Privacy Quiz - Final Report, Group 7

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1 Introduction

Ethics is a challenge many young professionals face in the business world. In order to be able to make a sound judgment when faced with a moral dilemma, professionals should be able to reason logically and take into account the various aspects of the dilemma, including future consequences. The importance of teaching ethics is therefore clearly not negligible, yet it is something that is usually ignored, especially in engineering courses. In order to tackle teaching engineer and science ethics, various teaching tools can be developed and used. Our goal was to find/develop one that is effective and could actually be used to teach privacy ethics to university students.

2 Design Process [1]

2.1 Empathize

We were geared towards teaching privacy ethics to EPFL master students. To get a better understanding of their current situation, we did an initial empathy study. In this study we asked what they already knew about privacy and what they would like to learn about it (on an individual, company, or worldwide level). This study was done as an open interview, which gave a lot of flexibility to the interviewee to express his/her ideas and opinions. Given the type of empathy study, no statistics were done. The point of the study was to get a feel for our users and to understand the fundamental needs to be addressed. The main take away was that the majority of the students interviewed knew very little about privacy in general, except for the computer science majors who have had some courses on it. However, the majority said that they would be interested in learning more, especially in terms of company privacy.
Along with this empathy study, we also did a literature review to see what difficulties are faced in general when teaching engineering ethics and what tools are already available. The main difficulties we found were the motivation of the students, the combining of ethics - a social science - with hard technical sciences, the unawareness of privacy issues of most students, and the limited number of methods and materials available for teaching engineering ethics.
Both the initial empathy study and the literature review are discussed in greater detail in the interim report.

2.2 Define

Having met EPFL master students, it was surprising that there is so little awareness of privacy and privacy ethics. Therefore, we decided to come up with a tool that would be interesting enough to keep the students motivated to learn about ethics and easy enough to be used and integrated into any university classroom.

2.3 Ideate

During our brainstorming meeting, we discussed multiple different tools that would fit our requirements. We talked about doing a quiz on general privacy knowledge, a quiz on moral dilemmas, user-generated case studies, regular case studies followed by a discussion, and a story-line. Results from the initial empathy study helped narrow down our choices. The story-line was the one that was preferred since it came off as the most interesting. The student-generated case studies were ruled out since it seemed very difficult for students with little to no background in privacy to come up with their own case studies. Our ideas therefore converged to a quiz, but the format was still left undefined. Should the quiz be quick questions with a concrete answer such as questions about the law relating to privacy? Should it be various short case studies? Or more complex case studies? Should the students come up with their own case studies? Should it be a story-line? Or a combination of multiple formats?
The results of our initial empathy study gave us some basic criteria our quiz should fulfill. Knowing that the users have no background in privacy ethics meant that, on the one hand the information on the quiz has to remain basic and simple enough to not overload the cognitive load of the users, and on the other hand, there are practically no prior misconceptions that the users need to unlearn first. To keep the users motivated to complete the quiz, the questions should remain relatively short and the scenarios plausible to the students' future lives. Having the scenarios relate directly to the field of engineering also helps with the mixing of social and technical sciences. Most importantly, to keep the quiz usable as a teaching tool, it has to be easy for the professors to implement.

2.4 Prototype I

We made our prototypes with the idea in mind that one variable will be tested - the format (or the mix of formats) of the questions. Three initial prototypes were developed. They are each a different combination of questions picked from a pool of six case studies and 25 short direct questions, which we accumulated from online research or came up with ourselves. Prototype A is an html document composed of a few quick questions followed by six case studies which are all interconnected through a story-line, where the user's click on an answer determines the following text. Prototype A was created using the tool Twinery and gives an idea of what the final product will look like. Prototype B is composed of five quick questions and four case studies that are independent from each other. Prototype C is composed of ten quick questions and two independent case studies. In prototypes B and C, the case studies each have two possible actions which lead to different consequences. These consequences, along with a brief explanation of the privacy issues encountered by choosing whichever action, are explained once the user selects his/her action. The purpose of these prototypes is to test in parallel the format in order to end up with a more refined product which best fits the user's needs and desires.

2.5 Test I

The three prototypes were given to 16 EPFL master students to compare. During the test, we also observed how they interacted with the questions and their general thoughts and experiences with the quiz. They were asked to express their opinions on the length of the quizzes, on how interesting the questions were, on what they learned if they did learn something, on which of the three prototypes was their favorite, on whether they will be more likely to ask themselves more ethical questions after going through the prototype, and finally if they had any suggestion or idea to improve the prototypes. We emphasised that they should rather focus on the content than on the layout, since only prototype A has a sophisticated layout, but seeing the results

the message was maybe not well understood. Indeed they all (but 2) preferred this prototype, arguing in most cases that it had a better layout.
There were 4 students in robotics, 4 in physics, 3 in communication systems, 2 in computer science, 1 in electrical engineering, 1 in mechanical engineering, and 1 in life sciences.

- Apart from 4 students that found the prototype A too long (they suggested to split the long text parts), nearly everyone else considered the length of all the prototypes acceptable (2 found prototype B and C too short, 2 found prototype C too long), and 5 of them even suggested that the length could be increased if we wanted to.
- Apart from 4 students who found that the law questions were too technical and needed too much prior knowledge, all the prototypes were qualified as interesting.
- 4 students had enough prior knowledge such that they did not learn much in some of the prototypes, and that most of the questions were too easy. All the others said they learned new things.
- Again 4 students said that they would not ask themselves more ethical questions after going through the prototypes, however 2 of them said that they will be more cautious when browsing on the internet.

Finally, we had several valuable specific recommendations and remarks which helped us to improve our material a lot on various levels. Some students even gave us new case study ideas. The general feeling that emanated from this test is that we are walking on the right path to generate an interesting and empathy sensitising story-line, which teaches some useful general privacy knowledge and fulfills our goals.

2.6 Prototype II

A second round of prototyping and testing was done, this time with one 'final prototype'. This final prototype was made using the knowledge gained from testing the three prototypes and has a similar format as prototype A (they were both made with Twinery), but more quick questions were added in the beginning and the story-line was modified using the input from the first round of prototype testing (questions with a lot of text were split over multiple slides and the outcomes of the scenario were more developed).

2.7 Test II

The final prototype was given to 11 first year EPFL master students. The intention of this round of testing was to get more in-depth feedback for detailed corrections. Of these 11 students, 4 are in computer science, 2 in physics, 2 in robotics, 1 in electrical engineering, 1 in mechanical engineering, and 1 in biological engineering. Overall the feedback was very good. They all said it was interesting and worthwhile to take as an introduction to privacy ethics. Most students gave some specific corrections (spelling mistakes, confusing wording for some questions, etc) which were directly implemented for the final product. One student found the quick questions a bit challenging. The others made no comment on the difficulty of the questions. One student said that sometimes the story ended too early (the length of the story depends on the decisions of user), but all the other students were happy with the length and found the scenarios and outcomes interesting.

3 Final Product

The final product is made using the program Twinery, which was especially created to make story-lines. The final format of the quiz was selected based on the results of the testing phases. The story starts off with a job interview, where seven quick questions (true/false or multiple choice) about privacy knowledge are asked. This is then followed by a maximum of five case studies. The number of case studies the user actually goes through depends on the choices he/she selects. There are six possible endings to the story-line. The general scheme of the story-line is shown in figure 1.

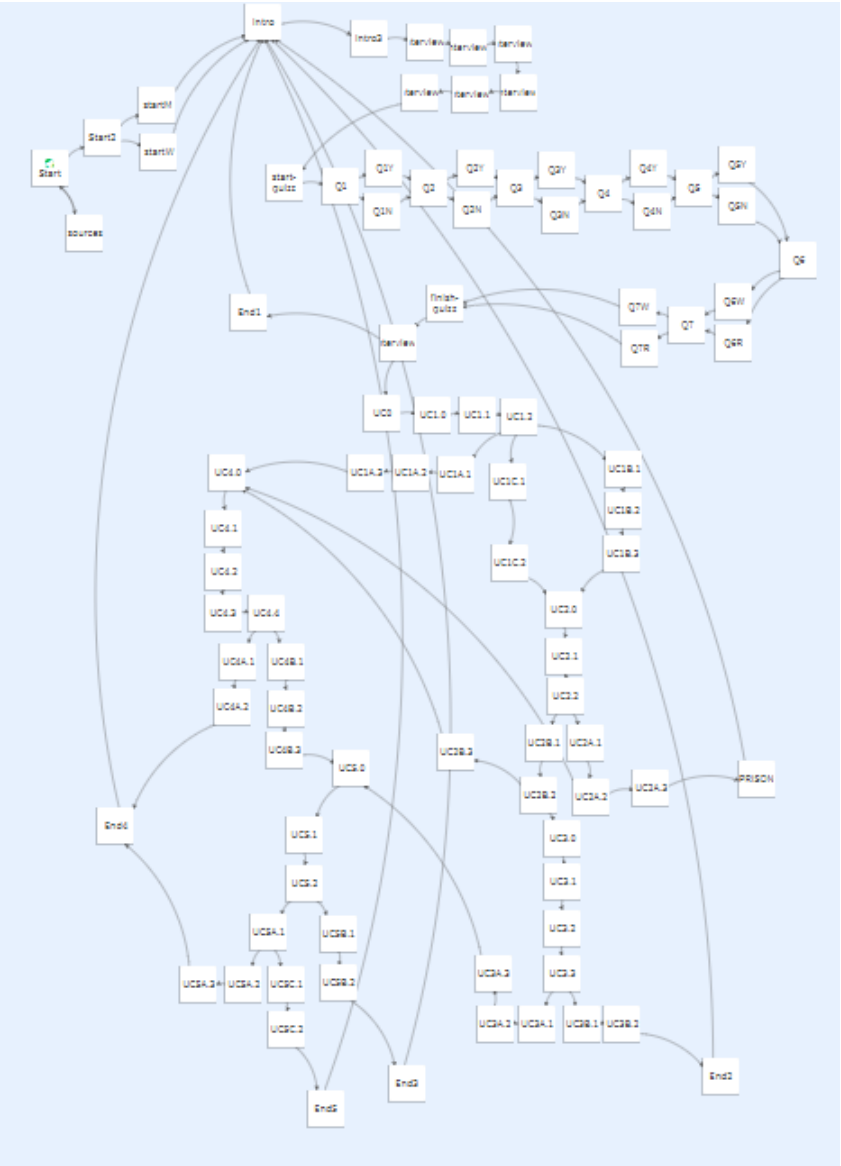

Figure 1: Story-line scheme

4 Future Development

The next logical step in future development of this teaching tool would be to do large scale testing. This testing would use the quiz in its online format, so that the users' interaction with the program can be observed. This could then be followed by a test in a classroom setting, as this is the intended use for the final product. To further develop this quiz, it could be interesting to adapt the questions for a specific course, i.e. ask a professor what sub-domain of privacy

ethics would complement his/her course. Doing so would ensure that the integration of the quiz in an actual university-level engineering course is something that can be done with ease, making the quiz usable. The quiz could potentially be accompanied by several open-ended discussion questions, which the professor can ask after the students finish the quiz. This would increase the learning efficiency, as a discussion is a type of interactive learning (the most efficient type of learning, according to the ICAP hypothesis [2]). Another important step would be to measure more accurately how much the user learns by taking the quiz. The difficulty of the questions can then be better adapted to fit the learning needs, if necessary.

5 Conclusion

A fun and interactive tool to teach ethics to engineers and scientists was developed following Stanford's design process. The tool is effective and easy to use. Integrating it into a classroom context and combing it with other already developed ethics-teaching tools would be the first step in tackling the lack of material for teaching engineering and scientific ethics in universities. Hopefully our tool will inspire others to continue investing in and developing this domain, as ethics is extremely important for future engineers and scientists.

References

[1] S. Doorley *et al.*, *Design Thinking Bootleg*, Stanford, 2018. Accessed on: 30.04.2020. https://dschool.stanford.edu/resources/design-thinking-bootleg

[2] M. Menekse *et al.*, "Differentiated Overt Learning Activities for Effective Instruction in Engineering Classrooms", *Journal of Engineering Education*, Vol. 102, No. 3, pp. 346–374, July 2013. doi: 10.1002/jee.20021