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Why Do Programmers do What They Do?

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Abstract

Technologies are continually adapting to match ever-changing trends, and as this occurs, new vulnerabilities are exploited by malignant attackers and can cause significant economic damage to companies. Programmers are therefore repeatedly having to expand knowledge and skills to protect software. We must understand the thinking behind the decisions and influences of programmers to interpret how they implement and adopt security practices. This proposal will cover an overview of the project 'Why Do Programmers do What They Do?', regarding the security choices programmers make, and the output of the project will ultimately present a theory on the chosen topic.

1. Introduction

The lack of security in software open businesses, clients and end-users to exploitation by external bodies. As software is now ubiquitous across industry, programmers have to ensure that the security processes that they implement are resilient to any attacks. Lack of attack prevention can cause leakage of sensitive information, massive economic damage and danger to massive numbers of users and employees.

This project will investigate how software developers implement and adopt security practices in the work they do in order to develop an understanding of what influences and impact decisions surrounding their technical work. This project will be conducted using grounded theory. Grounded theory is a method which aims to establish a theory when there is none [1]. It is a commonly used method for data analysis. Interviews will take place to collect the data, from which the answers will be analysed to draw conclusions on common security practices in the professional workplace.

2. The Problem

Qualitative research is often neglected and overlooked in favour of more quantitative reasoning and technical traits; the security method used, the programmers task-completion rate [2]. Programmers provide a human aspect to a technical solution and therefore, there should be a shift to understanding the more background 'soft' processes that occur when making decisions; why are the choices made based on past influences, and how they affect the programmers work in the present?

Past the research aspect, when issues do occur in real-world scenarios, developers are blamed first as it is their projects that have allowed the vulnerabilities to be exploited [3]. However, they do need the support to make the better security decisions and there is a lack of this in the industry [3]. Security mechanisms often have an increased complexity as well, which make them difficult to use [4].

Exploring this topic is essential as it allows for more understanding on how and why programmers think the way they do, and it builds a more robust understanding of the human and social aspects of Software Engineering [5]. The findings can also support developers in terms of education and the better design of security methods in programming [6] that have an emphasis on usability.

3. Proposed Solution

This project aims to implement a theory as to why programmers implement and adopt security practices in the work they do by interviewing professional developers and using the Grounded Theory Method to analyse the outcomes. The findings of this project can be used to identify what security methods developers find as beneficial in their programming. This will allow programmers to complete their work to a high standard, by adhering to proper security protocols, thus overall making their work of a higher value both in a secure and professional sense.

The project will be an informative investigation on understanding the decisions programmers make, therefore obtaining data from actual programmers as soon as possible is essential for the smooth running of this project; human ethics approval will be needed quickly.

When the human ethics application is approved, contact with the sample group will occur by posting on groups and mailing lists and also using supervisor contacts [4]. At this point, I can then start semi-structured interviews with 10-20 interested individuals on their security practices while programming.

These people will all be developers in varying stages of their careers and career paths to allow for a broader range of responses. Examples of appropriate job titles include; DevOps engineer, front-end security developer, database administrator and security architect.

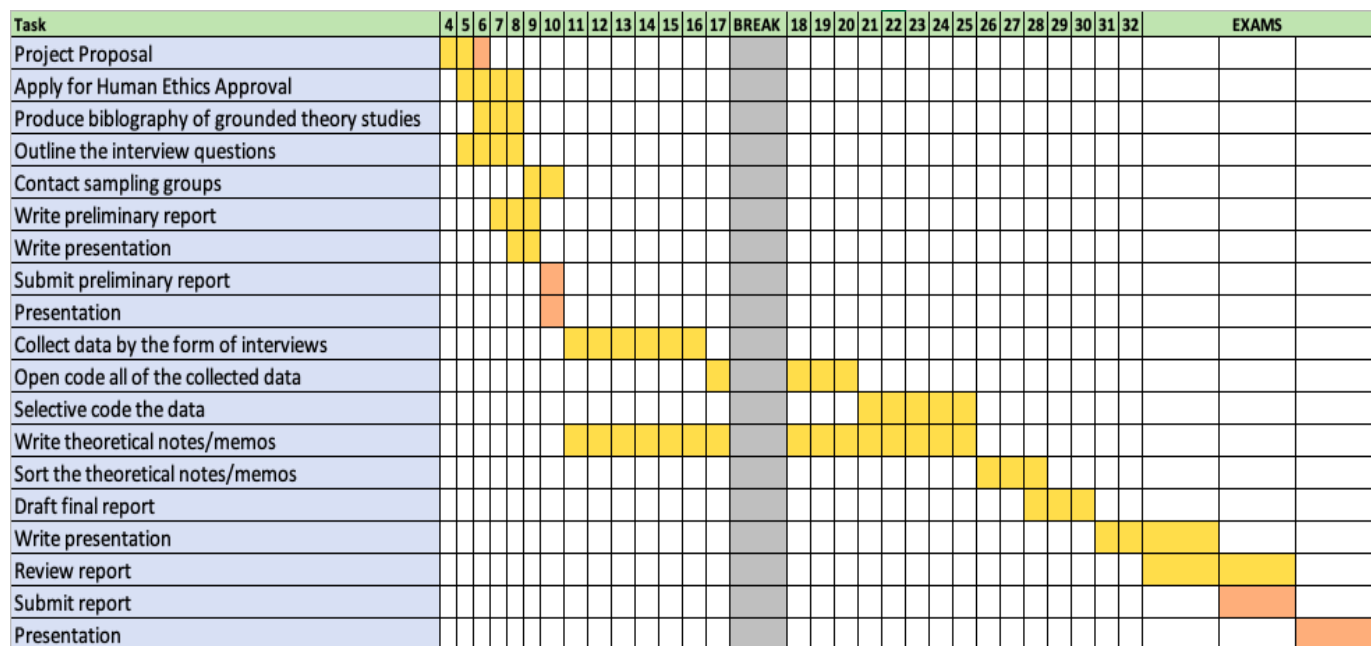
Potential questions include:

- What languages do you use?
- Are you changing languages based on what you do?
- Are you adding any specific security components?
- How are you managing security in languages; do you use libraries, toolkits and/or frameworks?
- When do you use security practices in your work; start, end or during a project?
- Do you do maintenance on security features afterwards?
- How many years experience do you have with security?
- What qualifications do you have (tertiary and industry)?
- How do you test the security features that you implement?

This project will lead to a deeper and new understanding of the psychology of the decisions made by programmers and the research done by this project could lead to future qualitative research to be done on another under-developed topic on why programmers do what they do. Paired with this research, that future one could help build a profile of a programmer and their thought processes. Data collected could also be the foundation that allows a developer to build a tool that helps other developers implement proper security practices; a Grammarly for security.

Gantt Chart of the proposed timeline:

This has been edited past the COVID-19 lockdown that New Zealand is currently under, but it does not account for any future lockdowns. If future lockdowns occur, significant impact to the workflow should not occur as this project involves a lot of research and work that can be done outside of the physical engineering and computer science (ECS) school.



The break outlined as a gap is a hesitant gap as there has been a 5 week gap on course work and a lack of communication from the wider university about the university procedures after lockdown.

4. Evaluating your Solution

There are limitations to evaluation the solution as the project does not produce a technical outcome. Pertaining to the final “coded” category from this project as the solution, finding a core group will be essential in the evaluation process. A core category is identified in every grounded theory research, and it holds the most common category that is related to the other main categories. Therefore, without a clear common subject, there is an issue with the outcomes of the research, and I will need to go back to once again find categories.

5. Ethics and Resourcing

5.1. Ethics

A human ethics application will need to be approved before any work with participants will occur. This will need to be done as soon as possible as a big portion of this project is dependent on the interviews.

The interviews will be confidential rather than anonymous as they are done in-person and to also allow for follow up questions if necessary. Participants will be welcome to leave at any time during the interview, do not have to answer any questions they do not want to and can choose to withdraw data within a week after the interview if they would like.

5.2. Safety

Interviews, should be done in safe and private environments, with all participants clear on earthquake and fire evacuation procedures relevant to their location. I will ensure that my own mental and physical wellbeing is taken into account, by mitigating any significant amounts of pressure, Repetitive Strain Injury (RSI) and migraines. Not practicing taking breaks from work will increase eye strain and encourage bad ergonomics which would case RSI and migraine issues.

For both myself, as the surveyor, and for my interviewee's, I will ensure that interviews will be taken between the times 9 am and 5 pm to support work/life balance. Due to the recent COVID-19 outbreak, I will offer Xoom interviews for those who are unable or unwilling to meet directly. For in-person interviews, I will provide a box of tissues in the room and a bottle of sanitiser.

5.3. Budget

Sanitiser and a box of tissues will be needed to promote healthy hygiene practices during in-person interviews.

All individuals who participate in the interviews will be given a \$10 supermarket voucher, and all will go into the draw to win a \$60 supermarket voucher.

Therefore, the estimated budget for this project will be approximately \$180-\$280, dependent on the number of participants and the inflated cost of sanitiser. This is within the approved course budget of \$500.

5.4. Space and Access

Access to private ECS meeting rooms on campus will be necessary. Small rooms such as CO242A and CO242B will be ideal as they are fairly private, quiet and small enough for to be comfortable locations for one-on-one interviews. University is a good location as it is close to the central business district so participants do not need to go too far out of their way.

5.5. Risks and Hazards

Risks	Likelihood	Severity	Mitigation
Participants are ill/Access to participants are limited	Moderate	Moderate	Ask many people to participate, so if someone cannot make it, the saturation of available people will allow the development cycle to continue as planned. Want the research to have 10-20 participants to interview.
COVID-19 Lockdown	High	High	Have regular video call meetings with supervisors and communicate with participants via video.
Ethics approval takes too long	Moderate	High	Start this as soon as possible to allow for any delays that revisions of the application may cause.
Underestimation of project life cycle	Moderate	High	Need to strictly timebox issues and break down tasks into reasonable blocks.
Failure to obtain relevant data	Low	High	Interview questions need to be planned and revised to ensure that they are relevant to the grounded theory question.

6. Bibliography

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