

Gender Influence in Software Engineering

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Abstract—The purpose of this extended abstract is to summarize and present my tentative plans for my master’s thesis. The thesis will explore the imbalance in gender distribution within teams, serving the purpose of developing software, by taking a closer look at how gender balance affects team quality and product quality

I. INTRODUCTION

As of today, research agrees on women being underrepresented within the fields of computer science. Some research has been conducted, however there’s still a great knowledge gap within how gender imbalance affects software engineering. With the world is becoming more and more digitalized, with a growing need for people within computing, is it possible that a lack of diversity within the developing process may affect the diversity of the developed product. This thesis will take action within the context of “IN2000: Software engineering with project work” at the Department of Informatics, a cornerstone course teaching bachelor students about agile teamwork. The course divides 250 students into teams of 6 with the instructions of developing applications based on the Oslo Meteorological Institute’s weather programming interface. The subject consists of students from three different bachelor’s programs in computer science: programming and system architecture, interaction design, and economics and management. Given this wide variety of students and disciplines, is it interesting studying how teams manage and complete the development cycle, in conjunction to varying gender distributions.

II. MOTIVATION AND RESEARCH QUESTIONS

Both in the worldwide software industry and academia, the figures agree: women are underrepresented. Where the figures vary, we can estimate that among the world’s software developers, the proportion of women is around 10 percent [1]. Despite the skewed distribution of gender, we know little about what effects the gender imbalance has on the industry. and we know even less about the impact that gender imbalance has on software development teams.

Previous research has til now focused on uncovering the extent to which gender balance affects team performance and success in software development. Other studies focus on biases and obstacles women encounter in work-life and in academia. Both types of studies have a consensus about teams developing software is benefiting from female participation. However, we

lack knowledge about how female participation benefits team quality.

Agile methodology is becoming more and more important in software development, which increases the importance of students being taught agile teamwork during their education. Many developers have their first encounter with agile software development through courses conducting teamwork, during their education, where this teamwork experience sets the tone for developers’ view of agile collaboration. This makes student teams interesting when studying developers’ experiences with agile collaboration and which characteristics affect team quality. This is because we get an insight into raw experiences, influenced by little other than a theory about agile development. Today, we have some research that finds and names characteristics of team quality in student teams (Tegelaár, 2020)(Almás, 2021).

The studies that do examine student teams and gender distribution disagree on the extent to which gender affects team quality. One study, looking at a capstone course in software development at the University of Chile, concludes that mixed-gender teams are more effective and coordinated (Marques, 2015). Tegelaár, who examines team quality in student teams at the University of Oslo, refers to results where the representation of both genders in teams does not affect the outcome of teamwork quality (Tegelaár, 2020, p42).

We, therefore, see a couple of knowledge gaps in gender distribution and teamwork. We lack knowledge about why the representation of gender affects team quality, and the difference between teams with a preponderance of men compared to women. In addition; how are the Norwegian student teams within software development affected by gender distribution compared to other nations’ student teams?

Motivated by these knowledge gaps, this master’s thesis wants to explore how gender balance affects team quality and the final product, as well as what presence the imbalance makes and what considerations students take when dealing with gender-dominated teams. More specifically, this research explores how the teamwork of Norwegian students in a capstone course on software development is affected by gender distribution.

This master’s thesis wants to contribute to the lack of knowledge and research around equality and gender distribution in agile teams, especially in Norway and around student teams, by understanding 1) whether agile teams are affected by gender distribution, 2) what characteristics are found in teams

with skewed gender distribution, contributing either negatively or positively to their team quality, and 3) how can we learn from the student's experiences?

RQ1: To what extent is the team quality of agile software development teams affected by gender distribution? RQ2: What measures and qualities do agile software development teams with skewed gender distribution have, which contribute to team quality? RQ3: What experiences do women have in agile software development teams and how can we learn from them?

By presenting a qualitative case study of the course IN2000 - Software Development with project work, at the University of Oslo, seen as a capstone course for computer science students, studying how the student teams are affected by gender distribution, as well as what characteristics the student teams have that influence the team quality seen according to with the gender distribution.

III. METHOD

This master's thesis will use qualitative and quantitative methods, compiled and designed as a case study. This methodology has been defined in many different ways, particularly varying from research field to research field. This research takes use of the definitions developed describing case studies within program development; "an empirical inquiry that draws evidence from multiple sources to examine an instance (or a small number of instances) of a killer software development phenomenon, within its real context, especially when the boundary between phenomenon and context cannot be clearly specified" (Host et al., 2012). [2]

The field of software engineering is constantly evolving in terms of both theoretical definitions and industry practices regarding agile methodology and technology, with new phenomena emerging at a breakneck speed. Case studies are therefore a fitting methodology, enabling the discovery of new contemporary phenomena in their reality-linked context. In this study, we examine the contemporary phenomenon of gender distribution within software engineering teams. In Norway, the gender distribution within computer science has undergone significant changes in recent years, with an increased percentage of women entering the field. However, this increase has yet to reach the workforce, as the entering women first enroll in university, yet to graduate. This makes student teams an interesting case when discovering the phenomena of increased gender distribution within CS. To explore this phenomenon, we define the case of student teamwork within the context of the capstone course IN2000 at the University of Oslo during the spring of 2023. By examining the role of gender distribution in student teams, we aim to provide insights into how gender distribution affects software engineering teams.

Since this thesis seeks to explore "how" questions, a case study is a suitable study design (Yin, 2003). Due to the lack of a clear hypothesis and data pertaining to the research questions, this research makes use of an imperative case study, focusing on gaining a deeper insight into people's

experience of teamwork, emphasizing subjective opinions and perspectives. [1]

IV. RESEARCH CONTEXT AND BACKGROUND

This case study explores research questions through the lens of "IN2000 - Software Engineering with Project Work" course at the University of Oslo. This course spans four semesters and is designed for bachelor's students at the Department of Informatics. Within twelve weeks, students are semi-randomly partitioned into self-governed teams of six, expected to develop an Android mobile application using Kotlin programming language and weather data from the Norwegian Meteorological Institute, all within Android Studio. While the course is mandatory for students from three different computer science disciplines, namely Programming and System Architecture, Design and User Interaction, and Digital Economy and Leadership, all students possess basic competence in informatics, including object-oriented programming in Java and Python. The course also enables interdisciplinary teams, which are comprised of students with specialized skills in programming, methods, user-driven design, leadership, and economics.

At the Department of Informatics, the proportion of female students across all bachelor's programs in 2022 was 37%. This trend is also reflected in the IN2000 course, where 34% of the total enrolled students are female, with designers comprising 49% and software developers comprising 29% of female students. Over the past five years, we observe a positive trend in the proportion of women attending informatics studies at the University of Oslo, with a slight decline in the last two years. The following table shows the proportion of women who have been granted a place and have registered attendance in computer science studies at the University of Oslo.

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