MOOC on Human Factors in User Interface Design

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1. Introduction

This case study describes the development of the first MOOC addressing Human Factors in User Interface Design. A massive open online course (MOOC) is a model for delivering learning content online to any person, who wants to take a course, with no limit on attendance (Royce, 1970). MOOC provides interactive user forums that help build a community for students, professors, and teaching assistants. It is a recent development in distance education, which emerged in 2012. To promote reuse and remixing of resources early MOOCs often emphasized open access features, such as connectivism and open licensing of content, structure and learning goals. Some later MOOCs used closed licenses for their course materials while maintaining free access for students. MOOC courses are listed at https://www.mooc-list.com/.

The purpose of this course was to give an overview of Human Factors Engineering and Ergonomics (HFE). In HFE a systematic, interdisciplinary approach is necessary for design and analysis. Interdisciplinary knowledge from Psychology and Engineering are required in human factors design: to formulate systems goals; to understand the functional requirements; to design a new system; to analyse a system; and to implement the system (Helander, 2006).

1.1 Project Organization

Several leading institutions of higher learning have embarked on MOOC. The Nanyang Technological University in Singapore initiated a MOOC on Human Factors in User Interface Design as an elective for the undergraduates in Year 4 of the Computer Engineering program. A small production team was involved in the creation and production. The course content was authored and produced by Dr. Halimahtun Mohd Khalid, and the course was delivered by Professor Martin Helander. The course video was developed by Mr. Daniel Bob. The evaluation of the course was organized by Associate Professor Dr. Miao Chun Yan. Graduate students and researchers of the LILY Centre in Active Living for the Elderly, and students of Computer Engineering Faculty participated in the evaluation.

1.2 Coverage

The course first introduced the concept and field of Human Factors or Ergonomics, which addresses design for people. As users of products, systems and environments users perform a variety of tasks. Some tasks are well designed and easy to perform. But users rarely take note of good design, because the work task flows well and there is no reason to stop and hesitate what was just done. However, we do take notice of poor information design. This is because the information may be misleading or may cause user errors so that we have to do the task over again.

User centred design considers the abilities of people and the goal is to minimize the effects of human limitations. Rather than forcing users to do a task, user centred design will guide users along so that they will complete the task to their satisfaction. At the same time we consider the capabilities of users with the purpose to create a task environment that is enriching and satisfying (Helander, Landauer and Prabhu, 1997).

By applying human factors knowledge and best practices in the design of user interfaces, the products will be easier to use, and task performance will be more satisfying. These are the hallmarks of efficient design. Human factors practitioners have the required knowledge to design products, systems and environments, so that they operate safely, effectively and satisfactorily.
This course on human factors of user interface design is intended to impart knowledge and skills for applications in various application domains. The topics are grouped under 5 major headings:

- **Know the User** in terms of human cognition and visual system as well as anthropometry and biomechanics.
- **Know the Task** in relation to skills required, task design, and training.
- **Know the Technology** concerning input and output devices, and interaction design.
- **Know the Process** in relation to usable design and methods.
- **Know the Environment** in terms of physical and organizational characteristics.

Several examples of human factors models, methods, and principles were presented to enable learners apply Human Factors and Ergonomics Design in their everyday encounter with products, systems and environments.

### 1.2 Project Phases

We will present MOOC development in four phases: Content creation, Production, Course review to Publication.

#### 1.2.1. Content creation

The content was authored by the producer who prepared scripts in Microsoft power point to illustrate the organization of content and flow of material. Images were used as placeholders for the animator to create animations and graphics. An example of the script is shown in Figure 1.

![Figure 1. MOOC Script for Learning Unit 1 on “Introduction to Human Factors and Ergonomics”](image)

#### 1.2.2. Production

The production involved several steps: (1) setting up recording equipment, comprising a laptop, text prompter, and video camera; (2) reading the script by the actor; (3) design, production and integration of the videos by the developer; (4) review of the videos by the producer and actor; and (5) redesign of the material by the developer. Figure 2 shows some sequences of a completed video based on the script illustrated in Figure 1.
1.2.3. Course Review
Researchers and students from the School of Computer Engineering reviewed the videos and their feedback were summarised in Figure 3a General Comments and Figure 3b Specific Comments.

**General comments**
1. Is it “Human Factors” or “Human Factor”? Both seem to be used interchangeably in the slides.
2. It would be good to standardize the videos. Each video should have an introduction, should mention the learning points, and should contain a summary/conclusion.
3. Most videos are too long. It would be ideal to split them so that each video is 5-10 minutes long. Otherwise, it’s hard to focus for 20-30 minutes at a time.
4. It would be ideal to have optional subtitles so that people can follow what Prof Helander is saying more easily.
5. Diagrams and tables presented in videos need to be fully explained. It is not sufficient to simply mention “Here is a table that contains XYZ.” Elements that are not fully explained should be removed.
6. Tables that require a scrolling effect so that their whole content can be shown are too long and should therefore not be placed in a video.
7. No clue shows that there are several videos in one lesson. If I do not know the total time of each lesson, I will watch only one video in one lesson and miss all the others certainly. Furthermore, I have no chance to know this mistake.
8. Titles of each video can be added into the catalog. E.g. Lesson 3 Anthropometry and biomechanics: Lecture 1. Work risk factors and posture. And this whole title should be shown on the screen in each video. Or we can try to add one slide in front of each video to introduce it.

Figure 3a. General Comments
Specific comments

Lesson 1 (Introduction to human factors design)

Video 1.1 (Interfaces and human factors)

1.1.1. [1:50] Prof Helander says “Active Aging for the Elderly” instead of “Active Living for the Elderly”

1.1.2. [2:00] Is the textbook necessary for the MOOC? In most MOOCs, there is a recommended textbook but it’s not required to be able to follow the course.

1.1.3. [3:05] Threatening people of logging them out of the system if they do not answer all the quiz questions may not be very conducive for the students. In a MOOC, people have different learning goals, and not everyone may be interested in doing the assignments, quizzes, etc. A MOOC should be flexible enough to accommodate all kinds of students and participants. There is also a question as to whether it is technically feasible for users to log people out of the system based on their quiz results.

1.1.4. [5:23] Despite the fact that its name is hidden, the ‘bad design’ phone is easily recognizable as a Blackberry (we can see the logo). This may cause some legal issues.

Figure 3b. Specific Comments

Based on the feedback the videos and content were revised. The modifications are not yet finished; the finished product is expected in 2016.

1.2.4. Publication

Once the product is approved, the course will be published on a platform that is compatible with the requirements of Udacity, https://www.udacity.com

2. Conclusion

Through this MOOC development we demonstrated that it is possible to develop a low-cost production that does not compromise quality. Learning via MOOC is intended to reach a wide audience. In this way more people can acquire human factors knowledge directly from the experts.

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References

