



Unicorns in Moderation

Gender and Epistemology on Stack Overflow

Tanya K Osborne



UNIVERSITY OF
GOTHENBURG

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Cover:

The image illustrates both literally and figuratively the uniqueness of the individual behind the screen - in this case with queer coded symbols. It also shows how lonely and conspicuous it can be to break the prevailing norms.

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Abstract

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Stack Exchange is a global knowledge sharing platform centred around programming, computer science, and a variety of other topics. It is a ubiquitous resource for coders and programmers. Knowledge sharing platforms, like Stack Exchange, are increasingly part of informal professional learning, and make professional knowledge accessible to people across the world. However, the platform has several persistent issues, like the under-participation of women and gender minorities. Given the ubiquity of the platform, and its positioning in recognising the expertise of programmers, there is an urgent need to understand how and why gendered participation patterns are reproduced in this environment.

Female participation in computer science and engineering has long been a subject of academic research. This thesis extends this line of research to cover female, non-binary, and trans experiences of participating in the online production of programming and coding knowledge. The title of the thesis, *Unicorns in Moderation*, has multiple meanings: it refers to the ‘unicorn’ success of a technology platform; the unique way in which of Stack Exchange’s approach to moderation combines platform affordances, volunteer moderation, elected moderation, and automation; and the relatively low participation of female and non-binary members.

Using a hybrid approach to digital ethnography, drawing on a mixture of interview, observation, document analysis and data analysis, I explore the gendered issues that are produced and reproduced on Stack Exchange. I find that the language policies on Stack Exchange are central to the reproduction of gendered discrimination and find that this is exacerbated by the gamified approach to content moderation. I also find that it is difficult for users to have measured

discussions about gender-based discrimination on the platform due to the lack of recognition for embodied knowledge. From this, there is great potential to understand how online professional learning and knowledge sharing environments might avoid reproducing gender-based discrimination. Future research could extend this by observing how communities on emerging user-coordinated platforms, such as Slack and Discord, manage professional knowledge creation and documentation practices and how these practices are institutionally coordinated.

The thesis has three main contributions. The first a theoretical contribution, by applying contemporary social epistemologies, such as epistemic ignorance, to digital contexts. The second is in the methodological design, which brings together a mixture of digital and conventional methods under the banner of institutional ethnography. The third is an empirical contribution, shedding new light on the discourses of gender on platforms.

This compilation thesis comprises an extended history of Stack Overflow, three empirical papers, and one methodological paper. Paper 1, *Writing the Social Web*, argues for how digital platforms can be understood as institutional settings. Paper 2, *Gaming Expertise Metrics*, explores how the platform mechanics on Stack Overflow reinforce existing masculine hierarchies in programming. Paper 3, *No Room for Kindness*, examines the codification of communication on Stack Overflow, using interviews, policy texts, and social media data to explore the relations that prevent politeness on the platform. Paper 4, *Silencing Tactics*, discusses how queer issues are discussed in the Stack Exchange community, and how these issues are minimised through the mechanisms of epistemic ignorance.

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Distribution of Work

Papers 1, 3 and 4 are solo authored. Paper 2 was authored in collaboration with the SOCDEX project group, following the Vancouver recommendations¹.

Paper 2: The roles of the authors

Following the Contributor Roles Taxonomy (CRediT) framework², the roles of the contributors for Paper 2 are as follows:

Tanya Osborne: Conceptualization, Investigation, Methodology, Data Curation, Writing – Original Draft. **Markus Nivala:** Conceptualization, Data Curation, Writing – Review & Editing. **Alena Seredko:** Conceptualization, Data Curation, Writing – Review & Editing, Resources. **Thomas Hillman:** Conceptualization, Data Curation, Writing – Review & Editing, Funding acquisition

¹ <https://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>

² <https://beta.elsevier.com/researcher/author/policies-and-guidelines/credit-author-statement?trial=true>

print(“Introduction”)

In the era of digital knowledge production, the nature of power and knowledge is changing. For many people, the authoritative source of knowledge is no longer a textbook or a teacher, but a digital platform, like Google (Davies, 2018), or Facebook (Pimmer et al., 2012). On the surface, digital platforms might seem like a good way to democratise knowledge and expertise (Shaw & Hargittai, 2018) – an opportunity for everyone to contribute to the generation and curation of knowledge. However, many of these platforms are not transparent about the nature of their knowledge production, continuing to replicate hierarchies and reproduce disparities. Furthermore there is a demand in research to examine how platforms operate organizationally (McIntyre et al., 2021), and to explore platforms as a form of social organization (Stark & Pais, 2020).

In this thesis, I focus on a knowledge repository platform central to professional learning in coding and programming environments, *Stack Overflow*. Stack Overflow is the name of both the parent company who operate the *Stack Exchange* network, a collection of questions and answers forums, and the name of the flagship question and answer forum in the network which is one of the largest online programming communities. I offer an institutional framing as a way to examine the social organization of the platform. This platform is strongly integrated into the everyday working lives of programmers and coders, and affects many facets of the work of coding, from changing the way that documentation for software languages and application programming interfaces (APIs) are written (Li et al., 2018; Zhang et al., 2021), to becoming an important source of reused code (Lotter et al., 2018). Tools even exist to extract knowledge from Stack Overflow and place it directly into the consoles and integrated development environments (IDEs) where developers write their code (Fuller et al., 2021; Ponzanelli et al., 2014). Input any coding question into Google, and it is quite likely that you will find a Stack Overflow post first in your search results. Yet, with 7.8 million daily pageviews (*Stack Exchange Traffic*, 2022), a global audience, and near ubiquity in the sector, Stack Overflow historically suffers from low participation of women (Vasilescu et al., 2013) and has an environment characterised as hostile to newcomers (Santos et al., 2020). This low participation is disproportionately low

when compared to the already relatively low levels of participation of women in the coding and programming sector (Nivala et al., 2020). Despite presenting itself as a democratic environment, and despite its thorough integration into the work lives of programmers, Stack Overflow is dominated by discourses of men and masculinity. Previous research on the participation of women on Stack Overflow has tended to focus on quantifying and identifying women (Lin & Serebrenik, 2016) and on identifying behavioural differences between men and women (Brooke, 2021; D. Ford et al., 2016a; Vasilescu et al., 2013), implicitly taking a deficit approach to participation, where women are framed as lacking in relation to men.

Stack Overflow is a vital part of lifelong and professional learning for many who are engaged in coding and programming. As university education plays a substantial role in helping students to develop strategies and resources for continued professional development (Peters & Romero, 2019), it will be important to understand the impact of particular online educational resources on those who are entering programming careers. For programming especially, participating in the complex array of different learning and knowledge sharing platforms has been likened to a form of apprenticeship that is essential to the work of becoming a programmer (Johri, 2022).

The urgency of understanding how global platform contexts become hostile environments is partly to understand the effects of platforms on how expertise is recognised, and partly to understand whose knowledge becomes canonical. The former question raises concerns about how we understand and recognise expertise in work-based settings. To understand the latter question, I introduce theories of epistemic injustice and epistemic ignorance.

Following Gerrard's (2020) call for more feminist internet researchers to engage with moderation guidelines and policies, I focus my analysis on how the practices of moderation are coordinated by Stack Overflow as an institution. Moderation can be understood as the processes by which a platform curates its content (Gillespie, 2018). Taking an approach inspired by institutional ethnography (D. E. Smith, 2005) and ethnography for the internet (Hine, 2015), I keep Stack Overflow as a platform in view, and ask what it is about Stack Overflow as a platform that affects participation from minority groups. I look at gendered participation broadly, examining both the perspectives of women (*Paper 2 and Paper 3*) and queer perspectives (*Paper 4*). I centre my investigation around the moderation practices of the platform, supplementing this with official policy documentation. Due to the Wikipedia-like nature of the platform, most of the

moderation is not done by formally elected moderators but rather by a mixture of platform mechanics and editors.

The figure of the unicorn is present at many points throughout this thesis. At first, the unicorn symbolises the success of Stack Overflow as a platform. Following the history of the platform in the *Context* chapter, we understand Stack as a ‘unicorn’. The financial definition of a ‘unicorn’ is a startup company that has a valuation of over one billion dollars (T. Miller, 2023). While Stack does not tend to make official ‘unicorn’ lists, the company was acquired for \$1.8 billion by Prosus in 2021 (Williams, 2021), showing that it has the financial potential of a unicorn. Unicorns appear as symbols on Stack Overflow. While reflecting on Stack Overflow’s growth and cultural representation, it becomes apparent how the company invokes the image of the unicorn as part of its performative approach to inclusivity; knowingly self-referential, the unicorn calls our attention to the joke of pretending to broaden the appeal of technology by adorning the technology with traditionally ‘girlish’ themes, like horses and unicorns. The unicorn shows up on blog posts about inclusion, and indeed, it shows up every April Fools’ Day. In this respect the platform welcomes unicorns – often symbolising members of the LGBTQ community – but only in moderation. The final form of the unicorn in this thesis is the way in which Stack Overflow combines many different forms of moderation, ranging from community moderation, democratic moderation, to automated moderation both coordinated by Stack Overflow and by the community to create a unique moderation approach strongly influenced by its institutional values. In this respect, Stack Overflow truly is a unicorn in moderation.

Research Project

This doctoral research is part of a larger research project titled, *social dimensions of expertise development in networked communities* (SOCDEX), funded by the Swedish Research Council. The purpose of the project is to study expertise development in an online programming community, Stack Overflow. This doctoral research project contributes to SOCDEX by providing a critical lens on expertise development from the perspective of gender.

Aim and Research Questions

The aim of this dissertation is to better understand the discursive arrangements on digital knowledge sharing platforms and their impact on the participation of women and gender minorities, with the objective of identifying mechanisms that prevent or obscure their full engagement. As key arbiters of expertise and knowledge in many areas, critically examining how discursive arrangements on digital knowledge sharing platforms prevent and obscure participation from minority groups is an important task. In doing this I take on a nuanced approach to gender within Stack Overflow research, noting that the majority of the prior gender studies focus more on identifying gender, discussed in the *Gender on Stack Overflow* section. To explore the role of Stack Overflow itself in the creation of hostile environments, I focus on the official texts and policies made by the platform, examining how they influence the practices of the people who contribute toward creating knowledge on the platform. Stack Overflow's unusual approach to moderation becomes important in examining how hostility and politeness are shaped within the context. During my ethnographic exploration, I became interested in how these divisions intersect with anti-transgender sentiments.

As an arbiter of programming expertise and knowledge, understanding how discursive arrangements on Stack Overflow prevent and obscure participation from minority groups has applications for people working in science, technology, engineering, and mathematics (STEM) education.

The research questions for this thesis are as follows:

- **Research Question 1.** How do digital platforms act as institutions?
- **Research Question 2.** How do moderation practices contribute to gendered inequalities on *Stack Overflow*?
- **Research Question 3.** How do programmer masculinities coordinate the silencing of queer experiences on *Stack Overflow*?

I use the *Context* chapter of this thesis to show a historical, materialist approach to understanding Stack Overflow as an institutionally coordinated setting, as a compliment to *Paper 1*. I use *Paper 1* to discuss the benefits of applying a feminist institutional framing to a platform environment and to argue for the benefit of recognising platforms as institutions. *Paper 2* shows the impact of the platform's policies on recognising programming expertise, and analyses this in relation to masculinities. I use *Paper 3* to explore the textual coordination of moderation on

Stack Overflow, focussing on how the platform's policies create a hostile environment for women. I use *Paper 4* to show how the institution acts to systematically silence users who raise issues around queer inclusion.

The main area of theoretical development is in the theory of epistemic ignorance. Epistemic ignorance theories give a way of explaining how power and domination is reproduced in systems, by control of knowledge, and by changing what kinds of knowledge are available to know. This theoretical development is applied to the ways in which knowledge is created and shared on platforms, both to examine the features unique to platforms that reproduce ignorance, and to examine the ways that platforms replicate systems of power and domination.

This thesis also makes an empirical contribution in several areas. Firstly, it contributes further empirical data for the study of ignorance and agnotology in engineering education. Secondly, it contributes empirical analysis of the types of discourse about gender that occur in masculine settings, particularly STEM settings.

This thesis also aspires to contribute to the methodological development of institutional ethnography. Currently, this is a methodology that has not been used in exclusively digital spaces. By developing this methodology alongside other digital methods, I hope to showcase a different way of doing digital feminist and critical ethnographic research.

The Thesis

The thesis is divided into two parts. The first part contains seven chapters that explore the background of the thesis, the theoretical underpinnings of the thesis, and discuss overarching themes in the thesis.

The first three chapters of this thesis form a background. The first chapter of this thesis, *Context*, lays out the story of the development of Stack Overflow as a platform. Inspired in part by platform biography (Burgess & Baym, 2020), the purpose of this chapter is to start out by framing Stack Overflow as a historically grounded, materially instantiated site of ethnographic study. This type of history is also an important part of doing an institutional ethnography, by laying out the social and political relations that already exist in this field and showing how they are historically grounded. The next chapter, *Literature Review*, gives an academic background to the overarching themes of the thesis: democracy, geek masculinities and moderation practices in online communities. This chapter helps to contextualise the findings of the thesis and situates the thesis within a wider field.

As part of this, *Gender on Stack Overflow* gives a focussed literature review, critiquing and assessing previous literature on gender and Stack Exchange. I set forward the challenges to studying gender in online environments, particularly where identities may be unknown. By examining previous gender studies closely, I set out an argument for my own approach to studying gender in this environment, in a way that avoids the major weaknesses of similar studies in the field.

The next three chapters of the thesis form a research design. Starting with the chapter *Theory*, I introduce the core theoretical concerns of the thesis. In this chapter, I introduce institutional ethnography as a sociological cannon, and invoke some of the concepts from institutional ethnography that are analytically important to the thesis, such as work and texts. I situate this against a background of Foucauldian critical theory. I also introduce concepts from social epistemology that will be of analytic interest, particularly concepts from epistemic ignorance. This is capped off with an introduction to the gender theory that underpins this thesis, taking from Butler and Connell. The next chapter, *Methodology and Methods* introduces institutional ethnography again, this time as a methodological orientation to ethnography, unpacking some of the analytical tools used in the development of this thesis. I also situate my orientation toward studying the internet in the tradition of ethnography *for* the internet, following Hine. After this, *Ethics* outlines my virtue ethics approach to doing feminist research, drawing on Ess and Foot. As part of this, I explain my approach to harm reduction in internet research.

Following from this, *Paper Summaries* gives a brief outline of the main findings of the four papers that comprise the second part of the thesis.

The final two chapters of part one of the thesis offer a discussion and reflection on the overall contribution of the thesis, synthesising the work of the four papers.

After the final two chapters, the *Swedish Summary* gives an overview of the text in Swedish language, intended for a general audience.

The *Appendix* contains supplemental materials for the thesis. Among these materials is a glossary of terms, which may be of use to readers who are less familiar with some of the technical language in the thesis relating to programming and the specifics of Stack Overflow as a platform.

The second part of the thesis comprises four papers, three of which are empirical, one of which is methodological.

The four papers are:

- Paper 1: Writing the Social Web: Toward an Institutional Ethnography for the Internet
- Paper 2: Gaming Expertise Metrics: A Sociological Examination of Online Knowledge Creation Platforms
- Paper 3: No Room for Kindness: Women and Communication on Stack Overflow
- Paper 4: Silencing Tactics: Pronoun Controversies in a Community Questions and Answer Platform

Context

The cornerstone of an ethnography is a rich understanding of the field. This chapter of the thesis draws inspiration from platform biography (Burgess & Baym, 2020) to provide a rich field description. The purpose of the chapter is to show Stack Overflow in its social and historical context, and in doing so, render the materiality of the platform visible. Stack Overflow is not just an abstract website with ephemeral posts, but it is a developing institution involved and implicated in the day-to-day doings of many people. By showing the historical context, the politics of the platform are made available to analyse, and the institutional context becomes apparent. Presenting Stack Overflow in this light forms the basis of my argument that we can and should explore platforms as institutionally organised settings.

Stack Overflow launched on 15th September 2008, during the beginning of the social web. MySpace was the most popular social media platform. Facebook had been around for about four years, and Twitter was just one year old. Blogs and blogging were extremely popular. Within 5 years, Stack Overflow already had over 5 million questions answered (Hanlon, 2013). After 10 years, the platform had 16 million answered questions, and the answers to those questions are claimed to have been used 12.3 billion times (Hanlon, 2018b). During this time, Stack Overflow grew rapidly to become one of the largest online coding and programming communities, with more than 15 million registered accounts and upwards of 50 million monthly users (Brooke, 2021; May et al., 2019).

Stack Overflow was the result of a collaboration between Jeff Atwood and Joel Spolsky. Joel Spolsky runs a blog about being a developer, called Joel on Software³ which has been active since 1999. The blog had an active forum, which was closed around 2009. The Joel on Software forum was considered in some ways the precursor to Stack Overflow because it also had fairly strict rules about what could be discussed (A. Miller, 2011), and therefore set many of the conventions that Stack Overflow uses to govern itself. Data from this forum was even used initially in load-testing early iterations of Stack Overflow (Johnson-Pint, 2014). Joel Spolsky is gay, and has a husband (Spolsky, 2015). While he has previously said that ‘politics are orthogonal to software’ (Spolsky, 2004), on a few occasions he

³ <https://www.joelonsoftware.com/>

has shared his political views, notably in relation to Stack Overflow showing support for gay marriage, which attracted backlash from the community (Spolsky, 2015).

Jeff Atwood also runs a blog, called Coding Horror⁴, established in 2004. Jeff's blog had comments, but only gained a forum in 2014. In his blog, Jeff frames his relationship with Joel as an unlikely pairing of two people with quite differing opinions, and frames Joel as the more successful and famous of the pair.

Both Jeff and Joel received moderate fame on the basis of their blogging activities, at a time when the internet was marked by the proliferation and popularisation of the blog and of discourse through blogging. Blog posts have a particular importance in software communities (Pagano & Maalej, 2013). In 2007, Jeff estimated that 100,000 people read his blog every day (Atwood, 2007).

Jeff Atwood stepped away from Stack Overflow relatively early, after about four years of being the CEO. Joel retains an association with Stack Overflow to this date but stepped back from being CEO in 2019.

Stack Overflow was originally described as a 'developer community website' (Atwood, 2008b), positioned firmly against spaces like Experts Exchange⁵ who use a paid model for access to information technology expertise. Instead Stack Overflow is described as 'Wikipedia meets programming reddit' (Atwood, 2008c). Atwood describes the vision of Stack Overflow as 'the confluence of a wiki, discussion, blog, and reddit/dig ranking systems' (Atwood, 2008d):

The problem that Stack Overflow was built to address was a fractured landscape of programming knowledge, divided between small communities focussed on single programming languages, and between listservs and UseNet communities (Popper et al., 2021). Programming communities were a diaspora, and there was no clear space for coders and programmers in general to converse.

Joel Spolsky described the idea for Stack Overflow as a website that was 'free to ask questions, free to answer questions, free to read, free to index' (Spolsky, 2008). In this way, Stack Overflow framed itself as diametrically opposed to Experts Exchange. From the very inception, 'free to index' notions at the importance of Stack Overflow being an open resource. Stack Overflow was conceived of as a commons, an intellectual resource for computer programming. I discuss the commons further in the *Literature Review*.

⁴ <https://blog.codinghorror.com/>

⁵ Experts Exchange (<https://go.experts-exchange.com/>), founded in 1994, is a community for Information Technology workers, which requires a paid subscription for access.

A Biography

Timelines are important within the Stack Overflow community, and a number of community owned timelines exist (*Stack Exchange Timeline of Events*, 2021). In this section I put forward highlights of some of the major events in the history of Stack Overflow, not including User Interface (UI) and design updates.

Birthing a community

Taking on the core values of democracy and openness, Stack Overflow was designed to be community-led. The name of the website was chosen by Jeff Atwood's blog readers, where 6,895 votes were received, and the name Stack Overflow won with 25% of the votes (Atwood, 2008b). The actual names were user submitted, solicited from Jeff Atwood's Twitter:



Figure 1: Tweet about naming Stack Overflow, (Atwood, 2008a)

The logo for the website was designed using a crowdsourcing platform, and attracted 302 entries by 105 individual designers (99designs, 2008). Both of these movements show discursively that Stack Overflow was intended to be a democratic space, owned by the community, by giving over some stake in the branding of the platform.

Shortly after the launch of Stack Overflow, the platform widened its ambitions and broadened its scope. In 2009, Stack Exchange was developed as an umbrella network of community questions and answers forums, and Stack Overflow became a part of the Stack Exchange network. Initially, new Stack Exchange websites were available for a fee, and were part of the platform's monetization model (oshiro, 2009). By 2010, this monetization model was dropped in favour of creating new Stack Exchange websites as part of a 'democratic' process (Spolsky, 2010).

Also in 2009, Stack Careers (later rebranded ‘Jobs and Developer Story’) was launched. Joel Spolsky described the idea as creating a talent market for programmers to be headhunted, saying ‘recruiting should work like Hollywood, not like union hiring halls of the last century’ (Spolsky, 2009). Originally, job seekers were charged \$19 dollars to post their CV. It appears that both Joel Spolsky and Jeff Atwood had some individual interests in programmer job listings at the time, and that developing an offering via Stack Overflow presented an opportunity to reduce redundancy between their personal ventures (Atwood, 2009b).

In this early period, the discursive positioning of Stack Overflow as democratic is particularly important and is done by offering the community an early opportunity to buy in to shaping the platform in cosmetic ways. This is contrasted by the individualist ideals of the ‘Hollywood’ programmers.

Becoming a Platform

Platforms are discussed further in the *Literature Review* chapter. In brief, a platform is a website that users can interact with, characterized by its programmability and by its ability to link to other services through an application programming interface (API).

In May 2010, Stack Exchange introduced a public API, and a website to support the API called Stack Apps (Atwood, 2010a). This turn marks the start of Stack Exchange as a platform. The Stack Exchange API gives access to much of the base question and answer data on the platform, and all the metric data, such as reputation. Stack Apps both functions as a space to ask questions about developing apps with the API and as a space to share apps written for Stack Exchange. This is an important development in making Stack Exchange an open-source arena and in opening Stack Exchange to researchers. In this way, even the programmable features of the platform have an air of democracy, in that they too can be shared freely, and anyone is able to use these resources.

However, the API was not the only ambition that Stack Exchange had for making their data accessible. In June 2010, Stack Exchange introduces the Data Explorer. People can write structured query language (SQL) queries on the Data Explorer to interrogate the monthly Stack Exchange data dumps, and share those queries with other people (Atwood, 2010b). This allows users to query data without the need for API access, and also makes visible what kinds of data users are interested in. Users can save, share, and favourite queries made in the Data Explorer. The Data Explorer is an interesting and quite unique feature of the

platform, which both makes it possible to use Stack Exchange’s data from within the platform, to share queries in a social way, and to organize moderator work. Some of the more popular queries on the Data Explorer are queries that allow users to track their progress towards achievements and their status on the site (‘How many upvotes do I have for each tag?’; ‘How Unsung am I?’; ‘What is my accepted answer percentage rate?’). Others are used to find work on the platform or to streamline the work of maintaining answers (‘Suggested edits on my stuff’, ‘Posts with many “thank you” answers’). The Data Explorer is an interesting use case for the programmability of a platform; while other platforms might leave programmability in the hands of API developers (Helmond, 2015), Stack Exchange offers programmability and interaction with platform databases directly available to users. I discuss how people use the Stack Exchange Data Explorer further in *Paper 2*, *Paper 3*, and the *Discussion*.

Around 2010, Stack Exchange starts to get involved in work to support the wider open source community by donating to Open Source projects (Ellis, 2022), donating annually from 2010 to 2017, with a gap of a few years, resuming again in 2022. Benefactors include several of the open-source projects that Stack Overflow has historically used to run parts of their business.

The earliest research on Stack Overflow emerged in 2011, around three years after the inception of the platform, and discussed the platform’s rapid response speeds as a questions and answers forum (Mamykina et al., 2011). Research on Stack Overflow is possible in part due to the increased availability of platform data, which researchers can access via either the API or the Data Explorer.

Cementing itself as an authority on programmers, Stack Exchange positions itself to leverage information on programming as an industry. At the start of 2011, the Stack Overflow Annual User Survey was launched (Sperling, 2011). This survey would become an annual feature, and the focus of several research papers. In February 2011, the next iteration of Stack Careers was launched, this time for free (Spolsky, 2011).

Despite the burgeoning success of the platform, the days of ‘Jeff and Joel’ were numbered. A year later, in February 2012, Jeff Atwood resigned from his post at Stack Exchange. He cited the death of Steve Jobs as part of his reason, realising that it was important to spend time with his young family (Atwood, 2012a).

As people learn to master the new platform features, the increased programmability of the platform slowly grows dividends. Towards the end of 2013, a section of the community create Charcoal, a bot to detect spam across the Stack Exchange network (Charcoal, 2023). This is an important landmark, as we

now start to see the community collaborating to make moderation tools independently of the platform.

Changes to the structure of the platform became necessary as the active user base of the platform increased. In April 2014 there is a relatively important reconfiguration of Stack Exchange's Meta forums, where people discuss about Stack Exchange. At this point in time, Meta Stack Overflow is divided into two new websites: a new Meta Stack Overflow for discussing specifically the Stack Overflow community, and a Meta Stack Exchange for discussing network-wide issues and feature requests (Post, 2014). This reconfiguration is in part due to the expansion of the Stack Exchange network, necessitating different spaces to talk about the network as a whole and Stack Overflow. This offers a useful context for researchers, who can use this as a resource to follow the ways that a community discusses its own internal issues.

While Stack Exchange had stayed out of politics, eventually the company dabbles in some performative allyship. In June 2015, Stack Overflow briefly changed their logo to a rainbow icon in celebration of the legalisation of gay marriage in the USA (Tim, 2015). While CEO of Stack Overflow, Joel Spolsky, was very supportive of this move (Spolsky, 2015), there was a considerable amount of backlash. Some of this backlash was targeted very much at Spolsky and his identity as a gay man. Much backlash followed the reasoning that politics and programming had no place together, echoing something that Spolsky himself had written early in his blogging days (Spolsky, 2004). Discursively, using silence in this way is a move toward resisting narratives of acceptance. Some of these issues are explored in *Paper 4*. This is perhaps the first big incident demonstrating the kinds of hostility that exist towards the LGBTQ community on Stack Exchange.

Also in 2015, Stack Overflow started to experiment with its own formula, and launched the short-lived Stack Documentation website (Montrose, 2015). The main goal of this project was to create documentation for programming languages that also included examples. This feature was discontinued two years later in 2017 (Ericson, 2017). This can be considered a bit of a failed experiment of moving into the technical manual space and attempting to repeat the Stack Overflow project with a stronger nudge towards the style of Wikipedia. In some ways, this experiment foreshadows the tension between form and content on the platform, which I return to in the *Discussion*.

In September 2015, Stack Exchange officially changed its company name to Stack Overflow (Hanlon, 2015). Previously, Stack Exchange had been the name of the company and the network of questions and answer forums. After this point

Stack Overflow becomes the name of the company and the name of the original forum, and Stack Exchange remains the name for the network. In this way, Stack Overflow strengthens its own brand identity.

Three years after the launch of Charcoal, community-based moderation bots on Stack continue to grow. Around 2016, SOBotics⁶ is formed (SOBiotics, 2019). SOBiotics creates bots to help with community moderation, by detecting new answers to old questions, low quality questions, and problematic tags. Community owned bots with no direct affiliation to Stack Overflow are an important fixture of the moderation ecosystem of the platform, and continue to grow in number (SOBiotics, 2019).

Corporate Concerns

At this point in time, Stack Overflow turns to address its public image. During 2017, Stack Overflow pairs up with researcher Denae Ford to review new user experience and pilot a mentorship programme (kristinalustig, 2017). Many of the comments on the announcement post are not particularly supportive of the initiative. The mentorship pilot lasted about 33 days, and showed improvement to the quality of questions posted by new users who had been mentored (D. Ford, 2018). This action was very much undertaken under the looming shadow of Stack Overflow's reputation as an unwelcoming environment. Over the years that follow, attempts to salvage this cultural reputation are numerous.

Many sweeping changes happen during 2017 and 2018 at Stack Overflow. In tandem with these sweeping changes come staff cutbacks. At the end of 2017, Stack Overflow laid off around 20% of its staff (Grant, 2020).

During early 2018, affiliated advertising started to be rolled out to the Stack Exchange Network (Post, 2020b). This was a move not widely accepted by the community and shows a continued need for Stack Overflow to develop a sustainable financial model.

Once again looking to secure revenue streams, Stack Overflow starts to experiment with new offerings. During March 2018, Stack Overflow announces 'Stack Overflow for Teams' (Post, 2018a). This is a private instance of Stack Overflow, designed to be run inside a company, and not related to Microsoft Teams. In many ways, Stack Overflow for Teams is the spiritual successor to the original monetization idea for Stack Exchange. Instead of a one-off fee, Stack Overflow for Teams operates on a Software as Service model, with a monthly fee.

⁶ <https://sobotics.org/>

Shortly after this time, Stack Overflow publishes a blog post about its own problem with being welcoming (Hanlon, 2018a). This is followed by the implementation of a Code of Conduct to replace the previous ‘be nice’ policy (Post, 2018b). The immediate events surrounding this are explored in *Paper 4* of this thesis in greater detail. In short, the community underwent a massive internal upheaval over the soft introduction of a pronoun policy and consequently mishandled the dismissal of a high-profile moderator. It is noteworthy that, much like the incident with the Stack Overflow logo, this community dividing issue is again centred around the acceptance of LGBTQ+ identities within the community.

Over the following months, several members of Stack Overflow staff resign. Notably, Joe Friend, who had a background in inclusive design (Friend, 2018), resigned. This was followed by Jay Hanlon, who had been the Vice President of Community since 2012 (Jaydles, 2019). The period that followed contained a large number of high-profile resignations, and some significant reconfiguration of community managers. While this is unlikely to be start of a major shift in Stack Overflow, the instability in this period is symptomatic of issues that had been brewing for quite some time. Many of these resignation notices cite the changing business model and decreased quality of the platform as their reason for resigning. The resignations are discussed in more detail in *Paper 4*.

During this time, we also experienced the advent of the global pandemic. It was also during this period that I embarked on my PhD and started to plan out my ethnographic engagement.

In 2019, Stack Overflow started to allow users to log in via a GitHub account (Dalgas, 2019). This move shows a symbolic unity between GitHub – a repository for sharing version-controlled code – and Stack Overflow as two major players in the online code-sharing ecosystem. By doing so, Stack Overflow again consolidates its grip on the work lives of programmers. In September 2019, Stack Overflow began the process of changing the creative commons licensing for its content (Post, 2020a). This was a widely criticised move because they applied new licenses retroactively. Eventually this decision is partially reversed, and only new content is given the newer creative commons license (*What Is the License for the Content I Post?*, 2021).

A Changing Business Model

The next period of time is marked with rapid changes and structural shake-ups to the core of Stack Overflow. In October 2019, Prashanth Chandrasekar became the CEO of Stack Overflow (Spolsky, 2019). While Joel Spolsky retains a presence in the leadership of Stack Overflow, this marks a change in the levels of involvement of the original founder.

During April 2020, Stack Overflow introduces a council of moderators to act as a kind of advisory board to the community managers (Catija, 2020a). This council comprises 11 moderators elected by their peers. This represents a slightly different take on the previous instantiation of democratic leadership, with the lines of report to management taking on a more distinct hierarchy.

In 2020, Stack Overflow finally gets the much-requested ‘dark mode’ feature (Catija, 2020b). This is a feature that allows the platform to show in darker colours and had been long the subject of discussion. It was also one of the most demanded features in the developer survey (Stack Overflow, 2019, 2020).

Around mid- 2020 Stack Overflow goes through another round of staff layoffs, reducing their headcount by 15% (Chandrasekar, 2020).

In 2021, Stack Overflow was acquired by Prosus (Williams, 2021), a technology and internet platform investment firm based in Europe. Spolsky was keen to iterate the benefit of this arrangement is that it keeps Stack Overflow independent with most major decisions still being made by Stack Overflow leadership (Spolsky, 2021). This move marks a dramatic shift in the way that the company is financially managed.

Early 2021, Stack Overflow launches a project to help flag and identify outdated answers (Taylor, 2021). This results in the addition of a prompt on questions asking readers if the answer is outdated (Taylor, 2022). This highlights the project of documenting answers and developing Stack Overflow into a wiki (Hillman et al., 2021).

In summer 2021, Stack Overflow launched Collectives (Dietrich, 2021). This appears to be a way for companies to group certain tags into a hub and have their branding on this group of tags. Tags are labels that organize questions into specific categories, usually relating to specific programming languages or tools. As part of Collectives, Stack Overflow also markets user data to companies (Stack Overflow, 2021), promising insights into user engagement with their ‘brand’. This continues the trend wherein Stack Overflow turns away from prioritising benefits to users of

the platform and toward monetising via offering services to companies. Here the neoliberal turn in the platform economy grows ever more apparent.

Over the years, it was clear that Stack Overflow had put a lot of effort into their careers offering as a passion project, going to great lengths to refine and improve their job matching algorithms (Gasser, 2017). However, by 2022, careers related platform features were depreciated, ‘to focus more on customer employer branding and company awareness needs, and moving away from job slots and direct hiring’ (Chandrasekar, 2021), effectively subsuming careers into Stack Overflow’s advertising offering. This decision was not met with support from the community (Mulchandani, 2022). Far from Spolsky’s original idea of turning programmers into Hollywood stars who are headhunted for their merits, now the employer is again king.

In late 2022, Stack Overflow introduced a new project for enabling access to Stack Overflow offline, aimed at users with unreliable internet access (Popper, 2022). This development shows Stack Overflow thinking about its global userbase and securing its stake in the global market. Also during late 2022, Stack Overflow introduces Ask Wizard, a tool to help first time users put together their question (Cleary, 2022). Contrasting with the project in 2017 with Denae Ford, this does not put new users into contact with moderators, but rather nudges new users from a design perspective to follow the posting conventions on the platform. This shows a veer away from the idea of integrating new members into the community, and towards trying to get questions answered faster.

At the start of 2023, Stack Overflow starts to show promotions for courses from Udemy and Pluralsight (Dietrich, 2023). These are both learning technology companies owned by Prosus. This is likely an attempt to capture the millions who browse Stack Overflow for answers to coding questions and funnel them towards places where the new parent company can earn money. At the same time, this move positions Stack Overflow more formally as part of a learning ecosystem.

In April 2023, Chandrasekar hints that Stack Overflow is working on an AI chatbot or Large Language Model (LLM) that will be trained on Stack Overflow data (Chandrasekar, 2023), presumably to compete with ChatGPT.

At time of writing, Stack Overflow once again launches an update to its Code of Conduct (Bella_Blue, 2023). The development of these most recent changes is not covered in this thesis.

Platform Mechanics

In this section I highlight briefly some of the important mechanics on Stack Overflow as a platform. I cover the importance of reputation, and briefly discuss the complex mechanics involved in how users form threads.

Reputation and Privileges

Reputation is a number that is associated with an individual user account that is vital for ordering, ranking, and sorting users. Alongside elected moderators, Stack Overflow also grants users additional powers based on how much reputation they accrue. These powers are generally access to tools that allow users to take up moderation responsibilities within the community. This is known as gaining privileges. The first privileges are gained at 1 reputation point, and the last privilege is gained at 25,000 reputation points (Privileges, 2023). A non-exhaustive list of important reputation gates follows:

- At 15 reputation points users are allowed to upvote posts
- At 20 reputation points users may post in the chat
- At 50 reputation points users may post comments anywhere – prior to this they may only post comments on their own posts.
- At 125 reputation points users may downvote posts
- By 500 reputation points users are able to access the review queue, which enables them to start determining if questions require review actions by more experienced members.
- By 2,000 reputation points users are able to edit others' questions and answers.
- At 10,000 reputation points users have access to moderator tools and may delete questions.
- By 20,000 reputation points a user is considered 'trusted', and gains expanded editing access.

It is perhaps not obvious about the format of the platform that even upvote and downvote mechanics must be earned through gathering reputation. From the get-go, one is expected to prove one's worth before partaking in community life. Due to the population spread on the platform, relatively few people have access to all of these permissions. The majority of Stack Overflow accounts are not able to upvote posts. Using the Stack Exchange Data Explorer, it is possible to see the

distribution of reputation across accounts. From this, the average user reputation is just 90, and the majority of user accounts (70%) have only 1 reputation point.

To put this into perspective, as of October 2023 there are 21,286,489 Stack Overflow accounts with 1 or more reputation. If we narrow this down to accounts who are able to upvote and downvote posts, with more than 125 reputation, there are 1,050,284 accounts. There are around 145,369 accounts with high enough reputation to edit posts. There are only 11,687 accounts with high enough reputation to be considered trusted users. I discuss these uneven distributions of reputation further in *Paper 2*.

Reputation is an important visual marker that represents one’s standing in the community. Reputation is displayed prominently whenever a user asks or answers a question. It is also displayed prominently alongside badges on a user profile, along with other platform achievements. The following images show how this looks in an anonymised way. Personal data has been pixelated, the pixelized avatar images have been recoloured to avoid the possibility of recognition.

Figure 2 shows the way in which user information is displayed next to their username on question-and-answer posts. A miniature version of a user’s avatar is displayed next to their username, and underneath this their reputation score is given alongside their badge scores. In this format the reputation score is typically rounded for space, for example, ‘300k’ rather than ‘300,001’.

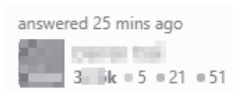


Figure 2: User information displayed on a post.

Figure 3 shows the main information contained in a user profile. A user’s profile can be accessed by clicking on their username or avatar. In a user profile, it is possible to see a more detailed breakdown of statistics that the platform has deemed relevant. In the statistics box, one can see the exact total of reputation. One can also see how much ‘reach’ this user has, which represents how many times their posts have been viewed. After this, there is a breakdown of how many questions and answers this user has posted. This is followed by their overall standing, a trophy representing their position in the ‘reputation league’ (Stack Overflow, 2024). The next set of boxes gives a breakdown of badges – badges shown on a black background are general badges that can be earned for any activity, the badges with a grey background - blurred in this image for privacy –

are tag badges, earned for activity within specific tags. It is worth questioning how well this system of reputation matches to the proclaimed ideals of democracy.

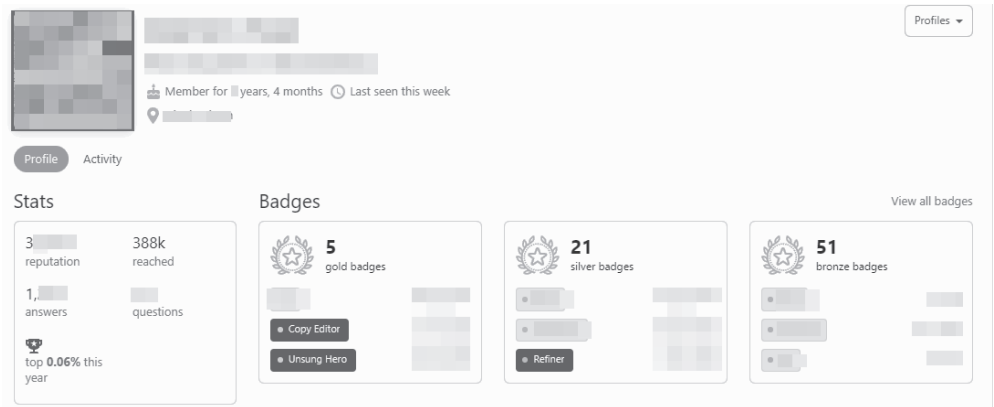


Figure 3: User profile

Communication Format

While the format and presentation of the platform is mostly that of a traditional questions and answer forum, unlike traditional questions and answer forums anyone with enough reputation can edit the questions and answers that are displayed. This means that while the audience is presented, at first glance, a conversation between two interlocutors, the reality is often much more complex. Questions and answers in a thread may be edited by third parties, and sometimes even each other (e.g., a question answerer may edit the question). The edit trail for questions and answers is included and is viewable by anyone. While a question or answer post remains attributed to the original poster, at times, and on some of the most popular questions, the original post may bear no resemblance at all to the post after edits.

Comments and chat follow different rules to questions and answer posts. Comments are intended to be temporary (Stack Overflow, 2023a), and can only be made after a user has 50 reputation. After a comment is posted, there is a five minute window in which the poster can make edits (Cyril, 2016). Otherwise, only official moderators can make delete comments, although ordinary users are able to flag comments for review. Chats are real-time communication between members, and a user requires 20 reputation points to post in a chat. Chats are often made on question and answer threads, but large chats also exist for specific forums

on the Stack Exchange as a whole or for specific topics. Chats on Stack Overflow are persistent and archived, and it is possible to permalink chat messages. Stack Overflow refers to chat as ‘the third place’ in reference to sociologist Ray Oldenburg (Stack Overflow, 2023b). A ‘third place’ is understood as being a space outside of home and work where people can interact on neutral ground to converse, enjoy the company of other people, and engage in a playful mood (Soukup, 2006). Many of the social chats on Stack Overflow take on names that reference taverns or cafes, alluding to this idea of a third place. However, from my own observation, this ideal falls short, as chats are frequently used to discuss and coordinate actions being taken on the front-facing questions and answer forums. In such spaces, chats are generally focussed on the business of curating and moderating the platform rather than on social connection. Given that access to chats is reputation gated, this also challenges the idea of chat as a third place, since ability to participate in this space must be earned. Overall, chats supplement the workings of the platform, are a place to coordinate moderation activities, share reports from moderation bots, discuss quick corrections to questions and answers, and occasionally interact socially.

Stack Overflow Theory of Moderation

Stack Overflow abides by its own ‘theory of moderation’, first outlined by Jeff Atwood in 2009. First and foremost, the approach to moderation is described as democratic and self-regulating (Atwood, 2009a), with the bulk of work ‘amortized’ by the reputation system, while elected moderators handle exceptions. These exceptions are imagined to be things that are flagged by the community as anything ‘evil, weird or in any way exceptional’ (Atwood, 2009a). Stack Overflow present five principles for how they hold themselves responsible to their moderators: trust, support, agency, accountability and autonomy (Post, 2018c).

Official moderators are elected by the community in what is described as a democratic process. The formal process has three stages: a nominations stage, a primary stage and an election stage (Atwood, 2010c). During the nominations phase, anyone can nominate themselves as a moderator if they have 300 reputation, and the top 30 nominees ordered by reputation will go through the election process. During the primary phase, members with 150 or more reputation can cast a vote up or down on each candidate, and after four days the top ten candidates will go through the final election stage. During this final stage, community members with more than 150 reputation are invited to privately vote

for a first, second and third choice, and after four more days a winner is calculated according to single transferrable vote rules. There are 24 officially elected moderators on Stack Overflow and 540 elected moderators across the Stack Exchange Network. Importantly, the majority of people who contribute to the moderation of Stack Overflow do so as editors rather than elected moderators.

Moderators on Stack Overflow are seen as a liaison between the community and the company (Cartaino, 2010). Formally elected moderators have access to a Teams instance for moderators, and have access to ‘the Teacher’s Lounge’, a real time chat area (*Moderator Agreement*, 2023).

Cultural Position

In this section I briefly highlight how Stack Overflow is generally received in popular culture. Stack Overflow positions itself as a ubiquitous entity in technology, claiming that 59% of developers visit the platform every day (*Stack Overflow Advertising*, 2021), and that it is one of the 50 most popular websites in the world (*Stack Overflow About Us*, 2021). Stack Overflow therefore is a platform that has great prominence in informal and professional learning about coding and programming. Perhaps the three things that are most associated with Stack Overflow are the extent to which programmers copy and paste code from Stack Overflow, the ubiquity of Stack Overflow, and the general hostility of Stack Overflow.

Popular culture

It is a relatively common joke or meme that developers regularly copy and paste code from Stack Overflow into work projects:

The meme below, tweeted by Stack Overflow’s official X account (Stack Overflow [[@StackOverflow](#)], 2021), takes the style of a typical book cover for a teach-yourself-programming book from the O’Reilly series. These book covers typically use a black and white image of an animal – in this case the meme uses a sloth, presumably to convey the idea of laziness. The phenomenon of code copying and pasting also generates some research interest and evidence. To a degree, a real-world implication of Stack Overflow is that the code shared on the platform finds its way into a variety of mainstream software, causing potential security issues (Firouzi et al., 2020; Rahman et al., 2019), but also to a degree defining the style in which code is written.

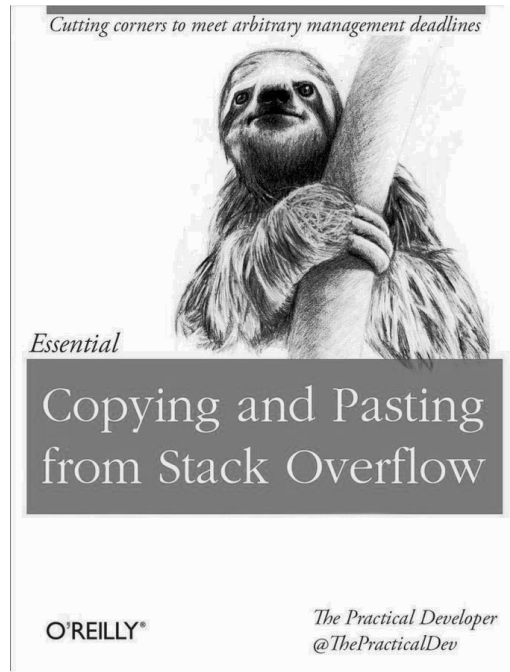


Figure 4: Meme posted on Stack Overflow's official X account

Inhospitable

Stack Overflow has a long-entrenched problem with attracting women to participate. According to the 2020 Developer Survey run by Stack Overflow, 8% of Stack Overflow participants are women, and 1% are transgender, and 1% have other gender identities (Stack Overflow, 2020). This survey is based on a small sample of the user base. When asked what they would like to see changed on the platform, women were more likely to say 'rude', 'culture' and 'toxic', and men were more likely to say 'GitHub', 'mobile', and 'dark' (Stack Overflow, 2020): women want a more respectful environment; men want dark mode – the ability to show the platform in inverting black and white text colours, making reading easier in low light. Other studies have found that there is a significant and unexplained reputation gap between men and women (May et al., 2019). It is difficult to assess from this how much the issue extends to other genders and minorities on the platform, but we might infer that this is symptomatic of an unequal and potentially hostile environment.

Unicornicopia

As a platform with a dominant presence in the programming community, Stack Overflow also absorbs and mirrors cultural phenomena, and has its own memes and in-jokes. Of particular note is the presence of the unicorn meme, also known as ‘I like ponies’ (*Answer to ‘The Many Memes of Meta’*, 2009). Unicorns return again and again as symbols on Stack Overflow, often as part of April Fool’s Day jokes. While it might seem tempting to attribute this to the reboot of My Little Pony, which gained a notorious male fandom, this in fact predates the popular reboot. It is quite likely instead that it is a reference to a Slashdot – a popular technology news sharing platform - April Fool’s Day joke from 2006 (Kosmonaut, 2011).

The Slashdot April Fool’s Day joke involved asserting that the news platform was attempting to appeal to more women by rebranding the platform, changing the colours to pink and changing the slogan from ‘News for Nerds’ to ‘OMG!!! Ponies!!!’.

‘I like ponies’ has long since been the non-sequitur of choice on Stack Overflow, often used to mark the previous statement as an unreasonable demand. Jeff Atwood blogs about a version of this that he calls ‘...and a pony!’ which he attributes to a popular Calvin and Hobbes comic strip (Atwood, 2006). In this comic strip, Suzie complains about Calvin, wishing that she had other friends to spend time with, ending her rant with ‘and as long as I’m dreaming, I’d like a pony’ (Watterson, 1987). Over time, it is possible that this became corrupted to simply ‘I like ponies’.

A notable place where unicorns show up, without comment, is on the imagery for the blog post that discusses Stack Overflow’s problem with being a welcoming environment (Hanlon, 2018a). The post contains an image of a Lego minifigure wearing a unicorn costume, against a white backdrop. The body of the unicorn is white, but the hands and feet are blue, and the chest contains small blue and pink stars arranged in a line, possibly alluding to the trans pride flag. The irony here is that in the original Slashdot context, ponies are offered as a sarcastic pinkwash. While Stack Overflow tries to seriously navigate and unpack its problems with its cultural reception, it still references this original context, calling in to question just how seriously the institution takes the issue.

Conclusion

Overall, the rise of Stack Overflow is a journey of a community growing to success, and gradually shifting from the ideal of a commons that aims to unite the diasporic programming landscape, to a business-minded model of financial growth.

Due to Stack Overflow's data being open and available under creative commons licensing, Stack Exchange is a popular source of training data for developing language models, topic modelling and sentiment analysis. Stack Overflow also attracts plenty of research on metrics and gamification. This is in part due to the wealth of information available through the API about upvotes, downvotes, badges, reputation, and other point-accumulating activity.

As a site of study, Stack Exchange websites offer a complex assortment of different kinds of interaction and possible functions of interest, including gamification elements (badges, reputation, upvotes and downvotes), interaction elements (questions and answers, comments, real-time chat, meta discussions), documentation elements (FAQs, platform documentation, editing trails, blog posts), API modification elements (SQL interface, scripts, API data), and 'backstage' elements (triage queues, automated and machine learning derived moderation, moderator only areas).

Hostility in the community has always been a problem for Stack Overflow. Looking with a historic lens, frictions around accepting LGBTQ+ narratives on the platform have often caused disjuncture that make visible the conflicts on the platform. Later in this thesis I will frame this as a conflict between competing discourses (*Paper 3*), and as a product of epistemic ignorance (*Paper 4*).

The unique approach to moderation on the platform will become an important object of examination as the thesis develops. Ordinary users earning their way to editing positions and thereby informally participating in moderation contributes in part to the ways that hostility play out in this environment. This is explored further in *Paper 2*.

Through this background section, we can see how the platform has gradually developed as an institutionally organised setting. This compliments the findings of *Paper 1*. The initial discursive positioning of the platform was within the ideals of democracy and openness, following FLOSS culture; however, simultaneously we see the company testing new ways to secure itself financially, revealing tensions between its founding ideals and pragmatic need to remain profitable.

Literature Review

Building on the *Context* chapter, the literature review explores some of the issues connected to the thesis in the broader research landscape. The background is divided into four sections: knowledge platforms, moderation, masculinities, and gender on Stack Overflow. The first three sections form a narrative review of the problem space. The first section discusses the open internet, ideals of democracy online, and platforms generally. The second section explores moderation and online communication with a focus on how other platforms experience toxicity. The next section explores contemporary issues in masculine online spaces, and within engineering. This section contextualises Stack Overflow within a broader discursive frame. After this, *Gender on Stack Overflow*, gives a systematic review of previous gender research on Stack Overflow, offering extensive critique of previous research. This is followed by a brief commentary on the literature.

Knowledge Platforms

Platforms

Within platform studies, digital platform are defined as an interactive and programmable content sharing website (Plantin et al., 2018), such as Facebook or Instagram. Platforms can be defined in rigid technological terms by the features that they possess, such as Application Programming Interfaces (APIs) (Bogost, 2009). Others might argue that platforms are more like an infrastructure (Plantin et al., 2018). An infrastructure is something that society depends on, that is ubiquitous, and that is required for membership to communities of people (Plantin et al., 2018). Stack Overflow shares many features that make it an infrastructure for those learning and sharing coding knowledge.

In conceptualising platforms, it is important that we consider them as not neutral conduits through which content flows, but rather see them as active participants in their content (Gillespie, 2010). Moderation, and content curation, are one of the most important features of a platform (Gillespie, 2018). Furthermore, platforms exert power not just through their creation and moderation processes, but by the complex of ways in which they interact with the

markets and ecosystems that use the platform. For example, Spotify, the popular music streaming platform, exerts power not just through the curation of playlists but also by careful positioning of itself between record labels, artists, and advertisers (Prey, 2020). When observing the ways in which a platform uses its power, we ought to look beyond just the content but at the markets in which it operates.

Programmability is another defining feature of a platform (Helmond, 2015), and it means that users are able to customise the way that the platform operates in order to curate their own content. For this thesis, the notion of programmability is important for unpacking the social relations that occur on platforms.

In educational contexts, platforms might include learning management systems, community encyclopaedias, search engines, social networks, civilian science sites, forums, and community question and answer sites. It can be argued that much of our social lives are mediated through the internet, and that platforms effect our daily lives in socio-economic ways (Rufas & Hine, 2018).

By using digital platforms, people can present themselves in new ways which are separate from the inhibitions of how people perceive them in the offline world (Torres et al., 2009). In some situations, people may choose to present themselves in ways that minimise the risk of discrimination. For example, women may deliberately assume masculine personas to avoid harassment in online spaces (Vasilescu et al., 2013).

Democratizing knowledge

As the internet has grown and developed, the expansion of internet availability and the variety of platforms and tools available on the internet have made it increasingly more accessible for people to use the internet to share information. In the development of Stack Overflow, described in the *Context* chapter, I note that the ideals of democracy are an integral value held by the platform. Within studies of digital citizenship, Tewksbury and Rittenberg (2012) define information democratization as ‘the increasing involvement of private citizens in the creation, distribution, exhibition, and curation of civically relevant information’. Indeed, platforms like Stack Overflow are positioned to involve private citizens in the creation and curation of knowledge.

Tewksbury and Rittenberg (2012) identified potential threats to democratizing knowledge as economic forces, net neutrality, and inertia. Economic forces here refer to the useful information not necessarily being profitable information; the

kinds of localised knowledge needed for society to function democratically does not necessarily have mass appeal. Net neutrality refers to internet providers themselves limiting access to certain websites or internet media. Inertia refers to generally society not changing in line with technology. However, these barriers to democratization do not consider the way in which uptake of internet-based information is affected by sociodemographic factors.

When considering how effectively information is being democratized by the internet, we need also consider who is able to become involved in creating and curating civically relevant information, and whether or not current engagement systems perpetuate inequalities. Early research in critical internet studies focussed on the digital divide; or on how readily certain populations were able to access the internet and therefore participate in knowledge creation and curation (Selwyn, 2004). In the past twenty years, research in critical internet studies has gradually shifted towards studying digital inclusion, rather than studying digital access (Livingstone, 2005; Selwyn, 2004). This line of research rather explores equalities in the use of digital tools, centring the social, economic, and cultural reasons why inequalities persist.

There are notable gendered disparities in internet usage, which are theorised to stem from the gendering of content and gendered labour market processes, both of which present barriers to women (Robinson et al., 2015). There are reasons to want to encourage higher levels of internet use. For example, for people from structurally disadvantaged groups, engaging in online spaces can be powerful in enabling people to share knowledge and experience free from discrimination or prejudice (R. A. Miller, 2017).

Some have theorised that gaps in participating in online knowledge creation is caused by pipeline issues, whereby people drop out from the pool of potential contribution at earlier stages, due to lack of experience with technologies or with specific websites (Shaw & Hargittai, 2018). Pipeline theories are relatively common in the wider field of equality and diversity studies but are often criticised for presenting deficit models of contribution. Such pipeline models also miss out the deeper structural and political reasons for inequalities (Mendick et al., 2017).

In a recent review of research on digital divides, Lythreath et al. (2022) note that very little research currently explores how the digital divide plays out in corporate or organizational settings. My own research, with its focus on Stack Overflow as an institutionally organized setting, attempts to foreground issues relating to digital divides that occur in such spaces.

Internet as a Commons

A commons is a resource shared by a group of people, and can be understood to cover a broad array of resources, from concrete assets such as libraries to more ephemeral assets such as the environment or knowledge (Hess & Ostrom, 2006). Commons are an important way in which resources are made available democratically. Knowledge on the internet forms a distinct commons, particularly where this knowledge is essential and collectively created (Fuchs, 2012), sometimes known as the intellectual commons.

In the research, there are numerous ways to talk about intellectual commons. An intellectual commons can be understood ontologically as the process of ‘commoning’, or pooling common resources (Broumas, 2017). This type of commons is called a processual commons, to denote that these commons arise from social relations rather than physical resources. In this respect, a processual commons is a set of social relations that governs access to intellectual, often intangible, resources. This processual commons is always in movement, reproducing itself through social relations, and always ‘becoming’, never being in a finished state.

Knowledge sharing sites like Stack Exchange and Wikipedia, unlike other social media sites, typically grew from the commons-based and collaborative content creation movements, and are intertwined with notions of geek masculinities (Menking et al., 2019; Reagle, 2013). Since they are constantly in the process of assimilating new information, we can understand them as a processual commons.

The domain of programming is punctuated by one particularly important knowledge commons: open source software (Bollier, 2006). Free and Open-Source Software (FLOSS) is a software movement in which the source code for projects is open and able to be (re)used free of charge. This commons is integral to the work of many programmers and software developers. Stack Overflow is part of the FLOSS ecosystem. It can be argued that Stack Overflow’s biggest contribution to open-source software development is the large bank of code available to anyone that is available through their platform. With the intention to be a Wikipedia for programming, Stack Overflow pooled the collected resources of thousands of coders and programmers, offering that resource to the world for free, and in doing so shaping many tools that software developers use in their day-to-day work lives. This code, available in the many millions of questions and answers on Stack Overflow, could be considered an intellectual commons.

Moderation and Communication

Moderation

If the knowledge sharing platforms can be understood as an intellectual commons, then those who moderate content on these platforms become the arbiters of knowledge.

Moderation refers to a variety of mechanisms by which a platform regulates its content. Some researchers argue that moderation is the core service that many platforms have to offer their users (Gillespie, 2018; Zolides, 2021); the content itself is supplied by those who engage with the platform, but the end product is the moderated set of interactions. For many platforms, positioning themselves as open and impartial and creating a distance from the operation of moderation, is a political move to avoid liability for the content that they host (Gillespie, 2018, p. 7).

Moderators wield great influence on the kinds of knowledge that are recognised within communities, as they are the ones who influence which content is excluded and they are the ones who establish and enforce community norms (Linkevicius de Andrade & Vasques Filho, 2022). On knowledge creation platforms, moderators may find themselves acting as gatekeepers, policing the knowledge and expertise that is shared (Hara & Sanfilippo, 2017).

There is an urgent need for feminist researchers to engage with community guidelines and content moderation policies (Gerrard, 2020). Many large platforms rely to an extent on peers moderating each other using platform mechanics. This can be done through voting mechanics, like upvotes or account score (sometimes called karma). Early examples of such systems include Slashdot, an early large online forum with distributed moderation, who have a voting mechanism and a karma system (Lampe & Resnick, 2004). Slashdot describe their approach to moderation as ‘like jury duty’ (Slashdot, 2024) in that moderators are selected randomly and are called upon to be moderators for a limited time.

Robyn Caplan, in her report for Data and Society, categorises three different approaches to moderation on digital platforms: artisanal, community-reliant, and industrial (Caplan, 2018). Artisanal approaches, used by platforms like Vimeo (a video sharing platform) and Medium (a blogging platform) rely almost exclusively on humans to make moderation decisions, and these humans are usually directly employed by the platform. Community-reliant approaches, used by platforms like Wikipedia and Reddit, rely on volunteers to moderate, and may make a distinction

between platform-wide moderation policies and policies made within sub-communities. Caplan notes that in community-reliant models, often there remains controversy about platform-wide rules, and tensions between the company and the community (Caplan, 2018). The industrial approach, used by platforms like Facebook and YouTube, is characterized by having a ‘decision factory’ (Caplan, 2018). Such platforms hire thousands of employees to make moderation decisions and may supplement this with automated systems for detecting things like hate speech.

While Stack Overflow arguably follows a community-reliant approach, this approach is supplemented by a number of automated systems and bot systems consistent with some of the industrial approach. Interesting in the case of Stack Overflow, as mentioned in the *Context* chapter, a number of these bots are owned and maintained by the community rather than the company. This brings into question if Caplan’s typography adequately describes the kind of approaches to moderation seen at Stack Overflow.

Communicative Toxicity

Historically, some masculine platforms have deliberately taken extreme positions on moderation. One such example is Something Awful, an early forum-based community, who allow and encourage humiliation as part of their moderation practices, and consider being ‘boring’ a bannable offense (Pater et al., 2014). Such practices are reminiscent of hazing behaviours described elsewhere in the masculinities literature (Carrigan, 2018) and of the types of harassment encouraged in laddism (Jackson et al., 2015).

In studies of Usenet, an early precursor of the world wide web, researchers identified seven broad categories of transgressive behaviours in online communities: incorrect use of the technology, such as failure to format postings correctly; ‘bandwidth piggery’, including excessively long posts; violations of conventions, such as posting poor headers and posting to the wrong group; ethical violations, such as resealing private information; inappropriate language, including hostility and personal attacks; factual errors in posts (C. B. Smith et al., 1997). Of these, violation of norms, inappropriate language, and factual errors were the most common transgressive behaviours (C. B. Smith et al., 1997). The same study found very little gender difference in many communicative dimensions, such as tone or friendliness, but found that male users were more likely to be sarcastic when making reproaches (C. B. Smith et al., 1997).

C. Miller et al. (2022) conducted research on toxicity in GitHub, a platform for open source software version control ('git'), and concluded that toxicity in this environment presented differently than in studies of other digital platforms. Their study identified three types of toxicity that were common in open source environments: entitlement, where commentators make demands as if people owed them a contractual obligation; insults, where disrespect is targeted at individuals or at projects; and arrogance, where commentators speak from a position of unearned superiority (C. Miller et al., 2022).

Research on Stack Overflow frequently uses the platform to develop tools that are perceived as helpful for programmers. Examples include using Stack Overflow as a training set to filter out unwanted chatter in IRC (Chowdhury & Hindle, 2015), combining Stack Overflow and GitHub profiles to make visual resumes to aid recruiters (Kuttal et al., 2021), improving API documentation by using Stack Overflow data to make example scenarios (Zhang et al., 2021), and much more. This, to some extent, shows an acceptance of the communicative structures on Stack Overflow within the wider programming community, and demonstrates how information and metrics from Stack Overflow are portable to other professional contexts.

As a counterbalance to research on toxicity, there is a branch of research specifically into the ways in which online communication can be polite and constructive. Kolhatkar et al. (2023) propose a taxonomy of constructiveness for online news comments, that looks for the following attributes: if the comment provides a solution, if it is specific, if it contains evidence, if it provides a personal story and if it encourages dialogue. Conversely, the model from Kolhatkar et al. (2023) considers a number of features to be non-constructive, including sarcasm, lack of respect, and provocation.

Masculinities

We have discussed in the *Context* chapter how the demographics of Stack Overflow means that the majority of users identify as male. In this part of the literature review I examine some of the research on gender in programming and engineering, with a focus on how it relates to communication. The following section, *Gender on Stack Overflow*, focuses on how gender has previously been studied in the context of Stack Overflow.

Free as in Libre

In the literature on gender and computer programming cultures, it is noted that free culture movements, exemplified by things like Wikipedia and the FLOSS software movement, have distinct values that create gendered effects on participation (Reagle, 2013). Earlier in this literature review we have discussed FLOSS in relation to the internet as a commons. FLOSS describes a movement in software development that is characterized by a core belief in the freedom to use, modify and share software, and the freedom of access to source code. Frequently, this is called ‘free as in libre’, or free as in freedom of speech, making the distinction between free as in no cost, and free as in freedom (Reagle, 2013). This important but subtle discursive connection to freedom of speech becomes relevant for this research in *Paper 4*, where we see that the discourse on gender in Stack Overflow as being influenced by ‘freedom of speech’ discourses. Other recent literature has connected the ‘freedom of speech’ discourse to the spread of anti-LGBTQ+ hate speech in online communities (Brody et al., 2023).

As a site of study, Stack Overflow firmly belongs within the FLOSS ecosystem. This is evidenced both by their use of creative commons licensing for their content (*What Is the License for the Content I Post?*, 2021), their use of free and open source software modules to run the platform (Ellis, 2022), their contribution to the open source community (Atwood, 2012b), and by the quite distinct level of programmability that is available to users on the platform. While the Stack Overflow engine is not completely open source (Atwood, 2012b), it clearly has a strong place in the open source community.

FLOSS relies strongly on community participation and on collaborative learning environments, particularly forum based environments, to share knowledge and develop expertise (Johri, 2018). This has been likened to a form of apprenticeship that is essential to the work of becoming a programmer (Johri, 2022). Stack Overflow is an important cornerstone of these collaborative learning environments. Projects in FLOSS are often geographically distributed and, while socialisation into FLOSS projects is necessary, the responsibility of understanding how to contribute to the code in these projects, and how to adapt to the relationships within a team, are placed on the individual rather than on the team (Crowston et al., 2008). Newcomers to FLOSS projects are noted to have high rates of attrition (Yue et al., 2023). Uptake of mentoring, and effective mentoring, are noted as persistent issues within the research on FLOSS communities (Constantino et al., 2023). Effective mentoring might include being able to match

newcomers with tasks appropriate to their skills, orienting them to the high level practices within a project, and engaging them socially within their teams (Balali et al., 2020). These patterns of issues are quite similar to those seen on Stack Overflow.

Research suggests that the participation of women in FLOSS is even lower than the participation of women in closed-source software development, and that this difference is not explainable by other demographic factors like age or level of education (Wurzelova et al., 2019). In this respect, FLOSS is an environment coordinated primarily by masculinities.

Technical Communication and Programmer Masculinities

In the literature on masculinities, I identify that there are two strands of masculinities studies that are particularly relevant to Stack Overflow: those relating to programmer or engineering masculinities and those relating to geek or nerd masculinities. While there is some overlap between these categories, I would suggest that programmer or engineering masculinities tend to describe a type of masculinity that occurs within working and professional contexts, often as the dominant or hegemonic masculinity, while geek or nerd masculinities occur more often in leisure contexts, often as a marginalised masculinity. I note that the literature can be inconsistent around which computer-related masculine identities are interchangeable or comparable. In this section I briefly explore how programmer and engineering masculinities are presented in the literature.

Social dynamics are an important element to understanding how masculinities are discursively constructed in professional spaces. Particularly for establishing status as an expert in professional settings, research identifies that mastery of technical language is one of the ways in which masculinities coordinate the recognition of expertise (Connell, 1995/2005, p. 171). In other ethnographic studies of engineering masculinities, it is observed that there is a dichotomy between the social and the technical, which is frequently gendered (Faulkner, 2000, 2007). This dichotomy is often put in a hierarchy, with the technical and the masculine placed above the feminine and the social. We see this echoed in other masculine digital settings, like Wikipedia, a mastery of the technical is often required in order to succeed and participate (H. Ford & Wajcman, 2017).

While early studies pose that programmer masculinities, through the lens of hacker culture, are less masculine or at odds with their masculinity (Turkle, 1988), later studies position these masculinities as dominant within particular work

settings. For example, Ensmenger (2015) argues that programmers are able to mobilise masculinity as a way to secure status in the field of programming, building a highly individualist sense of masculinity that is exemplified by competition and eccentricity. Indeed, programmers may even enjoy an elite status thanks to their ability to navigate the ‘black boxes’ of technological knowledge. Ensmenger (2015) points out that in the early years of the computing profession, expert programmers were presented as an elite cadre, with IBM Corporation endorsing a study that one expert programmer was 26 times more productive than an average programmer.

It can also be recognised that programming in particular has a special relationship with language, since programming languages are capable of doing and producing activity in their own right (Easter, 2018). In this respect, language and the technical are deeply linked in the world of programmer masculinities. While the social element of communication may be downplayed, such as in the work of Faulkner (2000), the technical element of communication has a powerful shaping force that is important particularly to programmer identities and discourses.

Geek Masculinity

In the literature, geek masculinities and nerd masculinities are sometimes used interchangeably, though noting that ‘nerd’ tends to be discursively positioned as an undesirable quality while ‘geek’ tends to have more positive connotations (Kendall, 2011). More so than engineering masculinities, discourses around geek masculinities seem to be more geographically ordered and bound to anglophone-centric understandings, which may be in virtue of the connection between geeks and popular culture.

Geek masculinities are often characterised by competition (Ensmenger, 2015; Salter, 2018), a facet which often comes to the fore most on the gamer subtype of geek masculinity (Salter, 2018). Games, and competition as a form of creating dominance and social hierarchy is certainly not unique within geek masculinities, and appears as a common thread in studies of masculinities in general (Ensmenger, 2015; Meuser, 2007).

In parts of the literature, geek masculinity is linked to more extreme forms of toxic masculinity. Regehr (2020) makes the link between incels⁷ and geek masculinity, particularly through the notion that, like incels, geeks are discursively

⁷ ‘Incel’ is a portmanteau of ‘involuntary’ and ‘celibate’, describing a subset of people who have a number of extreme, often anti-woman views, that are unified by the ideology that they are owed access to sex.

positioned as outsiders and marginalised within prevailing masculine cultures. Massanari (2017) follows geek masculinities in the context of #gamergate⁸, putting this notion of the geek as an outsider in conversation with geek revenge fantasies of obtaining power from a position of marginality. In both of these cases, incels and #gamergate, women are generally the target of these revenge fantasies. The toxic form of geek masculinity is discursively positioned as anti-woman and anti-feminist.

Even more categories of masculinity within geek masculinities emerge as subjects of research within the field. One notable example that attracts research interest is ‘brony’⁹ culture. Researchers have coined the term ‘hybrid masculinities’ to talk about the way in which My Little Pony fandom influences masculinities. In particular, men who practice brony masculinity are more likely to frame gender inequality as the result of other types of men, and distance themselves from their complicity in upholding male privilege (Palmer, 2022).

The effects of geek masculinities, particularly the persistent discursive positioning of men as superior at mastering technology, are observed to transfer in to computer science and engineering work spaces (Carrigan, 2018).

Ignorance and Agnotology

The study of ignorance, also called agnotology, has a precedence in engineering education. In educational contexts, ignorance is usually theorised with Foucauldian renderings of power dynamics, and has shown useful in talking about race from the perspective of teaching students about historical injustice (Mueller, 2017; Whitt, 2016). Very few attempts have been made to use epistemological ignorance theories specifically in digital settings, but this is a promising line of inquiry (Bhatt & Mackenzie, 2019).

In the field of engineering education research, the notion of epistemic ignorance is used to explore why engineering cultures continue to have gender disparities. In particular, it is evoked to explore how men resist engaging with gender. Beddoes (2019) proposes a three part typology of the ways in which engineers remain ignorant of gender issues, based on an interview study with engineering professors. This typology includes: ‘not knowing because of the small number of women in engineering’; ‘not knowing because I am not a woman’; and

⁸ #gamergate was a reactionary harassment campaign that started in 2014, primarily positioned against feminism and progressive ideologies in videogames.

⁹ ‘Brony’ is a portmanteau of ‘bro’ and ‘pony’, used to refer to adult male fans of the television show ‘My Little Pony’.

‘not knowing because gender is not salient’. The first category, ‘not knowing because of the small numbers of women in engineering’, is connected to the valuing of statistical methods over other ways of knowing, appealing to the statistical validity of making claims based on small populations. The second category, ‘not knowing because I am not a woman’, connects to individuals not having personal experience of discrimination therefore justifying that they remain ignorant about such occurrences. The third category, ‘not knowing because gender is not salient’, refers to situations where interviewees invoked other explanations for gender differences, such as personality or learning styles, in a way that avoided addressing systemic gender issues.

While not explicitly evoking epistemic ignorance, Carrigan (2018) notes that the resistance to doing social research in engineering education contributes to making the issues around social practices in engineering invisible. On a similar track, Cech (2014) argues that the ideology of ‘depoliticization’ in engineering, in combination with both the technical/social distinction and the notion of meritocracy, work to foster a culture of disengagement around social and public welfare issues that are relevant to engineering education. Other studies have noted that masculine discourses can appropriate discourses of inclusivity in order to conceal and reproduce masculinised forms of dominance and power. This has been noted in relation to male students using free speech rhetoric and democratic rhetoric to conceal patriarchal systems of power (Haslop & O’Rourke, 2021). Combined, these point toward a need to develop ways of thinking about how epistemic ignorance prevents change in environments that are specifically coordinated by the discourses of engineering masculinities.

Gender on Stack Overflow

In this section I present a focussed literature review of previous gender research on Stack Overflow. The vast majority of this research is specifically about gender difference and specifically positions women and femininity as difference. I identify 14 studies noting 1 retracted study, and I exclude any studies for which I am author or co-author. I have also excluded studies that use the Stack Overflow Developer Survey to assess gendered trends in programming. Thirteen out of fourteen studies are published in pure computer science, informatics, or software engineering venues, the remaining publication is in *Information, Communication and Society*. I was unable to find any studies that engage with LGBTQ+ or trans issues. As such,

gender on Stack Overflow is a somewhat niche subject that is not widely studied in sociological contexts.

In this section, I critique the previous gender research on Stack Overflow. While I offer criticism of the mostly computational approaches to previous gender studies on Stack Overflow, I would like to also state that such studies are nevertheless valuable. Without massified, computation driven data it would be difficult to establish the need to pay attention to gendered divides in platforms such as these. However, I strongly believe that a more nuanced variety of approaches is required to push this area of research forward.

For the studies included in this set, it was reasonably common to define 100 reputation as the line over which a user is considered to be active (May et al., 2019; Y. Wang, 2018). I talk briefly about reputation distribution and rewards earned through reputation in the *Context* chapter. In order to contextualise this choice, eliminating users with less than 100 reputation means excluding around 85% of the population.

Computing Gender

A common approach to studying gender on Stack Overflow involves finding ways to detect or assess the gender of users using various algorithms. The logic behind this is simple; in order to study women, we must first find them. Many of these detection methods rely on extrapolating gender from usernames or information contained in user profiles. The bulk of the literature uses a method known as ‘genderComputer’ to evaluate the gender of users. This method looks up names based on username and geographical location, crawls for clues about names from linked websites (Vasilescu et al., 2012).

Approaches using genderComputer have limited success in predicting gender. Dubois et al. (2020) used genderComputer to analyse a set of users from the graphic design Stack Exchange and confirm that results were in line with their manual approach, but do not specify the success rate of the method (e.g. for how many users the application did not detect a gender). In their results they say that 4% of the answers in their sample were by women compared to 63% by men, so we can assume that no gender was detected for 33% of the sample.

May et al. (2019) used genderComputer on a sample of Stack Overflow users with more than 100 reputation. Out of a total of 565,171 users, genderComputer predicted that 42% were male, 4% were women, and did not make a classification in 53% of cases. For their study, they opted to also use a method called Gender

Guesser which only accounts for first name and location, and only included users who were rated as likely men or likely women by both Gender Guesser and genderComputer. Others in the literature also adopt these kinds of modification to the genderComputer method (D. Ford et al., 2017). Morgan (2017) adopts a simpler modification by only identifying a name if it exists on a list of ‘common names with inherent genders’. The idea of inherent genders positions this research within a discursive frame that accepts the gender binary. In one study, Ford (2016) combines genderComputer with Microsoft Project Oxford Face API (an image analysis tool) and validates predictions using self-reported gender.

Wang (2018) notes that during manual comparison with genderComputer, while most of the users flagged as male were accurate, almost half of the users flagged as women were inaccurate. Similarly, May et al. (2019) manually checked the profiles of 100 men and 100 women identified by genderComputer and concluded that while the set of users identified as men had around a 97% agreement with their manual check, only 44% of the users identified as women agreed with their manual check. This means that gender detection methods are not reliable at identifying women, giving a large number of false positives.

Lin & Serebrenik (2016) comprehensively review 16 different approaches to computing the gender of Stack Overflow users, which test the common methods alone and then paired with complementary methods on four different datasets. The researchers caution that name-based resolutions alone often caused failures, particularly in instances where users adopted names from popular culture that bore no relation to their real-life characteristics. This is in direct opposition to the original Vasilescu et al. (2012) paper, which says that genderComputer would infer that a user is a woman if their profile picture is of Angelina Jolie. Lin & Serebrenik (2016) conclude that the technology for gender identification ‘needs to mature’, and are not able to identify any one best approach.

From this, there are clearly problems with detecting women using the genderComputer method. However, no papers mentioned manually checking those that were not classified by genderComputer. The likelihood is that such methods detect only users who outwardly present their real-life identities, or those who make a special effort to masquerade in a feminine form. For an environment like Stack Overflow, these computational methods are unlikely to yield more precise results, as many users base their names on pseudonyms or handles rather than real names. Even so, these studies do not attempt to confirm their findings with individuals, so it is unclear how many results may yield false positives. Some people may have nicknames that play with gender (e.g., typically masculine names

like 'Fred' could be diminutive of uncommon feminine names like 'Winnifred'). Lin & Serebrenik (2016) isolate the name 'Chris' as especially problematic in their dataset, but many other names fall into this category. Equally, there is no way to detect a non-binary name, so these methods cannot account for other gender constructions. Without actually knowing how an individual classifies their gender, it is not relevant to make such assumptions based on typical pairings of outward appearance and physical sex. I would argue that these methods are trying to detect sex rather than gender. These studies seem to carry an implicit assumption about what Connell (1995/2005) would call 'sex roles'. Sex roles are best understood as the way in which culture produces differences in behaviour, social status, and so on, through the means of the often-presumed binary biological sex distinction. In this respect, these studies are divining gender based on assumptions about how individuals are performing their sex role, in accordance with classical stereotypes about masculine and feminine cultural presentation.

Brooke (2021) uses a modified version of the genderComputer protocol including more feminine nicknames and markers, and divides the usernames into masculine, mostly masculine, anonymous, mostly feminine and feminine. This acknowledges gender as a linear spectrum assessing proximity to femininity or masculinity, however it is still very much based on understanding gender as a binary and fails to deliver on her promise of 'computational research which can more faithfully represent social conceptions of gender' (Brooke, 2021). Attempts to approach gender from Butler's perspective of performativity falls flat and rely ultimately upon gender role speculation. Butler themselves warns against feminist research that is constructed inside the frame of the compulsory heterosexual divide of male vs female; the category of woman is produced by the same power structures that are being criticised (Butler, 1990/2002, p. 5), and we must therefore find more nuanced positions.

Other detection methods are present, but rare in the literature. Stakoulas et al. (2022) used a lexicon to detect the gender of posters based on their username, and complimented this with manual analysis of users based on profile pictures. Their study predicted a gender for 971 out of 1,589 profiles (61%) and estimated that 12.7% of those profiles belonged to women.

Computational gender detection methods *could* be a useful tool to assess how users are likely to interpret the gender of others. However, studies using such methods tend to present their approach as representing the actual gender of users. A few studies problematise this relationship, acknowledging that the participation of women may be underestimated due to women deliberately obscuring their sex

(May et al., 2019). Therein lies an important distinction and a clue toward the underlying assumption about there being a ‘true’ gender that is detectable. I argue that, realistically, the subject under study in these papers is rather the reaction of others to perceived gender. Any claims made about the behaviours of those with a detected gender is likely to be tenuous, but claims made about the behaviours of people towards a particular detected gender may be more accurate. There is also an ethical consideration to be made as to whether it is acceptable to try to determine the personal characteristics of someone without their consent, especially in cases where they may be deliberately obscuring their identity.

I have noted that no papers in the literature mention using the Pronoun Assist add-on to compliment gender detection. This add-on allows users to display their preferred pronouns beside their names. I explore this add-on briefly in *Paper 4*. However, I assume that genderComputer would be able to pick up on the pronoun data in a user profile.

Women Seeking Women

Homophily is a common theme in the Stack Overflow gender based literature, though this is often referred to as ‘peer parity’ (D. Ford et al., 2017). Homophily is a broad sociological concept that describes the tendency of people to form groups that coalesce around shared sociodemographic dimensions (such as age and gender) or shared values (Khanam et al., 2023). The term was coined in the 1950s by Lazarsfeld and Merton (McPherson et al., 2001). While gender homophily is indirectly discussed, relation to the broader homophily and homosociability literature is generally lacking in the Stack Overflow gender research.

In the Stack Overflow research, the notion of peer parity seems to originate from Ford’s early ambition to apply the ‘Bechdel Test’ to Stack Overflow (D. Ford, 2016). The Bechdel-Wallace test, often just called the Bechdel test, refers to a 1985 comic strip called ‘The Rule’ from a lesbian comic called *Dykes to Watch Out For*. The comic started to capture the public imagination in the early 2000s (Resmer, 2005). The idea behind ‘The Rule’ is not novel; Bechdel herself points out that the true origin of the test is Virginia Wolf’s *A Room of One’s Own* (Bechdel, 2013). The basic idea of the Bechdel-Wallace test is that a movie should meet three criteria: it should contain at least two women, the women should talk to each other, and they should talk to each other about something besides a man. While the Bechdel-Wallace test is often invoked in popular culture in relation to cinema, it is

less frequently applied to academic study, and is rarely used outside of media studies. As a simple tool, it helps to demonstrate the hegemony of (cis) male representation in popular culture. It is sometimes interpreted as a test that can be passed, but it is perhaps better understood as a minimum threshold, i.e., a movie that contains two women characters who talk to each other should not be considered *good* representation of women, but rather it is a marker that the movie attempts to have *any* representation of women. The idea gradually evolved in Ford's work to become peer parity, which may explain the lack of connection to other established research on homophily. This lack of connection to other homophily research is salient because it means potential links are missed to how men engage in homophily and homosociability in professional settings (Grummell et al., 2009). Instead, the framing used by Ford implicitly frames women as the problem.

In the Stack Overflow research, peer parity is defined as 'when an individual can identify with at least one other peer when interacting in a community' (D. Ford et al., 2017). This generally is applied to mean, when a user presenting as a woman is likely to be interacting with another user who is presenting as a woman. Research by Ford et al. (2017) finds that women re-engage with Stack Overflow faster after they interact with a thread that has gender peer parity. This means that feminine presenting users are more likely to post again on Stack Overflow, and are likely to post again sooner, if they engage first in a thread that contains another feminine presenting user. Brooke (2021) confirms Ford et al. (2017) in finding that feminine presenting users interact more with other feminine presenting users.

However, given the low incidence of feminine presenting users on the platform, finding such interactions is very difficult. A study by Morgan (2017) randomly sampled 228 question and answer threads, and estimated that peer parity for women only existed in 2.2% of the randomly sampled threads, and in the majority of cases peer parity occurs when the question is asked by a feminine presenting user.

Deficits

Deficit approaches show up repeatedly in the literature. Deficit approaches are characterised by positioning the people under study as lacking in comparison to others. Maftuoni et al. (2022), in their interpretation of the peer parity work by Ford et al. (2017) and Brooke (2021), characterise the problem of low number of women participating on the platform as a vicious cycle of women not posting

because they only want to interact with other women. While Brooke (2021) is reasonably consistent in saying feminine or masculine, these nuances do not get taken up in citing literature, being translated to men and women.

Both Wang (2018) and May et al. (2019) find that profiles identified as belonging to women ask more questions and write fewer answers. In these findings, an implicit deficit emerges, which is that women are not positioned as experts on this platform, but receivers of knowledge.

One study compares the perspectives of men and women about barriers to using Stack Overflow. Ford et al. (2016b) conducted an interview study with only women who both used and did not use Stack Overflow, and classified the barriers to using Stack Overflow into three broad categories: ‘Muddy lens’, which refers to a lack of knowledge about the platform and fears that time spent there is slacking; ‘Impersonal Interactions’, a variety of factors capturing concerns about the conduct of the community; and ‘On-Ramp Roadblocks’, like the high threshold required to successfully contribute. In a follow-up survey, they compared how men and women rated the barriers identified in the interview study, and they determined five statistically significant factors that affected women more than men. These factors were: awareness of the platform’s features, feeling unqualified to answer questions, feeling intimidated by the size of the community, feeling uncomfortable about interacting with strangers, and feeling worried that spending worktime on the platform will be perceived by employers as slacking.

Comparisons to Other Contexts

While few gender studies compare Stack Exchange with other contexts, Dubois et al. (2020) combine interview and content analysis to compare the Graphic Design Stack Exchange with Quora. The Graphic Design Stack Exchange is a sub forum for graphic design questions. Compared to Quora, they found that Stack Exchange had more evidence of gendered difference, noting that there were more women on Quora and fewer differences in types of contribution between men and women. In particular they note that women on Stack Exchange speak with more ‘clout’, which they define as confident, high-expertise text, but have lower reputation. They conclude that the gendered issues on Stack Exchange persist beyond just programming communities.

Danescu-Niculescu-Mizil et al. (2013) compare politeness between Wikipedia and Stack Exchange. This paper makes broad claims about women being more polite than men, but these claims are not substantiated from the data. However,

the paper does suggest statistically significant variations in politeness between different programming communities on Stack Exchange, and also suggests that higher reputation users are less polite. This shows evidence for different localised practices.

Computer Science Educators

Moudgalya et al. (2019) performed a content analysis of questions about gender and diversity on the Computer Science Educators Stack Exchange, a relatively small sub forum for teachers and educators. Their data set comprised 50 answers to six questions. In their analysis, they note both that the data set tends to assume a USA context, gender binary is assumed in all cases, and intersectional identities are not considered. For questions about the reduction of women in computer science, they analyse that 53% of the responses contained gender stereotypes and 12% were gender positive. For questions about increasing gender diversity in computer science, 40% of answers contained gender stereotypes and 33% were gender positive. In their discussion they note that many of the stereotyped positions (such as ‘men find programming more interesting than women’) were not supported by research. Their study is useful evidence of the types of discourse that occur on Stack Exchange, though it does not pursue a discursive analysis.

Improving Gender Participation

Many of the studies note that profiles that present as women have lower reputation scores. Wang (2018) finds that women have 52% of the reputation of men. May et al. (2019) find that women have on average 55% of the reputation of men.

In the discussion of the paper by Dubois et al. (2020), they suggest a number of changes that could alleviate the difference in participation between men and women, including amending policies that encourage only factual answers. In their analysis they consider the policies that have carried over from Stack Overflow, perhaps neglecting to realise that Stack Overflow is both the parent and the programming sub forum, and that these policies intentionally apply to the whole Stack Exchange network. While the discussion here is generally nuanced, it would benefit from a more general understanding of how Stack Exchange is organized.

Both Wang (2018) and May et al. (2019) argue for reconsidering the lower allocation of reputation to upvotes on questions. May et al. (2019) use statistical modelling to argue that if upvotes on questions received similar reputation points

to upvotes on answers, much of the reputation gap between users identified as women and users identified as men would be resolved.

Ford et al. (2017) propose a mentor program as a way to support more women in to contributing. This mentoring approach is taken up by Stack Overflow briefly in 2018, as discussed in the *Context* chapter and is eventually evolved in to Ask Wizard. Effectively, this evolution loses the gender focus.

Commentary

An implicit undercurrent in this research base is the assumption that women *should* be contributing more to Stack Overflow. This assumption is rarely foregrounded or called in to question. It is unclear whether there would be a benefit to women themselves in contributing more, although there may well be benefits for Stack Overflow as a company to increase their number of active women contributors.

Despite the fact that Stack Overflow is a predominantly male context, none of these gender-based studies on Stack Overflow engage particularly with masculinities research. Most start from the position of problematising women. This can often be an institutionally bound issue; as Beddoes (2017) argues, prevailing literature on diversity in engineering is mostly written by people trained as engineers, and lacks a willingness to examine the complicity of the institutional context. This is certainly the case within Stack Overflow research. As noted in the *Context* chapter, some of the research in this area is funded by Stack Overflow and as a result may be unwilling to look at problems in the prevailing culture. Common to these studies is what Beddoes (2017) would call ‘studying down’, or studying only the minorities. As a result of this, some of these studies take an implicit deficit approach, suggesting that women’s behaviour needs to be modified in order to remedy differences in participation and reputation. Others rather suggest mechanical changes to the platform to address disparities without explicitly addressing cultural issues. This highlights a significant gap in the literature for research that examines the influence of dominant masculinities.

Another issue rarely problematised in the literature is how exactly we can understand posts on Stack Overflow as attributable to one individual, or as representative of a natural interactional exchange. This applies to gender research as well as other kinds of interaction-based research. I briefly mention how editing works in the *Context* chapter, and I discuss editing in more detail in *Paper 3*. When we consider that many people can be involved in editing a question and answer,

aside from the original posters, it is perhaps difficult to make assumptions about how the content of question or answer posts relates to the gender (or mix of gender) of those who have crafted the posts. Most, if not all, of the analysis in this niche field refers to question and answer posts, and is not sensitive to edits, edit comments, or comments in general. I return to this in the *Discussion* chapter.

The unusual approach to editing and moderation on Stack Overflow can be a helpful starting point in unpacking gender dimensions. There is space to explore how the work of moderation is co-ordinated in this distributed environment. Considering that research suggests toxicity plays out differently in FLOSS communities (C. Miller et al., 2022), it would be prudent to consider how the interplay of moderation approaches, platform mechanics, and programmer masculinities effect Stack Overflow.

To avoid falling into the pattern of reproducing sex roles into gender research, I have avoided designing research that identifies and assumes the gender of people. Instead, I have chosen to focus on discourse about gender and about transgender issues. Additionally, in order to avoid ‘studying down’ I frame a position where it is possible to hold the institutional context accountable for the inequalities in the field. The study of ignorance and agnotology can be useful tools in accessing that institutional context and analysing how power dynamics effect what knowledges we can know.

By engaging the research on FLOSS and on other commons projects (such as Wikipedia), it is possible to see common themes emerge that are not explored in the existing gender-based research on Stack Overflow. Particularly, in approaching Stack Overflow through the lens of Wikipedia research into editing, greater links can be made with research that examines the gendered effects of knowledge creation and gatekeeping in environments that are highly editable (H. Ford & Wajcman, 2017; Menking et al., 2019).

Theory

In this thesis, the theory section deals with ‘grand theory’ (Mills, 1959/2000, Chapter 2), theory as it occurs on a conceptual level. Rather than testing or confirming micro-level theories, in my thesis I hope to situate the larger sociological phenomenon. The theory therefore helps to guide and sensitise my use of concepts, in a way that helps me to focus on what happens in the social rather than what happens between individuals. To build this framework, I draw upon concepts from feminism (embodied knowledge), critical theory (power, discourse), queer theory (gender as performative), and social epistemology (epistemic ignorance).

For my work, it is the middle social level of the institution that I foreground. In the *Context* chapter I demonstrated the genesis and evolution of Stack Overflow as an institutionally coordinated setting. In *Gender on Stack Overflow* I discussed the shortcomings of gender research on Stack Exchange, and I diagnose that too many studies become myopically concerned with identifying individual gender and miss opportunities to explore gender at the social level. My use of theory is concerned with bridging those two gaps.

Much of the work of the theory is to render platforms materially analysable. My approach in this thesis to materiality is to show the organization of the platform as temporally bound and as having material consequences, framing the platform as the sum of human activity and human labour.

The primary tapestry that I use to bring my theory together is the lens of institutional ethnography. While sometimes treated as a method, institutional ethnography is better understood as an alternative approach to sociology, which can be deployed both as a theoretical framework and as a methodological approach. How institutional ethnography is deployed as a method in my thesis is discussed in *Methodology and Methods*. In this chapter I explore some of the core theoretical and ontological concepts from institutional ethnography and put them into dialogue with Foucault (power), Butler (queer theory), and Dotson (epistemic ignorance). I briefly situate this within the context of platform studies, which is covered in more detail in *Paper 1*.

Across all of the papers that contribute to this thesis, I engage with feminist theory and critical theory. In *Paper 1*, I engage in particular with discourse and embodied knowledge, in combination with theories from institutional ethnography. In *Paper 2*, I engage with theories around masculinities and with discourse. In *Paper 3*, I focus again on masculinities and discourse. In *Paper 4*, I engage with queer theory and with epistemic ignorance.

Institutional Ethnography as an Alternative Sociology

In this thesis, institutional ethnography is used to help frame the materialist way in which platforms might be considered ontologically as institutional settings, addressing research question 1.

Institutional ethnography is an alternative sociology developed by Canadian sociologist, Dorothy Smith. One of the central pillars of institutional ethnography is the notion of the institution. Institutions are understood as a layer of coordination that uses texts to structure people's activities (D. E. Smith, 1999, p. 196), and do not follow the stricter understanding of institutions as found in the work of other sociologists such as Goffman, that require an institution to be enshrined within a physical location. I argue in *Paper 1* for why Stack Overflow can be considered an institutionally coordinated setting.

Texts and documents have a vital place in institutional ethnography. In institutional ethnography, texts are used to refer to a something that is produced in a form that can be replicated, that is material, that has the capacity to coordinate the doings of people across different sites and settings (D. E. Smith, 2005, p. 227). The focus of documents and text is primarily in the way that they enter an ethnographic setting and on how texts coordinate the practices of individuals in that setting (D. E. Smith & Griffith, 2022, p. 65). In particular, institutional ethnography looks for and is attuned to when texts are activated in a setting, and how that activation places those practices in continuity with the work of other people within the setting. For example, when exploring Stack Exchange, I may pay special attention to instances where users are referring back to specific texts when they are performing certain actions on the platform, like editing the posts of others, and I may use that information to explore how that text produced a particular practice. This comes to the foreground most strongly in *Paper 3*, where I foreground text analysis; however, this theory is an important touchstone for all of my analysis.

Work is also understood in a broad sense, and is considered to be ‘anything done by people that takes time and effort, that they mean to do, that is done under definite conditions and with whatever means and tools, and that they may have to think about’ (D. E. Smith, 2005, p. 151). This broad definition serves to capture all forms of work, particularly unpaid work, that people undertake. Due to these broad understandings about institutions and about work, institutional ethnography offers a pragmatic alternative to working in digital spaces with platforms. With this lens, we can look at a platform like Stack Overflow, and approach it as an institutional setting that coordinates the activities of its users through texts, and we can analyse the work of users in maintaining and contributing to this institution. Importantly, this approach lets us look at what happens trans-locally or extra-locally, meaning between different groups or communities, the institution, and other coordinating forms of power operating across multiple sites. Indeed, when initially undertaking analytic work with my data, I looked at it through the lens of what forms of work were being done by my participants, and what kinds of work practices people undertook to be successful on the platform.

Institutional ethnography borrows its conception of ideology from Marx and Engels. Smith talks about ideology as ‘those ideas and images through which the class that rules the society by virtue of its domination of the means of production orders, organizes, and sanctions the social relations that sustain its domination’ (D. E. Smith, 1987, p. 54). Ideology is, in this sense, something that comes from a position of power, outside of an individual’s embodied experience, and imposes a ‘forced set of categories’ (D. E. Smith, 1987, p. 55) on the world as we experience it. Production here includes the production of thought. In this respect, institutional ethnography is searching for ideologies that order how people’s everyday activities and align them with set social relations. The perspective of institutional ethnography, in alignment with Marx, is that it is not possible to see the actual practices that facilitate the possibility of ruling from inside the ideological standpoint of ruling (D. E. Smith, 1987, p. 80). I will return to this notion from a slightly different perspective when I take up a discussion of epistemic ignorance. In order to understand how the social order is maintained, it is then imperative to approach it from outside of the frame of ruling. This is not dissimilar to Butler’s view on gender, which I will return to when I discuss Butler’s work.

Institutional ethnography, then, does not aim to be theory generative, nor does it wish to use concepts as a dominant mode of interpretation (D. E. Smith, 2005, p. 54). Institutional ethnography is also critical toward assigning agency to conceptual entities (D. E. Smith, 2005, p. 56). In this respect, my own work is not

aiming at being theory generative but rather aims to provide an analysis of the social. The general goal of institutional ethnography is to instead describe the everyday activities of people without forcing them to fit in to categories and theories that may be developed outside of people's actual experiences. However, those categories and theories can provide a fruitful way of understanding how people make sense of their own experiences; but the categories and theories themselves should not be accepted as reality.

Following Marx, Smith makes the claim that 'history and society exist only in people's activities and in the forms of cooperation that have evolved among them' (D. E. Smith, 2005, p. 54), and situates ethnographic practice as a means to open dialogic relation between concepts and the actual of social relations. For Smith, the ontological location of the social is in the coordination of people's activities. In this respect, to reach the social one must locate what is being coordinated and how.

While Dorothy Smith describes institutional ethnography as a sociology for women in her earlier work (D. E. Smith, 1987), in her later work she reframes this as a sociology for people (D. E. Smith, 2005; D. E. Smith & Griffith, 2022). This is in part to situate the relevance of a sociology that puts experience first. I will argue later in this chapter that moving from 'women' to 'people' is a necessary one for institutional ethnography to live up to its promise of being a sociology that can describe the everyday lives of people.

Sociology, in the view of institutional ethnography, is not exempt from the problem of using concepts as a dominant mode of interpretation. Indeed, institutional ethnography is very critical about applying micro-level theory to the actuality of people's lives in a way that distorts that actuality, and of categorizing the behaviour of individuals within a specific frame. The end goal of an institutional ethnography is to preserve people as subjects, and not to merely transform people as objects of study (Kearney et al., 2018). At the heart of this is the notion that 'the social coordinates differences and generates differences' (D. E. Smith, 2005, p. 60). By this, I interpret that the way differences are rendered available for analysis is dependent on a social context, and that we should be critical not just about how difference is treated but about how certain characteristics are rendered different or other.

Overall, institutional ethnography uses an eclectic range of theory and concepts from sociology, Marxism, and critical theory. Of particular importance is a deployment of discourse from Foucault (D. E. Smith, 1987, p. 211). The institutional ethnography take on discourse differs slightly from the reading

directly through Foucault; I clarify this further in *Methodology and Methods*. In this chapter I give a background reading of discourse as it relates to other Foucauldian concepts based on my interpretation.

Power, ideology, discourse

In this section, I explore power, ideology, and discourse through a Foucauldian lens. These are important interpretive conceptual frames in my work, even if they are not always explicitly foregrounded. The notion of discourse is helpful for later exploring gender. It also enables analysis in support of research questions 2 and 3.

For Foucault, power is a force that enables the regulation and coordination of activities, or ‘action upon the actions of others’ (Patton, 2014). Power is an arrangement of shifting social relationships. It is not something that can be possessed, but rather something that we are always engaged with (Ball, 2013, p. 30). Power is produced and reproduced over time through those social relationships (Rouse, 2005). Power lends itself to domination and systems of domination (Patton, 2014).

Knowledge is both the means by which power is reproduced and the way in which the reproduction of power is monitored. Foucault gives us several ways to understand the interplay of knowledge and power, showing how this interplay brings about control and regulation (Foucault, 1975/1991). Surveillance and documentation, in particular, have a self-reinforcing position that facilitates control and discipline (Rouse, 2005). Surveillance is analysed in three distinct strands: hierarchical observation, normalisation, and examination (J. Allan & Murphy, 2013, pt. 2).

In summation, the kinds of knowledge that are reproduced become seen as the legitimate forms of knowledge. Alternate ways of knowing are not reproduced and have less epistemic power. Normalisation is driven by social interaction, in the case of Stack Overflow, by the use of platform mechanics. That choice of platform mechanics in part determine what kinds of knowledge are given power and reinforce particular patterns of behaviour.

Neoliberal ideologies are important to Foucault’s later theorization. Neoliberalism, at core, can be articulated as the project of producing political power through the principles of a market economy (Foucault, 2010, p. 131). For any social system to be converted into a market, it requires intervention to change its ‘framework’ to be compatible with a market economy (Foucault, 2010, p. 141).

Through the *Context* chapter, I have provided some evidence that Stack Overflow has undergone a neoliberal turn with regards to its monetization.

Also important to my thesis is the notion of discourse. I will return to discourse analysis in the *Methodology and Methods* chapter. For Foucault, discourse is, in part, an exploration of the relations between statements or groups of statements. Foucault (1969/1972, p. 28) makes three observations about statements. Firstly, that they exist both in the moment as an expression through speech or gestures in writing while also continuing to exist materially in recordings and memory. Secondly, that they are both unique yet can be repeated, transformed, and reactivated. Thirdly that statements are both linked to their arising situations and contexts, but also linked in a quite different way to the statements that surround it. Deleuze points out that, for Foucault, this means that the same statements can occur in totally different discursive formations (Deleuze, 1986/2006, p. 11). For example, the statement ‘developers use Stack Overflow to write their code’ could equally be situated in a discursive formation that is promoting the importance of Stack Overflow in programmers work lives, or it could be situated in a discursive formation that is problematising code sharing and re-use between companies. In that respect, Deleuze argues that the power of a statement is this particular way in which repetition operates. This interpretation harmonizes well with the way that institutional ethnography looks for activations of the texts and the way that texts are used differently across contexts, effectively prioritizing identifying repetition. For Butler, ‘subversive repetition’ (Butler, 1990/2002, p. 188) is one critical way in which we can disrupt the governing discourses. This would mean repeating acts in a way that allows other discourses to emerge.

In analysing discourse, the goal is not to isolate discursive events in to some kind of abstract pure space, but rather to describe the interplay of relationships (Foucault, 1969/1972, p. 29). In doing so, Foucault suggests that one should question any imposition of a natural or universal order that organises statements or discourses.

In this way, the bridge between power and discourse becomes apparent. Power is the force that coordinates and regulates. Knowledge is the way that power is reproduced. Statements and discourse are the material form through which repetition and reproduction can occur.

Epistemology

While institutional ethnography is more concerned with ontology and less with epistemology, there are benefits to extending institutional ethnography with ideas from modern critical social epistemology, particularly with regards to unpacking how certain activities are socially coordinated.

In this section, I first explore the epistemological orientation of the research, which is grounded in feminist theories of embodied knowledge and knowing through materiality. This part of the theory section describes the approach to knowledge from the meta-perspective of doing the research. I then discuss theories of epistemic ignorance, which operates as a sensitising concept when exploring how power relations shape knowledge in society.

In this thesis, I use the concepts from epistemic ignorance to unpack the structural and political reasons for inequalities in Stack Overflow. Epistemic ignorance is a tool that can conceptually help to explain *how* particular relations are produced and reproduced. In particular, using concepts from epistemic ignorance can highlight the mechanisms by which certain knowledges and power relations are not reproduced, and in analysing this, the discursive framing that coordinates the dominant knowledges becomes more apparent. In this thesis epistemic ignorance framings are deployed in two main ways. Firstly, they are deployed to analyse how particular communities become marginalized via the suppression of their contributions and testimony. Secondly, they are deployed to analyse how these marginalisation processes are made invisible or ignored within an institutional setting. This allows discussion of why progress stalls on meeting equality ambitions. In *Paper 4*, I use Christie Dotson's theory of epistemic silencing (Dotson, 2011) to show how trans issues are rendered invisible. This is a subset of epistemic ignorance theory, often put under the umbrella of epistemic violence. This concept helps to explain how voices in communities become marginalised. I return to reflect on other ways that epistemic ignorance shows up in the *Discussion* chapter.

Embodied knowledge

The overall epistemological framing is to take knowledge as something that is only ever gained from a particular vantage point, which is delimited by embodiment. Modern feminism is concerned with how we reconcile the problem of objectivity – the idea that the mainstream scientifically constructed notion of objectivity is deeply rooted in subjective rhetorical moves (Haraway, 1991, p. 185).

Instead, I understand knowledge as situated within a social context (Harding, 1991, p. 116). That is to say, knowledge is something created from a particular standpoint, which is informed by numerous social and cultural factors.

Haraway argues that the preferred position from which to take embodied knowledge is that of subjugation, since such positions are more attuned to the erasures and repressions of knowledge. She goes as far to say that objectivity cannot be practiced from the standpoint of the ‘master’ (Haraway, 1991, p. 194). She notes that Marx had an understanding about how ‘privileged positions block knowledge of the conditions of one’s privilege’ (Haraway, 2016, p. 111).

In *Paper 1*, and *Paper 4*, I engage more with the debate around embodied knowledge and connect this to my findings. In *Paper 1* I discuss why embodied knowledge is important to my methodological stance, particularly as a way to ground digital activities in a material way.

Epistemologies of Ignorance

Epistemic ignorance is a social epistemological theory that explains how certain absences of knowledge are used to maintain power and domination over oppressed people (Mills, 2017). It can be deployed critically to analyse the power relationships involved in knowledge production.

Charles W Mills (2017) identifies the three following mechanisms by which ignorance is perpetuated: ‘Perception and conception’, the ideologies through which we approach the world shape the knowledge that is available to us; ‘memory’, or how the social memory manipulated to conceal the truths of the past; and lastly, ‘testimony’, or how certain groups are discredited in advance in a way that prevents their testimonies from being able to contribute to knowledge.

In this thesis, I use Mills’ taxonomy of ignorance as the basis for exploring how epistemologies of ignorance can be located in Stack Overflow. In *Paper 4*, I use Christie Dotson’s theory of epistemic silencing (Dotson, 2011), which operates on the ‘testimony’ element of Mills’ taxonomy. Epistemic silencing is when an oppressed population withhold their testimony because they perceive that their testimony will be rejected. While I do not reference epistemic ignorance explicitly in *Paper 3*, the background notion of the paper addresses the ideologies which propagate ignorance. This will be detailed in the *Discussion* chapter.

The concept of epistemic ignorance is strongly related to the concept of epistemic injustice (Fricker, 2007; Medina, 2013). An act of epistemic injustice generally requires that some act of epistemic ignorance has occurred. I make use

of some of the theory around microaggressions in relation to epistemic injustice in *Paper 4*. Following the argument from Argyriou (2021), misgendering (the act of deliberately using the wrong gendered pronouns to refer to a person) can be seen as a hermeneutical injustice that is perpetuated through microaggression. Hermeneutical injustice aligns with the ‘perception and conception’ category of ignorance in Mills’ model; it refers to people having access to concepts or language that allow them to make their experiences known to others. Absences of certain concepts make it impossible for certain embodied experiences to be communicated and understood within society.

While Dorothy Smith does not talk explicitly about epistemic ignorance, there is a certain conceptual harmony. Smith talks about the ways in which institutional procedures and language allow certain things to come into view while prohibiting other things from being visible (D. E. Smith, 1987, p. 162). This view is quite similar to Mills’ definition of ignorance through perception and conception. Smith’s own work offers a toolkit for identifying these kinds of categorical and conceptual ignorance, which can be meaningfully extended by reading in modern social epistemological theory.

When working with the concept of epistemic ignorance, rather than moral ignorance, it is important to deploy the concept to analyse structural oppression, and not allow the smokescreen of individual blame to prevent attention being paid to the structural issues that allow oppression to replicate within society (Milazzo, 2017). For this reason, theories of epistemic ignorance also affect the ethical concerns of the thesis. This is discussed more in *Ethics*.

Gender & Masculinities

In this thesis, gender is a major topic under investigation. The direction of my own gender analysis is informed by queer theory, via Judith Butler, and masculinities, via Raewyn Connell. These theories are both situated within the post-structuralist tradition, influenced strongly by the work of Foucault.

Judith Butler’s maxim, subverting Lévi-Strauss, ‘gender is not to culture as sex is to nature’ (Butler, 1990/2002, p. 11) brings to our attention the notion that while gender is often analysed and framed as a cultural expression, it is not necessarily so. To Butler, there is no gender identity behind gender expression, gender is performative in the sense that it doesn’t represent a substance that can be verified as a ‘true’ gender. In their analysis, they situate gender as something that is rendered

intelligible through the matrix of power. Power here is understood similarly to Foucault.

In Butler's view, emancipation from gendered discrimination and homophobia cannot originate from within a system of thought that maintains the same dimorphic concepts – male and female. Similarly, the notion that heterosexuality and homosexuality are natural categories should be discarded. These artificial creations are analysed as ways in which power uses sex to regulate (Butler, 1990/2002, p. 122). This arguably echoes Smith's concern that we should be critical of taking up sociological concepts when being critical of sociology. It is not truly possible to mount a critique from within the established boundaries of a discourse, be that about gender or about other sociological phenomena. The challenge, then, is to find a position from which the effects of gender can be rendered visible without being captured by the discourse that divides up man and woman into ontologically distinct social categories.

With this in mind, my opinion is that an analysis of gender should not focus on trying to interpret or impose expressions of gender, as other Stack Overflow gender research has done, but rather should focus on how gender and gendered discourses are deployed to regulate or coordinate behaviour. It is then possible to relate to previous research by way of identifying other coordinating discourses about gender.

Stack Overflow is a setting that is dominated by the presence of men, as discussed in the *Context* chapter and in the *Gender on Stack Overflow* section. For that reason, it would be logical to take a theoretical approach to gender in this arena informed by studies of masculinity.

The study of masculinity is a relatively new field, which began gaining traction in the 1980s (Connell, 1995/2005, p. xiv). To talk about masculinity is to talk about how gender is socially ordered through discourse, in a way that produces masculine social practices. Raewyn Connell posits masculinity as something that arises through social relations, and something that is deeply intertwined with the history of institutions (Connell, 1995/2005, p. 29). She gives the example of the state as being ordered by masculinity through organisational practices that configure promotion, policymaking, and practical routines with respect to gender. Importantly, there is no singular masculinity, but rather different masculinities that arise within the same institutional and cultural contexts (Connell, 1995/2005, p. 36).

The emphasis in Connell's work on masculinity is the notion of hegemony. A hegemonic masculinity is 'the masculinity that occupies the hegemonic position in

a pattern of gender relations' (Connell, 1995/2005, p. 76). That is to say, among all of the masculinities within an institutional or cultural contexts, the hegemonic masculinity is the one that is dominant. This hegemonic masculinity is subject to change over time as other configurations of masculinity arise. Connell further clarifies hegemonic masculinity as 'the configuration of gender practice which embodies the currently accepted answer to the problem of the legitimacy of patriarchy, which guarantees (or is taken to guarantee) the dominant position of men and the subordination of women.' (Connell, 1995/2005, p. 77). In this respect, a hegemonic masculinity is the one that is the most successful strategy for upholding men in a dominant position in a particular social context, which aligns both with a cultural ideal and with an institutional power. Scholars have argued that nerd masculinity, geek masculinity, and masculinities associated with computer programming are subordinate masculinities that are stigmatized within the wider field of masculinity (Kendall, 1999).

Connell (1995/2005, p. 171) identifies two masculinized modes of defining expertise: generalized expertise and specialized expertise. Generalized expertise is legitimized through qualifications and examinations that establish a credibility as an expert and is more oriented toward establishing oneself as generally intelligent. Specialized expertise is vocational, gained through experience, and maintained through a peer group relationship with others. This type of specialized expertise may also contain a specialized technical language shared among peers. In Connell's examples, she positions specialized expertise as technical expertise within an occupation. Certainly, programming expertise meets this definition of specialized expertise, with programmers sharing a technical language that is complex.

It should be noted that Connell's modernist frame is often at odds with the more postmodern frame occupied by Foucault and Butler, since fundamentally masculinities work accepts the male/female dichotomy and does not play with troubling gender (Beasley, 2019). This is perhaps where my own theorising must find a point of harmony between analysing and deconstructing gendered categories. To do this, I invoke the notion of masculinities as a discursive framing and put focus on the institutional lens. In examining masculinities, I also remain inclusive of the notion that women can express masculinity – and vice versa – rather than considering masculinity purely something expressed by men (J. A. Allan, 2019; Landström, 2007). Bringing this back into contact with both Butler and Smith, when searching for the hegemonic masculinity that is active in a context, that masculinity is likely to be the one that is being replicated and coordinated discursively.

Methodology and Methods

This chapter of the thesis builds on the ground already explored in *Theory* to motivate a case for the methodology and methods used in this research. The two core challenges in developing a methodological system were one, to find concrete ways to work with the materiality of platform settings; and two, to avoid the pitfalls of gender research that ultimately rests on binarized assumptions of gender. In doing so, I have adopted a relatively pluralist approach to ethnography, combining interviews, document analysis, mapping, trace ethnography, among other approaches, to bring together a rich, cohesive picture of everyday life with Stack Overflow.

Some of my approach to methodology and methods is covered in *Paper 1*. In this chapter I focus on giving an overview of the methods used in this thesis.

Feminist Methodology

Overall, the methodological orientation is one that centres around feminist ethnography and methodological pluralism. Feminist ethnography gives a voice to individuals who are often marginalized, and restores power to the epistemologically dispossessed (Davis & Craven, 2011). Feminist research seeks to focus on social injustice, and feminist methodologies value the reduction of harm to their participants (Ropers-Huilman & Winters, 2011).

My particular methodological approach to feminist ethnography uses a hybrid of ethnography for the internet (Hine, 2015) and institutional ethnography (D. E. Smith, 2005). This hybrid approach is designed to facilitate combining contemporary methods for researching the internet with classical sociological concepts about power, discourse, and gender in institutional settings. In this way, the methodological approach attempts to meet the aims of the thesis by giving a way to hold the institution in view while thinking about the reproduction of gender dynamics.

From Hine, I take the notion that the internet is ‘embedded, embodied, everyday’ (Hine, 2015). This means that the internet is embedded in our daily material doings (Hine, 2015, p. 32), that being online is an extension of being *embodied* (Hine, 2015, p. 41), and the internet functions as an infrastructure in our everyday activities (Hine, 2015, p. 46).

From Smith, I take the notion that ethnography should describe the everyday/every night lives of people and should focus on how their activity is coordinated across different locations.

The purpose in choosing an ethnographic approach is to contribute to the literature on gender in the context of Stack Overflow by providing a more nuanced perspective, grounded in the activities and discourses of people. This is in contrast to previous literature that uses more abstract and computational approaches, as discussed in the *Gender on Stack Overflow* section.

Ethnography for the Internet

Hine's ethnography makes use of the idea of multi-sitedness. Multi-sited ethnography allows for exploration of a complex subject which may not have a well-defined 'field' (Hine, 2007), and expects for the researcher to follow the phenomenon between different fields of study. For this reason, the idea of multi-sitedness is well suited to blending digital ethnography with traditional ethnographic approaches. In digital spaces, the lines between what can be considered 'fieldwork' and the boundaries of the field can be hard to define (Fay, 2007), particularly because one is never truly away from the field.

For Hine, being online is considered an extension of worldly embodiment (Hine, 2015, p. 14). In this way, Hine's views about embodiment in this textually mediated environment work well with Dorothy Smith's views about text as an active part of everyday life.

Hine talks about the internet as an infrastructure that is active in 'invisibly shaping' actions of those who use it (Hine, 2015, p. 49). While I do not adopt the language of infrastructure, there is a clear similarity in Hine's focus on the 'shaping' of activities, and Smith's focus on the 'coordination' of activities. While Hine might take a broader view of an infrastructure as it relates to the internet as a whole, complementing this with Smith's idea of an institution can lead us to find a focus on the social level of the platform.

Central to my own approach is integrating Anne Helmond's discussion about programmability (Helmond, 2015) with this embodied and material take on platforms. The notion that platforms are programmable encompasses the idea that users can customize their experiences of the platform and can create and curate their content. I open some of this discussion in *Paper 1*, but it is a unifying thread present in all of the papers included in this thesis.

Institutional Ethnography as a Method of Inquiry

The way that institutional ethnography is deployed in this thesis as a sociological theory is covered in the *Theory* chapter. The distinct relationship between the institutional ethnography conception of institutional coordination and platforms is covered by *Paper 1*. In this section I will cover the more practical elements of how methods from institutional ethnography are used in this thesis.

Textual analysis, and recognizing the ways in which texts coordinate activities, is one of the central approaches within institutional ethnography. In particular, the researcher ideally looks for those texts that are replicated, and that may be interpreted and activated differently in different contexts (Murray, 2020). Rather than setting texts apart from everyday life, texts are understood in a material way, and are considered an active part of coordinating activities (D. E. Smith, 2005, p. 101).

Fieldwork in institutional ethnography is often done in two distinct stages, one stage being a field work stage where the researcher develops an understanding of the site under study, conducts interviews, and collects the texts that are important in that site, and the other stage being an analytic stage where the researcher works with texts and connects texts to actions (McCoy, 2006). Generally, the researcher moves between these two stages, and as they develop their understanding of the types of work that occur in the site, develop an institutional level understanding of the way that texts organize people (Murray, 2020). In my own work, I have relied much on iterating between these two stages, developing my understanding of texts, and then applying that knowledge within observational and interview-based settings.

Typically in institutional ethnography, observation is considered less important than interview and textual analysis (Balcom et al., 2021). However, in my own practice I have used observation to a much higher degree. In part, this is because the nature of an internet-based field site means that the line between textual analysis and observation becomes quite blurred. Compared to a physical field site, much more of the work of an online site is textually mediated. While there are some clear distinctions between institutional texts, like rules and codes of conduct, that have a defined intention to coordinate the activities of people across sites, there are many texts that might appear to be ordinary posts or blog entries but that are in some way canonized as part of the way in which actions are coordinated. Some of the effects of this are discussed more in *Paper 3* and *Paper 4*. For example,

take the idea from *Paper 3* that the rules of Stack Overflow specify ‘Saying “thanks” is appreciated, but it doesn’t answer the question’. This statement does not explicitly ban saying thank you, but editors on the platform often enforce a ban on such statements. By applying an institutional ethnography mindset, we can follow the chain of texts to find that there are several blog posts and discussions that canonize the idea that mentions of thanks are against the platform rules. Through observation, we can see that this rule to remove thanks is not universally applied, so it depends on the text-reader conversation (D. E. Smith, 2005, p. 104) – the different ways in which people activate the texts and how they act upon them. In this way – by focusing on how the same texts are activated with different results – we can start to locate oppositions and tensions that are of interest to institutional ethnography scholars. I explore this in *Paper 1*.

Timelines

In *Texts, Facts, and Femininity*, Smith discusses how the way in which organizations present sequencing of observations can reveal the difference in knowledge that comes from observation and knowledge that is already interpreted through an institutional lens (D. E. Smith, 1990, p. 118). This method is underpinned by the documentary method of inquiry (Garfinkel, 1967, p. 94), in this case creating a historical account using documentary evidence based on patterns known in the data. I argue for the importance of this approach in *Paper 1*. I have deployed this approach both analytically and as a method, demonstrated in the *Context* chapter and *Paper 4*.

I have also used this in my field exploration as a way of being critical about the flow of time on the platform. In internet settings, time is often not obvious, and it can be very difficult to establish at what point an event happened, or a page was updated. As posts become algorithm driven, it may not be apparent who replied first, who commented first, and what the sequence of events actually is, since they are ordered by ‘upvotes’ rather than by time. This is complicated by the relative invisibility of edits and editing on the platform, which require one to open a full edit trail to ascertain what has been changed.

Mapping

Another technique frequently used in institutional ethnography is mapping. Mapping is specifically a process of tracking sequences of texts and activity, called *work-text-work sequences* (D. E. Smith & Griffith, 2022, p. 73). The goal of this kind

of mapping is to produce a flow showing how texts coordinate the activities of individuals. In my analytic time, I have experimented with mappings throughout my analytic work though in many cases this process is not made visible in the resulting text.

For example, in *Paper 3*, I started my analysis by making a hand-written map to break down the kinds of work and activity that a question asker needs to do to write a successful question.

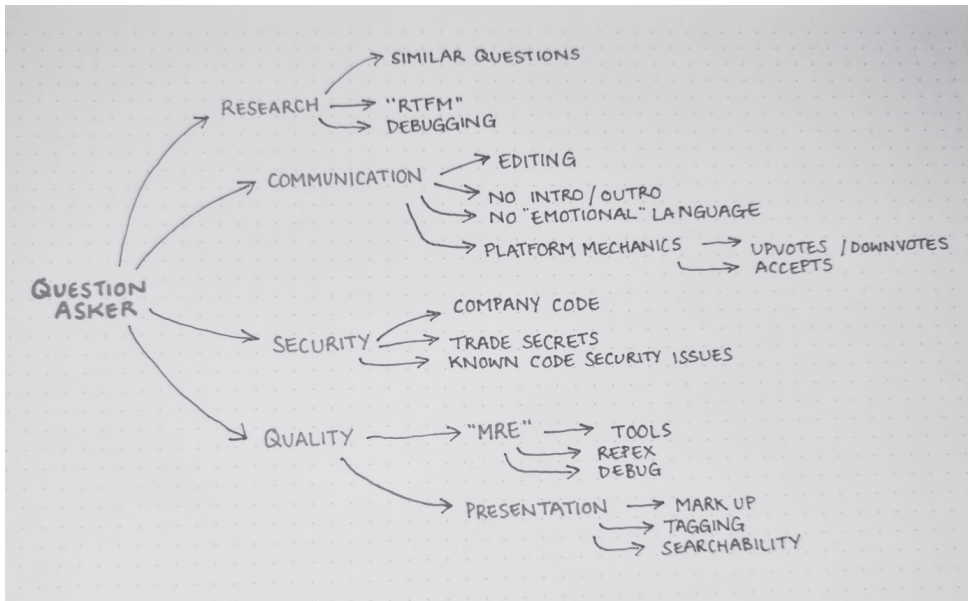


Figure 5: Preliminary mapping of the work of a question asker

To start my mapping process, I began by assimilating what I knew about the work of question asking from our interviews, from observation, from platform documents, and from research. I split this in to four main categories of work expected of question askers – research, communication, security, and quality. As I was doing this, I reflected that the Minimal Reproducible Example (MRE) seemed to be an important core that actually had a unifying role across all of the strands of work activity; in order to produce an MRE, and be successful doing so, one must have engaged with all of the other strands of work activity. I also identified that this term had a discursive function. Having realised this, I focused my further analysis in *Paper 3* on this concept. To start to understand how a user encounters the MRE, I experimented with using python tools to scrape URLs to help produce

network maps of texts, which can in turn be interpreted in to work-text-work sequences. This means writing algorithms to recognize website links and using script to collect these links with their text. Some of these results are shown in *Paper 3*, presented as a network diagram. In these cases, I have worked more in collaboration with scripting and coding, rather than fully automating a mapping process; allowing the script to collect documents and then manually intervening to interpret the order and importance of the acquired texts. There is ample opportunity to explore the confluence of machine-driven analysis and the institutional ethnography approach to mapping.

Discourse Analysis

In this thesis, discourse analysis is applied in an institutional ethnography lens, but with a sensitivity to Foucauldian discourse analysis.

Foucauldian discourse analysis uses notions of power, ideology, and resistance to analyse social relations (Powers, 2007). I have discussed Foucault on power and ideology in the *Theory* chapter of this thesis.

While Foucault's understanding of discourse evolved during his career, one can understand discourse as 'a complex set of practices which try to keep statements and utterances in circulation or try to seclude them from others' (Khan & MacEachen, 2021). Broader than text, discourse is social activity that may either replicate or act to reject particular statements that pertain to power structures. Discourse is an 'ongoing intertextual process' (D. E. Smith, 1990, p. 121) which contains attributes that are not reducible to individuals. The intertextuality of discourse means that discourses always occur in relation to other texts; one document is not a discourse, a discourse arises from patterns in many texts that may knowingly or not reference each other. Integral to discourse analysis is the notion that individuals align themselves with particular discourses in the way that they engage in communication, and this is evidence of the organizing effect of discourse. For institutional ethnography, discourse has a slightly enhanced meaning. Sharing the notion from Foucault that discourse is systematically produced, ordered and disseminated, in institutional ethnography discourse is also the translocal relations that coordinate the practices of individuals (D. E. Smith & Griffith, 2022, p. 45). When applied to institutional ethnography methodology, that means in practice that one is attuned to the coordinating effect of discourse, and sensitive to the ways in which discourse produces relations. When thinking

about discourse in institutional ethnography, I look for discourses that coordinate behaviours across multiple sites.

I have used discourse analysis throughout this thesis. For my work, discourse plays an important role in revealing the gender dimensions at play. In an environment where identities are unknown, exploring gendered discourse becomes one way to reveal gendered power relations. Discourse also becomes an important focus during *Paper 3*, when I examine the specific discourses around politeness.

Data Collection

In this section I describe the approach and timelines for data collection during the course of the thesis. Due to the nature of doing ethnography in a digital setting, it is not necessary always possible to distinguish between the boundaries of the field and the boundaries of one's own life, compared to a traditional on-site ethnography where there is a clearer line of demarcation. I present this reflection with the critical awareness that the complexities of this work require a degree of simplification.

See the appendix, *Data Collection* for a non-exhaustive list of data collected during this PhD thesis.

Pre-Study Phase: January 2020

During the initial months of starting research, before setting any particular methodological approach, I undertook a process of exploring the available data in the mindset of my prior training in mixed methods approaches. In this stage I explored API data in a more quantitative way, orienting to the possibilities for features that can be counted and measured in this environment. I also began exploring user data and testing ways that the research group could ethically identify persons for interview. At this point in time, I am working within a more empiricist framework.

Exploration Phase: July 2020 – November 2020

During this phase the group collects interviews. I am also starting to work in a more ethnographic way, experimenting with taking field notes while I explore Stack Overflow. I collect and explore data relating to gender on the platform, using a mobile ethnography approach (Hine, 2011). I look especially for where people

are *talking about* Stack Overflow in relation to gendered issues, for example, news outlets, blogs, and other social media. I try to follow the connections that I see in that material to trace how the phenomenon of women participating on the platform is discussed and understood. This reflects a more feminist turn in my fieldwork.

Identifying a disjuncture: January 2021

At around this point in time, I am experimenting with institutional ethnography as an approach to my research. From my prior field explorations, and from the interview data, I am interested in building a data corpus around the firings of moderators and its relationship to queer inclusion on Stack Exchange. Starting from blog posts and discussions on the platform I begin to amass data that enables me to get a preliminary understanding of this issue. During this time, I write analytic notes as a way to guide myself through the materials. These analytic notes contain more reflections and analysis rather than my field notes which have more of a diary structure. They are ordered by topic area or data type, for example, one note relates to the corpus of resignation letters, and this analysis was combined with other analyses to inform *Paper 4*. I would also consider *Figure 5* an example of a handwritten analytic note. As I deepen my knowledge of institutional ethnography, I start to see ways in which the ontological base can bring together my theoretical interests while offering me practical ways to organize my methodological approach. Institutional ethnography challenged me to think more about what working in a feminist way meant for my approach and pushed me in terms of being self-critical about how I position the people I am studying. It also offered me ways to think about how to use text and documents in an ethnographic way as a compliment to interview data.

Rediscovering the field: March 2021 – April 2021

During this period, I have reflectively noticed that some of my own emotional reactions are inflecting in my analysis and data collection. In particular, I notice that I am holding a lot of anger towards those who I perceive to be benefiting from doing harm to the queer community. Noticing these emotional responses is an important part of being reflexive in feminist research (Gore, 2018). For me, part of addressing this involved doing some work in my personal life to integrate my own queer identity. I reflect on how this relates to my virtue ethics approach in the *Ethics* of this thesis. In practical terms regarding my research, I decide to

take some distance from this line of study. To achieve this, I instead absorb myself in understanding how the work of editing operates on the platform and start to familiarise myself with edit logs, experimenting with different ways of mapping and tracing the effects of editing. I do this with the understanding of ‘work’ as found in institutional ethnography. At around this point I transfer my note-taking system into Evernote. Having experimented with a few different ways of writing field notes, I settle in to writing more of a diary of my readings and writings. A diary style approach to field notes helps me to keep track of what I was viewing during the day and why, making it much easier to retrace my steps when doing analytic work.

Returning to disjuncture: May 2021 – June 2021

At this point I feel ready to dive back into my core disjuncture: the silencing of queer narratives on Stack Overflow. During these months I focus my data collection specifically around moderator firings and resignations. My analytic notes cover commonalities in resignation notices and piece together a timeline of relevant events. This is informed by the process outlined in *Texts, Facts and Femininity* (D. E. Smith, 1990). I choose this as an approach both because different contested timelines appear in the data corpus as a way that people are understanding the events, and because I sense that attending to the ordering of events will be productive in untangling how the narrative is being socially organized.

Systematic literature review: September 2021

During this point in time, along with the SOCDEX research group, I undertake a systematic review of the Stack Overflow literature, producing an annotated set of over a thousand articles. While literature review is not usually considered part of ethnographic data collection, this is a more common way of approaching literature in institutional ethnography. This is due to the literature often being part of the construction of ideological positions and discourse within the field (Rankin, 2017). Recognising how concepts become abstracted from real lives of people is a part of understanding the social ordering of knowledge. For example, in *Paper 3* I trace the work contained within the notion of the minimal reproducible example (MRE); this abstracted concept conceals the reality of what it means to actually do the work of debugging. In the context of my research, the unique entwining of programmers’ work practices and publishing practices mean that the academic

literature often occasions helpful insights into the place of Stack Exchange in everyday work lives. These insights not only help me to frame my own research, but also fill in some gaps in my understanding about how Stack Exchange is actually used by programmers. For example, I was not previously aware of how much research work goes in to improving question recommendations (Ponzanelli et al., 2014; Procaci et al., 2016).

Writing to understand: 2022

Much of my 2022 is spent in analysis of my material and producing articles. During this time the bulk of my data collection is spread between analytic notes on various platforms and on pen and paper. As my own style of ethnographic work develops, I gravitate toward storing collected data directly on Zotero or within my analytic notes, rather than saving data as PDF files. This allows me to more easily include mixed media (such as podcasts) in the material that I am considering. Podcasts formed part of the data corpus both for *Paper 4* and the *Context* chapter of this thesis.

A discursive disjuncture: January 2023 – March 2023

After having more space from my material, and time to discuss my own work and the work of others in various forums, I become interested in pursuing more of the discursive dimensions of my material. In particular, I become interested in the role of the Minimal Reproducible Example on Stack Overflow, and the work that this concept does to coordinate the activity of users. I focus my data collection and analysis on finding ways to map this concept and reexamine my materials for how this concept shows up.

Locating the institution: March 2023 – July 2023

Looking back on my work, I feel that I want to begin this thesis by presenting a historical genesis of the platform, to show how the platform becomes an institution from its own perspective. To do this I collate the material I already have about the history of the platform and start to fill this in with a deep comb through of official and unofficial blog posts, as well as podcasts, once again building a timeline. This material comprises data that had been collected in support of *Paper 4*, and new data especially from the blogs of the founders of Stack Overflow as well as podcasts.

Data Overview

The following table describes briefly which types of data are used in which papers:

Study	Interview Data	Social Media Data	Stack Overflow Data	Stack Overflow Code of Conduct
Paper 1 Writing the Social Web		✓	✓	✓
Paper 2 Gaming Expertise Metrics	✓		✓	✓
Paper 3 No Room for Kindness	✓	✓	✓	✓
Paper 4 Silencing Tactics		✓	✓	✓

Observational materials, like data relating to threads and chats, have generally informed my view of each of the topics discussed, but this data is not always explicitly used in the papers. Often this is done so that the core argument remains strong, and to allow certain data types to take the foreground. For example, while *Paper 2* uses an eclectic range of data to help support the core argument, it is the interview data in this paper that sits in the spotlight. In contrast, while information from interviews helped me to frame the issue for *Paper 4*, interview data is not explicitly used for ethical reasons, discussed in the *Ethics* section of this thesis.

The following table describes briefly which analytic methods are primarily used in which papers:

Study	Timelines	Mapping	Discourse Analysis	Trace ethnography
Paper 1 Writing the Social Web			✓	
Paper 2 Gaming Expertise Metrics			✓	✓
Paper 3 No Room for Kindness		✓	✓	✓
Paper 4 Silencing Tactics	✓	✓	✓	

Other Analytic Methods

Trace Ethnography

Trace data can be understood as the residual data that is created by a system as the result of people interacting with that system, rather than data that is deliberately created by a person. Examples of trace data might include metadata (likes, times and dates of posts) or logs (records of activity that are created automatically). One can use data traces like this as part of documentary approaches to ethnography (Geiger & Ribes, 2011). This trace data can be used to build a picture of the kinds of activities and practices that people engage in when they are using digital systems (Jackson et al., 2020).

Much as in Geiger and Ribes' (2011) study of Wikipedia traces, Stack Overflow also has a fast pace of interaction and includes a number of automated processes. For that reason, it benefits the researcher to become familiar with the way that these processes can be tracked through trace data. Understanding which processes are significant is developed over time through ethnographic observation. I consider my use of the Stack Exchange Data Explorer in the *Context* chapter a way in which I have engaged in trace ethnography. It was also through trace ethnography that I developed a curiosity about the mods and add-ons that people use for editing work, as I discuss in *Paper 3*. For example, by using the Data Explorer to follow recent editing changes, I was able to notice patterns in the types of editing comments that were left, which lead me to become curious about how so many editing comments were exactly identical despite being written by different users. It turned out that this work was being coordinated by the use of scripts in the editing process. Without using trace ethnography, these parts of the platform may have remained invisible.

While trace ethnography isn't traditionally used as a part of the methods kit in institutional ethnography, it works well to complement the focus in this thesis on documentary methods of inquiry. Data traces add another layer that makes visible the activities of people on the platform.

Interviews

From the point of view of this thesis, the interviews form a resource for the ethnographic exploration of the platform, but they were not designed in accordance with an institutional ethnography tradition and were not specifically

designed to explore gender. I consider the interviews to be a supplementary data source.

The interviews used in this thesis were collected as part of the SOCDEX project by the project team, barring two interviews which I conducted in order to include diversity of gender. These interviews were conducted in 2020, at the very start of my time as a PhD student. Of the sixteen conducted interviews:

- One interview was a pilot interview with a woman sourced via a local ‘women in programming’ group. This interviewee did not have a Stack Overflow account. Her interview is excluded from *Paper 2*.
- Fourteen interviews are with men who rest in the top 2% of reputation on Stack Overflow. They range in age from 21 to 49 and represent a variety of nationalities.
- One interview is with a woman whose reputation lies in the top 2% on Stack Exchange, whose contributions are not purely on Stack Overflow.
- One interview is with a woman who blogs about Stack Overflow, coding culture, and who runs a coaching business for women in programming. This woman does not have a Stack Overflow account and is also omitted from *Paper 2*.

When approaching persons to interview, we only approached people who listed an email address or a website in their Stack Exchange profile, taking this as an assumed invitation to contact. It was naturally impossible to know for most of the persons being polled what their gender identity would be until the actual interview.

As the interviews were conducted by the group and were conducted prior to adopting institutional ethnography as a framework for my research, these interviews were semi-structured interviews with some elements of stimulated recall. In this case the stimulated recall involved asking participants to talk us through how they interpret different user profiles. Many of the questions were framed around expertise and platform mechanics. The interview schedule is available in the *Appendix*. To the additional two interviewees who identified as women, I opened a dialogue about their experiences of gender on the platform, by asking them if they felt their experiences of the platform were different on account of their gender. The project as a whole was not focused on exploring gender issues with participants who identified as male, but on some occasions these topics arose naturally. I also found that many of the participants would talk spontaneously about the politics of the platform, for example, referencing the events in *Paper 4*.

Fabrication

Content Warning: this section contains language that is derogatory to women and references to sex work.

Inspired strongly by both the way that Markham (2012) uses fabrication in internet studies and the way that Corman (2021) uses composite accounts in institutional ethnography, this thesis makes use of creative analytic practices to present data. The *Ethics* chapter of this thesis covers the reasoning for using fabrication methods to obscure information that could identify participants.

Throughout this thesis, participants are represented by fictitious usernames. These have been generated to resemble the kinds of names that people choose on the platforms that they use. For example, usernames on Stack Overflow tend to be a mixture of real-life names, geeky references, and short form names. I often used generators as a starting point for inspiration and then modified the results to be something that, to me, would be a realistic representation of a name. At times I have translated these into other languages to also give the sense of the community being international. For example, a word generator gave me the prompt ‘rush’, from there I decided that ‘data rush’ would be a realistic name for a Stack Overflow user, and I translated that to German to give, ‘Datenraush’ as a username. I have chosen to present participants who identify as women with women’s names. This is because, simply, they were often only identifiable as women because they were using women’s names. Using this contrast in the data felt like it captured something true about the experiences of these women.

For papers and examples in this thesis using ‘found data’, such as social media data, I have used an iterative process to fabricate exchanges. This can be seen in *Paper 3*, *Paper 4*, and is also used throughout this text. The iterative process involves first selecting one exchange or several exchanges that exemplify the kinds of exchange that I am trying to represent. In some cases, this also means shortening, reordering, and otherwise organising exchanges to make the flow of conversation easier for a reader to follow. Presented here is an example of how such an iterative process might look, based on a chat exchange. Note that the exchange presented is based on a real exchange from Stack Overflow chat, but this exchange is already altered – at no point am I using direct quotes. This data was collected while doing multi-sited research following places where the changes to the Code of Conduct were being discussed (*Paper 4*).

Original data:

{deleted user}	Basically, this tech startup has reinvented prostitutes then?
Genki	Going to buy from them?
Roach	What, really?
Knight	Tech startup makes money, the girl pays her rent, everyone wins
mirage	You guys are discussing sex workers??? Wtf??
mirage	{link to SO blog post "Stack Overflow isn't very welcoming, it's time to change that"}
Knight	Blah Blah blah
roach	@mirage welcome to the Ruby-on-Rails ¹⁰ chat
mirage	Not much of a welcome
Knight	Nobody was insulted
mirage	This is my first time in the chat
roach	Everyone was being civil except for you

First Iteration:

In the first iteration my focus is on maintaining who was talking and adjusting the wording with a thesaurus. I do this so that I avoid preserving words that might be searchable in subsequent iterations. During this first iteration the exchange is unlikely to feel that natural and could still be searchable since the syntax is mostly preserved.

Example:

Speaker 1	So, this <u>company</u> has reinvented <u>hookers</u> then?
Speaker 2	<u>Wanna</u> buy?
Speaker 3	<u>Really?</u>
Speaker 4	The <u>company</u> makes money, the <u>girl</u> pays her rent, everyone <u>benefits</u>
Speaker 5	<u>You lot</u> are talking about <u>hookers</u> ??? Wtf??
Speaker 5	{link to SO blog post "Stack Overflow isn't very welcoming, it's time to change that"}
Speaker 4	<u>Yea whatever</u>
Speaker 3	@user1 welcome to <u>Stack Overflow</u> chat
Speaker 5	<u>I don't feel</u> welcome
Speaker 4	Nobody was <u>hurt</u>
Speaker 5	This is my first time in the chat
Speaker 3	Everyone <u>else</u> was being civil except for you

Subsequent iterations:

After assessing what is important about the exchange – in this case, the gaslighting in insisting that speaker 5 is the one in the wrong for being offended about the conversation – and then preserving that. I also consider removing or merging

¹⁰ Ruby-on-rails is a framework used to make web applications. The real community in which this chat occurred remains anonymous.

speakers in order to make the narrative easier for a reader to follow. In this case, I choose to remove Speaker 1 and 2 from the exchange. Everything will be rewritten with the intention of translating and interpreting, with the hope of disrupting the syntax. The interpretation is done by incorporating later parts of the exchange and distilling the intent. Some of the context will be given around the text rather than in the text, in this case to avoid containing triggering content directly, in particular the slurs against sex workers. Each individual turn tends to be longer as a result, but this allows more flexibility to rephrase idiomatically in a way that is less likely to be searchable. In my process, I may do several iterations in this phase, until the exchange feels both natural, is unsearchable, but still representative.

Example:

Two users in one of the language-specific Stack Overflow chat forums are discussing a technology startup company who are offering paid for coaching for dates.

Magic	I can't believe you lot are making jokes about sex workers. Didn't you read the blog post about making Stack Overflow a more welcoming environment?
Podbay_door	Why should I care?
C0de	Welcome to Stack Overflow!
Magic	Don't you think people will see this conversation and feel uncomfortable?
C0de	Dude, you're the one making people uncomfortable

Ethics

The ethical approach for this doctoral thesis is grounded in virtue ethics and feminist ethics, which prioritise harm reduction and good personal conduct. In contrast to deontology, which prioritises adherence to contractual moral duties, and consequentialism, which prioritises outcomes, virtue ethics prioritises the moral development of a person's character.

There are no commercial interests represented in this research.

Virtue Ethics

Virtues are beneficial moral characteristics that are evident both in a person's intentions and actions (Foot, 1978/2002). Successfully acting in accordance with virtues depends on applying one's practical wisdom to select an appropriate course of action. There are many different approaches to selecting appropriate virtues to curate. In his writings on the philosophy of technology, Ess (2022) foregrounds the virtues of courage and care, and highlights the importance of embodied knowledge in deciding appropriate courses of action. I have chosen to focus on care and embodied knowledge as my primary virtues.

When researching in an ethnographic context, it can be difficult to anticipate the exact kinds of challenges that might arise during the course of observation. It may not always be possible to act in accordance with a pre-agreed ethical contract, and it may not always be obvious which outcome is 'good' or for whom the outcome is good. Virtue ethics offers a framework that allows a researcher to be flexible in how to prioritise ethical responsibilities. For this reason, prioritising developing virtue as a researcher is the primary goal when working with a virtue ethics framework. As part of this, it is therefore beneficial to develop a self-reflective approach to ethical conduct (Rawdin, 2018).

One of the ways in which I engage with this ethical project is to be mindful of how I, as a researcher, may risk acting with epistemic violence toward participants. By epistemic violence, I mean by discrediting someone's embodied knowledge or misrepresenting their beliefs. In the course of this research, it was important for me to practice the virtue of inclusiveness (Worden, 2019). To do this I have remained open to the possibility of understanding the social events from multiple points of view, and to consciously ensured that I avoid falling into online echo

chambers. For example, taking time between field engagements allowed me space to be reflexive about my assumptions. One other way in which I have reduced possible epistemic violence by being mindful about overdetermining the subjects of research, and to hold true to the idea that subjects should still be able to see their own experiences reflected in the finished research (Mulla & Hlavka, 2011).

As many of the studies were performed with me as an outside researcher, observing interactions in online spaces, subjects will not have always given explicit consent for their words and interactions to be used for research. Equally, I will not always have had opportunity to clarify their meaning and intentions.

In order to avoid deanonymizing participants, I remained a silent observer (Robson, 2017). This means that I did not make my presence known within the community and did not engage publicly with the community. Doing so may deanonymize participants because traces of the researcher interacting with participants will remain visible, therefore participants can become linked with their contributions.

General Ethics for Interview Data

Much of the formal ethics for this thesis was covered by the SOCDEX project's ethical review, which was approved by the Swedish Ethical Review Authority. This ethical approval covers interviews and the collection of platform data.

Interview informants were required to give written informed consent in advance and were given an opportunity to ask questions prior to the interview. Informants were selected from contributors in the top 10% of Stack Overflow users and were only approached if there was an email address publicly available on their Stack Overflow profile or via a personal website attached to their Stack Overflow profile. Two informants were selected specifically for inclusion in *Paper 3* and were asked additional questions related to the gender focus of this study. Of these two informants, one did not have a Stack Overflow account but was a prominent figure on Stack Overflow due to her blogging activity. The interviews themselves were conducted through the SOCDEX project and involved a pair of interviewers and one informant.

Interview data is used in *Paper 2* and *Paper 3*. This interview data is presented in an anonymised format. Informants are referred to by a pseudonym, and for the purposes of the study are listed with their stated gender. For *Paper 2*, the set of interview informants was limited to those in the top 2% of reputation on Stack

Overflow, meaning that two interviews from the set were not included in the analysis.

Interview data is not quoted in *Paper 4* despite there being relevant material. This is because I do not believe that the informed consent would have covered a study with a focus on transphobia. I feel that including interview data directly may have risked doing epistemic violence to our informants, who would not have reasonably expected their data to be used in this context. Informants were not directly asked about the events documented in *Paper 4*, but a small number raised these events unprompted. Rather than using this directly, I opted to follow their testimony back into the field and use relevant sources in the Stack Overflow platform data.

General Ethics for Online and Observational Data Collection

Textual and observational data was generated in support of this project. Some of these materials were collected as part of daily observational practices, such as reading and following threads and chats. Some of these materials were generated using SQL run on the Stack Exchange Data Explorer and Python queries run on the Stack Overflow API.

Use of observational material from Stack Overflow presents a dilemma. All user contributions on Stack Overflow are explicitly published under Creative Commons Attribution-ShareAlike (CC BY SA) licenses, with different licences applicable depending on the age of the post (*What Is the License for the Content I Post?*, 2021). This means that content can be used, reused, and shared so long as the poster is attributed, and the resulting work is published with the same license. That means that consent to use contributions from Stack Overflow can be assumed for the sake of research purposes, so long as the resulting research is open access.

However, given the nature of the research in this thesis, it is reasonable to assume that some individuals may feel harmed if their contributions are attributed to them. While contacting individuals for permission to use their texts and posts for research might be best practice in some arenas, taking such an approach can open both the researcher and the website users to harms (Korn, 2019). For example, those whose contributions are present in *Paper 4* as examples of transphobia may feel that such an analysis is damaging to them personally. Equally, those people, if they could identify themselves in my work, might wish to retaliate against me. This is an example of working in accordance with a virtue ethics

approach – where a deontologist approach may compel a researcher to only follow the pre-agreed ethics, following a virtue ethics approach I have made judgement-based changes to strengthen protections for informants, keeping the virtue of care in mind. As a mark of respect for what may be controversial research, I have adopted an approach inspired by Markham’s practice of fabrication (Markham, 2012). Where possible, I present fictionalised composites of interactions, that are based on multiple different interactions along a theme. Where this is not possible, I have abstracted and paraphrased text, often rewriting several times to avoid the possibility that the interaction is directly searchable. An example of how this operates is given in the *Methodology and Methods* chapter. In all cases there is a legitimate risk that contributors could be traced, but my hope is that it would not be obvious which specific people are being referenced.

Use of data from the Stack Exchange Data Explorer is less problematic with respect to the potential risks and harms to individuals since individuals are not often identifiable within such data. However, there is still an ethical responsibility to use the available data appropriately and be aware of the potential limitations of that data. With specific relevance to my project, platform data that Stack Overflow has identified as harassment is not made available through the API. For example, comments and posts that have been flagged as offensive are deleted. To obtain this type of platform data, it is necessary to apply directly to Stack Exchange, and to sign a non-disclosure agreement (NDA). I requested access to this data via the Workshop on Online Abuse and Harms (WOAH) in 2020, but Stack Exchange failed to respond to my application. For this reason, I am aware that to some extent the platform data from the API is not complete. While I have stumbled upon exchanges that were later deleted and removed, the true scale is not possible to know. Relatedly, the data corpus is a live object, being changed and transformed over time as users continue to interact with it. Unlike smaller scale studies, where it may be possible to consider deleted posts as withdrawing informed consent (Bergviken Rensfeldt et al., 2019), with the scale of Stack Overflow making such decisions would not be possible. In some cases, such as *Paper 4*, and in doing research for the *Context* chapter, it was even necessary to use tools like Wayback Machine¹¹ to access deleted materials.

It is therefore not necessarily ethical to use this platform data without acknowledging that it has limitations and is specifically limited to platform data

¹¹ <https://archive.org/web/>

that has not already been removed from the dataset for being considered abusive or harmful.

Harm Reduction

This section contains discussion of racist and bigoted language, which may be triggering.

In dealing with material that pertains to abusive behaviour and controversial topics, it is important to recognise the potential for harm to the researcher and to the potential audience. In particular, gender and sexualities scholars often face harassment for their research (Pevac, 2022), and sometimes are met with physical violence.

While it is difficult to describe what kinds of materials are present in the corpus that might cause harm, without that description causing harm, I am in particular referring to exposure to extreme anti-LGBTQ and anti-feminist content. While it was rare to encounter extreme cases on Stack Overflow, this kind of content was quite common on Reddit and on some of the technology news blogs that covered developments on Stack Overflow. For those of us who have experienced gender-based violence and harassment in real life, re-exposure to such materials can cause emotional distress.

While exposure to such materials on Stack Overflow was rare, this type of content was still something that I occasionally stumbled upon unintentionally. Given the neutral façade of the platform, it was jarring to find these materials. To illustrate this, I present here an example of how this material might appear on the platform. While browsing recent rejected edits, to get a sense of how the work of editing is organised, I came across a particularly egregious instance of racism (see third line from the bottom, Figure 6).

Looking at the creation and rejection dates, this comment would have been live and viewable for around two days. An advantage of automated systems for content moderation is that comments like these are usually detected very quickly and removed. However, while Stack Overflow uses some degree of automated moderation to detect certain words and phrases, evidence like this suggests that it is easy to trick such automation by using deliberate misspellings. After this point, it is down to human editors and moderators to protect the community from hate speech. After a few months, it was no longer possible to locate this editing trace, meaning that it had been entirely purged.

Suggested Edit Link	Post Link	Comment	CreationDate	RejectionDate
Suggested Edit #5349605	Flutter Read from disk and generate buttons	corrected spelling and fixed grammar	2022-04-04 06:54:06	2022-04-10 07:23:12
Suggested Edit #5352103	Adding and using custom image preprocessin...	added tags	2022-04-10 04:45:35	2022-04-10 04:47:22
Suggested Edit #5352099	Django: tags showing in HTML template even...	formatting fixed	2022-04-10 04:25:01	2022-04-10 04:43:16
Suggested Edit #5352030	no handler found for uri [-index>/_doc</docu...	Grammatical error fixed	2022-04-09 22:44:17	2022-04-10 04:39:22
Suggested Edit #5351963	How to check for spaces before or after a stri...	explained more, should have assigned the va...	2022-04-09 18:53:22	2022-04-10 04:19:45
Suggested Edit #5351786	71807733	Inline picture + remove unneeded comment	2022-04-09 11:42:44	2022-04-10 04:15:10
Suggested Edit #5351869	71809177	Output was not written as normal text.	2022-04-09 15:01:44	2022-04-10 04:14:07
Suggested Edit #5351201	npm not found from Visual Studio code termi...	Stack Overflow is like an encyclopedia, so we...	2022-04-08 01:18:47	2022-04-10 04:13:46
Suggested Edit #5351629	How to call VS Code Editor from terminal / co...	explained why it doesn't work with flatpak	2022-04-09 13:18:40	2022-04-10 04:11:01
Suggested Edit #5350887	while-read loop broken on ssh-command	added another standard solution	2022-04-07 08:20:42	2022-04-10 02:20:24
Suggested Edit #5352047	Print the Key for the N-th highest Value in a H...	we have iterate over list	2022-04-10 00:38:50	2022-04-10 01:42:07
Suggested Edit #5351588	How to increase the frame rate of live streami...	found which part is taking more time. Now ne...	2022-04-09 03:17:15	2022-04-10 01:19:20
Suggested Edit #5350337	Iterate through positional arguments with clap	App was renamed to Command, some metho...	2022-04-05 20:07:54	2022-04-10 01:17:25
Suggested Edit #5351504	how do i run this program in windows 8? I am...	why do we not have any blac slaves anymore	2022-04-08 22:03:33	2022-04-10 01:06:08
Suggested Edit #5348055	Running PostgreSQL in memory only	Correct mistake saying that it's in-memory	2022-04-01 10:22:30	2022-04-10 01:01:06
Suggested Edit #5351993	PySpark and SQL: join and null values	Formatted code	2022-04-09 20:19:38	2022-04-10 01:00:58

100 rows returned in 661 ms

Figure 6: Suggested Edits SQL Query results (content warning)

It is important to remember that the data traces we encounter as researchers using historical data is not necessarily a representative picture, especially when the platform regularly purges this data. Embodied experience of hostility on the platform is going to be quite different if a user is a member of a group targeted for harassment, who is likely to see hateful comments before they are deleted and purged, compared to a user who does not generally experience harassment on account of their characteristics. While it is undoubtedly better that this kind of speech is removed, it also gives people reasons to doubt the testimony of users who experience harassment. In *Paper 4* I discuss how people minimise the possibility of racism and sexism on Stack Exchange.

Where I believe material presented in the studies could cause harm to the audience, I have provided a trigger warning explaining briefly what kinds of potentially triggering material is contained in the paper so that a reader can make an informed choice about whether to continue reading.

Where observational data might cause harm to me personally, I have taken advantage of the natural gaps in my methodological process to attain emotional distance before engaging with and analysing the material, and I have accessed appropriate therapeutic and mental health support when needed.

Paper Summaries

This thesis contains four papers, which are referenced throughout this document. In this section I offer brief summaries of the papers.

Paper 1	Writing the Social Web	Edited book chapter	Methodology
Paper 2	Gaming expertise metrics	Peer reviewed journal article	Empirical findings
Paper 3	No Room for Kindness	Unpublished Manuscript	Empirical findings
Paper 4	Silencing Tactics	Peer reviewed journal article	Empirical findings

Paper 1: Writing the Social Web

Reviewed book chapter, published as:

Osborne, T. (2023). Writing the Social Web: Toward an Institutional Ethnography for the Internet. In P. C. Luken & S. Vaughan (Eds.), *Critical Commentary on Institutional Ethnography: IE Scholars Speak to Its Promise* (pp. 231–246). Springer International Publishing. https://doi.org/10.1007/978-3-031-33402-3_12.

This chapter has an important role to play in the thesis in terms of setting out my methodological project. In this chapter I set forward a broad argument for how institutional ethnography can be fruitfully used within a digital ethnography paradigm. This text is primarily written for the institutional ethnography community, in the hope of opening dialogue between digital methods and institutional ethnography. In this text, I explore the important features of platforms, such as their use for communication and interaction (Gillespie, 2010), and how they are programmable (Helmond, 2015). In particular, I focus on the application programming interface (API), and how this is important technical feature that helps to determine whether a website is a platform.

I argue that there is a case to be made in understanding platforms as institutionally coordinated spaces. I discuss how the activities of users on a platform can be coordinated both by the technical boundaries of a platform (for example, the ways in which the platform enables interaction), and by the policies and rules of the platform. I give the example of Reddit, where upvotes and

downvotes are used to rank content and users, which has a side effect of facilitating hateful content (Massanari, 2017).

In addition to the features of a platform that enable them to coordinate the activities of people, one can observe the historical context and genesis of a platform to see how it has shaped into an institutionally coordinated setting. This generally gives a better understanding of how discourse is used to shape the activities of people. For example, in relation to Stack Overflow, one can follow the historical context to see how the platform is affected by free and open-source software discourse, and how this relationship has changed over time. I also discuss how a sensitivity to the financial modelling of a platform can be instructive to the ideology of the platform. While I give a brief example of how following the history of Stack Overflow can reveal its ideological grounding, I discuss this in more depth in the *Context* chapter.

I also discuss how platforms use their powers to enforce discourse preferences and use the way that the New York Times changed the answer to a Wordle¹² puzzle in the wake of the overturn of Roe vs Wade¹³ in order to uphold their nonpartisan reputation. I offer this example as an accessible context that may be familiar to a wide audience.

I explore briefly how there are tensions between official policies and localised policies on some platforms. Giving the example of Facebook, I illustrate the difference between global, and often technical rules that govern what everyone can do when interacting with this platform, such as the limitations on how posts are made. I contrast the more local rules setting that may occur within localised groups, which have their own moderation practices within Facebook. I have discussed how these tensions manifest on Stack Overflow in more detail in *Paper 3*. Locating these kinds of tensions is helpful to institutional ethnographers as they help to trace the ruling relations and give us a more digital context for understanding the difference between local and translocal coordination.

I also discuss how the actions of people are not always coordinated by official texts on the platform, but sometimes by blogs and other canonised texts that operate outside of the official boundaries. These are often identifiable by how rules are interpreted within the platform context. This is known as the text-reader

¹² Wordle is a word puzzle where the player must guess the word of the day, which became very popular during the Covid-19 pandemic.

¹³ 'Roe vs Wade' refers to the name of a court settlement that was pivotal in granting women in the United States access to abortion; the Roe vs Wade ruling was overturned in 2022 meaning that people in the United States no longer have the constitutional right to access abortions.

conversation (D. E. Smith, 2005, p. 104). I go on to give an example of how politeness rules are applied on Stack Overflow, which will be fleshed out more in *Paper 3*.

In addition to this I discuss how public textual discourse can be understood in a platform setting. In particular, I begin to engage with the notion of temporal ordering of text, following the work of Eastwood (2006). I argue here why time and timelines are so important to my work, and why reconstructing a flow of events according to real time can be revealing in settings that are dominated by algorithmic ordering.

I also talk in more depth how programmability on Stack Overflow can be a helpful way to uncover tensions of interest to ethnographers. I outline an example of how mods and user-made tools are deployed as workarounds to bypass some of the privilege reward gates. These add-ons are especially important because they demonstrate ways in which users do deliberate work to achieve certain goals, and they highlight which tensions are most important to users. I further discuss how users make use of programmability across much of my other writing in this thesis; I will return to the use of mods and add-ons in *Paper 2*, *Paper 3* and *Paper 4* in different ways and contexts. For example, in *Paper 4* I discuss how users made add-ons to display the preferred pronouns of other users in response to updates to the Stack Overflow code of conduct.

I end the chapter with reflections on how institutional ethnographers can start to engage with platforms in their own fieldwork. I highlight how people in a particular environment may have their activities effected by the kinds of platforms, official and unofficial, that they use to coordinate and discuss their work with others.

Paper 2: Gaming Expertise Metrics

Peer-reviewed solicited submission to a special edition journal, published as:

Osborne, T., Nivala, M., Seredko, A., & Hillman, T. (2023). Gaming Expertise Metrics: A Sociological Examination of Online Knowledge Creation Platforms. *The American Sociologist*. <https://doi.org/10.1007/s12108-023-09607-x>.

In this paper, written with the SOCDEX group, we explore how Stack Overflow has the potential to disrupt traditional orderings of expertise but ultimately falls short of this due to the weaknesses of using metrics-based systems to represent expertise.

Starting by framing knowledge sharing platforms, such as Stack Overflow, as key to the democratisation, we discuss how similar platforms ultimately end up favouring elite knowledge over the knowledge of lay people (König, 2013) or reinforcing existing hierarchies (Marwick, 2013). We also frame the problem of gaming metrics in other digital platform environments. For example, search engine optimisation, a way of manipulating the features of a webpage to improve its ranking in search engine results, is simultaneously necessary for pages to be ‘algorithmically recognisable’ but also can produce undesirable effects (Gillespie, 2017). Strategies that are considered undesirable gaming, and strategies that are presented as legitimate, are often very similar in nature and are generally discursively positioned as legitimate or illegitimate by the platform (Petre et al., 2019). We argue that it is important to examine how these kinds of effects operate on Stack Overflow because it is used as an arbiter of programming expertise, both by recruiters and by researchers.

Focussing on the interview data from expert users, and official documents from Stack Overflow describing reputation, we conduct an analysis exploring how and why users are motivated to gain expertise metrics. In exploring the different metrics used to represent expertise on Stack Overflow, we find that the simplicity of those metrics obscures the nuances in what those metrics represent. In terms of reputation points, often they cannot be straightforwardly equated to a measure of programming expertise because posts continue to accumulate reputation over time and the reputation gained does not measure the difficulty of task. In terms of badges, we find that while they should be able to point at more specific expertise, as the platform vernacular drifts the badge tags may also drift in meaning. For software and programming skills that are entwined, it may not be possible to understand based on badge activities whether a user is, for example, proficient in a particular programming language, a particular integrated development environment (IDE), or a particular programming method, as it is likely that a question may end up being organized with tags that represent multiple domains.

This paper brings forward some of my gender interests that are relevant to my thesis. When discussing gaming and expertise, I invoke theories of masculinities. Games can be seen as part of masculine bonding rituals (Meuser, 2007). Equally, in some masculine cultures labelling something as a ‘game’ enables a distancing from emotional investment (Almog & Kaplan, 2017). For Stack Overflow users, we find that succeeding in the game of reputation reaps real life rewards, in the form of work opportunities and international recognisability.

The high stakes of the game of expertise on Stack Overflow motivates people to game the system and earn those rewards. We identify several ways that people may gain an advantage in the system: being a good communicator; being early; farming easy questions; and engaging with editing.

In our interviews, it was very clear that mastering the communicative style of Stack Overflow was key to success on the platform. This rigid style has elsewhere been linked to the low participation of women on the platform (Brooke, 2021; D. Ford et al., 2016b). I further explore what makes this style of communication so rigid in *Paper 3*. Importantly, our interviewees note that the communication skills they learn on Stack Overflow are portable to their work environments, and in particular help them in situations where they are communicating with people who have different levels of understanding of English.

Being an early adopter is also crucial to success on the platform. I reflect that being an early adopter also signals one's social status within a geek masculine culture (Marwick, 2013). However, being an early adopter gains significant mechanical advantages because being early to the platform meant being able to answer simple but frequently searched questions. Such questions offer easy ways to gain reputation. However, this is also in part due to there being no time-based limit on earning reputation; much like economic investments, a portfolio of questions can steadily gain reputation over time. This mechanism also literally helps maintain older established hierarchies and makes it harder for newcomers to the platform to have their expertise recognised.

Some who contribute to Stack Overflow pursue the path of answering many 'easy' questions or seeking out repetitive questions. However, this requires some time investment due to the very fast pace of the platform; the median time in which a question is answered is just 11 minutes (Mamykina et al., 2011).

However, one much more time efficient way to grow reputation rapidly is to engage in the editing processes on the platform. Editing earns a small amount of reputation up to a cap but does not require any domain-specific knowledge. It is likely that users make use of the Data Explorer to find easy to edit posts, particularly those that contain common grammatical mistakes, and then earn reputation in this way. This, unfortunately, provides a strong incentive to perpetuate the kinds of behaviours that I discuss in *Paper 3*.

This paper ends with a reflection on how expertise is rendered falsely objective through data, while the nuances of what expertise metrics represents are often obscured. These problems are transferrable to other forms of ranking metrics used elsewhere in education contexts.

Paper 3: No Room for Kindness

Unpublished manuscript, full title:

Tanya Osborne (2024), No Room for Kindness: Gender and Communication Conventions on Stack Overflow. [Unpublished manuscript]

This paper of the thesis explores the competing discourses about politeness on Stack Overflow. Triangulating interviews, observation, and policy documents on Stack Overflow, I discuss why it is that the platform has developed such a rigid approach to communication and examine how this produces gendered discrimination. This paper makes an important contribution to the thesis in terms of developing an understanding moderation and communication on the platform.

Previous studies on Stack Overflow have explored how high reputation users tend to be less polite in their interactions (Danescu-Niculescu-Mizil et al., 2013), and have tended to make assumptions about the communication preferences of women users.

This paper begins by discussing moderation in online environments more generally and highlights the unique features of moderation on Stack Overflow.

In this paper, I find that that the notion of a minimal reproducible example (MRE) is a core guiding principle for successful communication on Stack Overflow. An MRE is the smallest amount of programming code needed to reproduce an error, and it should be complete (i.e., executable without other additions). This notion is related to ideas about debugging processes.

That while linguistic niceties, like ‘please’ and ‘thank you’ are discouraged, the reasoning for discouraging polite language is mostly circular. By this, I mean that that posters are told not to include pleasantries because editors are likely to remove that kind of language. Editors do not seem to make distinction between situations where there is a reason to remove pleasantries (for example, at the start of the post, where adding a ‘hello...’ would make the question less searchable) and situations where adding pleasantries is a matter of style preference (for example, saying ‘hope that helps’ at the end of an answer).

Since editors can operate outside of the communities where they are active as contributors, this can lead to rules being enforced in sub communities where there is less acceptance of the strong interpretation of the ‘no chat’ rule. Such enforcement results in editing ‘wars’ between active members of a sub community and active editors. Edit wars eventually lead to inaccuracies being introduced into answers, dubbed as ‘gratitudinal inconsistency’ by Mondal et al. (2021).

Editing practices like this are facilitated by the platform's extreme programmability, enabling editors to easily automate searches for keywords like 'thank you' and 'hope that helps'.

While some might consider this a way in which the platform imposes masculinised communication, I instead diagnose that there are two competing discourses about politeness at play. One discourse of politeness is perhaps a commonsense understanding about what it means to communicate with tact and diplomacy. The other discourse of politeness is about precision and ensuring that an answerer does not have to spend time on unnecessary tasks. While these two discourses do not need to be in opposition, the pursuit of the second type of politeness can often exclude the first type of politeness.

Paper 4: Silencing Tactics

Content warning: please note that this section contains discussion of rhetorical strategies used in transphobic hate speech and may be upsetting for some audiences.

Peer-reviewed journal article published as:

Osborne, T. (2023). Silencing Tactics: Pronoun Controversies in a Community Questions and Answers Site. *Journal of Digital Social Research*, 5(1), <https://doi.org/10.33621/jdsr.v5i1.122>

This paper makes an important contribution to the thesis by bringing an opportunity to delve into issues in epistemic ignorance. This paper focuses on Stack Exchange – the wider network of questions and answers forums – wherein Stack Overflow is the largest forum. This paper maps the fallout from a change to the Stack Exchange code of conduct in 2019. This change introduced an explicit requirement for users to refer to each other by their preferred pronouns. Triangulating policy documents and discussion from the platform, I use Dotson's theory of epistemic silencing (Dotson, 2011) to analyse how the discourse about queer inclusion on Stack Exchange was silenced in favour of a discourse about the management of Stack Exchange becoming out of touch with the userbase.

Writing this piece involved a lot of going back and forward, from my notes to the site, to writing. Each time I delved into my field notes I found places where I had made assumptions, and I could question these assumptions again with fresh eyes. Why had I assumed this? What evidence did I have? Frequently I found that I was discovering and rediscovering the issue at hand, finding that the issues peeled

back layer after layer, to reveal a quite different form to that which I had anticipated. What on the surface appeared to me to be a straightforward manifestation of a transphobic act eventually revealed to me great complexities, a story about the intertwining of personal and institutional responsibilities, about the danger of speaking publicly as a women or gender minority, and about the triumph of heteronormativity in simplifying queer narratives.

The analysis for this paper involved building a detailed timeline of the community, some of which is outlined in the *Context* chapter. The focus of the timeline in this paper was on the events and documents surrounding the change to the code of conduct.

One observation from the documentary analysis is that Stack Exchange does not explicitly mention that the change to the code of conduct has anything to do with trans and nonbinary people. Instead, this is brought in via transphobic reactions, both by Stack Exchange users and by technology news outlets who were covering the code of conduct update.

I also observed that users had created their own ways to act in line with the new code of conduct and to signal allyship to the LGBTQ+ community. In particular, users had created a script that would display a person's preferred pronouns next to their username if they were present in the person's biography section.

In this text, I have presented some fictionalized composite quotes (Markham, 2012) which also contain fictionalized usernames. In each case I have tried to make fictionalized usernames that reflect the general characteristics of usernames present in those areas. For Stack Overflow, these usernames tend to be a mixture of real names and names that include references to 'geek' topics or to coding. For the tech news websites that I frequented, I noted that names were more general hobby and interest based or tended to include a first name and a possible year of birth and were on the whole less cryptic.

Using these quotes, I analyse some of the common rhetorical strategies that are used in anti-trans discourse. Among these, I note the use of 'constructed imperilment' (Marcks & Pawelz, 2020) – the strategy of implying that the existence of trans people endangers the existence of others, in this case the arguing that respect for pronouns is at odds with traditional Christian values. I also note the use of the 'compelled speech' argument, which is an appeal to the protection of freedom of speech, positioning using preferred pronouns as a violation of freedom

of speech laws. Both of these rhetorical strategies can be debunked and are more commonly associated with alt-right¹⁴ ideology.

Additionally, I note tensions about the burden of proof in situations where a marginalized party is being wronged. In this situation, the burden of proof is placed on the injured party, but what counts as proof is deliberately narrowly defined in order to stifle conversation about the types of discrimination that are in play. Personal experiences and testimonies are discredited as insufficient for proof, while simultaneously results from the Stack Overflow Developer Survey are conveniently ignored as statistical ways of supporting the evidence for gendered discrimination.

I reflect that one challenge for policy makers is including an appropriate level of information about pronoun strategies beyond preferred pronouns and suggest that further research is required to understand how to communicate about pronouns in intercultural settings. There is a strong dominance of anglophone and westernized discourse on pronouns, and Stack Overflow's institutional texts tend to assume this context for their users.

¹⁴ The 'alt-right' refers to the politically aligned far-right white nationalist movement.

Discussion

In this chapter, I reflect on some of the overarching outcomes of the research. I begin by reflecting on the limitations of the thesis. This chapter then follows the ordering of the research questions, to provide a summary of how each question is answered based on the research. This is followed by a summary that synthesizes the work of the thesis.

Limitations

This thesis uses a wholly digital approach to ethnography, in part due to the circumstances of the pandemic. Further research could enrich these findings by situating the ethnography within a workplace and observing how information sharing platforms, such as Stack Overflow and GitHub are used by programmers within their daily lives.

It is also a limitation that the interview set for the thesis did not include any trans or non-binary participants. Some of this is an unfortunate effect of chance, but this demographic may have been reached by using different participation selection approaches. At the time of interview sampling my own work had not taken on a queer perspectives focus. Further research could work in a participatory way with queer programming communities.

I would also reflect that, while I aspire to work outside of the accepted frame of gender binaries, it is very difficult to maintain this at all times. I consider developing a greater awareness of this part of the personal reflexive project of a researcher.

Despite critiquing western dominant discourses in the face of a globalized setting, this thesis still relies more on western produced knowledge. While I have tried to include global perspectives, this could be stronger. In particular, there is room to engage with Stack Overflow from specifically Indian perspectives, which queer the masculine/feminine divide in technology occupations (Gupta, 2015) and have a different cultural frame for gender diversity (Dutta et al., 2019).

Due to the theoretical grounding of the thesis centring on the work of people, there are potentially missed opportunities for exploring how this environment operates from the perspective of technology, or from the perspective of assemblages of people and technologies.

How do digital platforms act as institutions?

A digital platform has an important role to play in coordinating and organizing the activities of its users. Not only do platforms coordinate their users by the affordances of their technologies, but platforms also shape and coordinate through their policies and their discursive positioning.

In this section, I discuss the technological ways in which Stack Overflow coordinates and regulates the activities of users. To do this, I analyse the mismatch between the form and function of the platform. In my ethnographic engagement, I found that the way in which this particular disjuncture is made visible also reveals something about how the platform as a whole is institutionally organized.

Communication

One of the challenges of working with Stack Overflow as an ethnographic site has been simply getting a full and realistic picture of how the platform operates. In communicating my research, it is sometimes difficult to find a way to express succinctly that this platform, while it looks like a Community Questions and Answers platform, does not operate in that way. More than this, the modes of communicating on Stack Overflow are much more complex and interwoven than the questions and answers format suggests. With various backchannels, real-time chats and editing comments, the platform offers a sophisticated structure for different kinds of communication.

Layers of editing mean that the very writing of questions and answers is a collaborative effort. Considering a particular question or answer post, while the username and avatar remain those of the original poster, over time very little may remain of that person's post. Within the SOCDEX research group, we observed how posts often start with an orientation to help solve a query, and then turn towards editing and cleaning up the thread in order to preserve the question as documentation (Hillman et al., 2021). This kind of collaborative knowledge production means that, within the research field, researching Stack Overflow has more in common with research on Wikipedia than with research on other community question and answers platforms such as Quora. In this section, I reflect on how this kind of observance is enriched by an institutional view, and I put this in the context of my own research.

Often, following the editing makes visible how institutional ways of communicating are produced. In my data collection around editing, I observed a back and forth in the editing of pronouns within a particular thread. I have discussed in *Paper 4* how second language English speakers do not always understand how to deploy pronouns. In my observational data from *Paper 4*, I noted how different language backgrounds and interpretations of the Code of Conduct played out in how pronouns were used. For example, I found a case where someone used ‘his or her’ in text to refer to persons of undefined gender, and a later editor changed this to ‘their’. Understanding that ‘their’ is preferred over ‘his or hers’ would be very difficult to determine for a second language speaker or someone unfamiliar with local practices – the Code of Conduct prompts users to write in ‘gender-neutral language’ (*Code of Conduct*, 2022) but does not specify what that means. In this case, the failed attempt at correction points to a misunderstanding of how institutional discourse should be applied in context and shows others collaboratively editing the statement to its preferred state, thereby enforcing a particular interpretation of ‘gender neutral’. In these actions, it becomes apparent that ‘gender-neutral’ should be parsed to mean ‘without gender’ rather than ‘inclusive of both sexes’, as the original poster interpreted.

The problem may well lie with unclear codes of conduct, which do not do enough to help second language speakers understand how concepts like ‘gender neutral language’ should be deployed. However, this also points toward ‘gender neutral language’ as a ruling discourse that operates within a particular power frame. We encounter here a situation of mixed legibility (Schroer & Bain, 2020), a feature of microaggressions, where different messages are understood by different audiences who share a context. In this case, the discourse works to *erase* gender rather than be inclusive. Many other scholars have identified that, especially in internet spaces and STEM spaces, male-ness is seen as the default (Corneliussen, 2023; Nakamura, 2002; Wajcman, 2007). Therefore, a side effect of taking a gender neutral, rather than gender inclusive, stance is that the so called ‘default male’ identity is not challenged.

Equally in observing the kinds of changes editors make, I note that statements that contain emotions tend to be removed over time. These edits do not serve any technical function and do not change the meaning of the question, instead they show the process of aligning the statements to a particular ideology of communication on the platform. These are the kinds of changes that our participants in *Paper 3* referred to as making a question minimal and polite. In the context of the institution, being polite involves not adding emotional language and

not adding more than is necessary. These examples in action help to illustrate how coordination occurs to enforce institutional ideals about communication.

Polite talk, like ‘thank you’s, are generally discouraged at an institutional level by the Stack Overflow, in the context of noise reduction (*What Is Reputation?*, 2022). However, this is slightly at odds with the examples of friendly behaviour in the Code of Conduct, which use ‘thank you’ as part of longer sentences (*Code of Conduct*, 2022). It is therefore down to individual active editors to interpret whether this kind of talk is appropriate or not in an institutional context. This interpretation happens as part of the text-reader conversation (D. E. Smith, 2005, p. 104). It has long been observed in online communications that users identified as men prefer speed of communication over politeness (Herring, 1994). We could therefore interpret the orientation of Stack Overflow toward speedy replies (Mamykina et al., 2011) and away from platitudes as evidence that the institutional talk of Stack Overflow favours masculine communication styles. However, comments seem generally exempt from this rule, and are reasonably conversational in tone, even including emoticons. Therefore, it is arguable that because the posts themselves are treated as wikis, while comments cannot be edited, the rules and local conventions vary more in the comments. With this in mind, it is worth troubling the notion that the preference for speed over politeness is specifically masculine. We ought generally be wary of applying gendered stereotypes absent the critique of their power relations (Butler, 1990/2002). We might in turn understand that people perceived as speaking with kindness are received in this environment as performing femininity (regardless of their own gender identity), and that this is less welcome within the more formal content of the platform. As I discuss in *Paper 3* there appears to be a tension between the expectation of providing a minimal and complete set of information, and the frustration caused by ‘read-the-manual’ culture. I also noted in *Paper 3* that our interviewees did seem to find ‘thank you’s helpful on the whole or reported that people had gone through creative channels off platform in order to send a thank-you. Performing politeness is not well received but is nonetheless desired.

Thinking with Wikis

Following from *Paper 3*, I have shown that appearances are deceptive when it comes to interaction on Stack Overflow. While presenting similarly to a questions and answer forum, the platform is much closer to a wiki, with other communication coordinated by instant message and comment threads.

Without taking an institutional approach, these features may not have become apparent. Indeed, much of the existing research that uses Stack Overflow as a data source falls into the trap of approaching the platform as a simple questions and answers exchange (Morgan, 2017; Procaci et al., 2016). I offer two questions to the field. Firstly, how much of the existing Stack Overflow research remains valid when the platform is seen from an institutional viewpoint? Secondly, what is the benefit to Stack Overflow of maintaining this deceptive appearance?

Bearing in mind that previous research has concluded that people gendered as women prefer to interact with other people gendered as women (D. Ford et al., 2017), this finding is really a surface appearance. Perhaps initial posts were from feminine-presenting users, but the true depth of interaction occurs in edits. Identifying and locating feminine-presenting users may require looking at a wider variety of interactions. Would it be valid at all to conclude that a post was written by a woman if the bulk of the original text had been edited away by a litany of others? In some respects, the problem of post ownership is akin to a ship of Theseus paradox – if every word in a post is edited, is it the same post? Can it really be attributed to its original poster? I would advise caution in making claims that rely on the notion of posts being authored by one person. Researchers working on gender within these interactional paradigms could use this knowledge to develop different methods of assessing and quantifying gender that account for the multifaceted nature of communication on the platform.

Similarly, some of the ways in which toxicity occurs in this environment is through edits rather than through posts and comments. Drawing on the idea of editing wars from *Paper 3*, observing a scenario where a male-presenting user enforces stylistic editing on a feminine-presenting user (causing her to be locked out from editing her own post), the biggest fights may be happening behind the scenes. This stands in contrast to toxicity research on platforms like Reddit, where toxicity happens in plain sight within a community, and is exacerbated by moderation structures that have very localised practices and a high degree of freedom (Massanari, 2017). Instead, experiences of toxicity in Stack Overflow are more closely aligned to those seen in studies of Wikipedia, where toxicity can occur more through gatekeeping and the need to navigate complex rules and systems (H. Ford & Wajcman, 2017). Future researchers working on toxicity in Stack Overflow should consider casting a wider net when thinking about what it means to be toxic in this environment.

Programmability

Programmability is a defining feature of a platform (Helmond, 2015), and it means that users are able to customise the way that the platform operates in order to curate their own content. On Stack Overflow, programmability is very highly prominent and offers users easy access to very versatile tools. The way in which programmability plays out is one helpful way to identify disjuncture and oppositional actions on the platform. Previous research has analysed programmability in relation to Facebook messenger (Nieborg & Helmond, 2019) and academic library systems (Plantin & Thomer, 2023), taking a broader view of the architecture of these technologies. There is a gap in the literature regarding how individuals harness the programmable features of platforms, particularly around user-created add-ons. It may be the case that in the context of Stack Overflow, this kind of user engagement with programmability is more prominent because the userbase naturally has a proficiency with computer programming. Identifying this gap is a result of following what people do on platforms. Looking with this lens gives a glimpse into how users can alter the material conditions of platforms.

In *Paper 4* I discuss how users created an add-on that would display preferred pronouns on profiles, in response to the Code of Conduct updates. This add-on demonstrates how the community rallied together using their technical know-how to help create gender-inclusive solutions to emergent community problems.

In *Paper 1*, I talk about an add-on that exists to circumvent certain reputation privilege gating, which enables users to see the breakdown of upvotes and downvotes on a post before they have the required reputation to see this breakdown. This add-on is frequently updated as Stack Overflow changes the operation of the platform backend in order to prevent the add-on from working. These kinds of features are seldom, if ever, explored in research. On Stack Overflow, they have a particular importance as the content and project of the platform – programming knowledge – means that these users are very well placed to take advantage of opportunities to resist the institution in sophisticated ways.

In *Paper 3*, I allude to one add-on that is commonly used to semi-automate commenting on the platform. This add-on allows people to pre-program frequently used comments, meaning that a user need only select from a dialogue box which category of response is required, and that response is automatically copied into their reply. This add-on demonstrates a sophisticated way in which users coordinate each other and regulate the behaviour of others to produce

consistent and standardised ways of working and communicating. Importantly, while this coordination is facilitated by the platform, it is not done by the platform, rather by the people who do the work of moderation and editing.

In some cases, programmability of the platform is used in less altruistic ways. In both *Paper 2* and *Paper 3*, I allude to how users make use of the SQL Data Explorer to semi-automate certain parts of work. In particular, the Data Explorer has queries that can help users to identify post they can engage with that will help them to progress towards certain badges, or that help users to see how near they are to completing a particular badge. The Data Explorer also has queries to help opportunistic editors locate phrases like ‘thanks’ so that they can easily delete them.

I believe that there is ample opportunity for future researchers to focus on the programmability of platform environments beyond Stack Exchange, particularly as these add-ons contribute toward a particular kind of social coordination. Even simple, but relatively well known, universal add-ons like Grammarly¹⁵, which is an artificial intelligence powered browser and desktop extension for grammar and writing feedback, are under explored in relation to the ways in which people customise technology to streamline their everyday work lives (Ding & Zou, 2024). There are also opportunities to connect the way that individuals make use of programmability on platforms with research on ‘maker movements’, a term used to describe the intersection of technology, DIY, and craft (Papavlasopoulou et al., 2017; Tanenbaum et al., 2013).

Platforms as Institutionally Coordinated

Throughout the course of this research, I have used several approaches to exploring Stack Overflow as an institution. I have probed the official texts and documents of the platform in *Paper 2* and *Paper 3*. In the *Context* chapter I have made use of the official texts and blogs to construct the history of a platform. I have followed the programmability of the platform to explore how users develop their own tools to engage in the process of coordination in *Paper 3*, and *Paper 4*.

Digital platforms act as institutionally coordinated settings by leveraging their texts, their moderation practices, and their programmable features to coordinate and standardize the behaviours of their users. In the case of Stack Overflow, this has resulted in a very distinctive communicative style and a way of creating institutional discourse through editing. It also manifests in the terms and concepts that seem specific to this platform context, like the notion of a minimal

¹⁵ <https://www.grammarly.com/>

reproducible example (*Paper 3*) and the way in which people can transfer reputation as a marker of expertise between contexts (*Paper 2*).

This insight contributes both a theoretical and methodological perspective to platform studies.

How do moderation practices contribute to gendered inequalities on *Stack Overflow*?

Moderation is one of the ways in which platforms regulate the behaviour of their users and control the type of content that they host (Gillespie, 2018). As discussed in the *Context* chapter, Stack Overflow have a blended approach to moderation, using a variety of different systems to moderate their content. It is an important part of the way in which Stack Overflow, as an institutionally coordinated setting, directs behaviour and reproduces its values.

In this section, I discuss what it really means to deploy moderation at this scale, and how moderation with minimal oversight contributes towards gendered inequalities.

Coordinating the work of editing

For a part of my observation time, I spent time in the Stack Exchange chat rooms. It was illuminating as to many of the practices of the platform, and I feel that it is frequently overlooked in the literature. While I did not directly manage to include examples from chats in my published papers, observations from chats did help to form my analysis for *Paper 3* and *Paper 4*. Further exploration of chat functionality, and its relationship with moderation, could be a helpful extension of my work.

Some of the most active chats are entirely populated by bots. These bots have a function generally to notify moderators or editors about possible problematic posts, duplicate posts or other issues requiring attention. While it might be fruitful to treat these bots as agentic actors in this environment, using theoretical approaches from other arenas, such as Actor-Network Theory, I have not pursued this in my analysis. Instead, I choose to view bots as human-made tools that are part of the work that people do to coordinate and regulate activities. They are possible due to the programmable nature of the platform. The business of moderating and editing relies heavily on community-maintained tools that alert active users to the need to perform moderator actions.

While Stack Overflow’s moderation practices mostly align with Caplan’s ‘community reliant’ typography (Caplan, 2018), there are nuances and complexities that do not strictly fit. If Stack Overflow, then, requires a mixture of human and automated moderation, it is important to consider who does the bulk of the moderation. Since there are very few elected moderators, as discussed in the *Context* chapter, the bulk of moderation falls on people who have the required reputation to edit questions. Considering the size of the platform, relatively few people are able to edit. There are approximately 145,061 user accounts who can edit posts, and 24 formally elected moderators, compared to the 21 million user accounts, posting around 3 thousand questions per day (*All Sites - Stack Exchange*, 2023). And indeed, many questions require edits. According to one SQL query, around 54.5% of all questions on Stack Overflow are edited.

As discussed in *Paper 3*, it is widespread practice for editors to use built in search functions, often via the Data Explorer, to locate phrases like ‘please’ and ‘thank you’ and remove them from posts. For some editors, this represents the bulk of their activity. As discussed in *Paper 2*, this kind of activity is often motivated by badge-seeking behaviours. Badge seeking behaviours are recognised elsewhere in the literature as a side effect of the gamification of platform mechanics (S. Wang et al., 2020). One study found that the effect of badges on editing was particularly strong compared to other badges (Bornfeld & Rafaeli, 2017), meaning that badges are especially effective at directing editing behaviours. Certainly, my research shows the effect of such badge seeking behaviours and helps develop an understanding of how these behaviours effect the communicative norms of the platform.

In *Paper 3*, I discuss in greater detail how the work of editing is done on Stack Overflow, and its relationship to moderation. I find that when editors do their work, they can be drawing upon a variety of different texts and resources to make their editorial decisions. Exactly which resources are activated varies, depending very much on individuals and their relationship to the institution. Some may rely mainly on texts authored by Stack Overflow, some may be more embedded in the influential blogging canon surrounding Stack Overflow, and others may be influenced by the tools and add-ons designed to streamline editing.

A common issue in the editing processes on Stack Overflow is the lack of community boundaries. This lack of boundary is in part what makes Stack Overflow not fit well with the ‘community reliant’ typography (Caplan, 2018). Unlike Reddit, tag-organised sub communities on Stack Overflow cannot reliably maintain their own norms and, unlike Wikipedia, tag-organised sub communities

do not get full control over content. If one has editing permission, one is able to edit anywhere. As discussed in *Paper 3*, this lack of boundaries means that tag-organised communities cannot reliably maintain their own interpretation of the Code of Conduct. As a result of this, tag-organised communities who normally allow posts to include polite speech, like thanks, may find that editors who do not share their community context will edit away these niceties. Other research has confirmed that there is significant variation in politeness between sub communities on Stack Overflow (Danescu-Niculescu-Mizil et al., 2013).

Despite that Stack Overflow was conceived to address the fractured landscape of programming communities (Popper et al., 2021), it seems that these communities still retain their own distinctive features even under the umbrella of Stack Overflow. The movement towards Collectives (Stack Overflow, 2021), discussed briefly in the *Context* chapter, seems to be Stack Overflow's way of allowing sets of tag-organised communities to develop that distinct identity. While there is a high degree of user autonomy, there is also less scope to communities to resist this kind of editorialization where it is unwanted. This behaviour is similar to the kinds of behaviours noted in other open source communities (Reagle, 2010; Shaw & Hargittai, 2018). In institutional ethnography terms, these tensions are symptomatic of conflicts in translocal relations of ruling and the local settings. The translocal rules are applied by any person who has sufficient editing rights, who is organized by text-mediated social conventions. A person with a strong relationship to Stack Overflow as an institution and an extensive knowledge of the blogging cannon will be making edits in line with the general advice to remove niceties. They will, in their text-reader conversation, activate the Code of Conduct and interpret 'no chat' to mean no niceties. Others who do not have this connection to the cannon will not necessarily activate the Code of Conduct in the same way.

Regulating expertise

Another way in which moderation practices contribute to deepening gendered inequalities is through gatekeeping expertise, as discussed in *Paper 2*.

Reputation points are indicative of the level of power that a user can exercise on the platform, from allowing them to participate in the 'democratic' processes to allowing them access to platform tools. In addition to this, reputation has some degree of portability to professional work life, as discussed in *Paper 2*, occasionally leading to significant career development opportunities. Reputation points are also

presented as a measure of expertise, even if users understand that it is a flawed representation, it is still accepted as a symbolic measure.

In *Paper 2*, we discuss the kinds of expertise that reputation may measure, in particular weighing up the difference between measuring programming and technological expertise compared to measuring expertise at playing the reputation system.

Importantly, reputation is mostly generated as part of a collaborative activity, in a way similar to normalisation (Foucault, 1975/1991). Reputation is therefore a way to regulate and normalise what kinds of things can be recognised as expertise, and what kinds of things can be recognised as expert behaviour. As I discuss later, this includes formulating and enforcing certain kinds of institutional discourse and facilitates the normalisation of masculinised ways of communication.

Overall, this presents a justice issue. If masculine ways of communication are mostly favoured, and being favoured translates quite directly into hierarchical power and real-life opportunities, it is important to address disparities.

How do programmer masculinities coordinate the silencing of queer experiences on *Stack Overflow*?

Programmer masculinities are one of the key coordinating forces of Stack Overflow, very much shaping the structure and communicative style of the platform. In this section I explore some of the epistemic strategies that programmer masculinities appeal to which have the effect of silencing queer and women experiences on Stack Overflow. Following *Paper 3* and *Paper 4*, I focus this analysis on feminist epistemologies of embodiment and theories of epistemic ignorance.

Embodiment and Ignorance

This section contains discussion and reconstruction of sexist language, which may be triggering.

The disavowal of embodied knowledge as admissible evidence is a common theme across the data gathered for this research. I explore in *Paper 4* the way that discourses of proof play into this. In particular, I discuss how the notion of data is a part of the ideological ordering of the social. For something to go from observation to fact it must be transformed into an ‘objective’ reality by becoming

numerical data. There is no room for situated knowledge or embodiment to give rise to facts or proof.

In this reconstructed excerpt, taken from the evidence base for *Paper 4*, several users in a ‘Tavern’ chat are discussing a blog post on Stack Exchange in relation to a blog post by one of my women interview informants:

- Yukon Stack Overflow’s blog post seems to agree with [Victoria]’s blog post. What evidence is there that any of the sites on Stack Exchange are hostile to women etc etc etc? Sexist remarks get removed; how could they be common enough for it to be a ‘hostile environment’?
- Sword @Yukon I don’t get offended by much. I don’t like it when people are rude, but the stuff that offends women doesn’t offend me. You know, when I was new, I got a bunch of nasty comments and wanted to delete my account. But then I spoke to someone, and I realised that I had just taken the comment the wrong way, so I didn’t delete my account in the end.
- Yukon Sure, the culture sometimes means that comments are too blunt to be nice. But [Victoria]’s blog post doesn’t address that, she just calls Stack Exchange a toxic wasteland instead.
- Sword Is the sexism and racism thing just being blown out of proportion?
- Yukon @Sword it’s invented.
- Sword Do they show any evidence?
- Yukon No. SJWs¹⁶ go on emotions, not logic.

Exchanges like these exemplify the kinds of attitude I saw, both toward what constitutes evidence, and to how users talk to each other. I explore this further in *Paper 4*. In this exchange it is clear that both interlocutors have encountered unpleasant or hostile comments before, but neither of them construct this as evidence that there is hostility on the platform. Rather than address the issue, they instead discursively frame women as more sensitive than men. In fact, despite

¹⁶ ‘SJW’ is an abbreviation that stands for ‘Social Justice Warrior’, a generally derogatory term leveraged towards people who hold viewpoints that are seen as socially progressive.

having first-hand experience of hostile comments, they construct any kind of systematic misogyny or toxicity as ‘invented’. Franzway et al. (2009) show that similar tactics exist in engineering environments, where engineers deploy this type of wilful ignorance (Tuana, 2006) to avoid engaging with the politics of gender equality. These types of ignorance are perhaps not covered by Beddoes (2019) typology, though may be an extension to the ‘small numbers’ typography. As such this thesis contributes further empirical examples of different forms of epistemic ignorance in engineering education settings.

A similar line of thought emerges in *Paper 3*. It seems difficult to attribute experiencing hostility directly to gender, while it seems that persons who present as gender minorities face hostile or rude behaviour more often.

Epistemic Violence

Across my research, I recognise many places where epistemic violence occurs on Stack Overflow. Epistemic violence can include actions like gaslighting, forced disclosure, and silencing (Dotson, 2011; Hall, 2017), all of which have the commonality of attacking and undermining people in their capacity as knowers.

Because the rules of Stack Overflow are so institutionally bound and deployed in a way that requires specific activation of text, they are easily weaponised to shut down particular kinds of debate or particular kinds of users. This is a kind of epistemic violence. On Wikipedia, scholars have noted that rules are applied as weapons and as tools of domination, enabling expertise at following the rules to supplant subject matter expertise (Gauthier & Sawchuk, 2017). In this thesis, we recognise example of this kind of behaviour in *Paper 3*, where a woman is locked out from her own answer because she dared to resist the deletion of a ‘hope that helps’ – these kinds of incidents reproduce gender-based violence and silencing on the platform.

When incidents of epistemic violence occur, it is generally not in the interest of those being oppressed to speak out, since making oneself visible as an oppressed minority also opens oneself to further violence (Dotson, 2011; Medina, 2013, p. 95). In this regard, violence is an epistemic issue that brings together issues of both credibility and intelligibility and creates cycles that are difficult to escape. From my research, it seems that Stack Overflow is caught in some of these cycles, and that these are especially coordinated by things like freedom of speech ideologies, explored in *Paper 4*. The pattern that links freedom of speech ideologies to anti-LGBTQ+ rhetoric is also noted in a recent study by Brody et al. (2023), who note

a wider pattern wherein free speech approaches to moderation in social media enable hate speech to propagate unchecked.

Unicorns in Moderation

One thing that emerges, particularly with an institutional view, is the way that ideologies of democracy and freedom are deployed on the platform. Stack Overflow often refer to the moderation work that they do as democratic, for example, in their theory of moderation (Atwood, 2009a; Post, 2018c) and in their description of moderators as democratically elected (*Moderators - Stack Exchange*, 2021). However, the bar for entry into this democratic process is rather high, and in fact excludes the majority of Stack Overflow users, who do not have enough reputation points to engage in simple democratic activities like upvoting, downvoting, or voting in moderator elections. I problematise this in relation to the role of Stack Overflow as an arbitrator of programming expertise in *Paper 2*. Similarly, Stack Overflow users align themselves with the freedom of speech and freedom ideals of libertarianism, common in open source software communities (Reagle, 2013), which I problematise in *Paper 4*.

Interestingly, through the *Context* chapter we can see a distinctive turn in Stack Overflow where the platform begins to move toward more neoliberal ideals as it bolsters and strengthens its place within market capitalism. Cumulatively, Stack Overflow is presented as democratic and valuing freedom, but this is an ideology that instead allows a certain kind of normativity to be reinforced. With so many early adopting users able to accumulate and grow reputation thanks to clever gaming of the reputation mechanics, as discussed in *Paper 2*, these users end up having access to substantially more of the system mechanics available on the platform and are in turn much more able to influence the trajectory of the platform. Indeed, we see similar dynamics playing out on Wikipedia, where hierarchies become deeply entrenched and the work of contributing requires engagement with complex rules (H. Ford & Wajcman, 2017; Marwick, 2013). Resistant acts by gender minorities prove unsuccessful, and certainly newcomers to the platform will struggle to effect change without being able to play along with the system long enough to build up substantial reputation.

We ought really to be critical about how democratic such a system is. If reputation allows a user a certain degree of power on the platform, it should be noted that this power is not contained to the places where that power might be earned. As I discuss in *Paper 3* users can earn reputation in one tag-organised

community but still do edits in another community where they do not have the same level of connection to the local norms.

At this stage, it is worthwhile calling attention to the way in which both Stack Overflow and the research around Stack Overflow construct the platform as hostile and as having a pipeline issue of retaining women and gender minority users. In these constructions, as discussed in the *Literature Review* chapter, a lack of engagement by accounts identified as belonging to women is often implicitly blamed on women and gender minorities themselves. For example, women are positioned as sensitive to rudeness, as lacking in confidence in their abilities, or as requiring homophily or role models to contribute. These are discourses that Stack Overflow participates in, and that are in some way sanctioned by the actions of Stack Overflow in their collaboration choices and in their official positioning. We ought to be critical about why exactly such discourses are officially adopted, and about what benefit there is in upholding these, mostly deficit-oriented discourses. Similar issues with pipeline discourses and studying down are noted elsewhere in education literature (Beddoes, 2017; Mendick et al., 2017), and will be familiar across the board for those working on diversity in STEM education.

Firstly, deficit discourses put the blame and burden of inclusion back on to the minority groups who are being excluded. This is a strategy for distancing an institution from acknowledging their own position in maintaining inequalities. Secondly, strategies such as these function to find opportunities to be seen ‘fixing’ problems; by sanctioning this type of research, Stack Overflow, and other areas of work with inequalities, can also create projects to address surface issues and generate attention. These surface issues can be a distraction from the bigger and more challenging work that needs to be done. In the research this kind of activity may be called pinkwashing or rainbow washing (Wulf et al., 2022); indeed, in the historical genesis of Stack Overflow, unicorn-washing. Positioning issues in this way, and essentially maintaining them in an unfixable state, is one way of perpetuating power and social order.

Competing discourses of politeness have a role to play in how the platform is constructed as hostile, as discussed in *Paper 3*. I suggest that a programming notion of politeness, consisting of being concise and respectful of the answerer’s time, often butt up against more everyday understandings of politeness as being speaking with courtesy. While other scholars have posited that the social and the technical are quite separate in the realm of programming and engineering masculinities (Faulkner, 2000, 2007), or that programmers on the whole are not polite (Danescu-Niculescu-Mizil et al., 2013; Herring, 1994), my research nuances

this view. Certain styles of politeness are prioritized on Stack Overflow (*Paper 3*), and success at communication in the style of the platform is required in order to gain reputation (*Paper 2*). Rather than the social element being lower in the hierarchy, communicating within the correct technical discourse is seen as valuable. This can be problematic when communication values from Stack Overflow begin to permeate into everyday work lives as examples of ‘good’ communication. For example, one research paper demonstrated how Stack Overflow posts can be used as a training set to filter out unwanted chatter in the internet relay chats (IRC) that open source developers use to coordinate their work (Chowdhury & Hindle, 2015), thereby legitimizing social communication as a lower value activity.

One related issue is that entry to the programmers ideal of politeness requires quite a high level of technical knowledge. We can analyse this requirement of technical language and knowledge as part of the way that the platform is discursively positioned as masculine (Connell, 1995/2005). To be concise and minimal one must already know how to debug a program. This makes the platform not particularly approachable for newcomers, who will simply not have the technical expertise to start that journey. This is made complicated by the fact that the platform presents more as a questions and answers forum, and therefore looks like the kind of place where one could simply ask for help. However, the neoliberal direction of the platform *wants* there to be increasing levels of engagement, especially from newcomers, in order to maximise advertising revenue and, after the buyout from Prosus, to drive beginners to online courses. It seems that the financial model of the platform may actually benefit from beginners becoming frustrated and looking for other avenues to learn how to code.

Contribution

In this thesis, I have explored Stack Overflow as an ethnographic setting, and I have discussed the different ways in which gender dimensions affect how the platform is coordinated. In this brief chapter I discuss the main contributions of my thesis.

Firstly, I contribute by providing an argument for approaching platforms as institutionally coordinated settings. In *Paper 1*, I discuss how the activities of users on a platform can be coordinated both by the technical boundaries of a platform, and by the policies and rules of the platform. The major advantage to considering an institutional view is that it becomes more possible to think about the systematic choices made by the platform, and to see the platform as a materially, historically enshrined organisation. Rules that may seem random, toxic, or otherwise curious are put into new light, can be interpreted with the institutional frame in mind.

In my work, I find that the unique programmability of the platform – the variety of add-ons, scripts, and tools – allows for the coordination of activity on Stack Overflow to be incredibly consistent. Leveraging these tools, and harnessing programmability, shapes the way in which Stack Overflow governs itself. However, this kind of self-regulation leaves little room for resistant activities, as discussed in *Paper 3* and *Paper 4*. Users who want to act counter to the prevailing norms are easily stopped, allowing the prevailing norms to continue with little interruption.

Secondly, I contribute by demonstrating how features of Stack Overflow's technical boundaries end up reproducing traditional orderings of expertise. In *Paper 2*, I discuss the different metrics used to represent expertise on Stack Overflow. I find that the simplicity of those metrics obscures the nuances in what those metrics represent. In terms of reputation points, often they cannot be straightforwardly equated to a measure of programming expertise because posts continue to accumulate reputation over time and the reputation gained does not measure the difficulty of task. In terms of badges, I find that while they should be able to point at more specific expertise, as the platform vernacular drifts the badge tags may also drift in meaning. However, these metrics falsely render expertise objective. These problems are transferrable to other forms of ranking metrics used elsewhere in education contexts.

I also find that mastering the communicative style of Stack Overflow is key to success on the platform. This rigid style has elsewhere been linked to the low participation of women on the platform (Brooke, 2021; D. Ford et al., 2016b). Importantly, our interviewees note that the communication skills they learn on Stack Overflow are portable to their work environment. This shows how technical communication is important in the context of programming masculinities.

Thirdly, I contribute by providing a new perspective on how politeness operates in the communication styles of programmers. In *Paper 3*, I diagnose that there are two competing discourses about politeness at play. One discourse of politeness is a commonsense understanding about what it means to communicate with tact and diplomacy. The other discourse of politeness is about precision and ensuring that an answerer does not have to spend time on unnecessary tasks. Politeness discourse often positions politeness as a feminine. While these two discourses do not need to be in opposition, the pursuit of the second type of politeness can often exclude the first type of politeness. The work of doing politeness on Stack Overflow is therefore tied up in the work of debugging. The difficulty is that a true novice might not know where to start. The Stack Overflow mantra of the MRE (minimal reproducible verifiable example) is not something that beginners are necessarily taught.

Fourthly, I contribute by exploring how prevailing discourses produce the marginalisation of people in the LGBTQ+ community. In *Paper 4*, I demonstrate some of the common rhetorical strategies that are used in anti-trans discourse. Among these, I note that the appeal to the protection of freedom of speech, as is also discursively connected to the FLOSS software movement, positions using preferred pronouns as a violation of freedom of speech laws. These rhetorical strategies can be debunked and are more commonly associated with the alt-right ideology.

Importantly, this thesis has sought out practical ways to address feminist and queer research questions. By drawing on research and methodological paradigms that are materialist and often used in participatory research, and by focussing on discourse rather than identity, I have offered an approach grounded in the everyday lives of people.

This thesis also contributes to the literature base on ignorance and agnotology in engineering (Beddoes, 2019; Franzway et al., 2009) by articulating further examples of how epistemic ignorance contributes to maintaining gender inequalities. In my work, I have focused especially on the tension between embodied knowledge and numerical data.

Swedish Summary

Denna sammanfattning på svenska beskriver de viktigaste delarna i avhandlingen *Unicorns in Moderation – Gender and Epistemology on Stack Overflow* [Enhörningar i modereringssammanhang – genus och epistemologi på Stack Overflow]. Sammanfattningen utgår från kapitlen i den introducerande avhandlingskappan och avhandlingens fyra delstudier.

Introduktion och frågor

Digitala plattformar för kunskapsdelning som Stack Overflow har fått ett stort genomslag för de som arbetar med kodning och programmering. De onlinebaserade plattformarna utgör därför utbildningsresurser som har en stor betydelse för ett livslångt och professionellt lärande. Med detta genomslag är det viktigt för de som siktar mot en programmeringskarriär som till exempel studenter under universitetsutbildning, ges möjligheter att utveckla strategier och resurser för fortsatt professionell utveckling i sådana former (Peters & Romero, 2019). Särskilt inom programmeringsområdet har deltagande i det komplexa utbudet av olika lärande- och kunskapsdelningsplattformar liknats vid en form av lärlingsutbildning som är avgörande för arbetet mot att bli programmerare (Johri, 2022). Plattformsmiljöerna har dock återkommande brottats med att kvinnors deltagande är begränsat och att genusminoriteter osynliggörs. Det finns därför ett behov av att förstå hur och varför ett ojämnt genusdeltagande reproduceras i dessa miljöer. Kvinnligt deltagande i data- och ingenjörsvetenskapliga områden har länge utgjort intresse för forskning, och denna avhandling knyter an och kompletterar denna tradition genom att studera kvinnliga, icke-binära och transerfarenheter av deltagande på digitala plattformar för kunskapsdelning. Titeln på avhandlingen, ”Enhörningar i modereringssammanhang” [*Unicorns in Moderation*] har dubbla meningar och anknyter dels till beskrivningen av framgångsrika plattformsföretag, dels till Stack Overflows egna former för moderering av texter och inlägg på plattformen, de funktioner plattformen erbjuder, frivillig och framröstad moderering, automatiserade funktioner, och det relativt osynliga deltagandet av kvinnliga och icke-binära medlemmar.

Tidigare forskning om kvinnligt deltagande på Stack Overflow har tenderat att fokusera på att kvantifiera och identifiera kvinnor (Lin & Serebrenik, 2016) och på att undersöka beteendeskilnader mellan män och kvinnor (Brooke, 2021; D. Ford et al., 2016a; Vasilescu et al., 2013), implicit innebär det att kvinnligt deltagande betraktats som bristande och problematiskt. I den här avhandlingen, med ett tillvägagångssätt inspirerat av institutionell etnografi (D. E. Smith, 2005) och internetetnografi (Hine, 2015), fokuserar jag på plattformen Stack Overflow och reser frågan om hur Stack Overflow som plattform påverkar deltagande för genusminoritetsgrupper. Mitt intressefokus är därmed genusbaserat deltagande som jag undersöker både ur genusperspektiv (*Studie 2* och *Studie 3*) och queerperspektiv (*Studie 4*). I mitt arbete fokuserar jag särskilt på modereringsformerna för plattformen och hur plattformens officiella policyer reglerar modereringsformerna. Mitt argument i denna avhandling är att plattformar som Stack Overflow utgör en slags institutioner (*Studie 1*). Med det genomslag plattformar fått och eftersom globala plattformskontexter beskrivs blivit alltmer ovälkommande och fientliga miljöer, är det särskilt angeläget att dels förstå hur plattformarna påverkar hur expertis erkänns, och dels att förstå vems kunskap som blir kanonisk, vilket denna avhandling har som mål att bidra med. Dels behöver vi kunna identifiera och förstå hur expertis i sådana arbetsbaserade miljöer tar sig uttryck, dels kan teorier om epistemisk orättvisa och epistemisk ignorans utgöra en grund för förståelse. Syftet med denna avhandling är att bättre förstå de diskursiva arrangemangen på digitala kunskapsdelningsplattformar och deras inverkan på kvinnors och genusminoriteters deltagande, med målet att identifiera mekanismer som förhindrar eller försvårar deras möjligheter till deltagande. Eftersom digitala kunskapsdelningsplattformar spelar en nyckelroll i många olika sammanhang för expertis och kunskap är det en viktig uppgift att kritiskt granska hur diskursiva arrangemang i dessa plattformssammanhang förhindrar och försvårar deltagande från minoritetsgrupper. Avhandlingen har tre forskningsfrågor:

- Hur fungerar digitala plattformar som institutioner?
- Hur kan moderering bidra till genusmässiga ojämlikheter på Stack Overflow?
- Hur bidrar koordinerade programmerarmaskuliniteter till att queererfarenheter tystas ned?

Avhandlingsarbetet har utgjort en självständig del av forskningsprojektet *Sociala dimensioner av kompetensutveckling i nätverksambällen* [SOCDEX, Social Dimensions of Expertise Development in Networked Communities] finansierat av det svenska Vetenskapsrådet. Avhandlingens fyra delstudier består av tre empiriska och en metodologiskt inriktad studie som summeras senare. De fyra studierna är:

- Studie 1: Writing the Social Web: Toward an Institutional Ethnography for the Internet
- Studie 2: Gaming Expertise Metrics: A Sociological Examination of Online Knowledge Creation Platforms
- Studie 3: No Room for Kindness: Women and Communication on Stack Overflow
- Studie 4: Silencing Tactics: Pronoun Controversies in a Programming Community Questions and Answer Platform

Kontext

I detta kapitel beskrivs hur plattformen Stack Overflow som institutionellt koordinerad miljö historiskt och materiellt etablerats, delvis inspirerat av plattformsbiografi (Burgess & Baym, 2020). Avgörande händelser, dess kulturella roll, liksom plattformens funktionalitet tas här upp, med bäring på mitt fokus på genusfrågor och moderering. Historiebeskrivningen av Stack Overflow utgör en viktig del av den institutionella etnografi som avhandlingen baseras på genom att kartlägga hur existerande sociala och politiska relationer historiskt har etablerats (kapitlet kompletterar därmed *Studie 1*).

Litteraturöversikt

I denna del tas forskning relaterad till avhandlingens fokus upp som kunskapsdemokratisering, moderering och kommunikation, genus- och programmeringskulturer, och mer specifikt, genusforskning med fokus på deltagande på Stack Overflow-plattformen.

I tidiga föreställningsideal kring internet ansågs onlinegemenskaper ha potential att demokratisera tillgången till kunskap (Hindman, 2008). Dessa ideal har dock kommit att ifrågasättas inom forskning, särskilt i relation till ojämlikheter (DiMaggio et al., 2001; Graham et al., 2014). Även om plattformar som Stack Overflow erbjuder tillgång till information och samarbetsmöjligheter, kan de också

reproducera fördomar kring till exempel genus. Det finns därför ett behov av att man med feministiska utgångspunkter intresserar sig för policyer för innehållsmoderering på plattformar (Gerrard, 2020). Många stora plattformar, som Stack Overflow, Reddit och Wikipedia, är beroende av att communitymedlemmar modererar varandra. Dessa moderatorer upprättar och upprätthåller gemenskapsnormer och deras arbete bidrar till i vilken utsträckning kunskapen som dessa plattformar bidrar till kan demokratiseras.

Programmerarkulturen beskrivs inom forskning som en maskulin kultur. Plattformar för kunskapsdelning för programmerare är beroende av kollaborativt lärande och deltagande i communityn (Johri, 2018). Dessa plattformsmiljöer har dock väldigt få kvinnliga deltagare, och det kan inte förklaras av andra demografiska faktorer (Wurzelova et al., 2019). I programmerarkulturer ses det tekniska och det sociala som ömsesidigt uteslutande (Faulkner, 2007). Det tekniska ses som maskulint och det sociala ses som feminint, och det anses ofta viktigare att lyckas med teknik än att lyckas med sociala relationer. Vissa av dessa attityder är också hinder för kvinnor att delta i STEM-områdena (*STEM, Science, Technology, Engineering, Mathematics*) för naturvetenskap, teknik, ingenjörsvetenskap och matematik. Okunskap är ofta en anledning till att dessa hinder inte kan överbryggas. I vissa fall kan ingenjörer och programmerare förbli medvetet okunniga om genusfrågor för att undvika att engagera sig i dem (Beddoes, 2019).

Tidigare forskning om genusfrågor i relation till Stack Overflow har mestadels varit kvantitativt inriktade studier som tolkar genus i form av binära könsroller. Huvuddelen av denna forskning använder en metod som kallas *genderComputer*, som är en automatiserad process för att upptäcka relevanta könsmarkörer utifrån användarprofiler, såsom namn och platser (Vasilescu et al., 2013). Eftersom Stack Overflow-medlemmar inte alltid länkar sina onlineidentiteter till sina verkliga identiteter, har denna metod därför begränsningar. Även i de fall där namn kan identifieras, skulle jag hävda att ett namn inte är tillräckligt för att avgöra en persons könsidentitet utan annan information. Forskningen är viktig eftersom den belyser anmärkningsvärda klyftor och frånvaro av kvinnors deltagande, till exempel skillnader i anseende, men på grund av den avgränsat binära synen på genus är denna forskning begränsad i vad den kan bidra kring om upplevelsen av att vara en könsminoritet på Stack Overflow. Med utgångspunkterna för mitt avhandlingsarbete kan jag mer öppet undersöka dessa frågor genom att inkludera diskussioner om genusdiskurser, eftersom min analys inte är präglad av binära genusförståelser.

Teori och metod

Det primära synsättet som jag använder för att sammanföra mina teoretiska utgångspunkter är institutionell etnografi (D. E. Smith, 2005). Även om den ibland behandlas som en metod, så kan den också ses som ett alternativ ansats till sociologi som kan användas både som ett teoretiskt ramverk och som ett metodiskt förhållningssätt. Institutionell etnografi har en materiell ansats för att observera människor och fokuserar på hur organisatoriska strukturer samordnar människors aktiviteter, och av betydelse i mitt avhandlingsarbete, bland annat genom att vara särskilt uppmärksam på hur texter används i sådana sammanhang. På så sätt kan jag analysera hur människor gör ett arbete genom att delta på Stack Overflow samtidigt som jag relaterar till vilken roll officiella policyer spelar i sammanhanget. På det sättet följer jag Gerrards (2020) uppmaning och hoppas bidra till den feministiskt inriktade forskningen fokuserar på policyer för innehållsmoderering. Teorier om epistemisk ignorans (Dotson, 2011; Medina, 2013; Tuana, 2006) är också integrerade i mitt arbete. Epistemisk ignorans är en teori som förklarar hur kunskap som undanhålls kan användas för att behålla makten över förtryckta människor, och den beskriver de sätt på vilka information kan döljas eller undertryckas. Teorin bygger på idéerna om hur makt/kunskap utövas från Foucault (1969/1972), vilket exempelvis kan handla om hur vissa typer av institutionella kategorier som används för att samla in data begränsar den typ av kunskap som vi kan få ut. Om ett formulär till exempel bara ger människor möjlighet att välja kategorierna 'man' eller 'kvinna' kan vi inte erhålla kunskap om andra genusdimensioner.

I avhandlingen har jag använt en mängd olika analysmetoder och datamaterial. Jag använder spårdata för att undersöka vilken typ av data plattformen producerar om sig själv, och jag har också använt plattformsbioграфи (Burgess & Baym, 2020) för att beskriva Stack Overflows historia och utveckling som en institutionellt organiserad miljö. För att undersöka relationen mellan policyer och människors aktiviteter har jag använt mig av tidslinje- och kartläggningsmetoder. Grunden för dessa metoder utgörs av fokuset på de typer av diskurser som kommer till uttryck kring plattformen.

Sammanfattningar av de fyra studierna

Denna avhandling består av fyra delstudier som här sammanfattas kort.

Studie 1 - Writing the Social Web: Toward an Institutional Ethnography for the Internet

Publicerad som:

Osborne, Tanya (2023). 'Writing the Social Web: Toward an Institutional Ethnography for the Internet.' In Paul C. Luken and Suzanne Vaughan (eds.). *Critical Commentary on Institutional Ethnography: IE Scholars Speak to Its Promise* (pp. 231–246). Cham: Springer International Publishing.

I denna studie argumenterar jag för att använda institutionell etnografi tillsammans med digital etnografi. I artikeln utforskar jag funktionerna hos plattformar, och med stöd av Gillespie (2010) och Helmond (2015) fokuserar jag på plattformarnas kommunikation och ”programmerbarhet”. Min analys visar att plattformar på ett fruktbart sätt kan förstås som institutionellt koordinerade miljöer. Denna koordinering involverar både plattformarnas tekniska möjligheter, såväl som policyer och regler som styr plattformsaktiviteter. Jag argumenterar för att undersökningar av det historiska sammanhanget och tillkomsten av en plattform ger insikter om dess utveckling som en institutionellt koordinerad miljö, och att historiskt formade diskurser påverkar användaraktiviteter på plattformen. Med exempel från Stack Overflowmiljön, diskuterar jag hur diskursen kring fri och öppen programvara (*FLOSS, Free/Libre and Open Source Software*) utvecklas på plattformen över tid. I analysen av programmerbarhet på Stack Overflow, illustrerar jag hur användargenerade verktyg utnyttjas av användare för att gå förbi och modifiera hinder som därmed kan avslöja spänningar och maktförhållanden i plattformsmiljön (detta återkommer också i de tre andra delstudierna). Jag avslutar med reflektioner över hur institutionella etnografer kan inkorporera plattformsundersökningar i sitt fältarbete.

Studie 2 - Gaming Expertise Metrics: A Sociological Examination of Online Knowledge Creation Platforms

Publicerad som:

Osborne, Tanya; Nivala, Markus; Seredko, Alena, and Hillman, Thomas (2023). 'Gaming Expertise Metrics: A Sociological Examination of Online Knowledge Creation Platforms'. *The American Sociologist*. <https://doi.org/10.1007/s12108-023-09607-x>.

I den här studien, samförfattad med SOCDEX-gruppen, utforskas hur plattformar som Stack Overflow har potential att utmana traditionella expertishierarkier men i

slutändan kommer till korta på grund av villkoren inbyggda i de mät- och poänggivande system som används. Det innebär att även om plattformarna för kunskapsdelning syftar till demokratisera kunskap, tenderar de att gynna en elitkunskap eller förstärka befintliga hierarkier. Studien drar paralleller till frågor om sökmotoroptimering och lyfter fram utmaningarna med användning av spelliknande ansatser, och vilken påverkan plattformen utövar genom att kategorisera strategier som antingen legitima eller oönskade. Stack Overflow etableras på det sättet som en auktoritet kring programmeringsexpertis, men sett i ljuset av intervjuer med expertanvändare och officiella policydokument uppvisas dock komplexiteten i hur plattformens spelbaserade beräkningar representerar expertis. Poäng som ges som ”reputation points” som sedan genererar utmärkelser, ”badge” kan inte direkt likställas med programmeringskunskaper på grund av att faktorer som anseende på plattformen ackumuleras med tiden och utmärkelser över tid kan få förändrade betydelser. Studien tar också upp samspelet mellan spel och expertis där jag för in genusfrågor genom att se spel som maskulina bonding-ritualer och ett diskursivt sätt att distansera sig. Studien visar att framgångsrika och ansedda Stack Overflow-deltagare kan få avsevärda belöningar och reella arbetsmöjligheter och att de utmärks av att vara kommunikativa, tidiga plattformsanvändare, sluta upp kring enkla frågor och visa engagemang i redigering och moderering. Att bemästra den strikta kommunikationsstilen på plattformen är avgörande för framgång, men stilen har också kopplats till lågt kvinnligt deltagande. Överlag ger långt och tidigt deltagande på plattformar social status och mekaniska fördelar som gynnar etablerade plattformsanvändare och begränsar nykomlingars möjligheter till deltagande. Studien avslutas med att reflektera över hur expertis felaktigt framställs som objektiv genom data, där nyanser går förlorade kring vad mätvärdena för expertis faktiskt representerar, men också hur sådana problem är överförbara till andra former av rankningar i utbildningssammanhang.

Studie 3 - No Room for Kindness: Gender and communication conventions on Stack Overflow

Opublicerat manuskript, fullständig titel:

Osborne, Tanya (2024). No Room for Kindness: Gender and communication conventions on Stack Overflow'. [opublicerat manuskript]

Denna artikel utforskar olika och konkurrerande artighetsdiskurser på Stack Overflow och hur dessa bidrar till genusmässig diskriminering. Genom att

triangulera intervjuer, observationer och policydokument undersöker jag plattformens strikta kommunikationsstil och dess inverkan på moderering och kvinnligt deltagande. Tidigare studier har noterat att högt rankade användare på Stack Overflow inte bara tenderar att vara mindre artiga, ofta har de också förutfattade meningar om kvinnliga användares kommunikationspreferenser. Studien lyfter fram den särskilda modereringen på Stack Overflow och identifierar det ”minimalt reproducerbara exemplet” (*MRE, minimal reproducible example*) som en vägledande princip för effektiv kommunikation på plattformen. En MRE är den minsta mängd kod som behövs för att reproducera ett fel, och används i felsökningsprocesser. I studien visar jag hur användare avråds från språkliga artigheter, och hur spänningar uppstår när regler för artighetsfraser som ”snälla” och ”tack” regleras och avråds ifrån. Redaktörer som ska upprätthålla dessa regler kan genom att vara ovetande om undergruppers egna tolkningar av reglerna bidra till redigeringskonflikter, som kan leda till att felaktigheter förs in i svar, grammatiska redigeringar av texter kan exempelvis inkludera tekniska fel. Genom plattformens höga grad av programmerbarhet möjliggörs automatiserade sökningar efter nyckelord som ”tack” som kan utnyttjas i redigeringsarbete. Sammantaget visar min analys att två konkurrerande artighetsdiskurser karaktäriserar plattformskommunikationen. I den ena betonas att diplomatiskt uppvisa takt och ton i kommunikationen medan det i den andra handlar om att prioritera precision och undvika onödig kommunikation. Dessa artighetsformer existerar dock sällan samtidigt, vilket understryker artighetsdiskursernas komplexa dynamik på en plattform som Stack Overflow.

Studie 4: Silencing Tactics: Pronoun Controversies in a Programming Community Questions and Answer Platform

Innehållsvarning: observera att det här avsnittet innehåller diskussioner om strategier som används i transfobisk hatretorik och kan vara upprörande för vissa läsare.

Publicerad som:

Osborne, Tanya (2023). 'Silencing Tactics: Pronoun Controversies in a Questions and Answers Site. Journal of Digital Social Research, 5(1), 1-22.

Denna studie undersöker följderna av en förändring i Stack Exchange (det större nätverket av frågor- och svarsidor som Stack Overflow ingår i) uppförandekod som skedde 2019, där ett uttryckligt krav på att användare skulle referera till varandra med de pronomen användare själva föredrog infördes. Med hjälp av

Dotsons teori om epistemisk tystnad (*epistemic silencing*) analyserar jag hur en queerinkluderande diskurs på Stack Exchange tystades till förmån för en annan diskurs som framställer plattformens ansvariga som fränkopplade från sin användarbas. Analysen består av en detaljerad tidslinje av händelser som relaterar till förändringen av uppförandekoden. Jag observerar att även om Stack Exchange inte uttryckligen kopplar förändringen i uppförandekoden till trans och ickebinära personer, så går det att spåra transfobiska reaktioner från Stack Exchange-användare och i tekniska nyhetskanaler. Jag kunde också notera att användare som respons på uppförandekoden utvecklade sätt att anpassa sig till den genom att skapa kodskript för de pronomen som användare föredrog, för att på olika sätt visa stöd för LGBTQ+-communityn. I studien använder jag fiktiva och sammansatta citat för att utforska vanliga retoriska strategier i anti-transdiskurser, exempelvis hur hot konstrueras och hur yttrandefrihetsargument används för att bestrida rättighetsfrågor, båda förknippade med alt-höger-ideologi. Jag diskuterar också att bevisbördan i diskrimineringsfrågan faller på den som diskrimineras, där marginaliserade parter måste bevisa fel inom snävt definierade ramar. Avslutningsvis föreslår jag att beslutsfattare bör tillhandahålla mer omfattande information om pronomenstrategier utöver de nu gällande pronomenreglerna och jag efterlyser ytterligare forskning om att kommunicera om pronomen i interkulturella miljöer, med tanke på den diskursiva dominansen av engelskspråkiga och västerländska kommunikationsnormer som Stack Exchange bygger på.

Resultat och diskussion

I det här avsnittet sammanfattar jag de övergripande resultaten och diskussionen med utgångspunkt i de tre forskningsfrågorna.

Hur fungerar digitala plattformar som institutioner?

I avhandlingen har jag identifierat programmerbarhet som ett av de avgörande sätten för hur digitala plattformar fungerar som institutionellt koordinerade miljöer. Programmerbarhet är en bärande idé inom plattformsstudier och avser funktionen hos plattformar som gör att de kan konfigureras eller anpassas till människors behov (Helmond, 2015), till exempel genom ett tekniskt API, (*Application Programming Interface*). Under mitt avhandlingsarbete har jag använt flera metoder för att utforska Stack Overflow som institution. Jag har undersökt de officiella policytexterna och dokumenten för plattformen i *Studie 2* och *Studie 3*.

Jag har följt plattformens programmerbarhet för att utforska hur användare utvecklar sina egna verktyg som ett sätt att engagera sig i en institutionell koordinering i *Studie 3* och *Studie 4*. Det jag visat är hur digitala plattformar koordineras institutionellt genom sina policytexter, former av moderering och programmerbara funktioner och som också koordinerar och standardiserar användarnas beteenden. I fallet med Stack Overflow har detta resulterat i en mycket distinkt kommunikativ stil och ett sätt att skapa en slags institutionella samtal genom redigeringsaktiviteter. Den institutionella koordineringen manifesteras också i termer och begrepp som är specifika för denna plattformskontext, som föreställningen om MRE, ett minimalt reproducerbart exempel (*Studie 3*) och det sätt på vilket anseende på plattformen som en markör för expertis kan överföras mellan olika sammanhang (*Studie 2*). Dessa insikter bidrar därmed både med ett teoretiskt och metodologiskt perspektiv till plattformsstudier.

Hur kan moderering bidra till genusmässiga ojämlikheter på Stack Overflow?

I mitt arbete har jag visat hur användare utnyttjar programmerbara funktioner som sparade sökfrågor och tillägg för att samordna modereringsarbetet på plattformen. Detta gör att inslaget av redigering som en form av moderering kan tillämpas och skalas upp på ett mycket konsekvent sätt, men det betyder också att mindre undergrupperingar inom plattformen får det svårare att upprätta sina egna lokala överenskommelser. Modereringsformerna bidrar till att fördjupa genusmässiga ojämlikheter där redaktörer och annan expertis blir gränsdragande grindvakter som jag visar i *Studie 2*. Plattformens sätt att ange anseende i poängsystem och rankningar indikerar nivån av makt och inflytande som en användare kan utöva på plattformen, allt från att tillåtas delta i de "demokratiska" processerna i plattformsmiljön, till att ge tillgång till plattformsverktyg för att påverka det egna plattformsdeltagandet. Utöver detta diskuterar jag hur anseende kan överföras till professionellt arbetsliv i *Studie 2*, vilket ibland leder till betydande karriärutvecklingsmöjligheter men också väcker frågor om rättvisa och jämlika villkor för deltagande. Om det är maskulina sätt att kommunicera som mestadels gynnas och att bli gynnad alltför enkelt översätts till hierarkisk makt och verkliga möjligheter, är det viktigt att ta itu med sådana genusmässiga skillnader.

Hur bidrar koordinerade programmerarmaskuliniteter till att queererfarenheter tystas ned?

Avhandlingen har visat hur programmerarmaskuliniteter är en av de viktigaste och samordnande krafterna på Stack Overflow, och hur den diskursivt i hög grad formar strukturen och den kommunikativa stilen på plattformen. Framförallt verkar programmerarmaskuliniteter på ett sätt som tystar queererfarenheter genom att nedvärdera förkroppsligade erfarenheter. Ofta konstrueras den mångfald av systematiskt kvinnohat eller toxicitet som ”skapad”, trots att manliga användare torde ha förstahandserfarenhet av sådana hotfulla kommentarer i denna typ av miljö. Franzway et al. (2009) har visat hur liknande taktiker uppträder i ingenjörsmiljöer, där ingenjörer använder denna typ av medvetna ignorans (Tuana, 2006)(Tuana, 2006) för att undvika jämställdhetsfrågor. Jag har också identifierat platser där epistemiskt våld kan sägas förekomma på Stack Overflow. Epistemiskt våld kan inkludera handlingar som manipulation genom så kallad gaslighting, påtvingade avslöjanden och tystnad (Dotson, 2011; Hall, 2017) som alla har gemensamt att de går på och underminerar människors möjligheter till kunskap och vetande. Eftersom reglerna för Stack Overflow är så institutionellt bundna och distribuerade på ett sätt som kräver en särskild typ av aktiv textbearbetning, bör en plattform som Stack Overflow kunna vara väl rustad för att stänga av vissa typer av debatt eller särskilda typer av användare.

Bidrag

I den här avhandlingen utforskar jag genusdynamiken på plattformen Stack Overflow, framförallt visar jag den inflytelserika roll som medlemmar med högt anseende har i att forma plattformens kulturella praktik och hur de legitimeras av institutionen. Plattformens programmerbarhet som gör möjlig olika tillägg och verktyg resulterar i ett konsekvent och koordinerat plattformsdeltagande, men begränsar också utrymmet för motstånd och bidrar till att upprätthålla rådande normer. Stack Overflows historia synliggör hur plattformen varit orienterad mot att assimilera nykomlingar i den befintliga kulturen snarare än att främja ett mer individuellt och relationellt mentorskap eller använda uppförandekoder för att ta itu med fientlighet.

För att uppmärksamma genusaspekter i den här miljön är ett sätt att undvika antaganden om användaridentiteter. Jag har genom att undersöka hur användare diskuterar genusfrågor, och med analytiska metoder fokuserade på diskursiva

dimensioner, bidragit till att visa hur genus konstrueras institutionellt på Stack Overflow. Med avhandlingens institutionella ansats, har jag kunnat belysa de systematiska val som plattformen gör och hur reglerna tolkas inom ramen för detta. Ansatsen bidrar med ett nytt förhållningssätt till internetforskning med fokus på diskurs snarare än identitet och den erbjuder praktiska sätt att ta itu med feministiska och queerforskningsfrågor. Arbetet ska också bidra till litteraturen om ignorans och agnotologi inom ingenjörsvetenskap genom utforskandet av spänningar mellan förkroppsligad kunskap och numeriska data. Mitt arbete öppnar också möjligheter att vidare undersöka hur programmerarkulturer bryggas över miljöer online och offline och vilken betydelse detta har i ett utbildnings- och professionellt lärandesammanhang.

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Appendix

Glossary

Application Programming Interface (API). An API is a way for computer applications to communicate data between each other using requests and responses.

Blog. A blog, or weblog, is a website containing diary-like entries, usually written by one person.

Editing logs and Post History Summaries. While present on each question thread, the editing chains and post history summaries are not always obvious. The editing chain captures all of the changes that others have made to a post, and the post history summary summarises the activity in a thread to an overview and keeps a record of when threads may have had an active bounty or may have been promoted in the network.

Free/Libre and Open-Source Software (FLOSS). FLOSS is a software movement that is free – both in terms of cost and in terms of liberty – and that promotes making the code for software publicly accessible.

Minimal Reproducible Example (MRE). An MRE is the smallest amount of code needed to reproduce a particular error. It is created as part of the process of debugging.

Integrated Development Environment (IDE). An IDE is a software environment that allows programmers to manage their code. It may include features such as testing, debugging and building, that enable coders to increase their productivity without the need for multiple tools. Some IDEs support multiple programming languages; some may only support one programming language. Popular IDEs might include Eclipse, Visual Studio, and PyCharm.

Internet Relay Chat (IRC). A real-time text chat protocol.

Stack Apps. Apps are extensions that have been written by users to modify their own experience of the platform in some way. A wide variety of apps exist with different purposes, ranging from revealing otherwise hidden platform metrics, to toys that are made for entertainment purposes. Apps are presented on a separate subsite of Stack Exchange, and have comment threads and votes, similar to the main Stack Exchange content.

Stack Exchange Chat. Stack Exchange chat is a real time chat platform, which exists across all of the Stack Exchange subsites. All of the chats that are available are archived indefinitely, so it is possible to go back to historic chats as well as observe synchronous chats in real time.

Stack Exchange Data Explorer. Stack Exchange has an SQL interface that allows users to write and share SQL queries. Unlike the API interface, this can be done from within Stack Exchange and does not require any third-party programs or software. This interface has some limits on the amounts of rows that can be retrieved, so is generally better for returning summary tables rather than extracting large quantities of data. It is possible to search and find popular queries and to get a sense of what kinds of questions the community asks of the platform data.

Stack Exchange Meta. Meta is a sub-forum where users can discuss the operation and management of Stack Exchange itself.

Stack Overflow API. Stack Overflow has an application programming interface (API) end that can be used to obtain data from user profiles, question and answer data, and comment data from the platform based on a query. This needs to be done via third party interface. In this case, I have used Python via Jupyter to write queries and download data.

Science, Technology, Engineering, and Mathematics (STEM). An acronym for a subject grouping frequently used in education policy discourse.

Structured Query Language (SQL). Sometimes pronounced sequel, SQL is a programming language used to interrogate, build, and manage databases.

Tags. Tags are a type of metadata, based on keywords, used to organise and filter questions on Stack Overflow. Users can, for example, filter questions based on tags for programming languages.

Usenet. One of the earliest networks, predating the World Wide Web, Usenet was created in 1979 as a decentralised bulletin board and messaging system.

Data Collection

The following is a **non-exhaustive** list of data collected during the thesis, as a compliment to the *Methodology and Methods* chapter.

Collection	Year	Type	Contents	Description	Size
General Observation	2020	API data	An excel file and an SPSS file	API data for Jan 2018 questions under the python tag	15,625 rows 105MB
Analysis Notes	2020	Analysis Notes	Analysis notes mostly covering the interviews	Analysis notes stored in OneNote	N/A
Platform Data	2020	API data	6 xlsx files	Selections from the Stack Overflow API listing users with high reputation, for interview selection	25MB
Field Notes	2020	Field Notes	Field notes mostly covering the platform data elements	Field notes stored in OneNote	N/A
Interviews	2020	Interview transcripts	16 text files	Interview transcripts	
Gender	2020	Social media data	2 PDF files	Quora threads about women on Stack Overflow	6 pages 846kb
Gender	2020	Social media data	17 PDF files covering 10 different Reddit threads	Reddit threads about gender on Stack Overflow	62 pages 3.75 MB
Gender	2020	news articles	3 PDF files	two news articles about Stack Overflow's blog post on being welcoming, plus comments	221 pages
Gender	2020	Social media data	13 PDF files, 12 files covering twitter threads, 1 covering a stack overflow chat referenced in a thread	Selection of Twitter conversations about Stack Overflow	8.8MB 7.4MB
Blogs	2021	Blog posts and comments	6 PDF files, 1 word document	six blog posts relating to stack overflow, plus comments	147 pages 3.5MB
Silencing tactics	2021	Stack Overflow posts	10 PDF files	Selection of Stack Overflow posts about gender on Stack Overflow	203 pages 7.4 MB
Code of conduct	2021	Platform Documents	9 PDF files	Collection of key parts of the Stack Overflow Code of Conduct	16 pages 822KB

Collection	Year	Type	Contents	Description	Size
Silencing tactics	2021	Community letters, Podcast	2 PDF files, 1 word document	The letters written to Stack Overflow, and a podcast transcript covering the events	70 pages
					1.62 MB
Chats	2021	Chat logs	4 PDF files	Selection of chat logs from four different persistent Stack Overflow chats	76 pages
					13MB
Silencing tactics	2021	Social media data	Seven PDF files	Social media data relating to the moderator firings	190 pages
					9.2MB
Edits	2021	Edit logs	Four edit logs, selected from recently edited posts	Edits logs from selected posts	15 pages
					722KB
General Observation	2021	Platform Documents	Tour, Chat FAQ, April Fools Day blog post	Stack Overflow documents	22 pages
					3.7MB
Silencing tactics	2021	Blog posts, News articles, Platform documents	15 PDF files - 3 blog posts, 3 news articles, 2 platform documents, 6 Stack Overflow threads, assorted social media threads	Collection of articles specifically around and by moderators about the firing of a moderator	269 pages
					11.8MB
Silencing tactics	2021	Blog posts, Platform Documents, Threads	33 pdfs	Assorted posts and documents covering the update to the Code of Conduct and subsequent resignations, used in <i>Silencing Tactics</i>	660 pages
					42MB
Literature review	2021	Literature	An excel file and an associated Rayyan repository	Abstracts of all Stack Overflow research up to September 2021, with an annotated version in Rayyan (online literature review software)	1,470
					2.9MB
SQL	2022	API data	1 xlsx file, 1 PDF	Selections from Stack Data Explorer	248KB

Collection	Year	Type	Contents	Description	Size
MRE	2023	Blog posts	three blog posts and comments, saved in pdf, annotated in comments	Blog posts about reputation by notable members	31 pages 2.8MB
MRE	2023	Websites, Blog posts, Platform Documents	23 PDF files	Documents linked to from the Stack Overflow FAQ on MREs	126 pages 12.7MB
MRE	2023	Generated data	One CSV file	Data produced from a python script, listing the details of pages referred to from the Stack Overflow page about MREs	98 rows 13KB
History	2023	Blog posts, forum posts, platform data	76 Zotero snapshot entries (i.e., html files stored locally)	Collection of articles, social media, and blog posts used to detail the history and development of Stack Overflow, stored in Zotero	118MB
Research Journal	2021-2023	Diaries, web snippings, data collection		Descriptions of field observations, stored in Evernote	N/A
Analysis Notes	2022-2023	Personal notes		Analysis of documentation, mappings, stored in Evernote	N/A

Interview Schedule

Introductions

- Anything you'd like to ask before we start recording?

Start video recording (total length:)

Background information

- Age -
- Gender (for our transcript) -
- Education -
- Profession -
- Programming experience before joining Stack Overflow, (purpose for doing/learning programming)?
- What online resources, besides SO, you use to develop your programming skills? Which resources you use most frequently, and why?
- Is there anything else about your personal background or circumstances that relates to your SO use that you would like to mention?

Stack Overflow use

- Please describe **when** you started using Stack Overflow and **why**.
- How and why you are using SO nowadays, and how it has changed?
- How often do you answer questions and are there particular kinds of questions you focus on?
- What makes a high quality answer? Please describe an example of an answer you are particularly pleased with.
- How often do you ask questions and how have the kinds of questions you ask changed over time?
- Please describe an example of a question that you got particularly useful help from.
- How often do you post comments on other people's questions and answers, and what kinds of comments do you generally post?
- Please describe a comment that you have made that you feel was particularly helpful for the discussion.

User profiles

Ask for screen share, post links on-by-one to the chat

Add links here:

[redacted for anonymity]

- Have a look at the user profile. Talk us through what you pay attention to and what information you find relevant in assessing users expertise?
- How would you rate the programming expertise of this particular user?

Ranking scores

- Please describe how you relate to having a high-ranking score. Is it important to you?
- How much attention do you pay to increasing your ranking score?
- Please describe how you developed a high-ranking score.
- How well do reputation scores represent the expertise of a Stack Overflow community member?
- Please describe examples of ways the scores do or do not represent the expertise of members.
- Do you adapt to the expertise level of the question asker? How? Do ranking scores change the way you respond to questions and answers posted by other members? If so how, if not why not?

Career and expertise development

- Is your SO use mostly related to your job or your freetime activities?
- How has your participation in the Stack Overflow community had an impact on your work and/or career?
- Please describe a time when Stack Overflow was particularly useful in your work.
- Does SO participation effect any activities outside of your work? How?
- Please describe a time when Stack Overflow was particularly useful in your activities outside of work.
- What would you say is the most useful skill you have developed from participating in the Stack Overflow community?
- Please describe an occasion that was particularly important for developing this skill.
- How important SO is or has been for the development for your programming skills?
- Does the platform facilitate learning or professional development? How?

Gender (for informants who identify as female)

- Do you think that (you are / you would be) treated differently to other users because of your gender? Why?

- Do you think it is a problem that only 7% of Stack Overflow users are female? How do you think this effects the site?
- Why do you think so few women participate on the platform?

SQL queries

Standard Deviation of Reputation

```
select min(Reputation) as min_rep,
max(Reputation) as max_rep,
avg(Reputation) as avg_rep,
STDEVP(Reputation) as 'standard deviation' from Users
```

Reputation Quartiles - 4

```
SELECT
Reputation_quartile,
MAX(Reputation) AS quartile_break

FROM(
SELECT
    Id,
    Reputation,
    NTILE(4) OVER (ORDER BY Reputation) AS reputation_quartile
FROM Users) AS quartiles

GROUP BY Reputation_quartile
```

Reputation Quartiles – 10

```
SELECT
Reputation_quartile,
    Count(1) as [count],
MAX(Reputation) AS quartile_break

FROM(
    SELECT
        Id,
        Reputation,
        NTILE(10) OVER (ORDER BY Reputation) AS reputation_quartile
FROM Users
    Where Reputation >100) AS quartiles

GROUP BY Reputation_quartile
```

Reputation for users above or equal to X rep

```
SELECT COUNT( * ) as "Number of Rows"
FROM Users
WHERE Reputation >= ##rep##
```

Previous publications:

Editors: Kjell Härnqvist and Karl-Gustaf Stukát

1. KARL-GUSTAF STUKÁT *Lekskolans inverkan på barns utveckling*. Stockholm 1966
2. URBAN DAHLJÖF *Skoldifferentiering och undervisningsförlopp*. Stockholm 1967
3. ERIK WALLIN *Spelling. Factorial and experimental studies*. Stockholm 1967
4. BENGT-ERIK ANDERSSON *Studies in adolescent behaviour. Project Yg, Youth in Göteborg*. Stockholm 1969
5. FERENGE MARTON *Structural dynamics of learning*. Stockholm 1970
6. ALLAN SVENSSON *Relative achievement. School performance in relation to intelligence, sex and home environment*. Stockholm 1971
7. GUNNI KÄRRBY *Child rearing and the development of moral structure*. Stockholm 1971

Editors: Urban Dahllöf, Kjell Härnqvist and Karl-Gustaf Stukát

8. ULF P. LUNDGREN *Frame factors and the teaching process. A contribution to curriculum theory and theory on teaching*. Stockholm 1972
9. LENNART LEVIN *Comparative studies in foreign-language teaching*. Stockholm 1972
10. RODNEY ÅSBERG *Primary education and national development*. Stockholm 1973
11. BJÖRN SANDGREN *Kreativ utveckling*. Stockholm 1974
12. CHRISTER BRUSLING *Microteaching - A concept in development*. Stockholm 1974
13. KJELL RUBENSON *Rekytering till vuxenutbildning. En studie av kortutbildade yngre män*. Göteborg 1975
14. ROGER SÄLJÖ *Qualitative differences in learning as a function of the learner's conception of the task*. Göteborg 1975
15. LARS OWE DAHLGREN *Qualitative differences in learning as a function of content-oriented guidance*. Göteborg 1975
16. MARIE MÅNSSON *Samarbete och samarbetsförmåga. En kritisk granskning*. Lund 1975
17. JAN-ERIC GUSTAFSSON *Verbal and figural aptitudes in relation to instructional methods. Studies in aptitude - treatment interactions*. Göteborg 1976
18. MATS EKHOLM *Social utveckling i skolan. Studier och diskussion*. Göteborg 1976

19. LENNART SVENSSON *Study skill and learning*. Göteborg 1976

20. BJÖRN ANDERSSON *Science teaching and the development of thinking*. Göteborg 1976

21. JAN-ERIK PERNEMAN *Medvetenhet genom utbildning*. Göteborg 1977

Editors: Kjell Härnqvist, Ference Marton and Karl-Gustaf Stukát

22. INGA WERNERSSON *Könsdifferentiering i grundskolan*. Göteborg 1977

23. BERT AGGESTEDT & ULLA TEBELIUS *Barns upplevelser av idrott*. Göteborg 1977

24. ANDERS FRANSSON *Att rädas prov och att vilja reta*. Göteborg 1978

25. ROLAND BJÖRKBERG *Föreställningar om arbete, utveckling och livsrytm*. Göteborg 1978

26. GUNILLA SVINGBY *Läroplaner som styrmedel för svensk obligatorisk skola. Teoretisk analys och ett empiriskt bidrag*. Göteborg 1978

27. INGA ANDERSSON *Tankestilar och hemmiljö*. Göteborg 1979

28. GUNNAR STANGVIK *Self-concept and school segregation*. Göteborg 1979

29. MARGARETA KRISTIANSSON *Matematikekunskaper Lgr 62, Lgr 69*. Göteborg 1979

30. BRITT JOHANSSON *Kunskapsbehov i omvårdnadsarbete och kunskapskrav i vårdutbildning*. Göteborg 1979

31. GÖRAN PATRIKSSON *Socialisation och involvering i idrott*. Göteborg 1979

32. PETER GILL *Moral judgments of violence among Irish and Swedish adolescents*. Göteborg 1979

33. TAGE LJUNGBLAD *Förskola - grundskola i samverkan. Förutsättningar och hinder*. Göteborg 1980

34. BERNER LINDSTRÖM *Forms of representation, content and learning*. Göteborg 1980

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Knowledge sharing platforms, like Stack Overflow, are increasingly part of informal professional learning, and make professional knowledge accessible to people across the world. However, the platform has several persistent issues, like the under-participation of women and gender minorities. Given the ubiquity of the platform, and its positioning in recognising the expertise of programmers, there is an urgent need to understand how and why gendered participation patterns are reproduced in this environment.

This compilation thesis comprises an extended history of Stack Overflow, three empirical papers, and one methodological paper. Paper 1, Writing the Social Web, argues for how digital platforms can be understood as institutional settings. Paper 2, Gaming Expertise Metrics, explores how the platform mechanics on Stack Overflow reinforce existing masculine hierarchies in programming. Paper 3, No Room for Kindness, examines the codification of communication on Stack Overflow, using interviews, policy texts, and social media data to explore the relations that prevent politeness on the platform. Paper 4, Silencing Tactics, discusses how queer issues are discussed in the Stack Exchange community, and how these issues are minimised through the mechanisms of epistemic ignorance.



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