is to design something that is expected to evoke that experience [2]. We tackled these challenges in a 9-week student project, where teams of 2 to 3 industrial design master’s students took a real-life design case from metal and engineering industry companies and aimed to produce a lo-fi prototype of the design concept, UX of which could be evaluated in the end. The task in the present case was to give a better and autonomous forklift driving education for the beginners and shorten their learning curve in becoming professional drivers. The e-learning tool would run on the smallish screen right in the forklift cabin, so the trainee could follow the training and actually operate the forklift at the same time. One team of two students (the 2nd and 3rd authors in this paper) took this challenge. The 1st author was in charge of the course.

**Defining UX targets**
As an inspiration to setting the UX targets for design we used the list of 10 psychological needs by Sheldon [6] since Hassenzahl et al. show that experiences with technology can be categorized by the primary need they fulfill [4]. After examining the literature and the current procedures on forklift driver training, the team chose Autonomy, Pleasure and Stimulation as the UX targets (or goals). Autonomy would mean that the system gives the trainee a feeling of independence in the learning process, since having a senior colleague as a teacher (often as an extra task in his daily work) might put too much pressure on them. Pleasure and stimulation would mean that trainees would be engaged by the training tool and keep on developing.

The first visit to a real environment, a warehouse operating with tens of forklifts, took place during the second week of the study. Interviews with two experienced drivers, who also teach the beginners at the company, revealed that safety is an important factor for the beginner drivers. It is very easy to cause an accident with serious consequences if the basics of safety are not learned. Another challenge in learning is that beginners don’t know if they do the tasks correctly. This makes them feel insecure and the first weeks might be very stressful. Some might advance too quickly and they become over-confident, which might lead to further accidents. Based on these interviews, the UX targets were updated to Competence, Security and Stimulation.

According to Sheldon et al., Competence-effectance means feeling very capable and effective in one’s actions rather than feeling incompetent or ineffective. Security-control is about feeling safe and in control of one’s life rather than feeling uncertain and threatened by the circumstances. Pleasure-stimulation is defined as feeling that one gets plenty of enjoyment and pleasure rather than feeling bored and understimulated by life [6]. By stimulation, we emphasized the system’s ability to encourage or arouse user’s interest or enthusiasm in learning more.

1 http://oxforddictionaries.com/definition/english/stimulate
Addressing the UX targets in design

After setting the above UX targets, the team started the actual design of the Driver’s Academy e-learning tool. To address the Competence target, the team needed to balance the feeling of incompetence and the feeling of being more competent than one actually is. The team designed a self-evaluation system that gives the beginner driver the power to decide how successfully the task was completed. The system rewards the driver but also lets him/her know what could have been done better.

![Figure 1. Self-evaluation addresses the Competence target.](image)

The initial UX target Autonomy was replaced by Security, because the interviews revealed that the trainees often value human teacher because of security, as opposed to the autonomy that the e-learning tool provides. The design aimed at strengthening the feeling of being looked after even without a human teacher by providing a virtual eye that “follows” the driver while practicing and gives feedback with natural language (Fig. 1 and 2, bottom). Security was also addressed by preparing the steps in the e-learning tool so that the driver advances step by step (on the left of Fig. 1), letting the driver practice each step as long as needed to feel safe (Try again and Continue buttons of Fig. 1).

To address the Stimulation target, the team provided the driver new challenges along the way and structured the process so that each phase was a step towards the most difficult task. After completing a task the driver was given a grade showing how well he/she did, and a progress bar to communicate the advancement on the number of steps taken and left (Fig. 2). One might choose to advance faster, or aim at a higher score by practicing the same steps again.

![Figure 2. Feedback and progress indication addresses the Stimulation target.](image)

The team felt that 3 UX targets was a good number of targets. As can be seen from the features, one feature often addresses multiple UX targets.
Evaluating the design against the UX targets

The proposed design was evaluated with 1 beginner driver, 3 experienced drivers, 1 manufacturer representative, and 5 students of industrial design (students had no prior experience with driving a forklift truck). The user interface (UI) designs for each step were shown on paper to the participants and participants’ comments were collected while going through the design. After the UI walkthrough the participants filled in an evaluation questionnaire and were interviewed about the reasoning behind their questionnaire ratings.

The questionnaire consisted of 10 statements adjusted to fit the three UX targets in the domain area. Participants rated their agreement with each statement with a 7-point Likert scale.

SECURITY
• I feel that beginners could start the learning process safely from the beginning with the DA
• I would feel secure practicing with the DA
• I feel that I could trust the instructions of DA
• I feel that the structured division of the DA makes the learning process safe and understandable
• I feel that the DA could offer a safe and independent learning process for the beginner drivers in the smaller warehouses

COMPETENCE
• I feel that I could evaluate my skills honestly and not skip steps too fast
• I feel that I could work independently after the DA
• I feel that the DA could offer the drivers enough information to complete their tasks

STIMULATION
• I would want to learn with DA and find it engaging
• I feel that unlocking the goals and following your progress make the learning more rewarding

The participants gave mixed feedback regarding the concept. Inexperienced participants (the beginner driver and the students) seemed to be more stimulated and engaged with the DA than the 3 experienced participants. The experienced participants preferred the human teacher and did not think the security target could be reached with an e-learning tool. However, DA-aided learning was seen to provide better security than learning completely alone.

Challenged faced

The team faced the biggest challenges in the evaluation phase, this is why we cannot report detailed results from the final evaluation. On one hand, detailed UI designs provoked many detailed comments regarding the ease of use of the tool. On the other hand, because the UI design was not working on the display of a real forklift truck, it was hard for the participants to imagine how they would experience DA in real life. This suggests that when the concept is too immature to be used in real context, detailed UI designs might not be the best way to collect feedback on the experiential aspects.

Regarding the best format for evaluating experiential aspects of an early prototype, Buchenau and Fulton Suri discuss the means for Experience Prototyping and UX evaluation [1]. They present several cases in which hardware designs were evaluated in real contexts of use. In our case, the design was for an intangible software application, and we did not have the time and
resources to run a longer-term field study (there was only one week for planning, executing, and analyzing the UX evaluation study). We hope future research helps us in finding the best way to gather quick UX feedback for software concept ideas.

Conclusions
We described an experience-driven design case of an e-learning tool for beginner forklift drivers. We took UX targets as the starting point for the design, and tested if a prototype could address the UX targets set. The initial three UX targets were chosen from the list of 10 psychological needs [6], and updated after interviewing experienced drivers who also teach newcomers to drive a forklift.

UX targets helped in inventing experiential features to the given concept idea, but it turned out to be difficult to evaluate the UI design against the UX targets. We learned that a walkthrough of detailed UI designs brings up comments mostly on the ease of use and the correctness of the content rather than on the experience potential of the design. It is important, however, to test the design ideas before investing a lot of resources into implementation, so we are looking for better representations for describing early prototypes of experiential software applications to UX study participants.

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References