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DEPARTMENT OF EDUCATION, COMMUNICATION & LEARNING

Using Stack Overflow for Professional Learning and Practices at Work

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Thesis:	30 higher education credits
Program and/or course:	International Master's Programme in IT & Learning
Level:	Second Cycle
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Supervisor:	Alena Seredko
Examiner:	Marisa Ponti
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Abstract

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Purpose: The study aims to investigate how people discuss Stack Overflow in terms of professional learning and how they integrate Stack Overflow into their professional practices at work.

Theory: The theories used in this study are Communities of Practice and Socially Situated Learning by Jean Lave and Etienne Wenger.

Method: Semi-structured interviews were conducted for gathering data that can answer the research questions. The collected data were recorded and transcribed. The method of data analysis is thematic analysis.

Results: The results of the study revealed that professional learning is understood differently according to each participant's understanding of learning. As for integrating knowledge gained from Stack Overflow in professional practices, the results reveal that the majority of the participants have to make modifications/alterations to the code they get from Stack Overflow to fit their work projects and environment.

Foreword

I wish to express my sincere appreciation to my supervisor Alena Seredko for her continuous support and guidance, without her help I wouldn’t be done with my thesis.

I would also like to express my very profound gratitude to my parents and to my partner Hamza for always providing me with unfailing support and continuous encouragement throughout my years of study.

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1. Introduction

With the rapid technological advancements and the urge to be up to date with the latest technologies, software developers in the same sense need to be updated regularly with the new technologies and approaches (Storey et al., 2017). For this reason, software developers access a wide range of online communities for professional learning.

Professional learning is not only accessible through educational institutions but also online communities. Nowadays there are Community Question and Answering (CQA) websites which are platforms that users seek when trying to get help for answering their questions directly, like *Yahoo*, *Quora*, Stack Overflow, etc. One of the most important factors in these online communities is the participation of its members in knowledge contribution by being those who supply knowledge and those who seek knowledge i.e knowledge consumers. Without these two factors the whole process of knowledge sharing is considered incomplete (Davenport and Prusak, 1998 as cited in Phang et al., 2009). In addition, these online platforms are also called virtual communities. In research from Chen (2007), he explains how internet technology has given rise to professional virtual communities which are cyberspaces that promote knowledge exchange between their participating members. The force that drives these virtual communities is the communication and interaction between their members that results in knowledge of a specific domain being shared and hence building relationships.

The communities are accessed by professional employees that could be seeking help to solve problems at work. Regardless of the different terms used by different researchers in describing online learning communities, the main goal remains knowledge sharing between members of

a specific community, regardless of the participant's racial background, or educational position, they all share the same goal which is sharing knowledge and assisting each other.

Stack Overflow (SO) is considered to be the most well-known Q&A platform for researchers and programmers who seek knowledge about software programming-related questions. The mechanism of the platform works in a way that a user has the right to post a question or answer a question and at the same time can vote up or down an answer or a question on the platform. On SO, when a user asks or answers questions, he/she attaches a snippet of their code along with the textual description. Hence Stack Overflow is known for accumulating and saving this vast amount of knowledge (Neshati, 2017).

Fewer researchers have addressed what happens beyond online communities such as in SO. However, such studies often rely on surveys and do not provide extensive details on participants' arguments regarding different resources for professional learning, or on the specific processes of integrating resources. That is how do people use the knowledge they gained from online communities and reflect it at work. Furthermore, is it easy for people to integrate knowledge gained from SO within their work environment or there are certain aspects that must be taken into consideration before integrating them. Hence there was a research gap and therefore, I was interested in investigating how people view SO as a professional learning platform, and how they integrate SO into their professional practices at work.

1.1 Significance of the study

The large scale of SO and its pervasiveness in professional and study practices call for closer attention to how SO can be viewed as a resource for professional learning and invites a more detailed examination of how SO becomes integrated into professional practices people engage

in both in their educational and work contexts. Previous studies conducted on SO were focusing more on topics related to engagement and participation, studying comments, etc (Zagalsky et al., 2017; Zhang et al., 2021). Less attention was given to studying professional learning and how users of SO integrate what they acquire from SO into their professional practices (environment) therefore, this research paper aims at shedding light on these areas.

1.2 Research questions

The research questions (RQ) are as follows:

RQ1: How do people discuss SO in terms of professional learning?

RQ2:How do people integrate SO into their professional practices?

1.3 Thesis outline

The research paper is divided into seven chapters, the first chapter introduces the area of the study, along with the research aim and questions while the second chapter reflects the literature review, which discusses previous studies conducted on SO along with studies conducted on online learning communities for software developers and programmers. The third chapter introduces the chosen theoretical framework (Community of Practice (CoP) and socially situated learning) for the study. Whereas the fourth chapter focuses on the Methods section where the context of the study i.e SO is introduced, as well as the data collection approaches chosen, the design of the study, the ethical considerations, and ending with the analysis part. The fifth chapter describes the findings of the collected data. The sixth chapter includes the discussion and finally, the seventh chapter includes the conclusion.

2. Literature review

In this chapter a review of relevant literature related to learning on SO and other online communities for software developers and programmers will be addressed. The literature review is divided into two sections. The first section will address the chosen databases for collecting the relevant literature for the study. The second section addresses previous studies conducted on SO and highlights other online communities used by software developers.

2.1 Chosen databases and selection criterias

The following databases were chosen when collecting relevant literature for the research study. These databases were chosen because they cover several important scientific journals, conference proceedings, etc within the scholarly fields of education, technology, and learning.

- Education Research Complete.
- IEEE Xplore.
- Scopus.

In terms of selection criteria, when searching for literature studies phrases such as “online community”, “ professional learning”, “informal learning”, “Stack overflow and learning”, etc were used. I was interested in previous studies revolving around the following areas:

- Software developers/ software engineers/programmers professional learning in online communities in addition to other professional domains.
- Knowledge acquisition/learning in online communities
- Informal learning in online communities for software developers.
- Studies about work environment regulations in using online resources.

There were no restrictions for publication years but more recent studies were preferred (between 2005 and 2022).

As the context of this paper is SO, the following sections will present a review of the relevant literature concerning learning on SO and other online communities for software developers and programmers.

2.2 Previous studies on SO

In the previous decades SO was discussed from several perspectives concerning motivation, participation, and engagement in online platforms (Spiro & Ahn 2016). Fewer studies focused on how users of the platform discuss professional learning and how they use the knowledge gained from the platform in their work environment. Therefore, my aim is to shed light on these specific areas. Below are some studies conducted on learning on SO as well as how codes are utilized by software developers. these two elements of focus, i.e. professional learning and practices of software developers.

Yazdanian et al. (2020) conducted a study on four online platforms i.e SO, Google trends, Udemy and SO jobs to understand what are the new skills of technologies within the profession of software programming. The data in the study is collected by comparing the four platforms to identify the new skills and technologies and measuring the agility of each platform. The study revealed that SO, among the other platforms, was considered to be the most agile in the software programming profession. Furthermore, due to the high moderation measures on SO along with the quality control measures the platform takes, it is considered to be an invaluable data source when considering the software industry.

For learning and staying up to date with the latest trends, software developers utilize resources from online communities for education and work. In a study conducted by Storey et al.(2017), they reflected how with the rapid advancement in technologies and dynamic

working environments, software developers are in constant need of being updated to the latest trends in their profession. Several channels like Questions & Answers platforms (Q/A), GitHub, SO, HackerNews, etc. provide software developers with the knowledge needed regarding the latest technological trends or advancements. These channels are known to support knowledge exchange at a community level. Hence they support developers to form and share knowledge respectively. In the study by Storey et al. (2017), they conducted a large-scale survey with software developers, in which they investigated the different communication channels software developers use to support their activities. The results of the study revealed that Q&A sites offer a quick way to debug issues and provide access to high-quality answers. In addition, the results also revealed that another benefit of such sites includes learning from the codes available and getting experts' feedback as well as staying up to date with the latest trends.

In addition to professional software developers, students studying software development are also interested in accessing online platforms for learning. In a research study by Bhasin et al.(2021), he highlighted that software developers depend heavily on social online platforms such as SO and GitHub to enhance their skills and learning. The research study revolved around how students use and contribute to SO and GitHub platforms and what barriers they encounter. The results of the study showed that the majority of the students use SO to get help with their code and strengthen their coding logic. The results also revealed that some participants of the study reflected that they use SO to look for solutions to the problems they face when they code, but none of them posted on SO as they reflect that it takes to post questions and wait for answers from the community members. Therefore, they prefer to view various available resources on SO and find their solution in that way. Likewise, Kanwal

(2019) discussed in his study how students learning software development used online resources throughout their university learning journey. It is quite common for students learning software development to integrate online resources (e.g SO, GitHub) during their learning journey. This is because these online resources provide students with easily accessible knowledge.

2.2.1 Software developers code utilization

Platforms like Q&A sites are known to accumulate a vast amount of knowledge that can be accessed by different users. An example of such a platform is SO, where the platform has thousands of source codes posted by its users (Neshati, 2017). In a research study conducted by Wu et al.(2018), they investigated how software developers utilize code from Q&A platforms. They conducted an exploratory study on 289 files from 182 open-source projects from the SO platform. The study revealed that in 31.5% of the studied files, developers had to modify the source code they got from SO to make it work in their projects. The study also revealed that to incorporate these codes into a developer's project, they needed to modify the codes. The level of required modification was varying from simple modifications like renaming variables to completely rewriting the whole algorithm. Moreover, sometimes developers prefer to implement a new algorithm from scratch based on the information from SO answers. Moreover, a study conducted by Fischer et al.(2017) investigated the effect of copying and pasting code snippets from SO to Android applications. Fisher et al.(2017) state that although SO provides software developers with ready-to-use code snippets, the integration of these codes into software production might raise concerns related to code security. In this study, they scanned SO for code snippets to evaluate their security score and examined how the code was reused in Android applications. The results of the study revealed

that out of the 1.3 million Android applications analyzed, 97.9% had at least one insecure code snippet taken from SO.

Although the focus of this paper is SO, it will be also interesting to see how learning is described in other online communities. The section below illustrates other online communities for software developers.

2.3 Online communities for software developers

Nowadays, software developers are not interested in working solely on their projects but are also interested in engaging, learning, and co-creating with other developers. This kind of engagement and collaboration among software developers occurs in communities of practice. Software developers within these communities are not only concerned about the codes they are expected to write but about the skills they will acquire and the connections they will create with other developers in addition to the kind of contributions they will make (Storey et al., 2017). The presence of the internet and the vast amount of online resources available make it easy for individuals to acquire knowledge (Guan et al., 2018).

To understand how professional learning and professional practices of software developers are discussed in other online communities than SO, relevant literature on other online communities used by software developers will be presented below:

Free/Libre open-source communities

Software developers use a wide range of open source communities to learn and acquire new skills in coding. One such community is the Free/Libre open-source communities (FLOSS). This community is known for providing its members with several different resources that can be found both in traditional educational settings such as tutorials, manuals, etc and in other content resources such as blogs, forums, etc. The communitys' support system is known for

its user support approaches known as peer support. This kind of support system reflects how web-based technologies could fuel learning processes (Meiszner et al., 2008). A study was conducted by Cerone & Barbosa (2014), where they considered FLOSS projects and how participation in such projects has a positive impact on the contributors' learning processes. The interaction and collaboration of members in the community of FLOSS itself seem to provide valuable learning processes. To examine whether FLOSS had a positive impact on the contributors, Cerone & Barbosa (2014) ran an online questionnaire that aimed FLOSS contributors. Their study revealed that what drives the interactions between the community members is the goal of developing software projects. The participants of the study reflected that participating in FLOSS projects could replace formal education such as software engineering courses. The participants considered that learning by doing is a concept embedded in FLOSS projects that could complement formal education within the field of software development. Learning by doing is reflected in how the participants collaborate in developing software and hence learn from one another.

GitHub

GitHub is a social platform that provides a set of tools for social coding. Software developers use GitHub for learning and getting engaged in projects. The platform incorporates in its features the ability to make a developer's identity and activity transparent and visible to other users. The users' internal projects' artifacts and their actions are also made transparent and visible across the community. The transparency of the platform allowed its users to learn by watching how others coded, and what particular aspects others paid attention to as well as how issues and problems are solved (Dabbish et al., 2012).

Twitter

Twitter is used by Software developers for work-related tasks. A qualitative study was conducted by Singer et al (2014) where they investigated how Twitter is used by software developers for their development activities. The study was conducted by interviewing 27 active developers on GitHub, a well-known coding platform, and surveyed 271 other software developers. The study revealed that the software developers believe that Twitter allows them to learn informally. One of the findings of the study is that software developers view this kind of learning mode at Twitter as valuable when shared among their developer teams at work. In addition, the results of the study also showed that software developers use Twitter to stay up to date with the latest trends in technologies and learning as well as to build relationships in the industry of software development. Despite the usage of Twitter by software developers for learning, the results also revealed that some software developers were not embracing Twitter for their work (Singer et al., 2014).

It is also interesting to see how online communities facilitate professional learning in other professional domains such as the teaching profession although the results within this professional domain will not be used in my study.

Researchers have extensively studied how teachers use and learn from participating in online communities. In research by Anwaruddin (2015), he discusses how teachers worldwide are getting more engaged in online communities. These online communities serve as a preferred place where teachers can collaborate with their peers from a distance and enhance their professional learning. In similar research by Booth (2012), they discuss how online learning

communities for teachers support the open exchange of ideas, experiences, and resources among educators. The interactions among teachers in these online communities resulted in teachers' skills and knowledge development. Whilst these online communities seem to be promising, the success and continuity of the platform can not be guaranteed by just creating the platform, but the success of such online communities lies in the successful engagement of its members. Furthermore, online social platforms like Twitter, Reddit, Quora, etc also serve a similar purpose to SO which is establishing a space where individuals can share and exchange resources, answer questions, debate on different topics, etc. These platforms could sometimes assist in career-related discussions, such as in the case of SO where there exist open forums for questions and answers related to the workplace. Learning practices on Twitter show how the platform could be intended for self-directed learning, this could occur by joining a Twitter community aimed at learning. Gruzd et al. (2020) reflect in their paper on how teachers use Twitter for creating an open online environment where they can freely utilize the platform beyond the formal classroom settings and aim for enhancing their teaching pedagogies as well as their professional learning objectives.

The literature review chapter demonstrated how previous studies discussed learning on SO and other online communities for software developers and programmers. Nowadays, these online communities are considered of high importance for professionals from varying domains. Right before the existence of these online communities, people used to learn through traditional approaches such as attending classes, reading books, joining seminars, etc. The emergence of these online communities has helped many professions to enhance their skills and professional learning. Not only professionals benefit from these online communities but also students studying in different fields. Furthermore, I have discussed how people use

SO and other online communities for software developers and programmers. The studies also discussed how software developers integrated the knowledge acquired from these online communities into the work environment.

3. Theoretical framework

In this chapter, the chosen theoretical framework will be presented and discussed in detail. For the purpose of this research study, the Communities of practice and Social Situated Learning theory by Jane Lave and Etinne Wenger will be applied.

3.1 Socially situated Learning

Lave Wenger (1998) suggests that learning occurs through an authentic context and in specific through relationships with people. According to Lave and Wenger (1991, p. 33) in socially situated learning, the main idea lies in considering learning, not as an "internalized" and "individualistic practice" but rather learning should be emphasized as a socially situated practice in which "agent, activity and the world mutually constitute each other".

The idea of learning being social helps learners to be part of communities that share the same interest as the learner and hence the learner benefits from the community by learning from those who are more knowledgeable than him/her. According to Lave & Wenger (1991, "Legitimate peripheral participation (LPP) describes how newcomers become experienced members and eventually old timers of a community of practice or collaborative project". Hence within this phenomenon, learning is identified as a contextual social practice that can be achieved through participation in community practice.

3.2 Communities of practice (CoPs)

The theory of Community of practice is a social learning theory developed by Jane Lave and Etinne Wenger (1991). According to Li et al. (2009), a community of practice (CoPs) is considered a learning community. "Community" is a group of people that share the same interest and are connected by the roles they play in group activities. Such communities can develop their own culture and it matures with time. They foster a sense of belonging where

individuals engage in learning through different means such as through observation and interaction with experts in the community.

Jean Lave and Etienne Wenger (1998) argue that a community of practice is everywhere around us and we are part of it whether it is in schools, at work, or during our leisure activities. In some of these communities, we could be the core leaders while in others we could be participants or at the margins. The fact that we are living and interacting with different enterprises results in learning. Accordingly, with time this collective learning results in practices that "reflect both the pursuit of our enterprises and the attendant social relations" (Wenger 1998 p. 45). Hence, these practices over time are considered the property of the community of a shared enterprise.

According to Wenger (1998), communities of practice are characterized by three elements, mutual engagement, joint enterprise, and shared repertoire. These characteristics are considered important in developing and fostering these communities of practice which ultimately results in the creation of knowledge and learning. Below is the definition for each of these elements:

- *Mutual engagement*: It refers to the interaction among members of the same community. These interactions result in shaping the community's culture and practices.
- *Joint enterprise: It refers to the mutual purpose that resulted in binding people together under the same unified purpose and goal.*
- *Shared repertoire: It refers to the common resources such as ideas, experiences, information, documents, etc that members of a community use to facilitate learning in the community.*

The above three elements outline the process in which an individual interacts in a CoP group (Wenger 1998).

The focus of the community of practice is learning, in specific learning as social participation. For a community to recognize itself as a community of practice certain indicators are used. These indicators are (Wenger 1998):

- The rapid flow of information and propagation of innovation.
- Knowing what others know and what they can do and how they can contribute.
- Shared stories.

When it comes to SO, the features of the platform seem to fit within CoP, as the platform supports the indicators suggested by Wenger (1998) such as operating in a community that shares information regularly, the engagement of participants voluntarily, sharing the same purpose and goal, etc. (Radford et al., 2016). As mentioned earlier, communities of practice comprise people that share the same interests and activities. These communities exist in many domains including software development.

The theory of Socially Situated Learning theory will be applied in the research study. SO as an online community possesses all the attributes discussed in CoPs and socially situated learning. The interactions between members of the community and the flow of information in the community show legitimate peripheral participation between members of the community. The research study will also reflect how much situated learning and LPP happen within work environments among colleagues as learning can also occur by integrating knowledge gained in online communities within professional practices.

Given the aim of this paper is about investigating how people discuss professional learning in SO and how they integrate SO into their professional practices, choosing Social Situated

Learning theory seems applicable in this study. In such online communities like SO, not only the participants but also visitors can develop their skills by reading the existing posts and obtaining benefits from the shared knowledge. Having the learner placed in the center of the educational process, the theory of Socially Situated Learning by Lave and Wenger suggests that an individual could gain knowledge by being part of the community, hence making the theory applicable for the context of the study i.e. SO as participants in the community are connected by their shared interest which is software programming.

4. Method

This chapter will provide a brief description of the context of the study, the design of the study, and the process of recruiting participants for the study. Finally, the data collection, validity of the chosen method, ethical consideration, and data analysis will be discussed.

4.1 Context of the study: Stack Overflow

I have joined an ongoing project by the department of Applied IT at Gothenburg University, called Social dimensions of expertise development in networked communities (SOCDEX). The project sheds light on how networked communities can contribute to expertise development with a focus on people that use online communities for programming to enhance their skills and knowledge of programming. The focus of the project is studying SO as an online community. Therefore, I aim to contribute by shedding light on how SO users view the platform in terms of professional learning and how they integrate SO into their professional practices.

Stack Overflow (SO) is a question and answer platform established in 2008 by Jeff Atwood and Joel Spolsky where users share knowledge about programming-related inquiries. SO is part of Stack Exchange which is a huge network of more than 100 question and answer platforms with several different topics ranging from academic-related topics to topics related to traveling, gaming, etc. (Novielli et al., 2014).

The users of the platform range from novices who are passionate about programming and would like to learn to experts in the field of programming. SO has over 100 million visits per month. The platform encourages users to ask questions, learn as well as share technical knowledge related to programming (Stack Overflow, 2022). As of October 2019, the number

of questions in SO were exceeding 18 million questions, and 28 million answers, along with 76 million comments in addition to 56,000 tags (Wang et al., 2020).

The ultimate aim of SO is to build a platform where users can use it as a library to check programming-related questions. In SO users can vote up or down the questions and answers by applying the up and down arrows provided on the platform. If a user asks a question, he or she can choose to accept one of the answers provided by other users, this is reflected by the check mark. The questions in SO are tagged to specify the subject area the question belongs to. Subsequently, a question can have a maximum of five tags that reflects the subject area it falls under. When developers post questions or answers, they usually attach snippets of source code to clarify their questions or answers in a form of textual descriptions. In this process of asking and answering questions, SO accumulates a large amount of knowledge (Wu et al., 2018).

Furthermore, users of SO have reputation scores shown in their profile, these are obtained through the total number of up and down votes each user gains from their posts. The user profile depicts the overall status of the user and reflects their popularity on the platform (Ishola & McCalla, 2016).

Some of the key features possessed by SO include:

AskQuestion

According to SO guidelines, it is advised to avoid opinion-based questions. The user is advised to post questions that summarize the problem they are encountering with a brief description of what went wrong, what they seek help with, and perhaps a snippet of their code (Stack overflow, 2022).

Tags

In SO, each question posted must have a minimum of one tag and a maximum of five tags. The tags used by users of the platform are keywords used to categorize posted questions with similar questions (Stack overflow, 2022).

Reputation system

Similar to many online communities (platforms), SO uses a reputation system to keep its users motivated to contribute to the platform. These reputation points earned by SO users are reflected in their profile, hence being reputable adds to their popularity on the platform and reflects their expertise, hence they earn more trust from other community members (Bosu et al., 2013).

The study by Bosu et al. (2013) highlights how reputation scores are earned in SO. According to Bosu et al. (2013), to build your reputation in SO, a user must contribute to the platform by providing high-quality answers that are accepted by the community users. In addition, to continue earning high reputation scores, the user must always be providing quick high-quality answers to be above other competitors on the platform that seeks a high reputation.

Vote

SO has a voting system where each question or answer can receive upvotes or downvotes from other users of the platform. The ability to vote up or down is earned by a user who has reputation scores. A user can vote up if their reputation scores have reached 15 points, consequently, a user can downvote if their reputation scores reach 125 points (Moutidis & Williams, 2021).

Users

Users of SO have profiles that show their background, their reputation score, and their contact

details. Each user profile is set unique according to the user's preferred way of sharing related information about him/her.

The above features of SO are of high importance in supporting knowledge sharing in the platform. For instance, participants can browse the tags or the questions and look for a specific area that reflects their problem, and hence they can view all the possible solutions proposed by the users of the platform, in this way a feature like a tag or questions aids in sharing knowledge among participants of the platform.

4.2 Design of the study

For the study, a qualitative research approach was chosen for data collection. According to Williams (2011, p.67) “Qualitative research is a holistic approach that involves discovery”. The data collected from qualitative research can be thought to be less structured since the data can be formulated and rebuilt into new theories or aspects based on the researcher and his interpretation (Williams, 2011).

In qualitative research the data is not quantifiable as in the case of the quantitative research approach, hence the data collected reveals a deeper understanding of the social aspects of the study. With this kind of approach, the participants will have the freedom to share their thoughts and perspectives on the current study. Furthermore, one of the most commonly known approaches for qualitative data collection methods is through interviews. Interviews are conducted to explore the ideas, beliefs, etc of a person. Conducting interviews is favored in research studies that involve collecting information about people’s opinions or beliefs directly. Since the aim of the study is to understand how people discuss professional learning and practices about SO, choosing interviews will assist in understanding the participants'

beliefs and ideas regarding the study in detail rather than other forms of data collection approaches.

There are three types of interviews namely, structured interviews, semi-structured interviews, and unstructured interviews. Briefly, in structured interviews, the questions are standardized systematically, while in semi-structured interviews, the questions are both standardized and open-ended where the interviewer has the freedom to ask the interviewee to elaborate more about a specific answer, etc. While in unstructured interviews, there are not any predetermined questions, and are more flexible (Wethington & McDarby, 2015).

For this research study, semi-structured interviews were chosen as a method for data collection. Semi-structured interviews are considered to be one of the most commonly used types of interviews in a qualitative research approach. In this type of interview, the researcher sets the topics that need to be covered and the interviewer's responses will help direct the interview (Stuckey, 2013). Semi-structured interviews were chosen over other interview types as the research questions of the study aimed at exploring the ideas and thoughts about how SO is discussed in terms of professional learning and also delving deeply into their professional practices at work. As in semi-structured interviews, the interviewees will be free to express their thoughts and feel free in responding to the questions. In addition, this type of interview will also assist me to look at the research questions from different perspectives since the interviewees have the freedom to express their thoughts. Moreover, semi-structured interviews will assist me in gaining a large range of data from each participant, consequently, this will help in answering the research questions.

To ensure a smooth and successful interview, an interview guide was composed in which the questions to be asked are written in addition to follow-up questions that could be asked during the interview, if necessary.

4.2.1 Recruitment

The process of recruiting SO users was a bit difficult since not all the users shared their contact details on their SO profiles.

A convenient sampling technique is chosen which is a nonprobability sampling where the researcher targets participants that meet certain practical criteria such as availability in a given time, easy accessibility, etc (Etikan, 2016). This type of sampling technique was chosen when recruiting participants to avoid being biased by the participants' reputation on the platform and to get an overview of different users' perspectives about the research topic.

The recruitment process started by randomly selecting user profiles from the SO platform and searching for their contact information. Besides, SO Facebook groups were also used for participants searching. Email invitations were sent to the participants to take part in the study. The email invitations briefed the participants about the nature and significance of the study, the significance of their participation, how the data collected will be used, the setting of the interview, and finally a link to the consent form. However, I did not get responses from many of the potential participants of the study, only five positive responses were received out of twenty invitations. As it was difficult to reach out to SO users since not all of them had their contact information on their profiles, in addition, the majority of those who had their contact information on their profile did not respond to the invitation emails.

4.2.2 Participants of the study

The total number of participants in the study was five. All the participants were from different parts of the world, including China, Australia, Germany, Russia, and Sweden. All the participants are working currently as software developers. The participants were in the age group 30-40. The gender of the participants was mixed male and female.

4.2.3 Setting of the interview

The interviews were conducted in the period between 10th April and 15th June 2022. The participants of SO are scattered worldwide, hence the interviews were conducted through Zoom video conferencing. Zoom is a video conferencing platform that allows participants to connect in real-time and allows for meetings to be recorded (Lobe et al., 2020). Each interview conducted lasted around 30 minutes. All the participants signed the consent form and agreed for the interviews to be recorded. The interviews began with a brief introduction of the research study and then proceeded with the interview questions.

4.3 Data collection

To answer the research questions, the data collected from the semi-structured interviews will be used. As previously mentioned, I have requested the participants to sign the consent form to participate in the research study. After the participants signed the consent form, a zoom link was sent out to participants. The interviews were recorded to save the data and have access to the data recorded at any time for analysis and to ensure accuracy. The data collected are transcribed through software called otter.ai software. This software generates meeting notes and transcribes saved zoom interviews. Transcriptions allow for accurate text-based data retrieved from the interviews and allows for easier data analysis and reflection based on the interviewees' point of view. Therefore, this will aid in answering the research questions

smoothly. A comparison between the interview recordings and the transcriptions generated was done to correct any mistakes in the text generated by the software. This step was crucial to avoid errors because one error in the transcribed data would change the whole context of the data and could be misleading.

4.4 Validity of the chosen method

To ensure the validity of the chosen method, the composed interview guides were based on the research questions. During the interviews, I personally restated what the participants said in order to make their points understood. To increase trustworthiness, the transcripts generated from the interviews were double-checked with the recordings and I made sure that the transcripts match the participants' statements. After listening to the recordings, I have also done some spelling corrections to the transcribed texts that will help in avoiding problems in interpreting the interviews later on.

4.5 Ethical Consideration and users privacy

In a 2008 research conducted by Klopper, he explains how important it is to ensure ethical considerations are met when conducting research. Ethical considerations are defined as " the protection of the participant's rights, obtaining informed consent and the institutional review process (ethical approval) (Klopper, 2008, p.71). Hence, protecting the participants' rights is considered highly important, these rights include "the right to self-determination, right to privacy, right to autonomy and confidentiality, right to fair treatment, and the right to protection from discomfort and harm" (Klopper, 2008, p.71).

To protect the privacy of the participants in the interview certain measures were taken:

- Informed consent was sent out to participants. The consent form was created using google forms, where the form explained in detail what is the aim of the study, how the

data will be used, and how the participants' privacy will be protected. The consent form as well explained in detail what is expected from the participants and in turn what data can be used/published. After the consent form is signed by the participant, the interviews can be conducted online.

- The participants' names are codified in order to protect their anonymity and confidentiality.
- The data collected from semi-structured interviews are transcribed and coded and only the researcher has full access to the data.

4.6 Analysis

To better analyze the results of the semi-structured interviews, I have decided to analyze the data through thematic analysis. Thematic analysis is referred to as an analytical approach that helps in identifying “themes” or patterns in a particular dataset, as well as helps in describing and interpreting the actual meaning and importance of the dataset. Thematic analysis has been known to be widely used in qualitative research approaches (Smith & Sparkes, 2016).

Thematic analysis is described based on the following six phase mode:

Phases 1–2: Familiarization and coding:

In the first phase of thematic analysis, being familiar with the dataset is highly crucial. A researcher must immerse himself in the data and have analytical skills in analyzing the data and finding ideas or concepts that can help answer the research questions. The second key phase in the thematic analysis is coding. Coding helps in setting a strong foundation for theme development.

At this phase, in order to get familiarized with the data, I read and re-read the interview transcripts. I have concentrated on meaningful and recurring ideas and comments in the data (Vaismoradi et al., 2016). The ideas and comments that were recurring the most and relevant

to the research questions are then highlighted and possible meanings are created. Finally, codes were generated from the data collected. The generation of codes allows for the data to be organized.

Phases 3–5: Theme development, refinement, and naming:

The most important phases of thematic analysis are these three phases, they are considered to be the core of the thematic analysis. In these phases, the aim is to organize codes and the coded data into the themes and finally do a thorough refinement and reviewing of the developed themes and hence through a rich analysis reach finalized themes.

In this phase of the study, I have analyzed, combined, and compared codes in order to create themes that are in direct relationship with the data. Since this whole process is considered iterative, I have read and revised the codes and themes continuously until finalizing the themes that best describe the data. (Kiger & Varpio, 2020).

Phase 6: Writing up

In this last phase, the researcher's job involves compiling, developing, and most importantly editing the analytical writing in the report.

Lastly, the data collected from the semi-structured interviews were thoroughly analyzed and each data collected was matched with the two research questions of the study.

One of the limitations of conducting thematic analysis is the problem related to the inconsistency and sometimes incoherence when themes are developed from the data of the research study. Various types of themes are generated from the data and sometimes this could be misleading if not handled properly (Holloway & Todres, 2003).

In the next coming chapter, the findings of the study will be presented and the research questions will be answered accordingly.

5. Findings

In this chapter, the results of the conducted study will be presented. The research questions will be answered based on the data collected during semi-structured interviews.

5.1 Professional learning on SO

The aim of the first research question is to see how people discuss SO in regard to professional learning. The results of the study revealed that some of the participants used SO before joining their professional careers as software developers. Therefore, the below results will shed light on some of the participants' discussions about using SO in terms of learning when they were students as well as professional learning as software developers.

RQ1: How do people discuss SO in terms of professional learning?

To answer the research question, the results collected revealed that each interviewee has their own interpretation of professional learning in SO as an online community. Each interviewee had their own definition of learning, and how learning can be achieved in the digital era we live in. The majority of the interviewees viewed SO as a lifesaving platform for solving study and work-related tasks. According to the interviewees, this is because the platform serves as a time saver when getting stuck at work since some of them are embarrassed or hesitant to ask their colleagues at work when they got stuck on a certain task related to coding.

Three of the interviewees reflected that they have been using SO even before getting into a professional career as a software developer. They have revealed that SO was the number one site they lean to when they cannot find a solution to their problem. Since nowadays most of the courses are given online, they found it easier to get help from SO. They have stated that SO provides a quick solution to their problems, instead of sending an email to their instructor

and waiting for an answer. The interviewees mentioned that engaging in the platform resulted in gaining the knowledge they needed when faced with tasks that were difficult, hence posting questions on the platform and reading comments of the users of the platform made their study life easier and consequently led to learning on the platform.

Below is a quotation from one of the interviewees describing how SO is saving his time.

> *"I will say that Stack Overflow saves a lot of time, saves a lot of my time. And also, gave me some kind of hope that I can find a solution even if I am stuck, because nowadays, you don't have really good contact with teachers. Before you could just go to the teacher and ask him a question. And now, it's not so because most of the courses are online, and you don't really have access to teachers and assistants, and so on. and save time"*

Interestingly, when it comes to professional learning on SO, not all interviewees had the same thought about SO. Two of the interviewees mentioned that SO has the potential to be used as a professional learning platform, as an individual can gain some kind of knowledge when posting a question and receiving different sorts of answers, an individual can learn by just reading other people's comments or posts on the platform.

In the quotation below we see how this interviewee describes SO as part of the building block for professional learning.

> *"Although professional learning is a broad term, Stack overflow can be used as part of professional learning, it could be considered as one of those building blocks of professional learning since it helps you to develop yourself, your knowledge, to gain more knowledge"*

While another interviewee mentioned how after engaging with the platform he was able to learn. Observing the conventions of how a code is written was another way of learning for the interviewee. Below is a quotation from the interviewee:

> *"In Stack Overflow you learn by viewing others' code and other solutions. There are a lot of different solutions you can find. And they may be related to your problem. So when you see others code you learn, of course"*

On the contrary, one of the interviewees was completely doubtful that SO can be used as a professional learning platform as learning according to the interviewees is based on following a specific structure, like having classes, learning from tutorials, or through reading books unlike SO which is more of a question and answer based platform. As one of the interviewees mentioned:

> "*I don't think you can learn by only using Stack Overflow. This would seem a wrong approach. Because when you want to learn something, you follow some kind of structure, you start with basics, and then you move to some labs, and then you gain the knowledge by reading theory and so on. You get some hints in Stack Overflow, you get some ideas, insights. But it's like having an assistant. You have a teacher that teaches you and gives you the knowledge, and then you have an assistant who can maybe help you to interpret what the teacher said".*

Therefore, the platform was viewed more as a time saver platform when getting stuck with work-related tasks that need immediate solutions, while learning is viewed by the interviewee as a structured activity led by instructors, online tutorials, etc.

In the coming section, we will see how the participants of the study integrated SO into their professional practices, as they have mentioned previously that they used SO mainly to solve work-related problems.

5.2 Integrating SO in professional practices

The second research question addresses how people use SO in their professional practices, meaning in what ways participants integrate SO in their work tasks.

RQ2: How do people integrate SO into their professional practices?

The data collected revealed that one of the common professional practices performed by the participants (interviewees) is to search for solutions to their problems, hence they search for answers and code snippets online, this leads them to somehow land on SO since it is known to be one of the most famous and reputable platforms for software developers and prioritized by google since it is one of the first options that appear when searching for solutions (Parnin & Treude, 2011). The interviewee in the below quotation describes how they land on SO in specific:

> *"When you have a problem in your code, then you Google it first, and then you probably land on Stack Overflow since it's one of the best known sites for programmers".*

5.2.1 Adapting code to practices within professional environment

The results of the research study conducted on the SO platform were interesting. The interview results conducted on the five participants that participated in the study revealed how each individual adapts the codes taken from SO differently.

Below are some of the interviewee's responses in regard to how codes were adapted in their working/studying environment:

Some of the practices revolved around the importance of ethical considerations while others were mainly about the company's policies and legal considerations when adapting codes in work-related tasks such as when working in teams.

Regarding legal considerations that must be taken into account when using codes from online resources, one of the interviewees mentioned that posting codes online is against their company's rules and it could be considered as leaking the company's code over the internet. The interviewee describes this issue below:

> "*You can't post the whole solution. I mean, you can't post too much code, you can only send and publish some parts of the code*".

Another interviewee shares the same concern about how it's very unethical and illegal to post a company's code online and how it is completely against the company's regulations as it puts the company's work at stake.

Below is a quotation from the interviewee:

> *"When you post something on Stack Overflow. You can't remove it. You're stuck with it. Yes, with your code and then you're stuck with your question. Yeah. So this is also the tricky part because you don't want to really show your code, especially when you're working. You are not allowed to post the company's code anywhere. So you're not allowed to post any code, especially not Stack Overflow. So what you can do is you just write your own code, something similar, but writing something very different".*

Hence the interviewees mentioned that it's very important to adapt their questions and usage of SO based on their company's regulations when using codes. Following the rules and policies of their company will save them from facing legal issues.

Participants also reported facing issues with integrating and making the code they found on SO work. Hence there is a necessity of making alterations to the code. An interviewee highlighted that sometimes when he tries to use the code snippet from SO in his work, it does not work right away, since there are no descriptions on how to apply the code and sometimes the context is different. Therefore, an extra effort must be made to search for other posts in the platform that have a code that can fit the work task of the interviewee. The interview describes this situation in the quotation below:

> *"Sometimes you get wrong answers. Sometimes you sometimes people offer you to do something, but the problem is not really what they're suggesting you to do".*

Another interviewee shares the same issue with code snippets and suggests what can be done in order to make the code work.

> *"If I use Stack Overflow, sometimes I need to reconstruct the answer from what I read. Some codes are really good but then in order to make it work, I have to alter it and use it in problems".*

The data above depicts how legal considerations are considered to be of high importance for most developers, as complying with the company's policies and legal considerations are highly important. The data also depicts how developers must adapt their codes based on their professional environment, as no code taken from any online platform like SO can be used as a copy and paste without having alterations being made to the code to fit the professional environment it serves and sometimes to fit the work context.

Moreover, the interviewees discussed what happens when trying to apply the codes they took from SO. They transfer the code knowledge they gained from SO and engage in activities at their work premises to make this code work. This shows that by participating in such online communities, knowledge gained is being altered to fit the environment it is being used for. As quoted by one of the interviewees:

> "*When we work, we work as a team, and you cannot write your code and it's approved directly. Everyone should know what you already wrote in the code. And that's why it's not copy paste things*".

The interviewees reflected that along with the alterations that are necessary to do, another important practice when using codes from SO must be done. That is all team members must agree on the code being used and they all must engage productively to solve the work assignments along with their peers at work. Hence all the codes are shared among the developer's team, and all the team members must agree for the code to be used. This shows how each working environment has its policies and rules when using online resources. The results show that the use of codes is more likely to be situated within the participants' working environment context. Participants engage with their colleagues at work when they apply codes taken from SO, and this depends on their organization's policies.

5.3 Reasons for using SO

Considering the cultural conventions of their workplaces and how one should position themselves to be recognized as a professional, there are many reasons why participants of SO use the platform rather than asking for help from their peers at work, one of these reasons is what one of the interviewees mentioned:

"So usually what I did is basically, I first tried to figure it out by myself. And if I stucked, I go to Stack Overflow, and see if I can find an answer or understand and try to use the solution they suggest, and if I couldn't figure it out, I would ask my colleagues. So colleagues wouldn't really be the first choice because you know, you still want to work on this stuff by yourself".

The above interviewee mentions how important it is for him to try and find the solution on his own first, the same thing applies to another interviewee that mentions:

"Sometimes you have no one to ask, especially if you are a senior developer, and you have only junior developers around you. So of course, you can't ask them, you assume that they don't know. So you have no one to ask and you don't want to look stupid by asking junior developers, so you go and search for a solution yourself".

The above findings demonstrate why some of the interviewees integrate SO into their professional practice.

5. 4 The impact of work and SO

From the results of the study, we can conclude that both contexts i.e work and SO impact one another. A company's workplace policies and legal requirements decide how participants use online platforms like SO. In some companies people are not allowed to leak so much of the company's code and risk their work hence to get help from SO, participants must write their problems in a more generalized version, as was mentioned previously by our interviewee:

"When you post something on Stack Overflow. You can't remove it. You're stuck with it. Yes, with your code and then you're stuck with your question. Yeah. So this is also the tricky part because you don't want to really show your code, especially when you're

working. You are not allowed to post the company's code anywhere. So you're not allowed to post any code, especially not Stack Overflow. So what you can do is you just write your own code, something similar, but writing something very different".

This shows that both SO and work policies have their impact on one another and therefore, they must be followed by the employees.

Another interviewee reflects how the company's policies restrain them from just copy pasting codes from online resources and that it should be approved by the developer's team before using them. The quotation below illustrates the interviewee's comment:

"Where I work there are certain policies we as developers must follow, among them is to abide by the coding policies of the company which emphasise the importance of not sharing a big part of your code online and hence when using platforms like SO, I have to change the whole code I have problem with and write something similar to get help with.".

People post questions on SO but it is not that easy, because they also need to follow SO rules. The platform has certain criteria for accepting answers, one of the interviewees mentioned how SO is strict with its rules in posting questions, the following quotation illustrates the interviewee's comment on this matter:

"Actually, I use it one time to ask a question. But what I noticed is that they have really strong policies you should follow. At first you should try to look for an answer to your problem. And you cannot create a new post, just like that's easy. I tried one time, and they deleted it. Actually, I didn't have time to read why they deleted that".

The above findings imply that work policies could impact what kind of content can be shared on SO, likewise when participants use SO to solve their problems, the code snippets they get

from SO need to be adapted to fit their work environments. The overarching idea here is that it is insufficient to just learn and be aware of the rules and norms of an individual's workplace or of that of a platform like SO, but familiarity with both contexts and knowledge about how to maneuver between these contexts are needed to engage productively into work tasks

To sum up the findings, professional learning is interpreted and discussed differently based on different participants. Some of the participants view SO as a platform for professional learning as a result of engagement and interaction with the platform and its users while others state that SO could be a building block of professional learning but not necessarily a platform that can be used for professional learning. In addition, some participants believe that learning can only be gained through fixed structures such as in classes or online tutorials, classes, seminars, etc.

As for how people integrate SO into their professional practices, we have seen that participants integrate SO into their work environment based on the company's policies and rules. Some companies do not tolerate copying from online resources, while other companies force their developers to work in teams and give the authority of approving a code through team decisions. Moreover, some companies are concerned with legal considerations therefore, any code used must be altered to fit the environment it will serve. To conclude, we have seen that the company's rules and policies must be followed to accept codes from online resources, the same thing applies when posting questions in SO, participants must abide by the rules and policies of SO, hence it's a two way process. In addition, certain alterations must be made when using codes from SO.

6. Discussion

This study aimed to investigate how SO users view the platform in terms of professional learning and how they integrate SO into their professional practices. This chapter will relate the findings from the present study to the previously introduced literature on the topic and it will point out the similarities or differences between both the literature and the findings.

The results of the study reveal that professional learning on SO depends on how the participant interacts with the platform. Some participants use the platform for browsing different solutions to their problems while others participate by posting questions and engaging in the platform. In both cases, learning on the platform is discussed differently. Furthermore, the main result of the study is acknowledging that although some modifications must be made to codes used from online resources like SO, the fact that the company's policies emphasize the nature of collaboration and engagement when applying codes used from online resources is interesting and was not discovered before.

In the coming sections, the research questions of the study will be answered in relation to the results of the study.

6.1 RQ1: How do people discuss SO in terms of professional learning?

Professional learning on SO

According to the results of my study, learning on SO is interpreted differently based on how a participant defines learning. This implies that the way a participant interacts with the platform decides how they interpret professional learning. The findings of my study imply that SO as a Q/A platform assists software developers in getting several quick solutions to problems encountered in coding but it is unclear whether it can be viewed as a platform that can be used

for professional learning. Previous studies conducted on online communities used by software developers showed that FLOSS, an open source community provides its users with software projects that encourage software developers to engage and interact and hence learn through this interaction and knowledge sharing between members of the community (Cerone & Barbosa 2014). However, some of the results of my study imply that using SO without interacting and collaborating with members of the community does not make SO a learning platform.

The data of my study also suggests that professional learning should be in a more structured format like lectures, seminars, etc which SO did not have. On the contrary, FLOSS communities might complement formal education in the way they carry out projects (Meiszner et al., 2008). In my view, the most compelling explanation for this is the way people view learning, and their experience with learning whether in formal educational settings or informal settings decides how they can view learning on online platforms. Whereas previous research conducted on Twitter (Singer et al., 2014) mentioned that software developers learn informally on the platform although Twitter does not have a structured format to be considered a learning platform. The same study on Twitter has mentioned that not all software developers embraced Twitter as a learning platform which is consistent with the findings of my study that the way learning is viewed depends very much on the way software developer understands it.

As for students studying software development, SO was the most visited site for solving coding problems. The results of the study imply that students prefer posting their questions and doubts on SO rather than asking their instructors. There could be several reasons for not

asking an instructor or a colleague. Some software developers would want to prove themselves in solving problems on their own and not show their weakness or hesitance in coming up with solutions to their problems. Hence SO was the right place to post random questions and not get recognized as who you actually were. This way, software developers can remain anonymous and still get assistance in solving their problems. The results of my study are consistent with the previous study conducted by Bhasin et al.(2021). These results show that students learn and enhance their coding skills by reading and interpreting various codes posted on SO, which is in contrast with other, previously mentioned participants of my study who viewed learning from a different perspective that was discussed earlier.

Previous studies on online platforms have reflected how members of the community learn and enhance their skills through collaboration and engagement (Wu et al.,2018; Storey et al., 2017; Dabbish et al., 2012) but less attention was given to how users who seek immediate solutions to their problems learn without interacting with the community.

The findings of my study demonstrate that software developers' level of interaction and engagement within the SO community can have an impact on how learning is interpreted. Therefore, it is questionable whether the notion of socially situated learning theory by Jean Lave and Wenger (1998) can be seen in the SO platform. In this theory, learning is perceived as social participation in the community while in the case of my study the findings indicated that participants were not active users. The data suggests that not all participants use SO for learning and collaboration but rather as a platform that provides instant solutions to their problems, which is in line with the previous studies (Kanwal 2019; Storey et al., 2017). On the contrary, previous studies conducted on online communities used by software developers

(Singer et al., 2014; Dabbish et al., 2012; Cerone & Barbosa 2014) assume that learning can be achieved within these communities as members of the community collaborate and share knowledge in the platform.

6.2 RQ2: How do people integrate SO into their professional practices?

The objective of the second research question was to understand how the participants integrate SO into their professional practices at work. The findings of the study were interesting since they go beyond previous studies, showing that learning can happen when SO is integrated into work environments.

Adapting practices to the company's policies and regulations

The findings of my study imply that software developers must take certain measures when using online resources such as taking code snippets from online communities and when posting codes online. The measures that must be taken are different based on the companies' policies and regulations. Due to ethical considerations and legal concerns, posting a company's code online to seek assistance with the code could lead software developers to legal issues. This implies that the work environment affects how software developers interact with these communities.

By exploring how participants of the study integrated SO into their professional practices, an interesting result was found. This finding implies that to be able to use codes from SO, participants must engage in activities in their work environments. The codes taken from online resources like SO must be agreed upon by all team members in the developers' team. The data of my study previously demonstrated that not all participants were engaged in SO,

therefore the idea of knowledge acquisition through engagement and participation in the community was questioned. However, when comparing the results to previous studies on socially situated learning (Radford et al., 2016), it is clear that the participants of the study engaged and collaborated within their work environments. This is a case of socially situated learning, the theory of which emphasizes that learning occurs as part of social participation and that knowledge is created and transferred (Lave & Wenger 1991). Moreover, this kind of code sharing, having discussions in work environments, and having a goal in solving a certain problem with the code could lead to participants learning from one another consequently this implies that novices can learn from experienced software developers in the team and this kind of participation fits well within the concept of CoPs and LPP (Lave & Wenger 1991).

Importance of code modifications

As expected, the findings of my study emphasized the importance of code modification when software developers use online resources. This is because an online community like SO has a vast amount of code snippets posted by its members (Neshati, 2017), finding the best code that is needed by software developers could be challenging. Therefore, in line with previous studies (Wu et al., 2018; Fisher et al., 2017), participants must modify codes and make alterations to make them fit their work tasks and to avoid insecure codes.

Another important aspect of code modifications concerns the protection of the company's codes from leaking into online communities of software developers. The data of my study suggests that although codes taken from SO should be modified, the same thing applies when posting questions on SO since participants are not allowed to post the company's code online.

Therefore, software developers are required to modify their original code with errors and then post it on SO to get assistance.

The main result of the study is acknowledging that although some modifications must be made to codes used from online resources like SO, the fact that the company's policies emphasize the nature of collaboration and engagement when applying codes used from online resources is interesting and was not discovered before.

6.3 Limitations and future research

One of the limitations of the study is the number of participants in the study. If the sample size was larger the data collected might lead to different interpretations in answering the research questions.

In the future, the same study could be repeated but with a large number of participants in order to get a good amount of data that can open up to different professional practices done by software developers in using knowledge gained from SO at their work environment. Having a good amount of data will help in shedding light on how different organizations integrate SO in their work practices.

7. Conclusion

In conclusion, this study aimed to see how people discuss professional learning on SO and how they integrate SO into their professional practices. To collect the necessary data to answer the research questions, I conducted semi-structured interviews. The results of the interviews revealed how each individual discusses professional learning on SO and how they integrate SO into their professional practices. Some of the participants believed that SO could be used as part of professional learning while others believe that SO can only be used as a problem-solving platform with a vast amount of codes available. Some of the findings of the study were in line with previous studies that focused on the utilization of codes by software developers (Wu et al. 2018). In this study, the results revealed that complying with the company policies and legal considerations are important factors that must be considered by software developers.

Nowadays we live in a digital era, and the use of online communities like SO play an important role in professional careers like Software engineering since these professions require learning regularly, hence they use these communities for learning. The results of the study could be used by researchers interested in knowing how users of online communities integrate the knowledge they get online into their professional environments. Professional practices at work can help researchers in designing and building content for online training programs for employees and suggest ways to enhance their collaboration and engagement to produce quality work.

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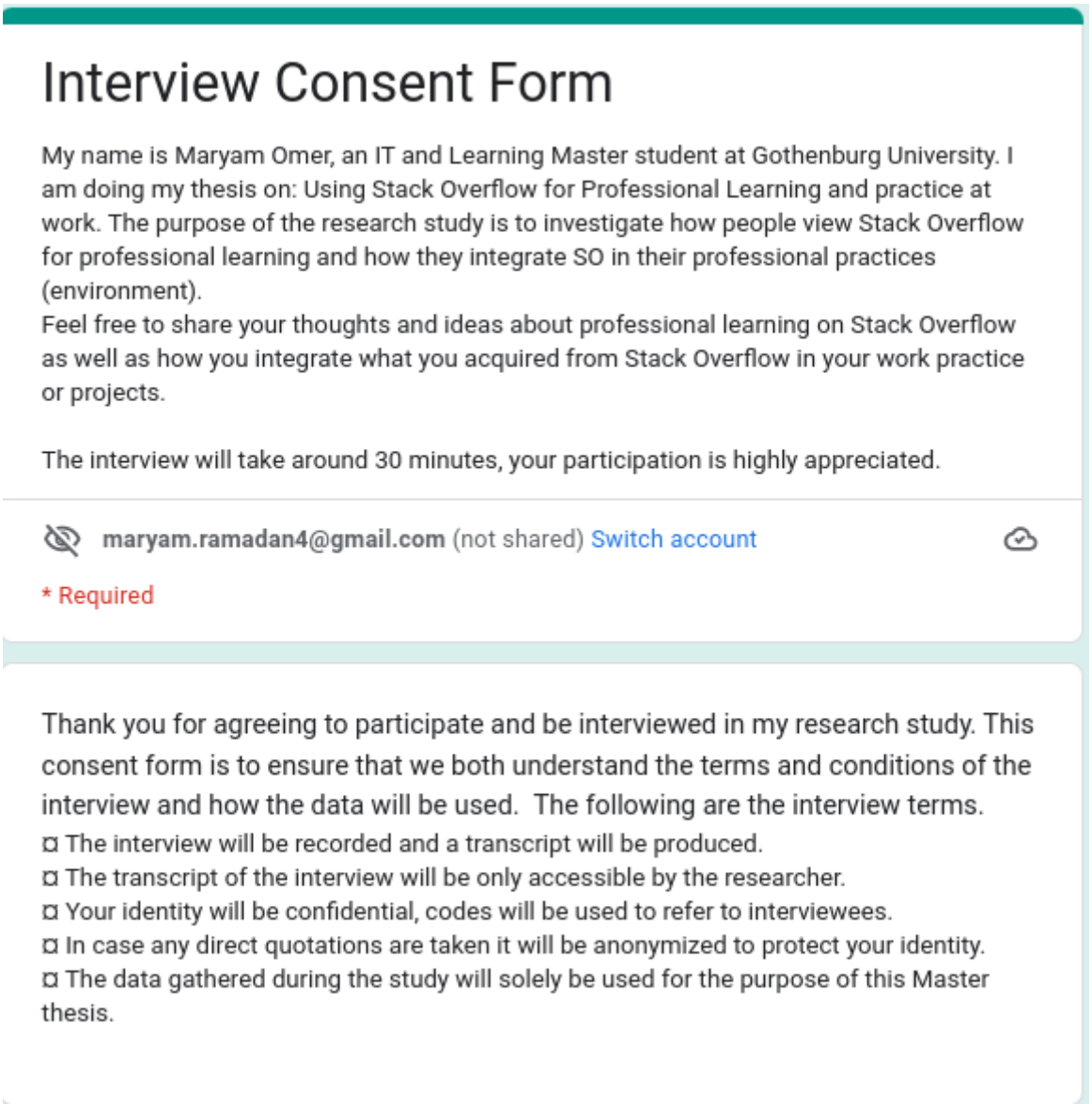
Appendices

Appendix 1 : Informed consent



Interview Consent Form

My name is Maryam Omer, an IT and Learning Master student at Gothenburg University. I am doing my thesis on: Using Stack Overflow for Professional Learning and practice at work. The purpose of the research study is to investigate how people view Stack Overflow for professional learning and how they integrate SO in their professional practices (environment).
Feel free to share your thoughts and ideas about professional learning on Stack Overflow as well as how you integrate what you acquired from Stack Overflow in your work practice or projects.

The interview will take around 30 minutes, your participation is highly appreciated.

maryam.ramadan4@gmail.com (not shared) Switch account

* Required

Thank you for agreeing to participate and be interviewed in my research study. This consent form is to ensure that we both understand the terms and conditions of the interview and how the data will be used. The following are the interview terms.

- The interview will be recorded and a transcript will be produced.
- The transcript of the interview will be only accessible by the researcher.
- Your identity will be confidential, codes will be used to refer to interviewees.
- In case any direct quotations are taken it will be anonymized to protect your identity.
- The data gathered during the study will solely be used for the purpose of this Master thesis.

I agree to participate in the research study under the above mentioned terms. *

- ◯ Yes, I agree to participate.
- ◯ No, I don't agree to participate.

Next Clear form

Interviewee

Please enter your full name. *

Your answer

Back Submit Clear form

Appendix 2: Interview Questions

1. How long have you been in the field of programming? Is it just a passion or a professional career?
2. What do you do on stack overflow? How do you use it?
3. How often do you use the platform? What are the situations when you use the platform, ask questions, searching for answers, etc and why?
4. Why do you use the platform? Can you ask a colleague at work if you had a question or you prefer to raise your question on stack overflow & why?
5. Can you think of a particular situation when you had to look for an answer on SO? What happened then?
6. Do you believe that stack overflow made a change in your work life? How did it help at work? What would have happened if there was no stack overflow? Would anything change?
7. What kind of challenges do you face when trying to apply the knowledge(by knowledge we mean the answers to your questions, the answers to your searches, etc) you gained from stack overflow?
8. Do you believe an online community like stack overflow could help you build knowledge that can aid you in your work life? How?
9. How do you integrate the codes you took from SO into your work tasks?