

The Use of Software in Higher Education

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On my honor as a University Student, I have neither given nor received
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INTRODUCTION

Thesis Background

As society has increased its use of technology, specifically software and the internet, people are subject to increased monitoring and companies are able to collect more and more data about you. At the same time, concerns are also increasing about what data companies are collecting and what data companies should be able to collect legally and ethically. The public has become more aware of the possibility of a data breach and the company itself using the data to target customers and are concerned about how they can prevent it from happening. The exact same pattern is happening in schools for students with educational technology. Over the last few decades, technology has become more and more prevalent in the school system—both colleges and K-12 schools. And now, with Covid-19 forcing schools to go online, the amount of technology used in all schools for all students has skyrocketed. So too has the amount of student data being collected and child monitoring software. This paper will use the Social Construction of Technology STS theory to examine the social factors that cause the use of these privacy breaching technologies.

Technical Background

Although the UVA computer science department is not specifically a software engineer training school, part of the goal is to prepare UVA students to be future well rounded software engineers. To this goal, part of that education should include a unit on the necessary regulations and ethics that go into building a piece of software. We are taught how to discover and build a product as well as how to optimize it, but regulations and ethics is also an important part of building a product. Although engineers are not the sole drivers behind a product being created, well educated engineers will build more ethical products that follow necessary regulations.

While software engineers can build any product they can imagine, the question is should they? There is a need to train future software engineers on these topics before they create things in the real world.

Thesis/Technical Implications

The software engineering students use in school will also have an impact on the future technology they build and what they think is ethical. Schools using more forms are monitoring and data collection will influence the opinions of their students about what software is morally right and wrong. The schools are sending a message about what they think is ethically acceptable, and without any source of information, students will accept that software is supposed to have increased monitoring and data collection.

TECHNICAL TOPIC

Software Privacy Laws

There are currently more and more boundaries and regulations being created around software. In the last two years in particular, the European Union has implemented a strict set of privacy laws called GDPR about usage of consumer data and California has implemented a similar set of regulations called CCPA. Carefully following these protocols when building software is a necessary step to releasing a product in either of these locations. Software is becoming increasingly global and even projects that were not initially intended for widespread use often expand beyond the creators early goals. Not including this knowledge from the start of designing your product can cause headaches down the line; in some cases you may have to spend time rebuilding or redesigning parts and in the worst case you could receive large fines or the ban of your software. This summer I worked on the Amazon Photos social features team and one engineer spent months retrofitting the product to be GDPR compliant for the European release.

He had to go back and forth with the legal team to check on the design of every feature and piece of data. Had the product been designed initially with compliance in mind, it would have been much easier and faster to release the product.

Teaching at UVA

Although the main purpose of the computer science department is to teach the fundamentals of computer science, some effort is put into preparing students to be future well-rounded software engineers. For example, the UVA CS department reaches out to industry partners to make sure students are learning languages and tools that will be useful in their careers. There are also product, business, and entrepreneurship subjects taught in classes—topics not directly related to computer science but useful in a software engineering career. Similarly, McIntire offers a course in Commercial Law to supplement students' direct business knowledge. Knowing the laws, at least the basics, that they will need to navigate will help them perform in their careers. A base of legal knowledge for CS students would help them know what to be careful of and when and how to find more information.

A survey of 4000 mostly European startups (where GDPR compliance is mandatory) found an average GDPR-readiness of 4.1 out of 10 with nearly two-thirds of companies collecting user data in a non compliant way (NetImperative, 2018). Especially for startups and new products, it is necessary to understand the rules and regulations you are building your product into. A small failure to comply could result in large fines or a public relations disaster which could be enough to kill a small company. UVA should give students the chance to at least have the knowledge the regulations exist before sending students out to make real world software. This technical project will be a design for a new unit in the UVA CS curriculum to

cover some fundamental laws that are relevant and necessary for all computer scientists and software engineers. Having some basic knowledge would give engineers an understanding of what they need to know, but more importantly the awareness and the language to search for more information.

STS TOPIC

SCOT Framework

The Social Construction of Technology (SCOT) framework can help to determine what social factors cause the adoption of technology into schools. SCOT looks at what human actions and social interactions shape a technology and its adoption into society. There are different stakeholders in every technology and the relationships between them determines how the technology will be accepted. Each social group will have different goals and needs and the relevant groups may be users and producers of the technology as well as outside social groups such as politicians.

When looking at the acceptance of technology into schools, the relevant social groups fall into four categories. They are the **users** of the technology, the **choosers** of the technology, the **makers** of the technology, and the **outside social groups** that also shape technology and influence adoption.

Category 1: Users

The users of the technology can be broken down further into the students who use the technology and the teachers who use the technology. In almost every case, if a class requires a technology to be used, the student is forced to use it if they want to participate to the fullest extent. No matter how the student feels about the privacy or data collection policy of the technology, they have no other options besides not taking the class (and even that is not possible

in many cases). The other social group that uses education technologies is teachers who may not have the same priorities as the students. Often, technology will help them run their class more efficiently through testing, participation tracking, grading and other things. This is an example of how a piece of technology can have different meanings for different social groups. They are also not entering as much personal information or being tracked by the software as much, so they may have less of a personal problem using it.

Category 2: Choosers

In some cases teachers are also in the social group of the choosers of the technology depending on the school and department policy. It may also require spending extra time or money if the teacher does decide to deviate from the school's norm. However, in other cases the choosers of the technology are the school administrations and department chairs who may or may not also be users. They set the rules about what can and cannot be used for all teachers although they may set very relaxed policies and allow teachers to make their own decisions. They have a completely different set of goals from the teachers when selecting technology. They want to please the teachers and the students to some extent with the policy they set. They also want to minimize the overall cost of the software (time, money, and other factors such as integrations with current systems) while still making sure it functions for faculty and students. Standardizing software helps students have consistency between classes but allows teachers to use what they prefer helps teachers optimize their workflow. Balancing these factors is an important factor for the adoption of a new technology in a school setting.

Category 3: Makers

The makers of the software can also be broken down into multiple sub groups—there are the engineers who build the product and there are the product team who design and market the

product. In some cases (often startups), the engineers drive the product and the decisions made but in larger companies the design is often driven by a product team, and the engineers are told what to make. In either case the engineers have an ethical responsibility to build ethical software within the rules and regulations. The sales and marketing teams objective is to get the software out to as many schools and users as possible. They have a responsibility to be truthful about the product, but their main motive is to convince school administrators and teachers to use their software in classes.

Category 4: Outside Social Groups

One of the social groups outside the education technology ecosystem with the most influence over it are politicians. Especially for public schools, the government has control over what data schools can have from students. In 1974, Congress passed FERPA, a set of regulations on educational data privacy (specifically for children under 18). Since 1974, technology has changed drastically and that set of rules does not provide comprehensive privacy protections. For example, email was not a concern of the regulators in 1974, but it was amended to include email as protected directory data in 2012 (Mendelsohn, 2012). Since then more conversations have taken place in government on how “how emerging technology in the classroom affects student privacy” (U.S. Government Publishing Office, 2015). The other outside social group is parents, especially for technology targeted towards younger children. Now more than ever as K-12 schools are moving online, parents are having more interactions with new educational technologies.

Case Studies

There are three specific pieces of education technology that have caused privacy and ethics concerns among students as well as teachers and administrators at the University level. These will be used as case studies for deeper exploration in the thesis. Examining the adoption of each of these technologies will show how the relevant social groups interacted to affect the adoption of the technology and even shape the technology itself.

Piazza is a class forum where students can ask questions to be answered by other students, TAs, and teachers. They make money by collecting student data and selling it to job recruiters. In particular, there has been pushback because it is not made directly clear to students and even teachers that this is the case (Hill, 2016). Canvas is a learning management system where teachers can post assignments and class resources for students. They have received privacy complaints because the software tracks student actions while on the site for teacher and administrator use (Vescera, 2019). ProctorU is a test proctoring software for teachers to administer tests at home and help ensure no cheating occurs. They have had issues because they record everything on your camera and computer during the exam and there have been many cases of falsely flagging students (Harwell, 2020).

In some cases, like in the case of Piazza, school administrators have the ability to shape the adoption and even the technology itself, if they feel that it doesn't provide enough privacy to their students. UC Berkeley pushed back directly against Piazza and banned it from their classes. Over time, they worked with Piazza to allow an opt out option in the software as well as keep the software free of charge (Hill, 2016). In particular, academia is a close network and pushback from one large administration will likely spread so Piazza was forced to change. Similarly, University of Toronto issued a statement recommending against the use of Piazza but leaving the

final decision up to teachers (Basilon, 2016). In this case, the interaction between two social groups, the administrators and the technology's creators, was able to shape the technology.

In the case of ProctorU, it was the administration who initially pushed the adoption of the technology as a way to prevent cheating at home. Students felt that it violated their privacy by always recording them and requiring a system level install on their personal computers. In addition, there were false positives of students cheating which were difficult to prove wrong (Harwell, 2020). However, the students' social influence at some schools was able to reverse this decision and caused some schools to stop using the software. Through the use of online platforms like change.org, students were able to group together and voice their opinions to the administration (Lawson, 2020). In these cases, the interaction between students and administrators changed how schools chose to use this software.

Conclusion

The impact of software has grown in the last few decades and with it has come a whole new set of ethical and regulatory challenges to navigate. Software engineers should leave school with a basic understanding of what those regulations are, in order to build good products. Additionally, there are many factors that influence the software used in education. Computer science students will go from users of these educational technologies to become the ones creating them in a few years. Adopting the right technology will help students continue to create ethical products in the future.

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