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A Contributor's Journey:
Exploring the Motivational Factors for Online Knowledge Sharing in a Gamified Environment

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ABSTRACT:

This research aims to investigate the motivational aspects of gamification elements on the inter-organizational knowledge-sharing platform, Stack Overflow. The study addresses the gaps in existing research by providing an in-depth analysis of gamification elements' effects and exploring top contributors' motivation to share knowledge. It follows a qualitative approach, conducting semi-structured interviews to gain insights into their motivations.

This thesis identifies three distinct phases in the contributor's journey and examines the role of gamification elements in each phase. This study indicates that bounties and badges have limited motivational aspects in different phases of a top contributor. It also highlights the limitations of selected motivational theories in fully explaining the motivations of top contributors. This suggests the need for alternative frameworks such as the social practice view, to better understand the underlying motivations and dynamics.

This research contributes to the understanding of the motivational aspects of gamification elements on knowledge-sharing platforms and suggests further exploration to better comprehend the motivations of top contributors in their support activities.

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1 Introduction

1.1 Research Problem

The resource-based approach emphasizes the key role of knowledge as an essential element of competitive advantages for organizations (Argote & Ingram, 2000; Kearns & Lederer, 2003; Kotlarsky & Oshri, 2005). By sharing knowledge, organizations can access a wider range of information and expertise, which can help them to make better decisions, solve problems more efficiently, and develop new ideas and innovations (Wang & Wang, 2012). Knowledge sharing can also support organizations to build stronger relationships with their employees, customers, and other stakeholders, which can enhance collaboration and trust.

In addition to intra-organizational systems for collecting, managing, and sharing knowledge, inter-organizational platforms have been increasingly established to support knowledge transfer (Chiu, Hsu & Wang, 2006; Loebbecke, van Fenema & Powell, 2016). Hendriks (1999) argues that the phenomenon of voluntary inter-organizational and domain-specific sharing of knowledge on platforms is a trend which is gaining importance. While the use is widespread among knowledge seekers, it is the providers of knowledge who play an essential role in these systems since these platforms are based on the voluntary contributions of their members and use the elements of gamification, especially to increase the willingness to share knowledge (Cavusoglu, Li & Huang, 2015; Vasilescu, Filkov & Serebrenik, 2013).

Emerging from the intersection of game design, psychology, and technology, gamification is the use of game design elements and mechanics in non-game contexts to engage users and motivate them to achieve their goals (Deterding, Khaled, Nacke & Dixon, 2011). It involves the application of game design principles such as rewards, challenges, and feedback to non-game contexts like education, health, and business to make these activities more engaging and motivating for users. Gamification has been shown to be effective in a variety of settings and has the potential to improve learning, motivation, and engagement in a wide range of contexts (Hamari, Koivisto & Sarsa, 2014).

According to Ghobadi (2015), knowledge sharing is important for software developers because it can help them to improve their skills, stay up-to-date with new technologies and best practices, and collaborate more effectively with others. By sharing knowledge, software developers can access a wider range of information and expertise, which can help them to solve complex problems, develop new ideas, and create better software.

A well-established inter-organisational question-and-answer (Q&A) platform for people interested in software development is Stack Overflow (Baltes, Kiefer & Diehl, 2017; Lou, Fang, Lim, & Peng, 2013). It provides a wealth of information and knowledge that is relevant to software development and is easily accessible. Stack Overflow uses the gamification elements (GEs) of bounties, badges, privileges, and a reputation score to promote and reward user participation (Stack Overflow, n.d. a).

The existing body of research about the application of gamification elements at Stack Overflow is characterized by quantitative research approaches aiming to investigate the effects on contribution (Amaral & Kang, 2021; Cavusoglu, Li & Huang, 2015; Gharibi & Malekzadeh, 2017; Jin, Yang, Kula, Choi, Inoue & Iida, 2015b; Kusmierczyk & Gomez-Rodriguez, 2018; Lu, Mao, Zhou, Zhang, Li, Wang, Ying & Wang, 2022; Marder, 2015; Papoutsoglou, Kapitsaki & Angelis, 2020; Zhou, Wang, Bezemer & Hassan, 2020). These investigations did, however, not

apply to qualitative research approaches. Those studies, which did use qualitative methods, dealt with specific gamification elements like promotional gamification (Mogavi, Zhang, Haq, Wu, Hui & Ma, 2022).

Previous research was unable to provide an in-depth analysis of the effects of these elements, while this research looks at key aspects of gamification elements and their influence on the motivation of knowledge sharing. Furthermore, previous research has also not dealt with the different roles of contributors on Stack Overflow in a differentiated way. As a result, the motivations of top contributors and the influence of gamification elements on their motivation have not been sufficiently researched yet.

Thus, this research work will further investigate this topic. The overall aim of this study is to develop an in-depth understanding of the motivational aspects of gamification elements on the collaboration of top contributors on the inter-organizational knowledge exchange platforms Stack Overflow.

1.2 Research Motivation and Aim

According to the discussed research gap in the previous section, the main motivation for this research is to gain a holistic understanding of the motivational aspects of gamification towards sharing knowledge on inter-organizational question-and-answer platforms. As previous research on gamification on Stack Overflow was mostly conducted with quantitative methods (e.g., Amaral & Kang, 2021), no in-depth understanding of the phenomenon has been developed, as current research results were not cross-checked with the user's perception of the gamification elements. Furthermore, we believe that understanding the view of top contributors on these elements helps to develop an in-depth understanding of how to integrate gamification into knowledge-sharing platforms. Based on this understanding, further researchers or practitioners might use this knowledge to improve the application of gamification elements used in knowledge-sharing platforms.

To achieve a holistic understanding, it is necessary to apply knowledge from different research directions. These are in particular knowledge sharing, gamification as part of human-computer interaction, and the psychological concepts of motivation.

Why people share knowledge voluntarily has been researched thoroughly (Hendriks 1999; Wasko & Faraj, 2005). Sarka and Ipsen (2017) summarize that knowledge sharing accelerates learning, promotes innovation, enhances problem-solving, reduces redundancy, fosters continuous improvement, builds a supportive community, and improves documentation. Furthermore, it increases collaboration and helps developers to improve their skills and stay up to date (Ghobadi, 2015). Hence, knowledge sharing is a crucial inherent part of software development.

Human-Computer Interaction (HCI) has been a long-standing topic of discussion in the field of Information Systems (IS), as evidenced by the work of Gerlach and Kuo (1991). HCI focuses on the design of systems that effectively cater to the user's requirements, as highlighted by Ebert, Gershon, and van der Veer (2012). Gamification can be seen as a research stream within HCI, as it concerns design elements to motivate and engage users (Deterding et al., 2011). The topic of gamification has developed into a prominent field of research. This is reflected in the increasing amount of research papers on this topic in recent years, as the search term

'gamification' on google scholar yields 136,000 hits, with more than 40,000 hits covering the period of 2017 to 2022, and 22,900 scientific articles published in 2021[1].

Koivisto and Hamari's (2019) research review shows how applied research on the topic of gamification is particularly concerned with the aspects of education, health, and crowdsourcing. The topic of software development is mentioned in their literature review, but with a share of 4.0% of empirical studies reviewed in their research, it is rather underrepresented. In addition, these research papers focus on gamification elements in the development process itself rather than the contributions of knowledge-sharing platforms supporting software development.

Although there has been research that combined gamification and knowledge sharing as well as research on gamification on Stack Overflow, there is a gap in the literature regarding the impact of gamification on the motivation of those users who contribute extensively. Motivation was traditionally defined as an "*internal process that energizes, directs, and sustains behavior*" (Reeve, 2016, p. 31) but can also be briefly described as wanting change (Baumeister 2016). Although one can see a significant impact of gamification on the contribution (Kusmierczyk & Gomez-Rodriguez, 2018) and the speed of answers (Lu, Mao, Zhou, Zhang, Wang & Li, 2020), an in-depth understanding of the impact on the motivation to collaborate is still pending.

Additionally, a holistic understanding of a phenomenon can only be achieved by using different vantage points and methodologies (Ågerfalk, 2013). As shown in the previous section, most research has been conducted quantitatively. Hence, using an interpretive qualitative approach will help to deepen the understanding of this phenomenon.

With this research, we, therefore, aim to develop a thorough understanding of the motivational effects of gamification elements on the collaboration of top contributors on inter-organizational knowledge exchange platforms using the example of Stack Overflow. Hence, the objective of this work is to answer the following research question:

How do gamification elements affect the motivation to share knowledge on Stack Overflow?

1.3 Delimitation

The research aims to address gamification elements of inter-organizational platforms. Thus, the results are applied in this area and can, therefore, be clearly distinguished from intra-organizational systems for knowledge sharing. In addition, this research deals with those elements provided on the platform Stack Overflow. A statement about the general effects of gamification elements can, therefore, not be made.

The research data will be collected through semi-structured interviews. While qualitative interviews can provide valuable insights and rich data, they involve a subjective interpretation of the responses, leading to bias or inconsistency in how the data is collected and analysed (Recker, 2013). Furthermore, the results of this study may not be generalizable to other knowledge-sharing platforms that do not use gamification elements. Further, participants may not always provide accurate or complete information in the interview, either intentionally or unintentionally, which can affect the reliability of the results. The sample for this study will be drawn from Stack Overflow users who choose to participate in the interviews. This may not be representative of the entire Stack Overflow user population, which could potentially limit the generalizability of the results. It should also be noted that the interviews were conducted with

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[1] https://scholar.google.com/scholar?q=gamification (accessed on 13th April 2023)

top contributors to the platform. Although they have extensive experience in using the platform, no generalised statements about the motivational effects of the gamification elements on all users can be made based on the research results.

Finally, it is pointed out that no general design principles, for example, according to concepts of design science, can be derived based on the research results, as only an analysis of the existing gamification elements on Stack Overflow is carried out.

2 Theoretical Background

2.1 The Role of Knowledge Contribution

2.1.1 Knowledge as a Resource

Knowledge and the capability to transfer it is an essential resource for any organization as it contributes to the development and sustainability of the organization's competitive advantage (Argote & Ingram, 2000; Kearns & Lederer, 2003; Kotlarsky & Oshri, 2005), particularly for businesses operating in uncertain (Miller & Shamsie, 1996) or highly innovative contexts (Kremer, Villamor & Aguinis, 2019).

Tsoukas and Vladimirou (2001) explained that organizational knowledge refers to the collective knowledge of an organization's employees, which includes tacit and explicit knowledge. Alavi and Leidner (2001) agreed and summarize that tacit knowledge is personal, experiential, and difficult to articulate, while explicit knowledge is formal and can be easily communicated. They also stated that the effective management of knowledge within an organization can enhance its decision-making process, promote innovation and growth, and create a learning organization culture.

Alavi and Leidner (2001) further defined knowledge management as the process of capturing, organizing, sharing, and utilizing an organization's knowledge assets to achieve its objectives. Further, knowledge management enables organizations to leverage their knowledge to create innovative products and services, streamline operations, and increase efficiency. It involves the use of technology, processes, and people to manage knowledge assets.

Grant (1996) described this systematic management of knowledge as the so-called knowledge-based approach. He defined knowledge as a valuable resource as it is difficult to be replicated by competitors. An organization's knowledge can be embedded in its products, services, and processes, making it challenging for competitors to imitate. Thus, an organization that can manage its knowledge assets effectively can gain a competitive advantage in the market. Nonaka and Takeuchi (1995) went even further when they state that knowledge sharing and knowledge retention are crucial to the success of an organization.

Alavi and Leidner (2001) summarized that an organization, which values knowledge as a resource, fosters a learning culture. A learning culture encourages employees to continuously learn, grow, and develop their skills and knowledge. By investing in employee development and promoting a learning culture, organizations can ensure that they remain competitive in the ever-changing business environment. Wang and Wang (2012) confirmed that by sharing knowledge, organizations can access a wider range of information and expertise, which can help them to make better decisions, solve problems more effectively, and develop new ideas and innovations.

Thus, managing knowledge is of great importance for organizations to gain and sustain a competitive advantage. Knowledge management involves capturing, organizing, sharing, and utilizing an organization's knowledge assets. Effective knowledge management enhances decision-making, promotes innovation, and creates a learning culture. Organizations which place a high value on knowledge foster a learning culture that encourages continuous learning, skill development, and employee growth, which in turn leads to increased competitiveness.

2.1.2 Managing Knowledge

While managing knowledge is generally an important task, organizations also must address three distinct forms of knowledge management. At the outset, the two fields of inter-organizational and intra-organizational knowledge management can be distinguished from each other. Both are two critical aspects of managing knowledge within organizations. While intra-organizational knowledge management refers to the management of knowledge within a single organization (Alavi & Leidner, 2001), inter-organizational knowledge management refers to the management of knowledge between different organizations (Chang & Gurbaxani, 2012). The third concept, interpersonal knowledge management, is a different concept that refers to managing knowledge within individual relationships between people (Ma & Yuen, 2011)

Intra-organizational knowledge management involves capturing, organizing, sharing, and utilizing the knowledge that exists within an organization to support decision-making and drive innovation. According to Alavi and Leidner (2001), this can include developing knowledge management strategies, creating communities of practice, and providing training and development opportunities for employees. It also involves creating an organizational culture that values knowledge, knowledge sharing, learning, and innovation. Hsu and Chang (2014) agreed and emphasized the importance of the trust factor. Alavi and Leidner (2001) further stated that effective intra-organizational knowledge management can lead to improved decision-making, increased productivity, and innovation. The use of technology and training programs can also help to support the management of knowledge within an organization.

Inter-organizational knowledge management involves sharing knowledge, skills, and expertise across different organizations (Chiu, Hsu & Wang, 2006; Loebbecke, van Fenema & Powell, 2016). This can result in a more significant impact on achieving business goals, increased innovation, and cost savings. According to Loebbecke, van Fenema and Powell (2016), inter-organizational knowledge management can occur through strategic alliances, partnerships, and joint ventures, where organizations share their knowledge to achieve common objectives. This requires effective communication and collaboration between different organizations. Panteli and Sockalingam (2005) emphasized the important aspect of establishing trust and developing relationships with other organizations to facilitate the sharing of knowledge. Effective communication channels, such as web-based collaboration tools, can help organizations share knowledge and improve collaborations.

These two concepts of knowledge management are subject to the responsibility and influence of organizations. On the contrary, interpersonal knowledge management focuses on how individuals acquire and share knowledge in a social context (Ma & Yuen, 2011). Interpersonal knowledge management is distinct from inter- and intra-organizational knowledge management in several ways. Firstly, it is focused on the individual level rather than the organizational level. Interpersonal knowledge management involves understanding how individuals share and acquire knowledge within their personal networks, rather than how organizations manage knowledge on a broader level. Secondly, interpersonal knowledge management is more informal and unstructured compared to inter- and intra-organizational knowledge management (Davison, Ou & Martinsons, 2012). The authors stated that it involves sharing knowledge through informal conversations, storytelling, and other social interactions, rather than through formal processes and systems. Thirdly, interpersonal knowledge management is often more subjective according to the authors and, thus, based on personal experiences and perspectives compared to inter- and intra-organizational knowledge management. It involves understanding the tacit knowledge that individuals possess, such as their skills, expertise, and intuition, and how they use this knowledge to make decisions and solve problems. So, while inter- and intra-

organizational knowledge management focus on managing knowledge at an organizational level, interpersonal knowledge management focuses on managing knowledge within individual relationships between people.

2.1.3 Managing Knowledge in Software Engineering

Software development is a knowledge-intensive activity that requires constant learning and knowledge sharing among team members and beyond to create high-quality software products (Robillard, 1999). Software developers create and maintain it "*by standing on the shoulders of many others*" (Storey, Treude, van Deursen & Cheng, 2010, p. 362). They do so by utilizing existing components, libraries, online resources, and further tools to find relevant information which aids them in their tasks.

Ghobadi (2015), therefore, identified various drivers for knowledge sharing and knowledge management in software development. The author also stated the importance of organizational and task-related aspects due to the complexity of software development projects as software development involves numerous interdependent tasks and each task requires different kinds of knowledge and skills. Consequently, knowledge sharing allows team members to leverage their expertise and experience to improve the quality of the software product.

According to Ghobadi (2015), the fast-paced nature of the industry is another reason why knowledge sharing and management are crucial in software development. Software development methodologies and technologies are continually evolving and software developers must keep up to date with the latest trends and developments to remain competitive. Knowledge sharing facilitates the transfer of new knowledge and skills among team members, while knowledge management ensures that the organization retains this knowledge and makes it accessible to others in the organization.

Ghobadi (2015) proceeded with software development being a highly collaborative activity and efficient collaboration requiring efficient communication and knowledge sharing. He summarized these aspects as people-related drivers for knowledge sharing. The development team must work together to identify and solve problems that arise during the development process. Knowledge sharing is essential to ensure that team members have the necessary diversity, capabilities, and team perception to contribute to the problem-solving process efficiently.

Finally, knowledge sharing and knowledge management contribute to software development due to organizational aspects as they promote a culture of continuous learning and improvement. Software development is an iterative process, in which team members must be willing to learn from their mistakes and use their knowledge to improve the software development process continually. Knowledge sharing, therefore, helps to identify areas of improvement, while knowledge management ensures that the knowledge gained from past experiences is accessible to everyone within the organization to drive continuous improvement.

Greene, Hur, Levy, Wang and Kang (2022) investigated the effects of media affordances and information security awareness on knowledge sharing in global software development. They found that media affordances positively influence knowledge sharing, especially when coupled with high levels of information security awareness. However, low levels of information security awareness may inhibit knowledge sharing. The authors, therefore, suggested that organizations should provide training and resources to improve employees' awareness of information security and use of media affordances to enhance knowledge-sharing in global software development teams. In conclusion, knowledge sharing and knowledge management are critical in software

development because they facilitate effective collaboration, improve the quality of the software, ensure that the organization keeps up to date with the latest trends and developments, and promote a culture of continuous learning and improvement.

While Ghobadi (2015) and Greene et al. (2022) listed several drivers for knowledge sharing and management in software development within organizations, external knowledge sources can be equally important for software development. Segelod and Jordan (2004) stated that with the rapidly evolving technology landscape, it can be challenging for organizations to stay up-to-date with the latest developments in the field. They argued that external sources such as customer feedback, industry trends, and academic research can provide valuable insights and help software development teams keeping up with the latest developments. The authors pointed out that external knowledge sources can provide a fresh perspective on the software development process, as well as help to identify new opportunities and challenges. They also suggested that external knowledge can help to stimulate creativity and innovation within development teams by exposing them to new ideas and approaches.

But these effects are not without risks. Tang, Fang, and Qualls (2020) examined how network effects influence open-source software development communities' absorptive capacity. They suggested that, while network effects can have positive effects on absorptive capacity, too much networking can lead to diminishing returns, which may result in decreased absorptive capacity. They also found that the relationship between network size and absorptive capacity is moderated by task interdependence and knowledge heterogeneity. Segelod and Jordan (2004) agreed with these findings when they further discuss the challenges associated with incorporating external knowledge into the software development process such as the difficulty of filtering and prioritizing information, as well as the potential for conflicting information from multiple sources. They suggested that effective knowledge management strategies can help to address these challenges and ensure that external knowledge is used efficiently. The authors also emphasized the importance of collaboration and communication with external knowledge sources, such as customers and vendors, to ensure that software development teams have access to the most relevant and timely information. They suggested that open communication channels and active engagement with external sources can help to build trust and foster long-term partnerships.

When considering external knowledge, Segelod and Jordan (2004) focused on customer feedback, industry trends, and academic research, but back then they did not consider online communities and networks as capable enough to provide valuable insights and have an impact organizational knowledge contribution. The past two decades show an increasing emergence of these communication channels (Chen, Baird & Straub, 2019).

2.1.4 Knowledge Contribution in Online Communities

Previous research has consistently shown that factors such as strong social connections, physical proximity, similarity in demographic or status characteristics, and pre-existing relationships are positively associated with knowledge sharing (Wasko & Faraj, 2005). However, these factors are not easily observable or present in online communities.

An electronic network of practice (ENP) may be defined as "*a self-organizing, open activity system focused on a shared practice that exists primarily through computer-mediated communication*" (Wasko & Faraj, 2005, p. 37). Electronic communities of practice (ECoPs), on the other hand, are more tightly structured and involve a smaller number of members who actively participate in discussions, share knowledge and resources, and collaborate on projects (Wasko

& Faraj, 2000). They are designed to promote social learning and create a sense of community among their members, with the goal of enhancing their collective knowledge and expertise. ENPs are more loosely structured than ECoPs and typically involve a large number of members who share a common interest but may not actively engage with each other. ENPs can be thought of as virtual communities where members can access information and resources related to their area of interest or profession, but they may not necessarily interact with other members.

Electronic Networks of Practice and Electronic Communities of Practice are, therefore, two types of online platforms that facilitate knowledge sharing and collaboration among individuals who share a common interest or profession. While both types of platforms are similar in nature, they differ in terms of the level of engagement and interaction among their members.

One of the strengths of ENPs is their ability to connect individuals with diverse knowledge and expertise who may not have been able to connect otherwise. ENPs can facilitate the sharing of information and resources across a large number of members who share a common interest or profession. However, one of the weaknesses of ENPs is that they may lack a sense of community or trust among members which can limit the level of knowledge sharing that occurs (Di Gangi, Howard, Goh & Thatcher, 2023).

ECoPs, on the other hand, have a strong sense of community among members, which can promote trust and encourage more active knowledge sharing (Nicolini, Pyrko, Omidvar & Spanellis, 2022). The authors further elaborated that ECoPs can foster social learning and collaboration among members, which can lead to the creation of new knowledge and innovation. However, the small size and tight structure of ECoPs may limit the diversity of knowledge and expertise available within the community.

Access to these communities is usually free of charge as the production of knowledge within them relies heavily on voluntary contribution (Butler, 2001; Guan, Wang, Jin & Song, 2018). However, Vadlamani and Baysal (2020) identified several challenges associated with knowledge contribution on these platforms. They stated that the volume of information available can be overwhelming, making it difficult to find relevant and accurate information. Additionally, there may be a risk of information overload, which happens when users are presented with too much information and struggle to make sense of it all. According to Lou et al. (2013), there may also be issues with the quality of information as contributions are typically made by a diverse group of individuals with varying levels of experience and expertise. This can lead to inaccuracies, biases, or incomplete information being shared, which can be harmful for information seekers if not properly identified and corrected.

In conclusion, both ENPs and ECoPs have unique strengths and weaknesses when it comes to knowledge sharing. ENPs can connect individuals with diverse knowledge and expertise, while ECoPs can foster a sense of community and encourage active knowledge sharing. In fields where the speed of technological advancement demands access to knowledge not available within a single organization, electronic networks develop more frequently (Powell, Koput & Smith-Doer, 1996). These communities also assist cooperative open-source projects (Sharma, Sugumaran & Rajagopalan, 2002), aspects that are both applicable to software development, leading to the development of technical question-and-answer platforms.

2.1.5 Knowledge Contribution to Stack Overflow

General online question-and-answer (Q&A) platforms promote knowledge sharing by allowing people to freely "*ask, answer, and discuss questions ... [and] provide people with channels to*

propose their personalized questions to the public directly" (Guan et al., 2018, p. 137). Q&A communities are becoming increasingly popular as they provide users with quick and free responses to their natural-language questions (Xu & Chen, 2006). These communities have experienced significant growth in terms of general visitors and user contributions in recent years, with top communities like Quora attracting over 300 million unique users monthly (Schleifer, 2019).

Technical Q&A platforms such as Stack Overflow, on the other hand, are popular online communities where individuals can ask and answer questions related to various topic-oriented fields (Baltes, Kiefer & Diehl, 2017; Lou, et al. , 2013). By participating in the Stack Overflow community, developers can ask questions, share their own knowledge, and learn from each other (Movshovitz-Attias, Movshovitz-Attias, Steenkiste & Faloutsos, 2013). Knowledge contribution on these platforms refers to the act of sharing technical information, insights, and expertise with other community members in response to posted questions.

Stack Overflow is an online community-driven platform for programmers and developers and was launched in 2008 by Joel Spolsky and Jeff Atwood (Atwood, 2008a). The website allows users to ask questions, post answers, and vote on the quality of answers (Stack Overflow, n.d.e). The questions and answers are organized into categories and tags, making it easy for users to find relevant information. Stack Overflow has a vast community of developers who contribute to the platform by asking questions, answering questions, and moderating content enabling users to quickly find solutions to coding problems. The platform established a database of questions and answers. A search function enables users to find answers to their coding problems, without having to spend time searching for a solution or formulating the question themselves.

Furthermore, the large and active community on Stack Overflow ensures that developers can access a wide range of information quickly and easily from a diverse group of individuals (Squire, 2015; Vasilescu, Filkov & Serebrenik, 2013). This can lead to the creation of a comprehensive knowledge base that is constantly evolving and improving as new contributions are made.

However, Stack Overflow has faced some criticism over the years. Some developers argue that the platform encourages lazy programming and promotes copying and pasting code (Fischer, Böttinger, Xiao, Stransky, Acar, Backes & Fahl, 2017). The authors argued that developers should learn how to solve problems on their own rather than relying on the community for answers. Furthermore, Stack Overflow has been criticized for being an exclusive platform, with a lack of diversity among its users (Ford, Smith, Guo & Parnin, 2016; May, Wachs & Hannák, 2019). According to the authors, many developers from underrepresented groups feel intimidated by the platform's culture and are discouraged from participating in the community. This lack of diversity can lead to a narrow perspective on programming problems and limit the range of solutions available.

Although there are certain downsides, Stack Overflow has become an essential resource for developers worldwide, providing a platform for users to ask and answer coding questions, connect with other developers, and overall share their knowledge. The platform has a vast database of questions and answers, making it easy for developers to find solutions to their coding problems.

2.2 The Role of Gamification

2.2.1 Gamification: Definitions, Elements, and Frameworks

Deterding, Dixon, Khaled and Nacke (2011, p. 9) defined gamification as "*the use of game design elements in non-game contexts*". They argued that gamification has become a popular strategy for motivating and engaging people in a variety of domains such as education, health, and marketing. Huotari and Hamari (2012, p. 17) added the aspect of improvement to this definition when they defined gamification as "*a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation*". Gamification gained widespread interest in the recent decade[2] and is increasingly being recognized in academic circles, including the field of Information Systems (IS), evidenced by a rise in the number of publications in academic journals (Schlagenhaufer & Amberg, 2015).

Deterding et al. (2011) further provided an overview of the various game design elements that are commonly used in gamification, including points, badges, leaderboards, feedback, rewards, and challenges, which are described in Table 1.

Table 1: Gamification Elements (Deterding et al., 2011)

Points	Points are a form of feedback that players receive for completing tasks or achieving goals. They can provide a sense of progress and accomplishment and can be used to measure and compare performance.
Badges	Badges are visual symbols that represent achievements or milestones. They can serve as a form of recognition and can be used to motivate players to strive for new achievements.
Leaderboards	Leaderboards are lists that rank players based on their performance or achievements. They can create a sense of competition and social comparison and can motivate players to improve their performance.
Feedback	Feedback is information that players receive about their performance or progress. It can be used to guide behavior and motivate players to improve.
Rewards	Rewards are incentives that are given to players for completing tasks or achieving goals. They can be tangible - such as prizes or discounts - or intangible - such as recognition or status - and can be used to motivate and reinforce behavior.
Challenges	Challenges are tasks or goals that are designed to be difficult or engaging. They can provide a sense of achievement and can be used to motivate players to overcome obstacles.

However, the authors also noted that gamification is often misunderstood and misapplied. They cautioned against using gamification as a silver bullet for all motivational problems and stressed the importance of considering the specific needs and motivations of the target audience when

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[2] https://trends.google.com/trends/explore?date=all&q=Gamification (accessed on April 13th, 2023)

designing gamified systems. The authors also argued that gamification can have unintended consequences, such as encouraging unethical behavior or fostering a narrow focus on extrinsic rewards. Hamari, Koivisto and Sarsa (2014) agreed with their critical review of empirical research on gamification. They argued that gamification can be effective in promoting engagement and motivation in certain contexts, but that many factors can influence its effectiveness, such as the type of task, the target audience, and the design of the gamified system. They also suggested that there is still research to be done to fully understand the potential benefits and drawbacks of gamification in various domains.

To address these issues, Deterding et al. (2011) proposed the concept of 'gamefulness' as an alternative to gamification. Gamefulness, they argued, is a mindset that is characterized by a playful and exploratory attitude towards tasks rather than a focus on winning or achieving external rewards. Gameful experiences offer a sense of autonomy, mastery and relatedness, and encourage intrinsic motivation and creativity.

Liu, Santhanam, and Webster (2017) also argued that many existing gamification efforts focus on extrinsic rewards and fail to engage users in a deeper, more meaningful way. To address this, they proposed a four-part framework that includes the elements of context, motivation, engagement, and performance. Table 2 provides an overview of the four elements of this gamification framework.

Table 2: Gamification Framework (Liu, Santhanam & Webster, 2017)

Context	Gamified systems should be designed to fit the specific context in which they will be used, considering the needs and motivations of the target audience.
Motivation	Gamified systems should be designed to promote intrinsic motivation such as autonomy, competence, and relatedness rather than relying on extrinsic rewards.
Engagement	Gamified systems should be designed to promote meaningful engagement, which involves a deep and sustained involvement with the system that goes beyond short-term motivations.
Performance	Gamified systems should be designed to promote performance by providing feedback, recognition, and opportunities for skill development.

The authors also proposed a research agenda for investigating the effectiveness and impact of gamified information systems. Furthermore, they suggested that researchers should focus on understanding the mechanisms through which gamification works and how it can be used to promote long-term engagement and behavior change. They highlighted the importance of considering the specific context and motivations of the target audience and of designing systems that promote intrinsic motivation and deep engagement.

Especially, the long-term effects of gamification elements on motivation have not been researched in depth. In a study of demographic differences in the perception of gamification, Kovisto and Hamari (2014) detected a decline in the impact over time. Furthermore, a similar change was also found in the research of an enterprise-related social network (Farzan, DiMicco, Millen, Brownholtz, Geyer & Dugan, 2008). Also, Coleman and Liebermann (2015) detected perceived diminishing marginal returns as a phenomenon in their study about Stack Overflow.

Hence, the research conducted sees a tendency towards reduced effects of gamification elements over time.

2.2.2 Gamification in Online Software Engineering Communities

While gamification is particularly considered in education and training, where the utilization of game elements is aimed at boosting the participants' motivation, involvement, and overall academic achievement, its application can, however, be seen in various other fields of interest (Papoutsoglou, Kapitsaki, & Angelis, 2020; Schlagenhaufer & Amberg, 2015). Furthermore, gamification can be useful to change or create habits (Hsu & Chen, 2021; Suleiman-Martos, Garcia-Lara, Martos-Carera, Albendin-Garcia, Romero-Bejar, Canadas-De la Fuente & Gomez-Urquiza, 2021).

Pedreira, García, Brisaboa and Piattini (2015) also showed that software engineering communities use gamification techniques to improve engagement and participation among members, which can lead to increased collaboration, knowledge sharing, and innovation. Papoutsoglou Kapitsaki & Angelis (2020) also identified that gamification is used in software engineering communities to encourage participation and engagement among users. Nakasai, Hata and Matsumoto (2019) confirmed these findings with their analysis of bug reports for the integrated development environment Eclipse which showed that badges result in a faster response time to the questions raised. A study by Cavusoglu, Li & Huang (2015) found that gamification elements have a positive effect on user engagement and contribution behavior, especially in the preliminary stages of user participation. They have, however, also found that this effect decreases over time, suggesting that additional measures may be needed to maintain user engagement in the long term.

Further, gamification can foster a sense of community and encourage collaboration among members (Bista, Nepal, Colineau & Paris, 2012). According to Bista et al. (2012), gamification can promote a sense of teamwork and encourage knowledge sharing in software development by providing opportunities for members to work together in order to achieve common goals, such as earning badges or points. The authors further emphasized that gamification could help to identify and reward valuable contributors to the community. By tracking and rewarding user activity such as the number of posts or the quality of contributions, gamification can help to identify valuable members who are recognized and rewarded for their contributions.

While gamification in software engineering communities can have several benefits, it also poses some challenges that need to be addressed. One of the challenges is the risk of creating a competitive environment that can have a negative impact on response quality (Jin et al., 2015b; Lu et al., 2020). If users are rewarded for completing tasks or contributing to discussions, they will more likely focus on quantity rather than quality. This can lead to low-quality contributions and may harm the community. The findings of Trockman, Zhou, Kästner, and Vasilescu (2018) contradicted this effect of gamification elements on the quality of participation. Their paper investigated the use of badges in the npm ecosystem, which is a social coding platform for JavaScript. The authors conducted an empirical study to analyze the effects of badges on repository popularity, maintenance, and collaboration. They found that badges significantly impact the popularity and maintenance of repositories, and they can serve as dependable indicators to emphasize the quality of both posts from contributors and users. According to Dubois and Tamburrelli (2013), gamification elements might also discourage collaboration and knowledge sharing. For example, if members are competing for points or badges, they may be less likely to share knowledge or help others in the community.

2.2.3 Gamification on Stack Overflow

Stack Overflow has several gamification elements designed to incentivize users to contribute high-quality content and reward them for their efforts. These include all the gamification elements, which are described by Deterding et al. (2011). They consist of a reputation score, badges, privileges, and bounties. They are summarized in Table 1 as well as depicted in Figure 1.
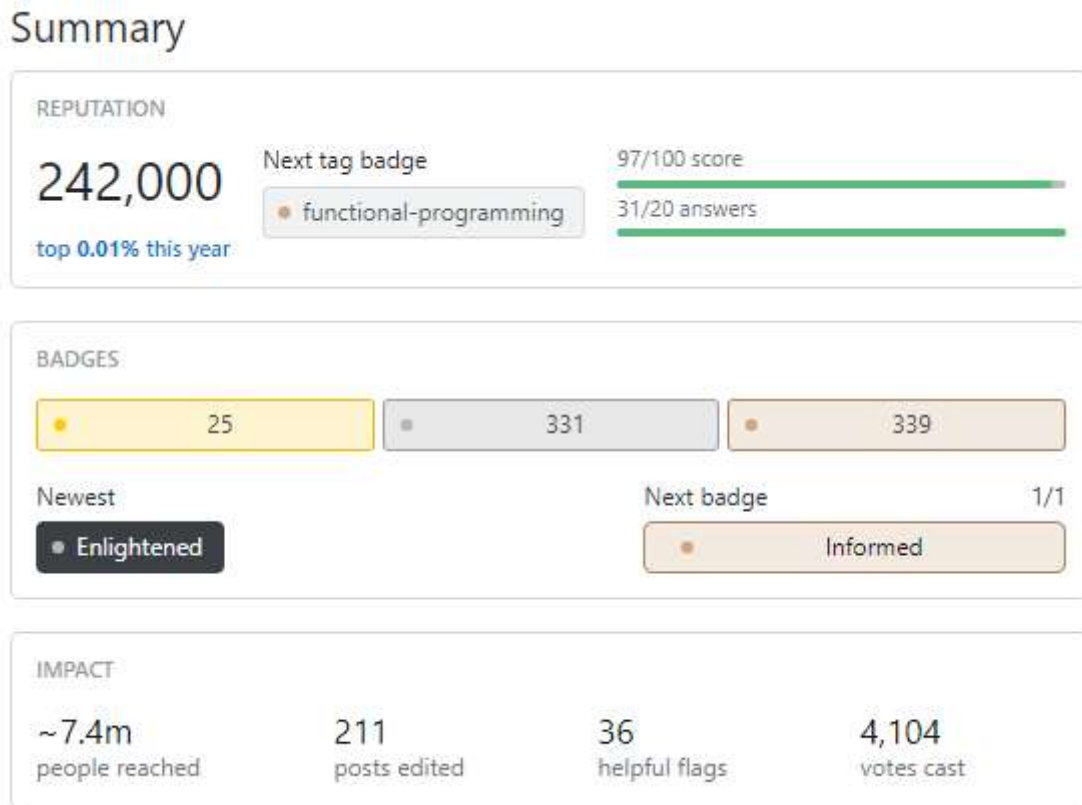
Figure 1: Screenshot of Stack Overflow's Reputation Score and Badge Award System

Reputation Score (Upvotes, Downvotes, Edits, and Leaderboards)

Reputation points are one of the core gamification elements on Stack Overflow. Users earn reputation points by asking and answering questions, editing posts, and voting on posts (Stack Overflow, n.d. a).

There are various methods by which the reputation score can be enhanced with the most significant being upvotes to questions or answer posts, received bounties, and edits made to other posts. According to one of the founders of Stack Overflow, namely Atwood (2008b), this system of rewards yields dual advantages: Firstly, it increases users' engagement and improves the quality of the questions and answers on the site. Secondly, it offers users a certain recognition from the community and internal information, including site traffic, which can prove valuable for research, marketing, and data analysis purposes. Reputation points are, therefore, used as a measure of a user's contribution and expertise on the platform, and they are displayed prominently on a user's profile page.

A user's reputation score on Stack Overflow can also decrease in several ways (Stack Overflow, n.d. a). If a user's post receives downvotes, their reputation will decrease by a certain amount. The amount of reputation lost depends on the post's score, the voter's reputation, and other factors. If a user's post is deleted by moderators or by the community, any reputation gained from that post will be lost. Furthermore, Stack Overflow has systems in place to detect and penalize fraudulent behavior such as creating multiple accounts or using automated scripts to upvote or downvote posts. If a user is found to be engaging in such behavior, their reputation may be reduced or their account may be suspended or even banned.

Stack Overflow also maintains a reputation-based leaderboard system. Stack Overflow is part of the larger Stack Exchange network, which includes various Q&A communities on diverse topics. The overall leaderboard is the main leaderboard that ranks users based on their total reputation points earned across all Stack Exchange sites (Stack Exchange, n.d.). It provides an overview of the most active community members. Stack Overflow also maintains a monthly leaderboard that resets at the beginning of each month. This leaderboard ranks users based on reputation points earned during the current month. It allows users to compete for recognition within shorter time frames.

Stack Overflow, furthermore, covers a wide range of programming and technology topics, which are summarized in so-called tags. Users can earn reputation points by providing contributions in those specific tags. The tags leaderboard ranks users based on their reputation points within that particular tag, showcasing their expertise in that area (Stack Overflow, n.d. d).

Additionally, Stack Overflow also provides a country-specific leaderboard, allowing users to see how they compare to others in their respective countries. It adds an element of regional competition and highlights the active contributors from different parts of the world.

Badges

On Stack Overflow, badges are awarded for achieving certain milestones or performing specific actions (Atwood, 2008b). Badges serve as one way to educate new users on the site's features and encourage their long-term participation and positive engagement within the community. For example, users can earn badges for asking a question that receives a certain number of views, for providing a popular answer to a question, or for editing a post.

As depicted in Table 3, the badge system provides three levels of badges. According to the founders, the badge system on Stack Overflow serves different purposes depending on the badge level (Stack Overflow, n.d. b). While bronze badges incentivize users to explore all the various features of the platform, silver badges encourage ongoing participation, and gold badges serve as goals for completionists and dedicated users.

Table 3: Badge Levels on Stack Overflow (Stack Overflow, n.d. b)

Badge Level	Description
Bronze Badge	Bronze badges encourage users to try out new features on the site. They are easy to get if you try!
Silver Badge	Silver badges are less common than bronze ones. You'll need to plan your strategy to get one of these.
Gold Badge	Gold badges recognize important contributions from members of the community. They are rarely awarded.

Users can track their progress towards the next badge, view the required actions and criteria for obtaining it, and prioritize which badge they want to aim for next. Although participation in the badge system is voluntary, a user's badges are always visible on their Stack Overflow profile and can serve as a visual representation of a user's accomplishments on the platform.

Badge categories include the following actions: question, answer, participation, tag, moderation, other and retired, with different actions required for each (Stack Overflow, n.d. b). Some badges require the same actions and reactions across different classes but with increasing demands in terms of the number of actions and reactions needed. For example, the Good Answer silver badge requires an answer score of 25 or more, while the Great Answer gold badge requires an answer score greater than 100.

The study of Marder (2015) focused on understanding how badges influence user engagement, participation, and contributions within the Stack Overflow community. The findings revealed that badges have a positive influence on user behavior. Users who receive badges tend to exhibit higher levels of engagement, contributing more frequently and actively participating in the community. The study identified specific badges that have a particularly strong impact on user behavior, motivating increased participation, and contributions.

Privileges

Privileges are additional features and capabilities that are unlocked as users earn more reputation points (Stack Overflow, n.d. c). They are designed to reward users for their contributions and to encourage them to continue contributing high-quality content to the platform.

Higher reputation points can lead to more privileges such as the ability to vote to close or reopen questions and the ability to review and edit other users' posts. Upon creating an account, users are granted the fundamental privilege of creating posts. On the other hand, the highest privilege, which involves accessing internal and Google site analytics, is exclusively bestowed upon users who have achieved the highest reputation score. The privileges, which can be achieved with different scores, are shown in Table 4.

Table 4: Reputation Score Privileges on Stack Overflow (Stack Overflow, n.d. c)

Reputation Score	Priviledge	Description
25000	access to site analytics	Access to internal and Google site analytics
20000	trusted user	Expanded editing, deletion and undeletion privileges
15000	protect questions	Mark questions as protected
10000	access to moderator tools	Access reports, delete questions, review reviews
5000	approve tag wiki edits	Approve edits to tag wikis made by regular users
3000	cast close and reopen votes	Help decide whether posts are off-topic or duplicates
2500	create tag synonyms	Decide which tags have the same meaning as others
2000	edit posts	Edits to other users' posts are applied immediately
1500	create tags	Add new tags to the site
1000	established user	You've been around for a while; see vote counts
1000	create gallery chat rooms	Create chat rooms where only specific users may talk
500	access review queues	Access the First posts and Late answers review queues
250	view close votes	View and cast close/reopen votes on your own questions
200	reduce ads	Some ads are now automatically disabled
125	vote down	Indicate when questions and answers are not useful
100	edit community wiki	Collaborate on the editing and improvement of wiki posts
100	create chat rooms	Create new chat rooms
75	set bounties	Offer some of your reputation as bounty on a question
50	comment everywhere	Leave comments on other people's posts
20	talk in chat	Participate in this site's chat rooms
15	flag posts	Bring content to the attention of the community via flags
15	vote up	Indicate when questions and answers are useful
10	remove new user restrictions	Post more links, answer protected questions
10	create wiki posts	Create answers that can be easily edited by most users
5	participate in meta	Discuss the site itself: bugs, feedback, and governance
1	create posts	Ask a question or contribute an answer

<u>Bounties</u>

In addition to these core gamification elements, Stack Overflow also has a bounty system. This system is a way for users to offer rewards for helpful answers to their questions and can be offered by the user who asked the question.

To start a bounty, a user must first ask a question on the site and then click on the 'Start a Bounty' button. The user can then choose the amount of the bounty, which ranges from 50 to 500 reputation points, and the duration of the bounty, which can be either 7 or 14 days. Once the bounty is started, the question is featured prominently on the site, and other users can see that there is a bounty available for answering it.

When a user answers a question that has a bounty, they have the opportunity to win the bounty if their answer is accepted by the user who started it. If the answer is not accepted, the bounty will be awarded to the highest-voted answer after the bounty period ends. If two or more answers have the same number of votes, the reputation points of the bounty will be split equally among them.

The findings of Zhou et al. (2020) indicated that offering bounties on Stack Overflow can significantly increase the visibility and engagement of questions. Bountied questions received more views, votes, and answers compared to non-bountied questions. Additionally, bounties were found to improve the quality of answers as they tended to receive more upvotes and were more likely to be accepted by the question asker. The study also highlighted the importance of the bounty amount in influencing the response rate and quality of answers. Higher bounty amounts attracted more answers and higher-quality responses. Furthermore, questions that had bounties applied to them received answers more quickly than those without bounties.

2.3 The Motivation to Contribute

In section 2.1, knowledge-sharing platforms have been described and defined. Furthermore, the relevance of knowledge-sharing platforms in general and more specifically for software development have been discussed. A central element of these platforms is the willingness of contributors to share their knowledge. In inter-organizational platforms like Stack Overflow where contribution is completely voluntary and no financial reimbursement of the shared knowledge can be expected, the motivation of contributors must stem from somewhere else. Hence, the motivation to contribute has been subject to extensive research (e.g., Lu et al., 2022; Wasko & Faraj, 2005).

Wasko and Faraj (2005, p. 39) described the occurrence of contribution as an act where "*individuals are motivated to access the network, review the questions posted, choose those they are able and willing to answer, and take the time and effort to formulate and post a response*". Thus, replies to questions reflect the voluntary effort invested by the contributors. But if sharing knowledge would be beneficial to potential free-riders and contributors would not benefit from their contributions (Wasko & Faraj, 2005), the question remains why anyone would consider contributing at all. Therefore, it seems clear that the effort into sharing would only be made if the contributor thinks that the investment would create value in general, but also for themselves (Nahapiet & Ghoshal, 1998). To conclude, contributors put effort into sharing knowledge with strangers with the anticipation that this will yield personal benefits as well.

To understand these expected, non-(directly)-financial benefits, thorough research has been conducted about the motivational factors behind the contributors in software development.

Research on voluntary contributions in software development has investigated two main areas: open-source software (OSS) (e.g., Hertel, Niedner & Herrmann, 2003; Ke & Zhang, 2009; Robert, Hann & Slaughter, 2006; Taylor & Dantu, 2021; von Krogh, Haeflinger, Spaeth and Wallin., 2012) and knowledge-sharing platforms like Stack Overflow (e.g., Coleman & Lieberman, 2015; Lu et al., 2022; Wasko & Faraj, 2005). Although motivational aspects differ between these two types, the basic concepts used for researching the OSS area provide interesting insights into the factors that influence the motivation of software developers to contribute in general (Lu et al., 2022). This approach contrasts with the approach of von Krogh et al. (2012) who explicitly excluded contributions in electronic networks of practice from the literature review in their study of motivation in OSS development.

2.3.1 Motivation in Open Source Software Development

"*OSS is usually developed by a loosely-knit community of programmers spread all over the world*" (Hertel, Niedner & Herrmann, 2003, p. 1159), in which developers are usually not employed or paid and often no official institution exists. Additionally, the literature emphasizes that "*OSS doesn't work without contributions from the community*" (Zhou & Mockus, 2012, p. 518). Hence, there are obvious parallels to Q&A forums where also no payment is made in exchange for contributions. Further similarities can be found in the general characteristics of OSS developments such as the fact that authority comes by competence, the implementation of a motivating credit policy for contributions, or the use of clearly communicated rules and norms (Hertel, Niedner & Herrmann2003). Furthermore, joining and leaving the OSS community is considerably easy (Hertel, Niedner & Herrmann, 2003), which is also the case for Q&A communities. Additionally, von Krogh et al. (2012) defined OSS as a public good with the attributes of non-excludability and non-rivalry in consumption, which is also the case for the knowledge shared in Q&A forums.

Since, as stated above, there are usually no financial rewards for contributions, the motivation for contributing to OSS projects stems from somewhere else. Linus Torvalds, the initiator of the Linux movement, described that his personal motive behind the project was the fun of programming (Hertel, Niedner & Herrmann, 2003). He also added that the success of the project led to the finding that contributors are also motivated by reputational factors and career opportunities which might appear in connection with the engagement in the project, which in turn leads to the two main categories of motives being identified by Hertel, Niedner & Herrmann (2003): intrinsic motivation (i.e., having fun with programming) and social comparison (i.e., reputational factors). After conducting their survey in the Linux community, they identified seven more detailed motivational factors: (1) the identification as a Linux user or (2) developer, (3) improvement of their own used software and improved career opportunities, (4) reputation, (5) motives related to the contributor's political and social views, (6) pure joy of programming, and (7) the acceptance of time loss by the contributor. Furthermore, it was detected that the fear of free-riding and exploitation was not an issue within this community.

Roberts, Hann, and Slaughter (2006) clustered the motivational factors in their study of contribution to OSS Apache projects into intrinsic, extrinsic, and internalized extrinsic motivations and researched the interrelations between these types. Intrinsic motivation is considered to be a highly important factor as software developers show a "*high degree of autonomy and self-determination and are valued for their competence*" (Roberts, Hann & Slaughter 2006, p. 986). An example of an intrinsic motivator in OSS is the joy of programming (Hertel, Niedner & Herrmann, 2003; Roberts, Hann, and Slaughter, 2006). On the other hand, internalized extrinsic incentives like reputation, status, and career enhancement were also detected as factors by

Hertel, Niedner & Herrmann(2003) and play a significant role in OSS (Roberts, Hann, and Slaughter, 2006). Financial payments, which were made in these Apache projects as companies employed developers for these projects and personal software needs, can be categorized as purely extrinsic (Ke & Zhang, 2009; Roberts, Hann, and Slaughter, 2006). The definition of the types of motivation will be thoroughly discussed in the upcoming sections.

Ke & Zhang (2009) used the concept of self-determination theory, which also focuses on intrinsic and extrinsic motivational factors (Deci & Ryan, 1985), to investigate the connection between the motivational factors and task performance. According to their research, the identification with the project group had the most significant impact on the performance. Furthermore, their results showed that extrinsic incentives increase long-term engagement.

In a more recent study, Tayler & Dantu (2021) examined new developments in OSS contributions by using self-determination theory in combination with the social practice views framework as developed by von Krogh et al. (2012). In the realm of a more commercialised OSS development, extrinsic incentives play a more important role than intrinsic motivations (Tayler & Dantu, 2021). Although no signs of commercialisation in the contribution to SO could be identified, and hence, SO and OSS differ in this aspect, the frameworks for investigating the motivational factors behind the contribution used by Tayler & Dantu (2021) and von Krogh et al. (2012) provide useful concepts for analysing the motivational aspects on Stack Overflow.

The main identified concepts are self-determination theory, as developed by Deci & Ryan (2000), which is based on a concept of intrinsic and different levels of extrinsic motivations, and the social practice views framework developed by von Krogh et al. (2012). Another concept, namely, the so-called VIST concept, as used by Hertel, Niedner & Herrmann (2003), in the second part of their work – was investigated but due to its focus on online team cooperation, it was found to not be suitable for the setting of Q&A sites where participants act on a more individual level. On the contrary, self-determination theory and the social practice views framework will be further discussed in detail after the discussion about motivation to contribute to Q&A platforms.

2.3.2 Motivation to Contribute to Q&A Platforms

Alike the question of why people would voluntarily contribute to OSS development, the question of why people would voluntarily share their knowledge in electronic networks of practice and Q&A platforms in general has been researched since the emergence of these platforms. As stated above, to contribute, the potential contributor must expect some kind of reward of which the value would exceed the effort of contributing (Nahapiet & Ghoshal, 1998; Wasko & Faraj, 2005).

Research has identified and discussed factors that support or reduce the motivation to contribute. The main and more often discussed factors for sharing knowledge are reciprocity (e.g., Coleman & Lieberman, 2015; Lu et al., 2022; Wasko & Faraj, 2000; Wasko & Faraj, 2005), fun and enjoyment in helping others (e.g., Coleman & Lieberman, 2015; Lu et al., 2022; Wasko & Faraj, 2005), community interest (e.g., Wasko & Faraj, 2000), trust (e.g., Tsai & Ghoshal, 1998; Zhou, 2020), reputation and signalling competence to potential future employers of future job-perspectives (e.g., Lu et al., 2022; Wasko & Faraj, 2005), individual experience and knowledge about the topic (e.g., Wasko & Faraj, 2005), learning and improving programming skills (Lu et al., 2022), personal attitudes or relations to the community and other users in general (e.g., Wasko & Faraj, 2005; Zhou, 2020), ideology (e.g., Coleman & Lieberman, 2015) and the identification with the platform (Zhou, 2020). Furthermore, structural factors were

investigated to cause continued participation in a platform (e.g., Coleman & Lieberman, 2015). Hence, manifold factors potentially can influence the motivation to share knowledge.

Also, how gamification elements affect contributors' motivation to share knowledge on Q&A platforms has been investigated but this research is still considered to be in the infant stage (Lu et al., 2022). While there are some quantitative studies (Amaral & Kang, 2021; Lu et al., 2022), qualitative studies have also been conducted. For example, Coleman & Lieberman (2015) investigated the impact of the reputation management system on SO by conducting semi-structured interviews.

The identified frameworks mostly used were self-determination theory (Amaral & Kang, 2021; Coleman & Lieberman, 2015; Lou et al., 2013; Lu et al., 2022) and social-capital theory (Jin, Li, Zhong, Zhai, 2015a; Wang, Wang, Ma & Wang, 2022; Wasko & Faraj, 2005). Amaral & Kang (2021) specifically included flow theory within self-determination theory in their research about gamification effects on motivation to contribute to SO.

2.3.3 Self-determination Theory

Over several decades, Deci and Ryan developed the self-determination theory (SDT) for explaining human motivation (Deci & Ryan, 1980, 1985, 1991, 2000). For their main concepts, the psychologists identified and defined three basic needs: competence, autonomy, and relatedness. These three needs are then used to explain intrinsic motivation, different forms of extrinsic motivation, and as an opposing phenomenon, amotivation. Although the main idea had been developed over a long period of time, a detailed analysis of the development would exceed the scope of this work. As a result, the following discussion of the concept will be based on Deci and Ryan (2000).

In contrast to other motivational theories, the three basic psychological needs of competence, autonomy, and relatedness of the SDT are defined to be innate and not learned (Deci & Ryan, 2000). In their concept, the fulfillment of these needs is a requirement for the healthy development and well-being of a human. Furthermore, these needs provide the basis for predicting the success of pursuing and attaining a goal, which is the aim of this theory. Finally, a supportive environment of these needs was found to maintain or improve intrinsic motivation and enhance the internalization of extrinsic motivation and aspirations or life goals, whereas a lack of support for one of the needs was shown to lead to poorer results and well-being.

For the first of the three needs (i.e., competence), Deci and Ryan (2000) built upon White's work (1959), in which he defines the term as a "*capacity to interact effectively with its environment*" (p. 297). The argumentation for a need for competence is that humans are thriving for creating an impact on their environment and taking advantage of that interaction. Furthermore, he argues that very few skills are innate and many must be acquired, so eagerness to improve is a necessity for human development. Deci and Ryan (2000) also argued that learning organisms adapt more easily to new challenges in ever-changing contexts, which further stresses the importance of competence. Therefore, White (1959) saw competence as one of the basic drives in human beings and Deci and Ryan (2000) defined it as one of the three psychological needs within their concept of self-determination theory.

Relatedness is also considered a basic psychological need in the context of self-determination theory (Deci & Ryan, 2000). The psychologists followed the definition of Baumeister and Leary (1995) and explain the term as the need to "*feel connected to others – to love and care, and to be loved and cared for*" (Deci & Ryan, 2000, p. 231). Resource sharing and specialisation made

it important to share knowledge, internalize group needs, and create common values, which are all subsumed in this construct. On the other hand, the need for relatedness can conflict with the need for autonomy (Deci & Ryan, 2000).

Thirdly, the basic need for autonomy relates to the self-organisation of experiences, behavior, and understanding of oneself (Deci & Ryan, 2000). According to Deci and Ryan (2000), this basic need is crucial to prevent one from being trained in wrong or disastrous ways and to improve the regulation of their actions.

Based on these three needs, the psychologists developed their theory for motivation, which can be classified as intrinsic, extrinsic, and amotivation. While in their concept, intrinsic motivation is regulated intrinsically and amotivation is non-regulated, extrinsic motivation can be distinguished into four different categories: external, introjected, identified, and integrated regulation. Furthermore, the kinds of motivations are differentiated by the locus of causality from internal to external (Deci & Ryan, 2000).

Intrinsic motivation in SDT concerns "*active engagement with tasks that people find interesting and, in turn, promote growth*" (Deci & Ryan, 2000). Hence, intrinsically motivated behavior is voluntary engagement in an activity in the absence of consequences. Furthermore, intrinsically motivated activities may be carried out without the activity being directed to need satisfaction. However, to maintain the activities over a longer period, the needs for autonomy and competence must be met (Deci & Ryan, 2000).

Early studies (e.g., Lepper, Greene & Nisbett, 1973) have already shown that the implementation of external rewards undermines intrinsic motivation and people feel controlled by the rewards. This can be explained by the underlying shift of focus from the autonomous decision for carrying out the activity towards the external rewards (Deci & Ryan, 2000). Hence, the need for autonomy is undermined by this shift.

While there is only one, pure kind of intrinsic motivation, extrinsic motivation is categorized into different kinds which depend on the stage of internalization. In SDT, internalization is interpreted as "*an active, natural process in which individuals attempt to transform socially sanctioned mores or requests into personally endorsed values and self-regulations*" (Deci & Ryan, 2000, p. 236). Ideally, the internalization process proceeds until one identifies with the significance of the task so that the person fully accepts it as if it was their own will.

The four different kinds of extrinsic motivations are external regulation, introjection, identification, and integration. First, under external regulation, one shows a certain behavior only to attain a reward or to avoid punishment. Therefore, externally regulated behavior will not be maintained as soon as the reward or threat does not exist anymore. Second, introjection can be described as swallowing a regulation without digesting it (Deci & Ryan, 2000). In contrast to extrinsic regulation, motivation results from motivational factors such as self-worth or guilt (Deci & Ryan, 2000). The psychologists interpret this category as being within the person but remaining external to the self. Thirdly, by identification one understands and accepts the underlying value of their behavior (Deci & Ryan, 2000). Although the motivation is still external, the behavior is perceived as being more autonomous which is why higher commitment is expected. Finally, in the case of integration, the value of the behavior is not only understood but also connected to a person's identity and values which results in self-determined extrinsic motivation (Deci & Ryan, 2000).

Although internalization is described as a natural process, it does not happen automatically. The fulfillment of the three needs – relatedness, autonomy, and competence – builds the basis for the process (Deci & Ryan, 2000). Hence, for full integration, a person must completely

understand the importance of the requested behavior and have the freedom to actively self-integrate it into their views and values.

2.3.4 Flow Theory

In their study on the impact of gamification on contributors' motivation to participate in SO, Amaral and Kang (2021) referred to flow theory.

Flow describes the state in which a person is extremely involved in their intrinsically interesting actions so that the person almost ignores everything around them while enjoying performing the action (Csikszentmihalyi, 2014; Shernoff, Csikszentmihalyi, Schneider & Shernoff, 2003). According to Csikszentmihalyi (2014), when in the flow, the border between the person themselves and their environment almost vanishes but at the same time the person feels full control over their actions.

To achieve the flow status, several requirements must be met (Csikszentmihalyi, 2014). First, the task must meet the person's skills. If the perceived complexity of the tasks exceeds the perceived capabilities of the person, the person would feel anxious. On the contrary, if the perceived skills exceed the perceived complexity of the task, the person will be bored (Csikszentmihalyi, 2014). In both cases, the state of flow will not be achieved. Second, the ability to completely ignore potential distractions is needed, which can be achieved through motivational elements provided by the system. According to the author, these elements can be competition or material gains. Third, the rules for performing the actions (e.g., the game) must be followed by all participants. Furthermore, the system must be "*understandable, definable and manageable*" (Csikszentmihalyi, 2014, p. 141). However, this state cannot be kept up eternally. It is regularly interrupted by reflections (Csikszentmihalyi, 2014). If the criteria are met and the challenge and skills meet each other as well, a flow state can be reached which leads to even more engagement (Hamari, Shernoff, Row, Coller, Asbell-Clarke & Edwards, 2016). Amaral and Kang's (2021) findings support the idea that gamification can help users to achieve a flow state and, therefore, support the motivation to contribute to Q&A communities.

2.3.5 Social Practice Views Framework

Tayler and Dantu (2021) examined new developments in OSS contributions by using self-determination theory in combination with the social practice views framework.

Von Krogh et al. (2012) developed the social practice views framework due to gaps identified in the existing frameworks. Building upon MacIntyre's (1981) basic idea of human lives being embedded in social practices, the authors developed their idea of the *unity of life.* According to this idea, people do not work towards immediate rewards but rather focus on reaching or maintaining consistency of actions over their lifespan.

Hence, the focus of the social practice view is seen to be long-term in contrast to the SDT, in which von Krogh et al. (2012) interpreted the goals and actions as short-term. Furthermore, in this framework, individuals learn what behavior is important and which behavior it makes sense to acquire in a social environment, which contradicts the idea in SDT of the basic needs as being innate. Also, the overall output is different in SDT and social practice. While in social practice the output is the good that is supported by the action, the social-determination view sees the produced features, or the hours of work spent as output. Finally, also the perception of quality differs. In the social practice view, the group involved strives for excellence. On the other hand,

SDT's perception of quality focuses on resolving its own technical problems. Hence, with these differences to the SDT, von Krogh et al. (2012) have developed a framework that acknowledges ethics as a central role and does not isolate individual motivation from the social environment.

2.3.6 Social Capital Theory

Although social capital as a term had already been discussed in earlier works, it was the work of Nahapiet and Ghoshal (1998) which formalized social capital theory as a framework and, thereby, split up the social capital into its three dimensions: structural dimension, cognitive dimension, and relational dimension. According to their work, the transfer and combination of knowledge (intellectual capital) are in direct relation to these dimensions. Furthermore, new intellectual capital is seen as the result of the combination and exchange of existing knowledge.

Each of the three dimensions covers different aspects (Nahapiet & Ghoshal, 1998). First, the structural dimension concerns issues related to network ties, network configuration, and the appropriability of the organization. Second, shared codes and language as well as shared narratives are covered in the cognitive dimension. Finally, the relational dimension deals with the factors of trust, norms, obligations, and identification. Hence, each of these dimensions covers different aspects that impact the exchange of knowledge.

However, in the framework of Nahapiet and Ghoshal (1998), these factors do not directly lead to the creation of knowledge, but first impact mediators that facilitate the exchange of knowledge. They have defined four main mediators, namely, access to parties, the anticipation of value, the motivation to share knowledge, and the capability to combine it.

As the framework is broad and uses different factors and viewpoints to understand which prerequisites influence knowledge sharing, it has been used in knowledge-sharing research (e.g., Wasko & Faraj, 2005). Besides the motivational aspect, which is included as one of the mediators, structural, and community aspects are considered as well.

2.4 Theoretical Frameworks

In the previous section, the motivational aspects that lead to contribution were discussed. Furthermore, four different main frameworks to investigate how contributions can emerge were described. While self-determination theory (SDT) and flow theory concern directly the individual motivations of contributors, social practice views framework and social capital theory apply different approaches that include constructs that go beyond pure motivation. Hence, the focus of this work will be on self-determination theory and flow theory. Table 5 summarizes the identified constructs of these two theories:

Table 5: Constructs of Self-Determination Theory (Deci & Ryan, 2000) and Flow Theory (Csikszentmihalyi, 2014)

Self-Determination Theory	
Autonomy	Self-organisation of experiences, behavior, and understanding of oneself
Competence	Skills to make a difference
Relatedness	Connection to others
Intrinsic Motivation	Engagement in interesting task
Internalized Extrinsic Motivation	Integration of socially expected behavior into own values
Extrinsic Motivation	The task is only performed to attain a reward or avoid punishment
Flow Theory	
A balance between challenge and skills	A need for matching the perceived skills and the perceived complexity of the challenge
Merging Action and Awareness	Full awareness of the action; loss of awareness of oneself; no reflection of actions
Centring of Attention	Full attention on the action; intruding stimuli are neglected
Loss of Ego	No need for the 'self' during the activity
Control of Action and Environment	No thoughts about losing the control
Demands for Action and Clear Feedback	Direct demands for action; immediate and clear feedback
Autotelic or self-rewarding experience	No need or rewards external to the task itself

3 Methodology

3.1 Research Philosophy

With our research on gamification elements on Stack Overflow, we aimed to gain a deeper understanding of the experiences and perceptions of individuals sharing knowledge within the Stack Overflow community.

Interpretivism is a research philosophy that focuses on understanding the meanings, beliefs, and interpretations of individuals within a social context (Saunders, Lewis & Thornhill, 2019). It is a qualitative approach that seeks to understand the subjective experiences and meanings of users concerning the gamification elements on Stack Overflow. This approach rejects the positivist assumption of objective reality and, instead, seeks to understand the social world from the perspective of the individuals involved (Saunders, Lewis & Thornhill, 2019).

In the context of our research study on gamification elements on Stack Overflow, interpretivism allowed us to explore how individuals interpret and engage with these elements and how they influence their participation on the platform. This approach is particularly relevant in this context as gamification elements are inherently subjective and can have different meanings for and effects on different individuals (Deterding et al., 2011; Mekler, Brühlmann, Opwis & Tuch, 2013). According to Saunders, Lewis & Thornhill (2019), interpretivism is particularly useful for studying complex social phenomena, such as gamification, where the meaning of the phenomenon is constructed and negotiated by the participants. The interpretive approach allowed us to understand the subjective experiences and meanings of the gamification elements for Stack Overflow users and how these elements influence their behavior and engagement with the platform.

Stack Overflow is an online platform for software developers that has been proven to have high levels of user participation and engagement as well as high levels of user satisfaction (Ye, Zhang & Li, 2014). Studies have found that most questions on the platform receive multiple answers and that users spend a significant amount of time interacting with the platform and other users (Bosu, Chaudhary & Kannan, 2016; Ye, Zhang & Li, 2014). One of the key advantages of using interpretivism in this study is that it allowed us to capture the richness and complexity of the user experience (Goldkuhl, 2012) and to understand the meanings and interpretations of gamification elements from the perspective of the users themselves. This is particularly important in the context of Stack Overflow, where the platform is designed to be highly interactive and participatory and where users can have a wide range of motivations and goals for engaging with the platform.

Saunders, Lewis & Thornhill (2019) further emphasized that interpretivism allows scholars to explore the social and cultural context. Thus, interpretivism allows us to explore the social and cultural context in which gamification elements are used on Stack Overflow. This includes examining how users' interpretations of how gamification elements are influenced by factors such as their social and cultural backgrounds, their motivations and goals for participating in the platform and the broader social and cultural norms, and expectations that shape their participation on the platform.

Overall, interpretivism offered a valuable research philosophy for studying gamification elements on Stack Overflow as it allowed us to gain a deep and contextualized understanding of the experiences and perceptions of individuals within the community.

3.2 Research Approach

When examining phenomena, which have not yet been thoroughly investigated, Recker (2013) considered qualitative research as an appropriate approach. Creswell (2013) stated that semi-structured interviews provide a flexible framework for the research process as it facilitates the exploration of specific research questions and unanticipated themes that may arise during the interviews. This approach allowed a more in-depth and holistic understanding of the motivational aspects of gamification elements as it also allowed to follow up on interesting ideas or observations brought up by the interview partner (Creswell, 2013). Thus, using semi-structured interviews allowed us to gain a deeper understanding of how contributors within the Stack Overflow community experience and make sense of gamification elements. This is particularly important as there is a variety of ways in which participants experience and perceive the effects of gamification elements on their motivation to share knowledge on Stack Overflow.

Current studies that have been conducted to analyse the effects of gamification on Stack Overflow had a quantitative focus (e.g., Amaral & Kang, 2021). Gamification is implemented to increase user engagement, which is directly interconnected with a user's motivation (Deterding, 2011). In the conclusion of their quantitative study of gamification and its effect on intrinsic motivation, Mekler et al. (2013) emphasized that social and contextual factors can impact motivation and need to be considered when studying motivation. Qualitative interviews, however, allow the researchers to *enter into the other person's perspective*" (Patton, 2015, p. 628) and are a widely applied research tool within information systems (IS) research and are argued to be powerful because of the opportunity to gather rich data (Myers & Newman, 2007). Especially semi-structured expert interviews are used to gather specialist knowledge about phenomena that are subject to the specific research (Recker, 2013). According to our research goal, we argue that using semi-structured expert interviews as a data collection method brought additional insights to the current understanding of the phenomena of voluntary knowledge sharing due to its advantages in gathering specialist data.

As there are no perfect methods, semi-structured interviews also have their challenges. Myers and Newman (2007) identified a list of problems, which we took into consideration when conducting the interviews. As Stack Overflow users are internationally represented, in-person interviews to reduce the artificiality of online interviews and create trust was not possible. However, Janghorban, Roudsari and Taghibpour (2014) argue that online video interviews can be even more convenient for participants and provide the same authenticity level. There is also a risk that respondents will give the answers that the researchers would like to hear as the researchers are not a neutral body in this process (Myers & Newman, 2007). Even though semi-structured interviews have some problematic areas, we argue that the semi-structured interview was still the best data collection method for our research purpose due to the possibility of gaining deep insights.

Furthermore, this methodology complemented the described research philosophy. Interpretivism emphasizes the importance of context and subjectivity in the research process (Saunders, Lewis & Thornhill 2019). In the case of gamification elements on Stack Overflow, we took the unique experiences and backgrounds of each individual interviewee into account, as well as the broader social and cultural context in which the community exists. By considering these factors, it was possible to gain a more nuanced and comprehensive understanding of the gamification elements on the platform.

In qualitative research, data collection and data analysis techniques are often connected and dependent on each other (Recker, 2013). Hence, the alignment between the methods is crucial

to achieve good results. Analysing the data in such a way that relevant data is identified, interpreted, and used to generate insights is a task for which there is no universal solution (Patton, 2015). According to Patton (2015), general principles for guidance have been developed, for which the application is still up to the researcher's judgement and creativity as general valid rules are missing.

The interviews were followed up by a thematic analysis of the collected data, according to Braun and Clarke (2012). Recker (2013) describes coding as useful for transforming qualitative data into expressive information. Thereby, this involved categorizing the data obtained through transcription of the semi-structured interviews by tagging and labelling them to identify the key ideas (Patton, 2015). To understand the meaning of the data, each part of the data must be considered and analysed (Linneberg & Korsgaard, 2019). Coding the interviews allowed a systematic and organized analysis of the data, which in turn allowed us to identify patterns and themes in the participants' responses (Braun & Clarke, 2012; Creswell, 2013). This provided a more comprehensive understanding of how gamification elements affect motivation to share knowledge on Stack Overflow and helped us to identify potential areas for further research and exploration.

Thus, a qualitative research approach with semi-structured interviews and thematic analysis was an appropriate method to answer the research question of how gamification elements affect the motivation to share knowledge on Stack Overflow. This approach has proven to be a systematic and organized way of analysing the data which provided us with a deeper and nuanced understanding of the experiences and perspectives of knowledge contributors.

3.3 Literature Review

In line with Recker's (2013) objective of acquiring knowledge to be able to contribute within the field of research, our study followed his recommendation to start the research journey with a comprehensive literature review. This involved exploring literature related to gamification, motivation, and knowledge sharing to identify existing gaps in these areas. Levy and Ellis (2006) emphasized the importance of literature in shaping research questions and validating the study's approach. Therefore, a wide range of literature was used to gain a comprehensive understanding of this topic. Especially the initial review helped in refining and narrowing down the research question.

To ensure a qualitative and effective literature review, we adopted Levy and Ellis' (2006) concept-centric approach, which minimizes the risk of overlooking essential literature. The review was organized by using keywords that were progressively adjusted based on the knowledge acquired throughout the process. We utilized search engines such as LUBSearch and Google Scholar to access relevant literature. In selecting the Information Systems literature, our focus was primarily on journals from the Senior Scholars' List of Premier Journals, supplemented with well-established publications to ensure the reliability and quality of the literature.

The findings of this extensive literature review are summarized in Section 2, providing a comprehensive overview of the current state of knowledge in this field.

3.4 Data Collection

While semi-structured interviews follow a general set of prepared questions, their setting allows follow-up questions and discussions which might come up during the interview (Recker, 2013). According to Recker (2013), this allows flexibility and the opportunity to discuss newly brought-up details which can be valuable for understanding the phenomenon. As quantitative research with restricted flexibility has already been conducted and interviewing in qualitative research "*requires openness, flexibility and improvisation*" (Myers & Newman, 2007, p. 14), we used semi-structured interviews as they enabled us to bring up new questions and to discuss ideas that are brought up by the participants in more detail which led to a deeper understanding of a contributor's motivation to share knowledge. The comprehensive interview guide obtained from our extensive literature review can be found in Appendix 2, serving as a valuable tool for conducting our semi-structured interviews.

To select our interview participants, we devised a procedure centred around contacting users who exhibited the highest increase in reputation score during the timeframe of May 2022 and April 2023. This selection process was justified with several arguments. On the one hand, users with a significant increase in reputation score are likely to possess a deep understanding of the platform and have actively engaged in its community. Their high reputation suggests a level of expertise and involvement that can provide valuable insights into the motivational aspects of gamification on Stack Overflow. On the other hand, users, who experience a substantial reputation score increase, are likely to have been motivated by various gamification elements such as earning badges, reputation points, or unlocking privileges. By interviewing these individuals, we gained access to firsthand experiences and perspectives on the specific elements that motivated their engagement. Furthermore, by targeting users with diverse backgrounds, expertise, and reputation score increase, we aimed to capture a wide range of perspectives. This diversity enhances the comprehensiveness and richness of our research findings, enabling a more nuanced understanding of the motivational effects. Finally, the users' reputation scores and their changes over time are readily available on Stack Overflow, offering an objective and easily measurable criterion for participant selection. This data-driven approach enhances the transparency and replicability of our research process.

All the interviews were conducted online in English. Conducting them in English was the best way to communicate with the participants as it ensured that everyone could understand each other. Furthermore, all interviews were recorded using the integrated recording services of the used communication tools, namely Microsoft Teams and Zoom. The recordings initially transcribed automatically with Google Pinpoint and reworked manually could then be used for analysis purposes.

Following the initial phase of two pilot interviews, we made minor adaptations to our interview guide based on the insights gained from these preliminary sessions. The use of pilot interviews allowed us to assess and refine our interview guide (Majid, Othman, Mohamad, Lim & Yusof, 2017). These initial interviews provided us with valuable feedback on the clarity of our questions, the effectiveness of probing techniques, and the overall suitability of the guide. Incorporating this feedback, we made necessary adaptations to optimize the guide for subsequent interviews.

Subsequently, we conducted four additional interviews, resulting in a total of six interviews for our study. By conducting four additional interviews after the pilot phase, we embraced an iterative approach. This iterative process allowed us to refine our research questions, deepen our understanding of the phenomena under investigation, and capture a broader range of

perspectives and experiences. Each interview informed subsequent interviews, enabling us to delve deeper into emerging themes and develop a more comprehensive understanding. The six interviews collectively yielded rich and diverse data. The participants' insights and experiences provided in-depth information about their motivations, engagement patterns, and perceptions of gamification elements on the platform. The data obtained through these interviews enabled us to gain a nuanced understanding of the motivational dynamics at play on this platform.

Saturation, the point at which new information and insights cease to emerge, is a critical concept in qualitative research (Fusch & Ness, 2015). According to Fusch and Ness (2015), achieving saturation indicates that data collection has reached a point of theoretical sufficiency, where further interviews are unlikely to generate significantly novel findings. By reaching saturation after six interviews, we can be confident that our data is comprehensive and that we have captured the major themes and variations in participants' perspectives on the motivational aspects of gamification on Stack Overflow. In addition to saturation, our research design incorporated data triangulation. By combining insights from multiple participants, we sought to validate and corroborate findings across interviews. This approach enhances the credibility and trustworthiness of our study, strengthening the scientific rigor of our analysis.

3.5 Data Analysis

Following the data collection, the interviews were transcribed and for accessibility and reference, the transcriptions have been provided in Appendix 3.

Following an interpretative approach to gain a holistic understanding of the motivational aspects of gamification, we applied manual inductive coding, as described by Saldana (2013) under the terms of initial coding. This helped us to avoid limiting the power of the data due to predefined lower-level codes and we used the opportunity to "*reflect deeply on the contents and nuances*" (Saldana, 2013, p. 100) of the data. Furthermore, we coded independently to achieve greater dimensionality (Linneberg & Korsgaard, 2019) and merged our coding afterwards.

As second cycle coding was performed to "*develop a sense of categorical, thematic, conceptual and/or theoretical organization*" (Saldana, 2013, p. 207), the thematic analysis provided a systematic and flexible approach to identifying patterns, themes, and meanings within data received from the interviews (Braun & Clarke, 2012). Higher-level categories were created to retrieve a limited number of themes and subthemes instead of a larger number of different codes (Linneberg & Korsgaard, 2019).

However, to utilize these insights more efficiently, it is essential to connect them with existing theoretical knowledge (Recker, 2013). Combining the data obtained in the qualitative interviews with the theoretical background from the literature review helped to contextualize our findings, identify patterns, and validate and refine existing theories. This process enhanced the credibility and richness of the research outcomes. In the discussion section, we, therefore, compared the interview findings with the existing theoretical background obtained from the literature analysis, seeking convergence, divergence, or expansion between the collected data and the theoretical concepts.

3.6 Ethical Considerations

When conducting semi-structured interviews, several ethical considerations should be taken into account. According to Patton (2015), one of the key ethical considerations in conducting interviews is ensuring the informed consent of the participants. Therefore, we clearly explained the purpose, nature, and potential risks of the study to our participants in a consent form, provided by us before the interview began (see Appendix 1). Furthermore, we allowed the participants to ask questions and express any concerns about the study before agreeing to participate. We emphasized this in the pre-interview discussions. In this discussion, we ensured that the participants were aware of their right to withdraw from the study at any time and that they were not required to participate against their will. We also pointed out that the participants were aware that their responses will be kept confidential and will not be shared with anyone outside of the research project without their permission. As we recorded the interviews, we obtained written consent to these points from the participants before beginning the interview.

Another important ethical consideration is the confidentiality of participants' responses (Patton, 2015). Researchers should ensure that participants' responses are kept confidential and are only shared with those who have a legitimate need to know. For the transcriptions, we used anonymous codes to identify the responses instead of using the interview partners' names. We kept the responses in a secure location and only shared them with people who needed to know sensitive information. After the conclusion of the research study, the audio recordings of interviews were expunged to ensure participant confidentiality and data privacy.

Additionally, researchers should be aware of the potential for bias or coercion in the interview process (Recker, 2013). For example, if the researcher has a particular hypothesis or perspective on the topic being studied, they may inadvertently lead the participants in a certain direction or influence their responses. To avoid this, we established clear boundaries and rules for the interview to avoid asking leading or suggestive questions that could bias the participants' responses (Sapsford, 2006). Finally, it can be helpful to have another person present during the interviews to provide a second set of eyes and ears and to help ensure that the interview is conducted in a fair and unbiased manner (Saunders, Lewis & Thornhill 2019). This has been achieved by having both authors of this study present during all interviews and alternating between one person taking the role of the interview guide and the other person taking the monitoring role.

3.7 Scientific Quality

Tracy (2010) defined "*eight 'Big-Tent' criteria for excellent qualitative research*" (p. 840): worthy topic, rich rigor, sincerity, credibility, resonance, significant contribution, as well as ethical and meaningful coherence. All these aspects were considered when conducting the research and will be further discussed in this section.

Criteria for a topic to be considered worthy of being researched are relevance, timeliness, significance, and interest (Tracy, 2010). Furthermore, Recker (2013) argued that the research question needs compelling argumentation for the significance of the problem. As discussed in previous sections, gamification as part of HCI is an intensively researched field within IS. Furthermore, Stack Overflow is an important platform for knowledge sharing within the community of software developers, in which a lot of recent research has been made. Hence, we are not only convinced that our research topic fulfils the criteria defined by Tracy (2010) but also closed a

gap in current research in terms of trying to understand the motivational effects of gamification towards knowledge sharing and therefore provide a significant contribution to the field.

According to Recker (2013), it is more difficult to demonstrate rigor in qualitative research than in quantitative research because there are different traditions in terms of epistemological views, data collection and analysis, and researchers' views on the role of theory. Tracy (2010) emphasized that choosing and correctly applying fitting interview and analysis methods, choosing and thoroughly describing the contexts, and collecting enough, interesting, and significant data are the crucial factors to achieve rich rigor. As the choice of the methods has been already described and argued in the previous sections, we, therefore, also focused on a detailed description of the contexts of this research.

Tracy (2010) discussed issues of biases and subjective values of the researchers under the term sincerity. Although it is hard and sometimes impossible to avoid bias (Sicca, 2006; Smith & Noble, 2014), Tracy (2010) argued that transparency by disclosure of critical aspects regarding the research and self-reflexivity can help to achieve sincerity. Furthermore, the same author emphasized the need for a thick description of the contexts and every facet of the research, as well as multivocality and triangulation, which are critical aspects to improve the credibility of the research. Bearing the aspect of a thick description in mind, we used the findings of existing quantitative research results (e.g., Amaral & Kang, 2021) to challenge our results and, hence, achieve triangulation within the research field.

The interpretation of generalization in qualitative research differs from the definition of its quantitative counterpart. As discussed by Tracy (2010) under the term of resonance, the result of qualitative research, which is mostly connected to specific settings, might still be transferable to other settings. As discussed in previous sections, we believe that our results are also helpful and applicable in the design and integration of gamification in other knowledge-sharing platforms.

4 Findings

In the course of analysing and coding the data, subthemes and main themes emerged. This chapter describes the categorization and delimitation of the identified phases and discusses them in further detail. While analysing the data, the need for separating the findings into three different phases became apparent. Gamification elements affect the motivation of contributors differently at different phases. The authors call the phases 'How do I get started?', 'How do I get hooked?', and 'How do I continue? / How do I stop?'.

Furthermore, eight main themes were detected, namely, 'Prerequisites', 'Creating a Habit', 'Playing a Game', 'Saturation', 'Gaining Competence', 'Being Recognized', 'Contributing to the Community' and 'Creating an Encyclopaedia'. 'Prerequisites', 'Creating a Habit', 'Playing a Game' and 'Saturation' could be associated with and influence a specific phase. 'Gaining Competence', 'Being Recognized', 'Contributing to the Community', and 'Creating an Encyclopaedia' were found to be differently affected by gamification elements in each of these phases. To summarize the findings and discuss the relations between subthemes, themes, and phases, Table 6 has been created and will be further discussed in detail throughout the following sections.

Table 6: Identified Themes and Subthemes Affecting the Motivation to Share Knowledge

	How do I get started? **Prerequisites**	*How do I get hooked?* **Creating a Habit, Playing a Game**	*How do I continue?* *How do I quit?* **Saturation**
Gaining Competence	Bounties as a Motivational Tool to Facilitate Knowledge Sharing	Gold Badges as Motivation to Increase Knowledge Developing an Answering Strategies to Increase the Reputation Score	Limited Motivational Impact of Bounties on Answering Questions Bounties as Signals of Challenging Questions
Being Recognized		Badges as Gratification and Signals of Expertise Motivation Through Upvotes, Reputation Points, and Leaderboards Reputation as an Indicator of Competence Motivation Through Accepted Answers	Gamification Elements as Signals for Competence and Career Advancement Missing Feedback through Gamification Elements Leads to Demotivation Saturation Effect of Sufficient Gratification on Motivation Recognition Beyond Points as a Motivation to Help Others

| | How do I get started? | How do I get hooked? | How do I continue? How do I quit? |
	Prerequisites	**Creating a Habit, Playing a Game**	**Saturation**
Contribute to the Community	Demotivation due to Downvotes among New Users	Gamification Elements as a Punishment in Demotivation	Upvotes as Encouragement for New Users
		The Benefit of the Doubt in Evaluation and Voting	Encouragement of Users Through Upvotes
		Specific Badges as Motivation to Answer Old or Downvoted Questions	Demotivation due to Reputation Cap
			Rookie Protection Through Downvotes
Creating an Encyclopaedia	Quality Improvement Through Downvotes and Comments	Motivation Through Good Questions and Earned Upvotes	Association between High Reputation Users and Good Contributions
		Privileges and Editing Options as a Result of Contribution	Contributing With the Knowledge of Limited Reputation Gain
		Editing Contributions for Reputation Gain and Quality Improvement	Bounties as a Signal for Value and Incentive for Answering
		Long-Term Return for Good Answers and Its Influence on Answering Strategy	Specific Badges as Incentives to Answer Questions, Beyond Daily Capacity Limits
			Privileges as Enablers of Efficiency and Enhanced Access in the Community

4.1 Phases of Contribution

The interview data show the necessity to split the investigation of the impact of gamification elements on the motivation to share into three phases. First, the 'How do I get started?'-phase is mainly characterized by the prerequisites that a future contributor will bring along. Second, during the 'How do I get hooked?'-phase, the contributor's motivation is shaped by the creation of a habit which was supported by the user's affection for playing a game and the individual's perception of the gamification elements. Finally, the saturation of the game characterizes the last phase 'How do I continue? / How do I quit?'.

4.1.1 How Do I Get Started?

In the 'How do I get started?'-phase, the way of a potential contributor towards contribution is discussed. During this phase, three prerequisites were found to play a major role: availability of knowledge, interest in a topic, and personality traits.

The interviewees described the availability of knowledge as a main driver to start contribution. *"I had this knowledge [...] and then I realized oh, this might be a way that I can contribute back"* (I3:2), was how interviewee 3 described the motivation to write his very first answer. Another participant reflected on his first answer, that he saw questions, *"saw that I know the answer to them and I decided to answer"* (I6:8). Hence, for users to have the courage to answer their first question, the existence of knowledge was important.

A second aspect is the future contributors' interest in a specific topic or question. The contributors explained that triggered by an existing question, e.g., by the challenge of a question or because the contributor is looking for an answer to a question, finds a question but it is not answered in the way it would help them. So, they would have to find a solution on his own and answer the question accordingly. Other contributors described their first answered question as *"fascinating"* (I5:2) or *"interesting"* (I1:4). The factor of interest was furthermore reflected by one interviewee as *"an outlet for my interest in the topic, even though I didn't have an actual project to work on actively"* (I6:8).

The final detected prerequisite is the personality traits of the contributors. A common motivational aspect was the urge to help people. Some interviewees were teachers or trainers themselves and contribute to the platform as they enjoy teaching. Another aspect was the affection for what they perceived as beautiful code, which leads to contribution.

4.1.2 How Do I Get Hooked?

During the second phase, two themes were detected: 'Creating a Habit' and 'Playing a Game'. After giving the first answer, the interviewees of this study became engaged in what they described as a game. Through that game, many of them created a habit, partly with elements which could be recognised as common in addiction.

The aspect of playing a game was the main driver in this phase. Contributors described the gaming aspect as *"A big part of it was definitely … it was basically a game"* (I6:22), *"I viewed SO at a point more as kind of like a game"* (I6:22), or *"whenever you get hooked into any game you might be very passionate about it for a while"* (I6:40). One driver of this development was the gamification elements. During that period, some contributors developed answering strategies to maximize their success in the game which, e.g., was reflected as *"sometimes getting your answer in quickly is the way to earn reputation"* (I4:8).

Through 'Playing the Game' users created a habit. Aspects of habits were widely mentioned by the participants. One contributor, for example, said: *"I start the day, I see some questions that I can answer. I answer them"* (I1:41). Because of their habit, the users keep contributing. *"I know, looking at the reputation growing was something that was fun for me for a very long time and it was definitely a driver"* (I6:10), or *"just getting more rep every day is kind of a … dopamine hit"* (I2:6) are just two examples of how contributors see the influence of gamification elements on their creation of a habit or addiction. Furthermore, the contributors reported that it felt like an obsession or that they felt hooked by these gaming elements.

However, at the same time, the participants' perceptions of gamification elements appeared to be contradictory to some extent. On the one hand, reputation scores were described as "*imaginary internet points*" (I2:18) and the contributors commented on them when describing the impact of the gamification elements as "*it sounds silly*" (I4:17) or "*it feels a bit absurd when you talk about it*" (I1:14). On the other hand, these elements were used and described as accomplishment and progress, which led them to procrastinate other tasks. More specifically, the gamification elements let users perceive the time spent on the platform as productive and useful. Hence, these elements had a great impact on the motivation to share knowledge and create a habit.

4.1.3 How Do I Continue?

In the last phase, users developed saturation towards the gaming aspect. While gamification was an important aspect to create a habit and get people involved, the importance of these elements has changed for the contributor over time. So, they reported that hunting reputation score had been a driver "*for a very long time*" (I6:22) but also that they did not care about them to the same extent anymore. They reported satisfaction with their badges and reputation score; however, they also reported boredom. More specifically, a theme of diminishing marginal benefits was detected as participants reported that they did not see an additional benefit of further reputation points or badges to the same extent as they saw it in earlier stages. This was expressed by statements such as "*Persons who have like 500 points for them 200 is a lot. I mean that's almost half of it extra. Whereas if you have like 10,000 points and 200 is not that much anymore.*" (I5:17), or "*You know, another 10 points doesn't [sic] actually move the needle all that far*" (I4:17).

While some interviewees stated that they did not have the same motivation to contribute anymore compared to when they started contributing on Stack Overflow, some managed to keep the habit. They reported that they did not care about the points anymore but still kept the habit to visit the site and answer the questions. In general, gamification in general was perceived by the contributors as a good early motivator to create a habit which leads to the continuation of contributing, even after the user lost interest in the gamification part.

Other aspects that keep people motivated to share knowledge on Stack Overflow mentioned by the participants were the contribution to the general good and the further development of skills. As discussed in more detail in the following sections, contributors want to help other people in the community by answering questions and solving problems or wanting to support the platform as it thrives to become an encyclopaedia for software developers. Furthermore, the contributors stayed active because they could improve their own skills by researching for answering the questions and could get immediate feedback.

4.2 Gaining Competence

The theme of 'Gaining Competence' emerged prominently as a motivation for active participation among the interviewed contributors on Stack Overflow. Several key aspects were identified within this theme. Contributors expressed a desire to continuously challenge themselves by seeking complex and diverse problems to solve. They viewed such challenges as opportunities for personal growth and intellectual stimulation. Overcoming these challenges allowed them to expand their problem-solving abilities and enhance their overall programming competence. The

participants demonstrated a strong motivation to acquire new knowledge and skills. They actively sought out questions and topics that aligned with their interests or presented opportunities to explore unfamiliar areas. The process of researching and finding solutions not only expanded their knowledge base but also improved their ability to assimilate information efficiently.

4.2.1 Bounties as a Motivational Tool to Facilitate Knowledge Sharing

"I heard about these bounties and I thought if I had enough points to put a bounty on a question, then I could get somebody to answer my question." (I2:2)

Within the broader theme of 'Gaining Competence', one subtheme that emerged was the utilization of bounties as a motivation to share knowledge. The participants highlighted the significance of bounties to motivate their knowledge sharing on Stack Overflow as the ability to offer bounties provides them with a tangible incentive to accumulate reputation points.

Offering bounties requires a certain level of reputation points. Hence, in the first phase, the desire to accumulate reputation became a driving force for the users as it would directly enable the option to put bounties on questions. Accumulating reputation points and reaching the necessary threshold became a goal, incentivizing a user's beginning of their contribution and further engagement on the platform. The participants emphasized that bounties provide an avenue to attract more attention and encourage knowledgeable individuals to invest time and effort in providing a solution. The act of allocating a significant portion of their reputation points to a bounty demonstrated the value placed on receiving assistance and the belief that higher point offerings increase the likelihood of receiving a satisfactory answer.

4.2.2 Gold Badges as Motivation to Increase Knowledge

"There were certain times that I wrote answers just to get those gold badges."
(I2:29)

The significance of gold badges as indicators of competence and their motivational impact on increasing knowledge is another subtheme that emerged in the broader theme of 'Gaining Competence'. This subtheme explores how the attainment of gold badges functions as a visible recognition of expertise, motivating contributors to actively expand their knowledge, and engage in knowledge-sharing activities. It was detected to be part of the second phase as it was linked to playing the game.

The participants emphasized the importance of gold badges as symbols of competence and expertise within the Stack Overflow community. Especially the attainment of the first gold badge was seen as a significant achievement, representing a validation of one's expertise and competence. The positive emotional response triggered by this accomplishment functions as a motivating factor for contributors to continue their engagement and knowledge-sharing efforts. The participants recognized that earning a tag-specific gold badge was dependent on demonstrating expertise in a specific topic. The gold badge acts as a visible marker, publicly acknowledging their mastery in that area. This recognition fostered a sense of pride and further motivated the contributors to actively engage in knowledge-sharing activities related to their specialized topics. The contributors expressed a deliberate pursuit of gold badges as part of their knowledge acquisition and development strategy. Furthermore, the desire to attain gold badges motivated them to explore new topics, conduct research, and provide comprehensive and high-quality answers. The pursuit of gold badges not only validated their expertise but also served as a

personal goal, driving them to expand their knowledge and deepen their understanding of various subject matters. The contributors acknowledged that the pursuit of gold badges influenced their behavior, leading them to actively seek opportunities to share knowledge to obtain badges. This behavioral motivation, driven by the desire to acquire gold badges, creates a virtuous cycle of knowledge acquisition, self-improvement, and contribution.

4.2.3 Developing an Answering Strategy to Increase the Reputation Score

The participants reported the development of answering strategies such as the selection of high-profile questions and the provision of canonical answers, which is another subtheme detected within the theme of 'Gaining Competence'. Within this subtheme how contributors strategically approach their participation on the platform by targeting prominent questions and delivering comprehensive, authoritative responses, intending to increase their reputation score were investigated.

The contributors highlighted the strategic approach they employed to maximize their reputation score. Therefore, it is categorized into phase 2 – 'Playing a Game'. They recognized the significance of high-profile questions that attract a large number of views and engagement. By strategically choosing to answer these questions, they sought to maximize their visibility and impact within the Stack Overflow community. Furthermore, answering high-profile questions was seen as an opportunity to showcase their expertise and gain recognition, leading to an increase in their reputation score. Additionally, canonical answers, which are comprehensive and authoritative responses that provide a definitive solution to common or frequently asked questions, were deemed valuable for reputation score growth. The contributors intentionally crafted answers that served as canonical references, offering in-depth explanations, code samples, and step-by-step guidance. By providing such canonical answers, they aimed to establish their expertise and reputation within specific subject areas.

4.2.4 Limited Motivational Impact of Bounties on Answering Questions

> *"I sort of gave up on those because they were very high-investment questions."*
> (I6:28)

Another subtheme of 'Gaining Competence' that emerged is the limited motivational impact of bounties on answering questions. This subtheme explored how bounties, despite their potential to incentivize answers, may not effectively motivate top contributors to invest their time and effort because of various factors such as high investment requirements and the relatively small value of bounties for experienced contributors.

The participants expressed reservations about the motivational impact of bounties on their willingness to answer questions. They recognized the potential productivity of answering bountied questions, which often require a higher level of expertise or effort. However, they expressed hesitation or reluctance due to the perceived high investment requirements associated with these questions. The significant effort required to provide satisfactory answers to such questions may deter contributors from actively pursuing bounty-related opportunities. The experienced contributors also highlighted that the value of bounties on Stack Overflow may not be significant enough to motivate them to invest their time and expertise. Furthermore, the relatively small value of bounties, in terms of reputation points, may not match the level of effort required to provide comprehensive and high-quality answers. Hence, it significantly matched the aspect of

diminishing marginal benefits as discussed in phase 3. As a result, the contributors may prioritize other activities or questions that offer greater intrinsic or extrinsic rewards.

4.2.5 Bounties as Signals of Challenging Questions

"They are the ones that are technically more challenging." (I5:7)

Distinguished from the prior subtheme, the perception of bounties as signals for technically challenging questions and specialized expertise is another subtheme that emerged. This subtheme explores how bounties often indicate the difficulty level or specialized nature of questions, which could influence the motivation and participation of contributors.

The participants recognized that bounties are typically associated with technically challenging questions and require specialized expertise. Furthermore, questions often required advanced knowledge and expertise to provide satisfactory answers. Hence, the perception that bounties are associated with higher difficulty levels could affect the contributors' motivation and decision to engage with such questions. It encouraged them to specifically search for these challenges. However, they also recognized their limitations in terms of expertise and felt that the bounties were associated with questions that demanded a specific set of skills or domain knowledge and, therefore, specifically did not search for bounty–questions. As these aspects go beyond the bounty as the possibility to earn reputation scores was part of the game, this subtheme is also categorized as a part of phase 3.

4.3 Being Recognized

The theme of 'Being Recognized' emerged from the conducted interviews as this theme encompasses various aspects related to recognition, including job perspectives, gratification, feedback, and being recognized for one's knowledge. The contributors expressed the importance of recognition as a motivational factor in their engagement and knowledge-sharing activities on the platform.

It consists of multiple dimensions that contribute to the motivation of top contributors on Stack Overflow. The recognition received from the Stack Overflow community and the satisfaction derived from helping others and solving complex problems were cited as sources of gratification. The contributors expressed a desire to be recognized for their knowledge and expertise within specific domains. They expressed a sense of fulfillment and personal satisfaction when their contributions were acknowledged and valued by their peers. Further, they valued feedback as a means of validating their expertise and efforts, as well as an opportunity for continuous improvement. Furthermore, the contributors discussed how their participation in Stack Overflow and the recognition they receive could positively impact their job perspectives. Their involvement in knowledge-sharing activities and their reputation within the community could enhance their professional reputation and potentially lead to additional career opportunities or advancement.

4.3.1 Badges as Gratification and Signals of Expertise

"... then I get a gold badge to say, 'Yes. I'm an expert in that.'" (I3:6)

Within the broader theme of 'Being Recognized', one subtheme that emerged is the perception of receiving specific badges as gratification and as signals to others. The recognition associated with badges motivates users to increase their contributions, particularly in programming specific tag areas.

The participants highlighted the significance of receiving specific badges as a form of gratification and a means to signal expertise. The contributors recognized that certain badges not only provide gratification but also come with tangible benefits and privileges. These additional privileges empower the contributors and signify their expertise, further motivating their engagement on the platform. Especially the attainment of the first gold badge was seen to signal expertise and establish oneself as an expert in a particular domain. These aspects were found to be particularly interesting to the participants in phase 2 as the motivational impact of badges in general seemed to diminish over time.

4.3.2 Motivation through Upvotes, Reputation Points, and Leaderboards

"... what kept me hooked for a very long time and contributing as much as I did was the fact that the reputation number was going up and I got points." (I6:22)

Another subtheme that emerged in this theme is the motivation derived from upvotes, reputation points, and leaderboards. It explored how these elements function as incentives for contributors, indicating the value and recognition of their contributions and fostering a sense of achievement and competition within the community.

The significance of upvotes, reputation points, and leaderboards as motivating factors was emphasised by the participants. Furthermore, they expressed their motivation to receive upvotes and have their answers accepted as the validation of their expertise. These acts of recognition signalized the value and quality of their contributions, reinforcing their motivation to provide helpful and accurate answers. The desire to gain reputation points was acknowledged as a common motivation among the contributors and the accumulation of reputation points was seen as a measure of accomplishment and status within the Stack Overflow community.

Additionally, the contributors expressed motivation derived from the leaderboard system. Moving up in the rankings and achieving higher positions on the leaderboards were perceived as a form of recognition and a testament to their expertise and contributions. The reputation points and leaderboards served as indicators and goals for the contributors to monitor their progress and compare themselves to others. The visibility of these metrics encouraged a sense of competition and motivation to improve their standing within the community. Alike the prior subtheme, the motivational impact of this subtheme was particularly high during the second phase.

4.3.3 Reputation as an Indicator of Competence

"I'll pay attention to their reputation, and I'll use that as a [sic] indication of how reliable their answer is." (I3:15)

Furthermore, the perception of the reputation score as an indicator of competence was discovered as a subtheme. This theme investigates how contributors consider reputation as a reliable

measure of expertise and reliability when evaluating the quality and trustworthiness of answers provided by other users. It is considered to be part of phase 2.

4.3.4 Motivation through Accepted Answers

> *"If somebody accepted my answer I will be like 'Wow. This is fantastic. Somebody thinks I'm good and useful.'"* (I3:6)

Another aspect that was found to be a subtheme is the motivation derived from having one's answers accepted by askers. It explores how contributors find motivation and a sense of accomplishment when their answers are accepted by question-askers, indicating that their contributions are valuable and helpful.

The contributors described a sense of satisfaction and motivation when their answers were accepted by question-askers. In phase 2, they perceived the act of acceptance as a recognition of their competence and usefulness in providing valuable solutions to problems. The acknowledgement of their contribution through the acceptance of their answer served as a motivational factor.

4.3.5 Gamification Elements as Signals for Competence and Career Advancement

> *"On my resume, I put in a 'Top 300 contributed Stack Overflow' and people always talk about it."* (I3:27)

A further subtheme that emerged is the recognition of gamification elements, particularly the leaderboard as signals of competence and their impact on career perspectives. This subtheme explores how participants perceive gamification elements, such as reputation points and rankings, as indicators of expertise towards recruiters and their potential value in professional contexts, including job opportunities.

The participants highlighted the importance of gamification elements, specifically the leaderboard, in signalling competence and fostering recognition. They observed that these gamification elements not only provide personal gratification but also serve as signals of competence and dedication, which can enhance their professional reputation and career prospects. As the awareness of this effect and possible job opportunities were described to come late in their participation on Stack Overflow, this subtheme is categorized into phase 3.

4.3.6 Missing Feedback through Gamification Elements Leads to Demotivation

> *"The difference between ... I thought I would have and what I do have ... that can lead me to stop for the day."* (I1:41)

The impact of missing feedback through gamification elements on the contributors' motivation is another aspect that is categorized as a subtheme. Within it, how the participants experience demotivation when there is a discrepancy between their expectations and the feedback they receive through gamification elements, such as upvotes, is investigated.

The participants emphasized the importance of feedback through gamification elements in maintaining their motivation. They expressed that when they expected a certain level of feedback or recognition through gamification elements but did not receive it, they experienced

demotivation. The absence of expected gratification or feedback created a discrepancy between their anticipated progress and the actual outcome, leading to a decrease in motivation to continue their contributions. Interestingly, this aspect was discussed as an aspect that some of the top contributors still consider to be of importance. Hence, the subtheme is categorized into phase 3.

4.3.7 Saturation Effect of Sufficient Gratification on Motivation

> *"When I got like a lot of votes for a few questions then I usually stop as well because I'm satisfied."* (I1:41)

An important and quite central to the phase 3 subtheme is the impact of sufficient gratification on the contributors' motivation. It concerns how the participants may reach a point of saturation in their motivation when they have received enough gratification or recognition for their contributions.

The participants expressed that after reaching a certain level of gratification or recognition, their motivation to continue contributing decreased. They indicated that once they achieved a satisfactory level of gratification, further accumulation of badges or rewards became less significant in maintaining their motivation.

4.3.8 Recognition Beyond Points as a Motivation to Help Others

> *"But it's still ... satisfying to be able to give people help, to get recognized for giving people help."* (I4:17)

The desire for recognition beyond mere points is another detected subtheme within the theme of 'Being Recognized'. It discusses how the participants derive motivation from being acknowledged and recognized for their ability to provide assistance and help others, even if it goes beyond the accumulation of reputation points.

The participants expressed that while feedback and recognition were important to them, their motivation to help others went beyond the numerical value of reputation points. They emphasized that the satisfaction they derived from assisting others and being acknowledged for their helpfulness was a significant motivator. They found joy and fulfillment in providing valuable answers and being recognized for their expertise and contributions to the community. Therefore, it is also an important subtheme in phase 3.

4.4 Contribute to the Community

The theme of 'Contribute to the Community' encompasses the motivations of the top contributors on Stack Overflow, who engage in knowledge-sharing and support activities, intending to be beneficial to the Stack Overflow community as a whole. This theme reflects their desire to contribute, participate in community service, and engage in reciprocal interactions within the Stack Overflow community.

The participants viewed their contributions as acts of service to the Stack Overflow community. They had a genuine desire to assist others, provide valuable solutions, and share their expertise. Furthermore, they perceived themselves as active members of the community and prioritized

the collective benefit over their gains. Additionally, reciprocity played a crucial role in motivating the contributors to engage in knowledge sharing. Hence, the participants value the mutual exchange of knowledge and support within the community. They appreciated the assistance they received from others and felt a sense of obligation to reciprocate by helping fellow community members with their questions and problems.

4.4.1 Demotivation due to Downvotes Among New Users

"When I was way back with low points - a single downvote was terrible." (I2:39)

Within the broader theme of 'Contribute to the Community' a subtheme that emerged is the impact of downvotes on the motivation of new users. This subtheme explores how the experience of receiving downvotes can negatively affect the motivation and engagement of individuals who are new to the Stack Overflow community.

As such, the participants expressed that receiving downvotes had a significant impact on their motivation and confidence, especially when they were new users or still had a low reputation. Hence, this subtheme is categorized into phase 1. The fear of negative evaluations through downvotes created a reluctance to ask questions or contribute actively to the community. This subtheme sheds light on the potential demotivating effects of negative feedback for new users.

4.4.2 Gamification Elements as a Punishment in Demotivation

"Because sometimes there are people who just downvote for an unfair reason and that would be something annoying." (I1:21)

Furthermore, the next subtheme that came up is the impact of gamification elements as a form of punishment on Stack Overflow during the 'Playing a Game'-phase. It concerns how negative experiences related to gamification elements, particularly downvotes, can demotivate users and hinder their contributions to the community.

Considering this, the participants described instances in which they perceived GEs such as downvotes as a form of punishment. Furthermore, they expressed frustration when they believed that their contributions were unjustly downvoted or when they perceived the downvotes as unfair. These negative experiences with GEs, specifically downvotes, impacted their motivation to continue actively participating and contributing valuable content to the community.

4.4.3 The Benefit of the Doubt in Evaluation and Voting

"And so sometimes just because I know them, I'll give them an upvote because I trust them." (I3:13)

The concept of applying the benefit of the doubt when evaluating others' contributions and casting votes on Stack Overflow was detected as another subtheme. In this subtheme, how the users may rely on reputation and familiarity with other users to make judgments and decisions, sometimes without fully evaluating the content itself, is investigated. As the perception of other users was particularly linked to the reputation score and the playing aspect, it is considered to play a major role in phase 2. However, these elements are also to some extent valid in phase 3.

Instances, in which contributors extended the benefit of the doubt to certain users, were described in the interviews. They acknowledged the possibility of biases or assumptions when evaluating answers or casting votes. Furthermore, the participants mentioned that reputation and familiarity with certain users might influence their voting behavior, potentially leading to automated or biased upvoting without thoroughly assessing the content of the contribution. Building and sustaining a community beyond the knowledge base is thus a strong motive to build trust in trustworthy community members.

4.4.4 Specific Badges as Motivation to Answer Old or Downvoted Questions

> *"There's one badge called Necromancer. I forget exactly now how you get it but basically writing canonical answers to old questions that start taking over, and then you get that badge. [...] I ended up getting lots and lots of those badges."*
> (I2:20)

The motivation to answer old or already downvoted questions driven by the desire to earn specific badges is another subtheme that arose during the interviews. It investigates how the existence of certain badges incentivizes users to contribute to the community by addressing neglected or problematic questions.

As such, the participants expressed that the existence of specific badges, such as the 'Revival', 'Resurrection', 'Necromancer', or 'Cleanup' badges, provided them with a sense of motivation and direction in contributing to the community. These badges would encourage the users to invest their time and expertise in addressing neglected or problematic questions, ultimately contributing to the overall knowledge base of the platform and with that to the community. As hunting for specific badges is part of the gaming aspect, it is categorized as a phase 3 subtheme.

4.4.5 Upvotes as Encouragement for New Users

> *"But when I see someone had that has not a lot of reputation and has a good answer I would usually more likely upvote the answer"* (I1:33)

The role of upvotes in encouraging new users on Stack Overflow was found to be another subtheme in this area. It concerns the significant role of upvotes in motivating and supporting new users by acknowledging their contributions and providing positive feedback.

The participants recognized the impact of upvotes in motivating and encouraging new users, particularly when they provide valuable answers or actively engage in asking and answering questions. By upvoting their contributions, the experienced users demonstrated support and appreciation for the efforts of newcomers, which can significantly impact their engagement and integration within the community. Hence, it is considered to be part of phase 3.

4.4.6 Encouragement of Users Through Upvotes

> *"I recognize people who were contributing and see what they're doing and keep them. Feed them the votes occasionally and so on."* (I4:19)

Within the broader theme of 'Contribute to the Community' another subtheme that emerged is the role of upvotes in encouraging and motivating users on Stack Overflow. How upvotes are

used as a means of providing recognition, support, and encouragement to users, who consistently contribute valuable content to the platform, is a concern of this subtheme.

The participants acknowledged the contributions of fellow users and demonstrated their support and appreciation by actively upvoting their content. By doing so, they not only recognize the value of the contributions but also encourage and motivate those users to continue their active participation on the platform. This practice helped them to create a positive feedback loop, where they feel acknowledged and motivated to contribute further, leading to a vibrant and engaged community. The awareness of these effects is also considered to be part of phase 3 as participants use these elements for a different reason than the game itself.

4.4.7 Demotivation due to Reputation Cap

> *"It doesn't really help to get any more because it just cuts it off right there. So, I wasn't really motivated to answer."* (I2:29)

Another subtheme that arose is the demotivation experienced by the users when they reach the reputation cap on Stack Overflow. It centers around the aspect of how the reputation cap, a limit on the amount of reputation that can be earned in a single day, can function as a demotivating factor for users.

As such, the participants expressed that once they reached the reputation cap their motivation to continue contributing decreased. They perceived that beyond the cap further contributions would not be rewarded in the mid-term, leading to a reduced desire to actively participate and answer questions on the platform. We consider this subtheme as being a starting point of phase 3, as the contribution shaped by the gamification elements stops at this point and further contribution goes beyond the gaming aspect.

4.4.8 Rookie Protection Through Downvotes

> *"But so generally I will try to be more understanding to people who have low reputation scores."* (I6:34)

Within the broader theme of 'Contribute to the Community', another subtheme that emerged is the concept of 'Rookie Protection' through downvotes on Stack Overflow. This subtheme explores how users tend to exhibit more understanding and leniency towards individuals with low reputation scores when they ask questions.

Considering this, the participants highlighted their inclination to be more understanding and forgiving towards users with low reputation scores who ask questions on Stack Overflow. They expressed a willingness to provide support and assistance to rookies on the platform who may not yet be familiar with the norms, guidelines, or best practices. They recognized that individuals with low reputation scores are still learning and may require more leniency when asking questions or making mistakes.

4.5 Creating an Encyclopedia

The theme of 'Creating an Encyclopedia' emerged from the interviews conducted, highlighting the various aspects related to the creation and maintenance of a knowledge repository akin to

an encyclopedia. This theme revolves around the concepts of generating high-quality answers, addressing the quality of questions, recognizing the need for answers, and fostering a culture of knowledge sharing.

The participants view Stack Overflow as an encyclopedia-like platform where users can find reliable and comprehensive information on various topics. Consequently, they perceive their contributions as a means to collectively build a repository of knowledge that is easily accessible to others who are seeking answers. Hence, the participants emphasized the significance of providing high-quality answers. Consequently, they aim to deliver accurate, well-explained, and informative responses to ensure that the information shared on Stack Overflow maintains a high standard of quality. By focusing on the quality of their answers, the users contributed to the creation of a reliable and valuable knowledge resource. Additionally, the quality of questions was deemed crucial within the context of creating an encyclopedia. The contributors recognized the importance of asking clear, specific, and well-formulated questions. By doing so, they enabled a better understanding of the problem or topic at hand and increased the likelihood of receiving accurate and relevant answers. Furthermore, the participants acknowledged the inherent need for answers on Stack Overflow. They understood that individuals come to the platform seeking solutions to their problems or seeking clarification on certain topics. By actively providing answers, they contribute to meeting the information needs of the community and enhancing the overall usefulness of Stack Overflow as an encyclopedia-like resource.

4.5.1 Quality Improvement Through Downvotes and Comments

"A lot of times people don't really put a lot of effort in asking good questions."
(I5:33)

The subtheme of 'Quality Improvement through Downvotes and Comments' highlights the participants' recognition of the importance of raising the overall quality of questions on Stack Overflow. This subtheme encompasses two approaches: downvoting poor questions or using comments to encourage others to improve their questions. The participants expressed their dissatisfaction with poorly formulated or low-effort questions and aimed to foster a culture of higher-quality question-asking.

Further, they acknowledged that by downvoting poorly formulated questions, the users signal their dissatisfaction and indicate that the question does not meet the expected standards of the community. This approach aims to maintain a higher overall quality of questions on the platform and encourage individuals to put more effort into asking clear, specific, and well-thought-out questions. Alternatively, some participants preferred using comments to address the issues in poorly asked questions. By providing constructive feedback, suggestions, or pointing out areas for improvement, the users aim to encourage the question asker to refine their question and raise its quality. This approach promotes a supportive environment that fosters learning and growth, intending to guide individuals toward asking better questions in the future. Considering this, the participants especially discussed these elements in connection with new users. Hence, it is categorized in phase 1.

4.5.2 Motivation Through Good Questions and Earned Upvotes

"If it's a bad answer, then I don't upvote it." (I1:47)

As part of creating the encyclopedia, the subtheme of 'Motivation through Good Questions and Earned Upvotes' investigates the participants' view that well-posed and high-quality questions serve as a source of motivation to contribute to Stack Overflow. The participants expressed a preference for upvoting answers which provide valuable and accurate information in response to good questions. They emphasized the importance of earning upvotes through the quality of their contributions, including providing insightful answers to well-formulated questions.

Encountering well-crafted and thought-provoking questions on Stack Overflow served as a motivational factor for their own contributions. Furthermore, engaging with high-quality questions stimulated their interest, encouraged their expertise, and motivated them to provide relevant and valuable answers. The participants also emphasized that upvotes should be earned through the quality and accuracy of the provided answers. Consequently, they indicated a preference for upvoting answers that demonstrate a deep understanding of the question and provide comprehensive, helpful, and reliable information. This suggested a reward system based on merit, in which recognition in the form of upvotes is given to contributions that meet the expected standards of excellence. The subtheme also highlights the role of gamification elements in encouraging the formulation of good questions. The participants recognized that the potential to earn upvotes motivated them to raise their question-asking standards and created well-structured, specific, and relevant queries, which shows a clear association with phase 2. Furthermore, these elements served as a reinforcement mechanism, motivating users to engage in the process of knowledge acquisition and dissemination through the presentation of earned upvotes as a symbol of recognition and achievement.

4.5.3 Privileges and Editing Options as a Result of Contribution

The subtheme of 'Privileges and Editing Options as a Result of Contribution' emphasises the participants' recognition that their contributions to Stack Overflow led to the acquisition of privileges and additional editing options. The participants explained that as they contribute and gain reputation points, they unlock certain privileges that grant them enhanced editing capabilities. However, they emphasized that these privileges are often automatic and not a direct motivation to contribute more, except for the tag-specific gold badges that provide additional editing options within a specific tag.

Through active contribution to Stack Overflow and accumulation of reputation points, contributors gradually unlock various privileges. These privileges confer additional editing options and capabilities that enhance their ability to improve the quality and accuracy of questions and answers. The acquisition of privileges was seen as a natural progression resulting from ongoing participation and contribution to the community. While the participants acknowledged the privileges they receive as a result of their contributions, they indicated that these privileges are often automatic and not a primary motivator for contributing more. The acquisition of privileges was viewed as a by-product of their ongoing participation rather than a direct incentive to increase their contributions. These automatic privileges, although recognized as such and appreciated by them, do not serve as a strong incentive to engage in further contribution.

Moreover, the participants highlighted that tag-specific gold badges provide an exception to the limited motivational impact of automatic privileges. They noted that these badges, which are awarded for achieving expertise within a specific tag, grant additional editing options and

capabilities within a particular tag. Hence, the ability to have more control and influence over the content within their area of expertise motivated the participants to strive for these tag-specific gold badges. These privileges are mostly earned during phase 2 as saturation of the gaming aspect comes later on.

4.5.4 Editing Contributions for Reputation Gain and Quality Improvement

> *"I'm also like a librarian improving the quality of the questions that are on there."* (I3:11)

'Editing Questions and Answers for Reputation Gain and Quality Improvement' is another subtheme that emerged through the conducted interviews. It concerns the participants' motivations and actions related to editing contributions on Stack Overflow. The contributors expressed their willingness to edit both questions and answers with the dual purpose of earning reputation points and improving the overall quality of the content. However, they also highlighted the missing gratification for removing duplicates, which they perceived will contribute to other users not removing them anymore and eventually result in the persistence of duplicate questions on the platform.

By actively engaging in editing tasks, the users can improve the clarity, formatting, and overall quality of the content, leading to upvotes and recognition from the community. Editing serves to increase their reputation and standing within the community, providing motivation to actively contribute in this manner. Beyond a reputation gain, the participants expressed a genuine desire to enhance the quality of questions and answers on the platform. They viewed themselves as librarians, responsible for organizing, and improving the content available. By editing contributions, the participants aimed to streamline formatting, correct errors, and make the content more accessible and understandable for future users. The motivation to create a well-organized and high-quality knowledge base drives their editing efforts.

While the participants actively engage in editing contributions, they expressed frustration regarding the lack of gratification or recognition for removing duplicate questions. Duplicate questions were perceived as a detriment to the platform's organization and user experience, and participants willingly spend time identifying and merging duplicates. However, the absence of a reward system or clear acknowledgement for this effort could contribute to the persistence of duplicate questions on the platform. Hence, the participants considered it to be a missing element of the game, which is why this is, therefore, categorized in phase 2.

4.5.5 Long-Term Return for Good Answers and Its Influence on Answering Strategy

> *"And so those kind of [answers] just keep generating rep long after I write them."* (I2:6)

The subtheme of 'Long-Term Return for Good Answers and Its Influence on Answering Strategy' concerns how the concept of long-term return, like royalties, affects participants' answering strategies on Stack Overflow. The contributors described their approach of providing high-quality answers to older questions that they perceive as lacking comprehensive responses. By doing so, they aimed to secure long-term reputation gains and contribute to the improvement of overall content quality on the platform.

Furthermore, the participants recognized that certain types of answers, particularly those addressing older questions with incomplete or missing responses, can generate long-term returns

in terms of reputation points. They referred to this concept as 'royalties' to illustrate the continuous accrual of reputation points for their valuable contributions. By focusing on these older questions, they strategically invest their time and expertise to create comprehensive and informative canonical answers that have the potential to attract ongoing upvotes and recognition.

The concept of long-term return for good answers influences the participants' answering strategy and, therefore, is part of phase 2. Instead of primarily answering new questions, the participants prioritize addressing older questions that they believed lacked satisfactory answers. This approach allows them to leverage the potential for long-term reputation gains and ensure that their expertise is utilized in areas where they perceive a need for improvement. By adopting this strategy, the participants contributed to the ongoing development and refinement of the platform's knowledge base.

4.5.6 Association Between High Reputation Users and Good Contributions

Another detected subtheme is the 'Association between High Reputation Users and Good Contributions', which investigates the perception that the users with high reputation on Stack Overflow tend to consistently provide good answers and ask insightful questions. Although, this association is not solely due to their high reputation itself but is rather a result of their extensive participation and experience on the platform. These high-reputation users have developed a deep understanding of how to effectively answer questions and have acquired domain knowledge, enabling them to consistently deliver high-quality contributions.

Considering this, the participants expressed a tendency to grant unchecked upvotes to high-reputation users based on the benefit of the doubt. They assumed that users who have achieved a high reputation have demonstrated their expertise and reliability over time, leading to a perception that their contributions are likely to be valuable and accurate. Consequently, these users may receive upvotes even without a thorough examination of their answers as their reputation serves as a heuristic for evaluating the credibility of their responses. However, they saw this aspect of automatic upvotes as critical as unchecked upvotes might lead to a higher acceptance of a weak answer. As this aspect was discussed by the participants with an emphasis on the quality of the answers rather than the importance of the gamification elements, this aspect is categorized into phase 3.

4.5.7 Contributing With the Knowledge of Limited Reputation Gain

> *"I will answer questions, even though I don't get very many points, upvotes for it."* (I4:19)

Under 'Contributing with the Knowledge of Limited Reputation Gain' the exploration of the motivation of users to contribute their knowledge and expertise on Stack Overflow, even when the participants anticipated receiving minimal reputation points or upvotes in return is discussed. Instead of solely focusing on maximizing their reputation score, these users prioritize addressing important questions and filling knowledge gaps within the community's informal database.

The participants understood that certain questions may not attract much attention or generate a high level of recognition, but they still perceived the value of sharing their insights to enhance the community's knowledge base. Rather than solely aiming to maximize their reputation score, they emphasized the importance of addressing unanswered or important questions. Hence, they

recognized that these areas represent opportunities to make a meaningful contribution and provide valuable insights to the platform. By focusing on filling these gaps, the users prioritized the overall improvement of the platform's knowledge repository rather than personal reputation gains, which associates this subtheme with phase 3.

4.5.8 Bounties as a Signal for Value and Incentive for Answering

A contradicting subtheme is the subtheme of 'Bounties as a Signal for Value and Incentive for Answering'. It investigates the role of bounties on Stack Overflow as a means to signal the importance and value of certain questions and incentivize users to provide answers. On the one hand, the participants stated that bounties can draw attention to specific questions that may have otherwise gone unnoticed or unanswered, ensuring their relevance and usefulness to the community. On the other hand, they experienced bounty questions as often specific and not helpful to anyone apart from the user who posted the question. Again, this subtheme was discussed by the participants from the perspective of the quality of the platform. Hence, it is beyond the gaming aspect and is, therefore, considered to be part of phase 3.

4.5.9 Specific Badges as Incentives to Answer Questions Beyond Daily Capacity Limits

"I hunted for a very long time and that was what kept my contributions high for a day." (I6:24)

Another subtheme is the 'Specific Badges as Incentives to Answer Questions, Beyond Daily Capacity Limits' – theme. It explores the role of badges on Stack Overflow as incentives for the users to continue answering questions even when they have reached their daily capacity limit.

As such, the participants described the pursuit of specific badges to motivate them to answer questions, even when they have already reached their daily capacity limit. These badges function as markers of achievement and recognition within the Stack Overflow community. They are driven to accumulate these badges as a measure of their expertise, credibility, and active participation, which in turn enhances their reputation and standing within the community. Furthermore, the contributors are willing to invest additional time and effort to achieve badge-related goals, even if it means exceeding their regular contributions. Hence, this behaviour demonstrates the powerful influence that badges can have in extending users' engagement and encouraging them to make extra contributions. As we found indicators that this aspect is still motivating, when a certain level of saturation towards other gamification elements is already reached, it is categorized into phase 3.

4.5.10 Privileges as Enablers of Efficiency and Enhanced Access in the Community

"It converts the side from a question-answer site towards more of a Wiki." (I5:31)

The subtheme of 'Privileges as Enablers of Efficiency and Enhanced Access in the Community' explores the impact of privileges on Stack Overflow users' ability to take shortcuts, access additional features, and perform certain actions that streamline their participation in the community. The advantages gained through privileges, such as bypassing formal processes, performing edits, and accessing hidden or deleted content were important to the top contributors. While they acknowledged the benefits of these privileges, they did not actively pursue them as primary goals but considered them as valuable extras obtained over time.

Furthermore, the participants noted that privileges grant them the ability to take shortcuts. For example, users gain privileges that allow them to remove tags without going through the formal tag removal process. This facilitates more efficient management of content and allows the users to contribute to the platform with greater ease and flexibility. The privileges create a sense of empowerment, enabling the users to have a direct impact on the site's organization and content quality.

Certain privileges provided the users with the ability to access hidden content such as deleted answers. The participants found value in these privileges as they allow them to retrieve potentially useful information that would otherwise be unavailable. This enhanced access to this content contributes to the community's knowledge base, enabling users to glean insights from previously inaccessible information.

The accumulation of privileges over time can transform the experience on Stack Overflow from a traditional question-answer format to a more wiki-like environment and is, therefore, categorized as a phase 3 subtheme. As users gain higher privileges, they can contribute in broader ways, such as performing edits and working on the wiki. This evolution towards a more collaborative and comprehensive knowledge repository reflects the dynamic nature of the platform and its commitment to continuous improvement.

5 Discussion

5.1 A Contributor's Journey

As described in the findings, the data showed that the motivation of contributors changes over time. As a result, we divided the contributor's journey into the following three phases: 'How do I get started?', 'How do I get hooked?' and 'How do I continue? / How do I quit?'. These phases map the journey of a contributor from the first post 'How do I get started?' through the time when the game aspect predominates ('How do I get hooked?') to the time when the game aspect is mostly saturated ('How do I continue? / How do I quit?').

Although the separation of phases concerning the impact of gamification elements on the motivation to share knowledge has not been discussed in the literature, the changing effect of these elements has been investigated. For example, Koivisto and Hamari (2014) saw diminishing effects of gamification elements over time in their research on gamification about exercise gamification services. While they detected a stronger impact in the beginning in terms of perceived usefulness and enjoyment, this effect fades away with the time spent on the service. Coleman and Liebermann (2015) also reported diminishing marginal returns as a factor in motivation to share knowledge on Stack Overflow in their study. We found similar aspects of this phenomenon in our interviews.

Additionally, we found different incentives in the very first stage up until the first contribution, which led to the necessity to create three different phases and discuss the respective aspects of gamification in each phase. Furthermore, gamification elements start to play a major role right after the first contribution to the platform but fade away as soon as enough perceived recognition is achieved. By then other factors such as habits, cause further contributions. Hence, these findings led us to the division of the contributor's journey into the described three different phases.

In phase 1, three main incentives to start with contribution were detected. We detected patterns in the interview data that we subsumed into the theme of prerequisites. The identified factors in this phase are the availability of knowledge, a general interest in the topic, and personality traits.

The availability of knowledge describes a user's technical capacity to answer questions in the field. Coleman and Liebermann (2015) also found that it is a factor which positively influenced the user's motivation to share their knowledge as the acquisition of knowledge is then perceived as useful. Interestingly, the authors discussed the factor from a reciprocal viewpoint, which was also described by interviewee 3, who stated that he had the required knowledge, and, hence, found a way to contribute back to the community. However, the aspect of reciprocity and the awareness of it was an aspect that was more apparent in phase 3, with this single exemption. On the other hand, in the overall model of Wasko and Faraj (2005), self-rated expertise was not a significant factor.

Interest was another subtheme that emerged in this phase. Lu et al. (2022) described this theme as 'enjoyment' and saw it as an expression of intrinsic motivation. Interestingly, they found a positive correlation between enjoyment and affection towards gamification elements. Hence, interest and enjoyment can be seen as important factors in this stage.

The third factor in phase 1 is personality traits. This subtheme mostly reflects the attitude of wanting to help other people. It was also detected in the literature as having a significant impact

on the motivation to contribute (e.g., Coleman & Lieberman 2015; Lu et al., 2022). Thus, this aspect of our findings aligns with the existing literature.

During phase 2, the contributors explained that they enjoy the gamification elements and perceive their contributions as part of a game, which is used by the platform to create a habit. While creating a habit through gamification has been discussed for gamification in different fields like environmental behaviour (Hsu & Chen, 2014) or creating a healthy lifestyle (Suleiman-Martos et al., 2015), it has not been considered a significant factor for motivational aspects in gamified knowledge-sharing platforms. However, our interviewees acknowledged the habit created through gamification as an important factor for long-term engagement.

In phase 3, the gamification aspect fades into the background and other motivational factors become more important again. These aspects are community service, the contribution to the general good, and the improvement of skills. Also, phase 2 created habit remains for many contributors and, therefore, plays a significant role.

The finding that improvement of personal skills (i.e., learning) plays a role in motivational aspects is aligned with the findings of Lu et al. (2022). They found that it is a key factor for motivation at the same level as helping others and reciprocity within the community, which in total 82% of their participants saw as a reason for contributing (Lu et al., 2022).

We also detected reciprocity, which we subsumed under the theme of community service, as a factor mentioned by the participants. This factor has been discussed in the literature with contradicting results. While Coleman and Liebermann (2015) detected it as a factor in community service and Lu et al.'s (2022) study confirmed this, it was detected in Wasko and Faraj (2005) that direct reciprocity does not influence the motivation to share knowledge.

Although the motivation to share knowledge on Wikipedia was generally discussed by Coleman and Liebermann (2015), to the best of our knowledge, no other research has yet discovered whether contributing to platforms like Stack Overflow and, thereby, creating an encyclopedia could be a motivational aspect for users. However, the interviewees were aware of and mentioned the contribution to the general good in terms of a wiki for programmers as a motivational factor.

5.2 Motivational Impact of Gamification Elements on Stack Overflow

The motivational impacts of gamification elements were arranged according to the main themes identified (see Table 6). They were then rearranged according to the gamification elements affecting the motivation, leading to the updated Table 7 summarizing the findings for bounties, reputation scores, badges, and privileges.

Table 7: Subthemes affecting the Motivation to Share Knowledge rearranged by Gamification Element

	How do I get started? **Prerequisites**	*How do I get hooked?* **Creating a Habit,** **Playing a Game**	*How do I continue?* *How do I quit?* **Saturation**
Bounties	Bounties as a Motivational Tool to Facilitate Knowledge Sharing		Limited Motivational Impact of Bounties on Answering Questions Bounties as Signals of Challenging Questions Bounties as a Signal for Value and Incentive for Answering
Reputation Score	Quality Improvement Through Downvotes and Comments Demotivation due to Downvotes Among New Users	Motivation Through Good Questions and Earned Upvotes Editing Contributions for Reputation Gain and Quality Improvement Long-Term Return for Good Answers and Its Influence on Answering Strategy Gamification Elements as a Punishment in Demotivation The Benefit of the Doubt in Evaluation and Voting Motivation Through Upvotes, Reputation Points, and Leaderboards Reputation as an Indicator of Competence Motivation Through Accepted Answers Developing an Answering Strategies to Increase the Reputation Score	Association Between High Reputation Users and Good Contributions Contributing With the Knowledge of Limited Reputation Gain Upvotes as Encouragement for New Users Encouragement of Users Through Upvotes Demotivation due to Reputation Cap Rookie Protection Through Downvotes Gamification Elements as Signals for Competence and Career Advancement Missing Feedback Through Gamification Elements Leads to Demotivation Saturation Effect of Sufficient Gratification on Motivation Recognition Beyond Points as a Motivation to Help Others

| | How do I get started? | How do I get hooked? | How do I continue? |
| | | **Creating a Habit,** | *How do I quit?* |
	Prerequisites	**Playing a Game**	**Saturation**
Badges		Specific Badges as Motivation to Answer Old or Downvoted Questions Badges as Gratification and Signals of Expertise Gold Badges as Motivation to Increase Knowledge	Specific Badges as Incentives to Answer Questions, Beyond Daily Capacity Limits
Privileges		Privileges and Editing Options as a Result of Contribution	Privileges as Enablers of Efficiency and Enhanced Access in the Community

5.2.1 Bounties

Phase 1

In analyzing the impact of bounties on motivation in the first phase, when individuals are seeking to get started and contribute, we found that we can link this behavior to the construct of autonomy from self-determination theory (Deci & Ryan, 2000).

In the context of Stack Overflow, bounties can function as a form of autonomy support by giving contributors the freedom to choose how they allocate their reputation points. By earning reputation points, contributors gain the autonomy to decide when and where to offer bounties as a means to reward and incentivize others. Further, bounties offer contributors the autonomy to allocate their reputation points towards questions or answers that they believe are deserving of additional attention. They have the freedom to identify valuable contributions and reward them accordingly, which will lead to a contribution to their sense of autonomy.

Moreover, the availability of bounties as a gamification element provides contributors in phase 1 with a sense of autonomy by enabling them to control and direct their efforts and resources. By gaining a certain reputation score and, therefore, achieving the possibility to give bounties, contributors feel a greater sense of ownership and autonomy over their contributions on Stack Overflow. This, in turn, can enhance their intrinsic motivation to share knowledge and participate actively in the community.

Phase 2

In phase 2, the motivation to participate and contribute is primarily driven by the development of a habit and the enjoyment derived from engaging in the platform. However, when it comes to bounties, there is a gap in their role in encouraging gameplay or habit formation.

While bounties can be a powerful motivator in phase 1, where contributors are just getting started and seeking to establish themselves, they do not directly contribute to the development of a habit or encourage gameplay in phase 2. Bounties are more focused on rewarding and incentivizing specific contributions rather than fostering the habit-building process.

The findings of the study mentioned above regarding the effectiveness of bounties in attracting contributors on Stack Overflow indicate a contradiction with the conclusions drawn by Zhou et al. (2020). While Zhou et al. (2020) found that bounties increase engagement and the quality of answers, the finding of this study suggests that bounties may not necessarily attract top contributors anymore.

This discrepancy within the findings highlights the need for further research to understand the complex dynamics of bounties on technical Q&A sites. Examining the reasons behind the lack of top contributors' participation in bounties could provide insights into their preferences, motivations, and potential barriers they perceive. This would be valuable for platform administrators and users seeking to optimize the use of bounties as a means of encouraging participation from experienced and knowledgeable individuals.

Phase 3

In this phase, where contributors reach a state of saturation and question whether to continue or quit, the motivational impact of bounties can be analyzed considering the findings related to the limited motivation they provide for answering questions, their role as a signal for a challenge, and their role as a signal for valuable questions. We can link these findings to the constructs of competence, the balance between the level of challenge and personal skill, and the importance of clear goals and immediate feedback from both self-determination theory and flow theory.

According to flow theory, maintaining a balance between the level of challenge and personal skill is crucial for motivation and engagement. Bounties, as a signal for a challenge, can impact motivation in phase 3. If the offered bounties represent highly challenging questions that align with the contributors' skills, they can provide a motivational boost by creating a sense of purpose and engagement. This also supports the contributors' sense of competence according to self-determination theory.

Clear goals and immediate feedback are essential elements for maintaining motivation and a sense of progress. Bounties can function as a signal for both valuable and not valuable questions. When the contributors see bounties attached to questions, they perceive as valuable or interesting, it provides a clear goal to strive for and an opportunity to receive immediate feedback in the form of the bounty reward. This can enhance motivation and satisfaction.

Considering these factors, the impact of bounties on motivation in phase 3 can vary depending on how they align with the contributors' perceived competence, challenge, and goals, as well as the feedback, they receive from their participation.

5.2.2 Reputation Score

Phase 1

The motivational impact of reputation points in the first phase can be examined considering the finding that downvotes demotivated, inexperienced, or new users, as well as the practice of downvoting bad questions and duplicates to improve the quality of questions.

Reputation points play a significant role in fostering a sense of competence among contributors on Stack Overflow. However, the finding that downvotes demotivate inexperienced users suggests that negative feedback, such as downvotes, can hinder the development of competence and have a demotivating effect. When inexperienced users receive downvotes on their

contributions, it may lead to feelings of inadequacy and a decreased sense of competence. As a result, they might be less motivated to contribute high-quality content or participate in the future.

Downvoting bad questions and duplicates to raise the quality of questions on Stack Overflow is an aspect where both autonomy and competence come into play. The community's ability to downvote serves as a mechanism to maintain quality standards and provide immediate feedback. It empowers users with the autonomy to contribute to the platform's overall quality by expressing their judgment on the relevance and value of questions. Furthermore, by downvoting bad questions and duplicates, the community demonstrates its autonomy to collectively raise quality standards and promote valuable content. This collective autonomy contributes to the creation of an environment in which contributors feel motivated to ask better questions and strive for higher competence levels.

The motivational impact of reputation points in phase 1 is, therefore, closely tied to the perceived competence of the contributors and their sense of autonomy.

Phase 2

In phase 2, the motivational impact of reputation points, a gamification element on Stack Overflow, can be examined based on several findings, including the impact of answering high-profile questions with canonical answers, the motivation provided by upvotes, reputation points and leaderboards, the reputation as an indicator of competence, and the motivation derived from having one's answers accepted. These findings can be linked to the constructs of Competence, Demands for Action, and Clear Feedback.

Reputation points can serve as a motivational factor by providing a sense of competence. Answering high-profile questions with canonical answers can contribute to an increase in reputation scores. This success reinforces the contributors' competence and expertise, motivating them to continue their active participation.

The presence of upvotes, reputation points, and leaderboards serves as feedback mechanisms that fulfil the needs for demands of action and clear feedback. When contributors receive upvotes and accumulate reputation points, they receive positive feedback that acknowledges their competence and the value of their contributions. This feedback provides clear indicators of their progress and performance, motivating them to continue engaging and striving for higher competence levels. The visibility of leaderboards also creates a competitive environment, which drives contributors to actively participate and seek recognition from the community.

Autonomy is exhibited through the selection of questions to answer and the design of the answers themselves. Contributors have the autonomy to choose which questions they find interesting or challenging, allowing them to leverage their expertise and demonstrate their competence. They also have the freedom to design their answers, highlighting their unique perspectives and skills.

The reputation score on Stack Overflow is commonly perceived as an indicator of competence within the community. As contributors accumulate reputation points, their reputation becomes a representation of their expertise and success. This perception can motivate contributors to actively engage and seek to enhance their reputation, further strengthening their sense of competence and validation.

Having one's answers accepted by question-askers serves as a motivational factor related to competence and clear feedback. When contributors receive the acceptance of their answers, it

signals that their contributions were deemed valuable and satisfactory. This recognition reinforces their competence, providing clear feedback on the quality of their answers, and motivating them to continue contributing at a high level.

Reputation points motivate contributors in phase 2 by fulfilling the needs for competence, demands for action, and clear feedback. To be even more precise, they provide a sense of competence through the achievement of high-profile answers, function as feedback mechanisms through upvotes and reputation points, allow contributors to exercise autonomy in question selection and answer design, and serve as an indicator of competence within the community. The acceptance of answers further enhances motivation by providing clear feedback on the quality of contributions.

Phase 3

In phase 3, the motivational impact of reputation points can be examined based on several findings. These findings include the impact of gamification elements as a signal in their CV, the importance of feedback and gratification, the need to go beyond mere points and still be recognized, the encouragement of new users through upvotes, the motivation provided by upvotes to other users, the demotivation caused by reputation caps, the rookie protection in the form of reduced downvotes, and the relatedness of high-reputation users providing appropriate answers and questions. These findings can be linked to the constructs of Extrinsic motivation, Competence, Relatedness, Demands for Action, and Clear Feedback.

Gamification elements like reputation points can serve as extrinsic incentives, especially when they are seen as signals in their CV or professional profile. The accumulation of reputation points becomes a tangible measure of competence and expertise, which can motivate individuals in phase 3 to continue engaging and displaying their skills.

Missing feedback through gamification elements can lead to missing gratification, which, in turn, can result in demotivation. In phase 3, contributors rely on relatedness, the sense of connection with others, as well as competence and the need for clear feedback. The absence of feedback and gratification can diminish motivation as contributors may not feel recognized or rewarded for their efforts. On the other hand, sufficient gratification from reputation points can lead to saturation. When contributors receive enough recognition and rewards through reputation points, they may reach a point of saturation where further engagement becomes less motivating. This can be attributed to the fulfillment of competence, relatedness, and the need for clear feedback, where the initial motivation may decrease due to a sense of accomplishment.

Contributors, who aim to go beyond mere points and still desire recognition to help others, rely on immediate and clear feedback. Reputation points function as a form of recognition and validation, providing contributors with a sense of relatedness to the community and motivating them to continue helping. Upvotes can further encourage new users by fulfilling the need for relatedness as they indicate that others value and appreciate their contributions. They also provide feedback on the competence of new users and serve as clear indicators of their progress and performance. This feedback and recognition motivate new users to continue participating and contributing. Encouragement through upvotes not only motivates the recipient but also motivates other users to contribute more often. When contributors see their peers receiving upvotes and recognition, it creates a competitive environment and serves as a clear feedback mechanism. This encourages other users to engage more actively, fostering a sense of relatedness and competence. However, reputation caps, which limit the number of reputation points one can earn within a certain time, can demotivate contributors. The lack of demands for action and

clear feedback due to these caps can break the attention and motivation of contributors as their efforts no longer result in immediate rewards or recognition.

Rookie protection, such as reducing downvotes for new users, promotes a sense of relatedness and inclusivity within the community. By mitigating the potential negative impact of downvotes on new users, it encourages their continued participation and engagement. Also, high-reputation users typically provide good answers and questions, even with unchecked upvotes, which contributes to a sense of relatedness. The benefit of the doubt given to high-reputation users indicates that there is a level of trust and respect within the community. This sense of relatedness motivates high-reputation users to continue providing valuable contributions and fosters a positive community atmosphere.

In phase 3, reputation points continue to have a motivational impact based on numerous factors such as extrinsic motivation, competence, relatedness, demands for action, and clear feedback. They can serve as signals of competence in professional profiles, provide recognition and validation, encourage new users to participate, motivate others through peer recognition, and contribute to a sense of relatedness and trust within the community. However, it is important to manage factors such as the provision of feedback and gratification, attention-breaking elements like reputation caps, and the promotion of inclusivity for new users to maintain a positive motivational environment.

The finding regarding that contributors may choose to focus on important questions and contribute knowledge without expecting a significant increase in reputation points poses a challenge in fitting this observation into the constructs of the chosen motivational theories.

This finding suggests that some contributors in phase 3 prioritize addressing knowledge gaps and addressing important questions rather than solely focusing on maximizing their reputation points. This behaviour may be driven by intrinsic motivation, namely, by the genuine desire to share knowledge and help others, and an intrinsic sense of purpose. These contributors may find fulfillment and satisfaction in contributing valuable insights and addressing critical gaps in knowledge within the community. While the constructs of self-determination theory (Deci & Ryan, 2000) and flow theory (Csikszentmihalyi, 2014) do not explicitly address this specific behaviour, we can, therefore, argue that it aligns with the overarching concept of intrinsic motivation. This emphasizes that users engage in activities for inherent enjoyment and personal satisfaction. In this case, the contributors are motivated by the intrinsic value of contributing to the collective knowledge base rather than external rewards like reputation points.

However, the gap lies in the fact that the constructs and the other elements in the chosen motivational theories do not fully capture this specific behaviour. While intrinsic motivation is acknowledged, these theories do not provide specific constructs to explain this behaviour where contributors consciously choose to prioritize knowledge gaps and important questions over reputation points.

This indicates a gap in understanding and suggests the need for alternative frameworks, such as the social practice view of von Krogh et al. (2012), to better explain and explore the underlying motivations and dynamics of top contributors in their support activities. To address this gap, future research could explore the concept of intrinsic motivation in more depth and investigate how contributors navigate the balance between reputation-seeking behaviours and the intrinsic desire to contribute valuable knowledge. It could involve studying the underlying motivations, values, and personal goals of contributors who exhibit this behaviour and examining how the community's perception and recognition of these contributions influence intrinsic motivation and satisfaction. By exploring this behaviour in more detail, researchers can provide

valuable insights into the complex dynamics of motivation within online knowledge-sharing communities.

5.2.3 Badges

Phase 1

In this initial phase of a contributor's journey on Stack Overflow, badges do not play a significant role in motivating or engaging top contributors. Although various badges for new users exist to get to know the platform and engage them in the knowledge-sharing aspect, they do not seem to affect the motivation of top contributors.

To better understand the role of badges and their motivational impact, future research could explore the influence of badges in this phase of a contributor's journey on Stack Overflow. By investigating how badges, which are integrated for the first time in the early stages of participation, affect the motivation of top contributors, researchers can shed light on their potential impact and how they can be leveraged to enhance motivation, engagement, and knowledge acquisition in the initial phase. Concerning this, our findings suggest that badges may not effectively motivate top contributors to support new users during their initial stages on Stack Overflow. This contradicts the findings of Marder (2015) and Kusmierczyk and Gomez-Rodriguez (2018), which indicated that badges have a positive influence on user engagement and behaviour, including increased participation and contributions. This contradiction highlights the need for further research to better understand the complexities of badge motivation and its impact on user behaviour in different contexts. Future studies could delve into the specific motivations and incentives that drive top contributors to support new users and identify alternative approaches or mechanisms that may be more effective in encouraging their involvement. Additionally, investigating the specific barriers or challenges that hinder badge motivation for top contributors in supporting new users could provide valuable insights for platform administrators and designers to develop strategies that foster a supportive and collaborative community environment.

Phase 2:

In phase 2, the gamification element of badges can have a significant motivational impact on the contribution in Stack Overflow. Based on the findings, we can examine the motivational impact of badges in this phase using various constructs from motivational theories.

Gold badges, which signify a high level of competence and expertise in a specific area, have a motivational impact on contributors. They serve as a form of recognition and provide clear feedback on the contributor's level of knowledge and skill. By striving to earn gold badges, contributors are motivated to increase their knowledge and expertise in specific areas, aligning with the constructs of competence, demands for action, clear feedback, and internalized extrinsic motivation.

Furthermore, receiving specific badges is considered both gratifying and a signal to others. This motivates users to increase their contribution within a specific tag. The desire to earn badges in a specific area not only demonstrates competence but also provides a sense of accomplishment and recognition. It fosters relatedness within the community as others acknowledge the expertise and contributions of the badge earner. The badges further create a challenge for users that can be perceived by them as worth the effort, avoiding both anxiety and boredom and encouraging continued engagement.

We can, therefore, see that badges serve as motivational tools that tap into contributors' desire for competence, clear feedback, recognition, and relatedness. Badges not only provide a sense of achievement but also function as signals to the community, motivating users to increase their contributions and knowledge in specific areas.

We found that specific badges in phase 2 can motivate contributors to answer old or already downvoted questions and, thereby, contribute to the community. This finding presents a challenge in fitting this observation into the constructs of the chosen motivational theories. Furthermore, it suggests that certain badges may serve as incentives or triggers for contributors to engage with and address neglected or less popular questions on the platform. By offering recognition or rewards tied to these specific actions, the gamification element of badges encourages contributors to contribute their knowledge and expertise to areas that may have been overlooked or deemed less valuable by the community. While this behavior aligns with the overarching concept of intrinsic motivation, it does not fit exactly into the constructs of the chosen motivational theories as they do not explicitly address the motivation to engage with old or downvoted questions based on specific badges. This indicates a gap in understanding and also suggests the need for alternative frameworks like the social practice view of von Krogh et al. (2012) to better explain and explore the underlying motivations and dynamics of top contributors in their support activities.

To address this gap, future research could explore the concept of intrinsic motivation and the role of specific badges in fostering community engagement and addressing neglected questions. It could involve investigating the underlying motivations, values, and personal goals of contributors who exhibit this behaviour and examining the impact of badges as external incentives in driving such contributions. Additionally, researchers could explore the potential impact of social influence and community norms in shaping this behaviour.

Phase 3:

In this phase, the gamification element of badges continues to have a motivational impact on the contribution in Stack Overflow

The finding suggests that certain badges serve as additional incentives for contributors to exceed their daily capacity limits and continue answering questions. Despite reaching this limit, the desire to earn specific badges provides a motivational factor to go beyond what is required and contribute further. This behaviour aligns with the construct of Demands for Action as it introduces an additional challenge or demand that contributors voluntarily take on. Moreover, the badges serve as clear feedback and recognition for the contributors' efforts. They provide tangible evidence of their dedication and expertise in answering questions, reinforcing their sense of accomplishment and competence. Clear feedback in the form of badges plays a role in maintaining motivation and engagement, even when contributors may feel they have reached a saturation point.

5.2.4 Privileges

Phase 1:

In this phase, privileges do not play a significant role in motivating or engaging users.

During the 'How do I get Started?' phase, contributors are primarily focused on getting to know the platform, understanding community guidelines, and acquiring the necessary knowledge and

skills to efficiently contribute. At this stage, privileges, which come with increased reputation points, are not yet relevant or influential as contributors are still in the early stages of their learning journey.

Phase 2:

In phase 2, privileges can have a motivational impact on the contribution in Stack Overflow, particularly with the construct of autonomy in mind. While one of the findings is that gaining privileges, especially the tag-specific gold badges, provides users with additional editing options within a tag, it is noteworthy that these privileges may not serve as significant intrinsic incentives to contribute more.

The finding suggests that the automatic granting of privileges based on reputation points may not inherently motivate contributors to increase their contributions. These privileges, which include additional editing options, are not perceived as direct rewards or incentives to contribute more actively. Instead, their motivation may be driven by the desire for autonomy and the freedom to exercise control and make decisions about their contributions. The tag-specific gold badges stand out in this regard, as they provide additional editing options within a specific tag. This allows contributors to have more autonomy and control over the content and contributions related to their area of expertise. By earning these badges, contributors gain a sense of ownership and authority within the tag, which can further motivate their engagement and contribution.

Phase 3:

In phase 3, the gamification element of privileges can have a motivational impact, particularly concerning the constructs of autonomy and competence. The finding suggests that privileges, such as the ability to take shortcuts or perform certain actions without formal processes, provide contributors with a sense of autonomy and competence, which in turn can influence their motivation.

By having privileges that enable them to bypass certain procedures or perform tasks more efficiently, contributors experience a greater sense of autonomy and control over their actions. They can take shortcuts and make edits or contributions without relying on formal processes or permissions, which enhances their autonomy and freedom to navigate the platform. This increased autonomy can be motivating as contributors feel empowered to make decisions and act without unnecessary barriers or restrictions.

Furthermore, the privileges related to accessing deleted questions or having additional editing capabilities on the platform allow contributors to demonstrate their competence. By being able to see deleted questions or make edits in specific areas, contributors can highlight their expertise and make valuable contributions. This boosts their confidence in their own abilities and enhances their sense of competence. The recognition of their competence through these privileges can serve as a motivational factor, encouraging them to continue contributing and sharing their knowledge.

6 Conclusion and Outlook

The purpose of this research was to understand how gamification affects the motivation of contributors to share knowledge on Stack Overflow. To answer the research question:

How do gamification elements affect the motivation to share knowledge on Stack Overflow?

we conducted six interviews with top contributors. The research on the motivational effects of gamification elements on Stack Overflow has yielded several unique findings. On the one hand, they concern motivational differences at different stages of interaction with the platform. On the other hand, they are associated with specific gamification elements.

Firstly, the perceived impact of gamification changes motivation over time. Top contributors reported that gamification elements impact their motivation differently compared to when they started to contribute to the platform. Additionally, all interviewees reflected that in-between gamification played a huge role in their motivation as they saw contributing as playing a game and created a habit throughout the motivation that arose from gamification. However, all participants reported some extent of saturation over time.

Secondly, it has been observed that bounties do not significantly motivate top contributors. Despite the potential for bounties to provide a reward or incentive, top contributors do not find them particularly motivating in terms of their continued engagement and contribution to the platform.

Thirdly, the findings suggest that badges do not motivate top contributors to support new users in phase 1. While badges can serve as recognition and signals of accomplishment, they may not play a significant role in motivating top contributors to actively support and guide new users during their initial stages of Stack Overflow.

Finally, the selected motivational theories, namely, self-determination theory (Deci & Ryan, 2000) and flow theory (Csikszentmihalyi, 2014), may not fully explain the thriving motivation of top contributors to support beyond being gratified by gamification elements. This indicates a gap in understanding and suggests the need for alternative frameworks, such as the social practice view, to better explain and explore the underlying motivations and dynamics of top contributors in their support activities. The social practice view framework (von Krogh et al., 2012) recognizes that motivations are not solely driven by intrinsic or extrinsic factors but are also influenced by social interactions, norms, and the community's expectations. Applying this framework can provide valuable insights into the motivations and behaviours of top contributors in supporting and contributing beyond the gamification elements.

The results of this study show possibilities for future scientific work but are based on certain limitations at the same time. Relevant limitations result from the research settings and provide possibilities for future research. Furthermore, the results indicate fields that have the potential to improve the understanding of the researched phenomena.

To investigate this phenomenon, top contributors were chosen as interview partners. Accordingly, we recruited participants, who have reached a certain level of reputation points and recognition on the platform. Furthermore, they reported different levels of saturation towards the gamification. From the data gathered in the interviews, three different stages of affection towards gamification were detected. As the participants were all in phase 3 at the moment of the interviews, they were only able to report on the effects in the other phases from a past perspective. Hence, potential future research could focus on contributors in phase 1 and phase 2 as the

effects of gamification elements could be perceived differently by contributors who are in these phases. Moreover, future research could be longer-term and follow users from their entry into the platform to phase 3.

In general, the developed framework, which suggests splitting the aspects into phases, can be used for further investigations. Research could be done to further improve the understanding of the effects of gamification elements in each phase. For example, the research has indicated that bounties do not generally motivate top contributors to share knowledge or answer questions. However, previous studies found that bounties are an effective way to get questions answered. Furthermore, we suggest quantitative research to enable the measurement of the effectiveness of each element in each phase.

While this study's framework and knowledge gathered might be used by other researchers to conduct future research, the findings of this and future investigations can be equally helpful for practitioners who want to encourage users to share knowledge in other inter-organizational Q&A platforms. The results of this work indicate the importance of a different application of gamification elements in different phases of a contributor's journey. Future research will need to quantify the phase-related effects of gamification to provide suggestions for the implementation of these elements to support the motivation of the contributors in each phase.

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Appendix 1 – Consent Form

Consent Form

Master's in Information Systems, VT23

Thank you for taking part in the study investigating the effect of gamification elements on the motivation to contribute to Stack Overflow.

The purpose of our Master Thesis research is to explore how gamification elements influence user motivation to share knowledge on Stack Overflow. We are using a qualitative research method of semi-structured interviews to gain a deeper understanding of the user experiences and perceptions of gamification on the platform.

The study forms part of the compulsory program curriculum and is supervised by one of the assigned supervisors of the Department of Informatics at Lund University, who will ensure that students adhere to all the necessary rules. The resulting thesis is assessed and graded by an examiner at the end of the course.

We ask for your approval to use the data collected for the study. Participation is always voluntary. In order to collect data for the study, we need your signed consent on the second page of this form. Even in the case that you sign the form at this point, it is still possible for you to withdraw from participation at any time without motivating why.

During the course of the student working on the study, your personal data is protected and will not be disclosed to unauthorized persons. We will store recordings and other details in a safeguarded manner. Any photographic/video/sound collected in the first phase will be anonymized, coded, and transcribed as text. This will be done immediately upon transmission in order to disable any potential for detecting that you have participated. The consent forms will be kept safely so that they may not be linked to our recording. When the study is completed and the thesis has passed the assessment, we will destroy the original data that has been collected.

The results of the study will be published in the thesis in a manner that will not reveal the participant's identity. The study adheres to the guidelines on research ethics and common laws.

In order to complete the study, it is very valuable for us to receive your consent. Please contact us in case you need further information.

Benedikt Vincent Keil   Patrick Senger

Email: be3222ke-s@student.lu.se   Email: pa3035se-s@student.lu.se

Supervisor: Avijit Chowdhury

Email: avijit.chowdhury@ics.lu.se

Consent Form

I have received the information of the study and accept that the material is recorded and stored for use in the master's thesis.

☐   Yes

☐   No

The name of the informant, date and signature:

_____

Print name:

_____

Appendix 2 – Interview Guide

1. Introduction

Begin by introducing ourselves and the research topic. Explain the purpose of the interview and ensure that the participant is comfortable with being recorded.

Ask the participant for their consent to participate in the interview and make sure that they are aware that they can withdraw at any time without any consequences.

2. Background Information

Start by asking the participant about their experience with Stack Overflow.

- Why did you join the platform?
- How often do you use SO?
- Why do you use the platform now?

Ask the participant to describe their motivation to share their knowledge on Stack Overflow.

- Why did you create your first answer to a question?
- Why do you answer questions / What drives you to contribute to the platform?
- How do you look up questions to be answered by you?
- How do you think you benefited from SO?
- How do you contribute to the community?
- How do you think your contributions have benefited the community?
- Are there elements on the platform that hinder you from contributing even more?

3. Gamification Elements

Ask the participant to describe the gamification elements that they have encountered on Stack Overflow.

- What gamification elements have you encountered on SO?
- What are your favorite gamification elements?
- How do you think these elements contribute to your motivation to contribute to the platform?

Ask the participant if they have ever received any rewards or recognition on Stack Overflow (such as badges, reputation points, or other gamification elements).

- What is your experience and how did it affect your motivation to share knowledge on the platform?
- Do you know your reputation score?
- Do you hunt for bounties?
- How do you perceive other users' reputation scores?
- How do you perceive other users' badges?
- What roles play privileges?
- Has this changed over time?

- Do you think that gamification elements like batches, reputation scores or other elements affect your motivation to share knowledge?
- Have you contributed to other platforms? Which Gamification Elements do they have?

Ask the participant if they think that the gamification elements on Stack Overflow are effective in motivating members to share their knowledge. Why or why not?

- Do you feel more motivated to contribute because of the rewards and recognition you receive?
- Can there be negative effects of these gamification elements?

4. Closing

- Thank you for your participation, time and contribution.
- Do you have any further thoughts or comments that you would like to share regarding gamification elements and motivation to share knowledge on Stack Overflow?
- Thank you again, and please note, that you can always have the right to withdraw your participation at any time.

Appendix 3 – Transcribed Interviews

Transcribed Interview with Interviewee 1 - April 27, 2023:

1	Benedikt	So, when did you join Stack Overflow? So, we start with some general questions and go into the gamification elements later.
2	Interviewee 1	Okay. Actually, I have my Stack Overflow page right now here, to get a sense of it, because I have never really reflected on those things.
		I think that my first activities traced back to something like 2021. I'm gonna check actually right now. 2020. That's my first answer that is not deleted at least.
3	Benedikt	Do you remember why you did join the platform?
4	Interviewee 1	That's a good question.
		I think I was a bit interested in it.
		Sometimes I got the answer to my question and sometimes not.
		I think that I remember now. Well, I never really thought this through.
		There was like one question where I couldn't see an answer that would fit my problem. It was basically to do a loop to read a lot of CSV files and there were a lot of people answering this and so I was trying to reply to use the answers but couldn't find a way to apply it to my to my problem.
		So I managed to do it by my myself.
		Then the first answer is basically answering this question in the way that I liked it.
		So I think that's how it started and then I think a lot of it is due to the game thing. It's part of a game a bit and this is maybe how I continued to do it.
5	Benedikt	So how often do you use the platform?
6	Interviewee 1	It varies a lot, I would say. Use it in terms of answering or looking at it in general
7	Benedikt	In general - looking at it
8	Interviewee 1	Every day I guess. Every day I work. I don't think there's a working day on which I don't look at Stack Overflow to answer questions whenever I am having a data codes problem, and now I have this routine of going and checking the questions once in a while - like once or twice a day.
9	Patrick	How do you look up the questions that you plan to answer?
10	Interviewee 1	I have this filter. So I look at dplyr, r markdown, or corridor tags. Those are my strong custom tags. I look at the newest and then I have it as a bookmark.
		So I just click the bookmark and see whether there are interesting questions. But that's for the questions.
		I really use it in two different ways. If I want to answer questions just as community service basically or if I want to look at answers.
		If I want to look at answers then I just google it, try to find questions that match my question and then usually it's Stack Overflow that comes up. There are all those smaller websites like yxz or Quora but usually, it is Stack Overflow that comes up.
11	Benedikt	Has the reason why you use the platforms changed over time?
12	Interviewee 1	It depends on the use. Of course in the beginning I was not using it actively. I think there was quite a time where I was using it passively. My first answer is 2020, but I

		started working with R in around 2018. So there was quite some time where I used the platform more passively in terms of looking at answers more than someone that answers questions.
		So I guess in that sense, it has changed, but since I registered for the platform, it has not much changed.
		Maybe it will. I think at as time goes by I won't have so much time like I have now to do those things and will definitely be less active than before.
13	Patrick	I want to follow up on a thing you mentioned just before. You used the word community service. So why do you answer questions? What drives you contribute to the platform?
14	Interviewee 1	Yeah, that's interesting.
		I think there are two parts – maybe three. First, the community service thing where it's nice to give answers to people. So there's maybe the gratification point of view.
		There is also the thing that you learn yourself. When you answer question, sometimes, I don't know the answer myself.
		And then the game aspect. Well, I think that that works on me. If I get some points – it feels a bit absurd when you talk about it because it's really like in another world, but I think it works a bit on me. Also the competition aspect a bit as well. Like you see the points yourself. You want to get those badges and stuff.
		I should mention also that – now that I think about it – I have also contributed to other platforms like this – maybe you had this in one of your bullet points to your interview. Before I actively contributed to Wikipedia.
		In Wikipedia, there is not really a game or you have to do it yourself. Basically, you have to compare yourself to others. So it's not something that will show up. There's not really a statistics on this.
		Maybe that explains also why I contribute to Stack Overflow.
		I like to contribute to the general good. Whether that's my real opinion. You know, I'm a sociologist. So I sometimes have conflicted thinking about why I do what I do. I tell you that I do this because it's good for the community and also it, it gratifies myself,
		but it may also be due to the game aspect.
15	Patrick	Yeah, we can understand that.
		So, how do you think you benefited from, from Stack Overflow?
16	Interviewee 1	Well, that's second point mostly, that I learned a lot. I think why I answer question is also because I'm interested in answering them. And why am I interested in that is because that levels of my skills in R. Because I'm only doing R questions. I learned dplyr through Stack Overflow. Dplyr is the main drama to do R.
		So you have different ways of coding in R. One is called base R which is the one that was developed by the guys that developed the software. Then you have other people that created libraries like in Python and dplyr is one of the more tidiers.
		So basically I learned that through Stack Overflow; through repetitive questions, I got to know which functions one should use or what tricks you can do. I also did a bit of cod golf. I don't know if you were aware of that thing.
17	Patrick	Yeah, I saw it when I did the research. It is a way to find the best code snippet to solve a certain issue.
18	Interviewee 1	I did that for some time and I think there I got to interact a bit with some active or cod golfers and it's crazy how you can level up your skill in terms of conciseness.

		I love beautiful code. So that relates a lot to why I use it.
19	Patrick	Okay, so let us focus on the gamification aspects.
20	Benedikt	Yeah, one more question just for that part. Are there any elements on the platform or the community in general that annoy you?
21	Interviewee 1	Well, I think the community is pretty okay in terms of people are not bashing each other. But I guess it depends on the community you are in really. I guess you, you'll see that, but there are really subcommunities in stock overflow. I'm only interacting with people that are using R. I mean interact because sometimes in the comments someone says one comment and you reply to it. And usually, you have a pool of something like 20 users. I would say maybe 20 to 50. If I see their username, I recognize it, because they're just people that I see over and over again. So that doesn't annoy me.
		I don't think there are major things that would annoy me honestly.
		One could say people that downvote every answer because that's not the rule of the game. That's really interesting. Because sometimes there are people who just downvote for an unfair reason and that would be something annoying. I don't think that happens often – maybe one in 200 answers. So that happens, but it's quite rare.
		Recently, in R there's a new thing called a collective or language collective. That's something that was created by stack Overflow moderators. If you look at any R questions, there's a little sign on them that says part of our language Collective. That's actually repetition here. Do you see that? You'll see that below the, below my name. There's a thing called recognized by R language. That is annoying.
		But that is something that is discussed among the community.
		We should remove it because it basically says that I have a more valid answer than someone else that doesn't have this badge, which is very wrong. So I would say that that's the latest annoying part but beyond that, there is not so much.
22	Benedikt	Let's talk about your, your most favorite gamification elements. What kind of gamification elements do you look at?
23	Interviewee 1	Can you define a bit more what you mean by gamification?
24	Benedikt	For example the badges, upvotes, downvotes, reputation score….
25	Patrick	The bounties as well if they are important to you.
26	Interviewee 1	I would say what I look for is reputation. No actually – it is the ratio of post score. That's what I'm looking at. Actually, you have to calculate it yourself, but basically for a given tag, or if you look at someone's profile, you look at their score and you divide it their number of posts. To me, that's a good way of assessing someone's capacity at answering questions. Meaning that you have a high mean value of upvotes per post.
		Also gold badges a bit. Not the silver and bronze because there are so many of them.
		Probably the highest top question in terms of answers if I look at someone else's profile for instance.
		I want to see yeah, he has a lot of highly upvoted answers. If those answers are recent answers this values more than an answer that was 10 years ago. Answers from 10 years ago usually have a way higher number of upvotes. So there is also a time component.
		What I'm searching for mostly I guess in the game is reputation and maybe having a few highly upvoted answers.
		I'm less and less looking at like everyday questions, question, but more at some that I think are important and I leave aside the others.

		There's a repetitiveness in the question usually and sometimes you get tired of answering the same questions.
		Was that a good answer or something you wanted to know?
27	Benedikt	Definitely. Do you want to go on, Patrick?
28	Patrick	So we talked about the different elements. Are there badges you recognize? So badges where you still know that they were important to you?
29	Interviewee 1	Yeah, I mean the first time I got the gold badge, I was happy because it really is a signal I think.
		Basically from one to two gold badges, I don't think it matters. It's very visual to me. I think it's a lot about how much space your name takes. So below the name you have the reputation score and then the badges. It is easy to see the difference between no to one gold badges, but not from one to ten.
		I'm sorry. What was the question again?
30	Patrick	Whether you recognize some special badge you received maybe.
31	Interviewee 1	Exactly. So I think whatever the badge was, I think when I got the first gold batch was particularly good.
		And especially the Oracle badge which gives a lot – not only gratification – but also actual things you can do. You can close questions, you can put things as duplicates. So that's actually giving pretty a lot of power.
32	Patrick	Yeah, this was, would have been another question from outside. What, what roles can generally do play the privileges that come with the reputation score?
33	Interviewee 1	So you have quite some things you can do and I think as time goes by, you kind of forget that you didn't have those privileges before,
		but closing a question or putting a question as duplicate is one that I use the most. Now I have a large overview of what has been asked and answered on Stack Overflow. So there are some, that I know that are duplicates and then I put them as duplicates.
		I don't think it gives any advantages in terms of upvotes or anything and I think it should not be the case. I just think that is agreed on within the community of people.
		It just gives a signal between them.
		So for instance, I would actually generally give more upvotes, but it's really, it doesn't happen all the time. But when I see someone had that has not a lot of reputation and has a good answer I would usually more likely upvote the answer. I mean, of course, the answer has to answer the question and everything, but on top of that if it's a good answer and someone that is early in the reputation game, I would more likely upvote, just to encourage and because I think it is a nice thing to do.
34	Patrick	So you see other users' reputation score? So you consider it when working on Stack Overflow?
35	Interviewee 1	Oh, yeah. Sometimes you don't look at it. But I know maybe 10 to 50 people that are really active. I know them. So I know this guy has something like a 100.000 reputation score or this guy has something like 20.000. I guess in the power of ten range I would know the score of the active people. And then the badges come along usually.
		Most of the time it is a good indicator, so you won't bash someone who has not asked many questions, so you would be nice to that person, but usually, it is a good signal for good or bad questions.
36	Patrick	Just a minor question relating to that. Are you aware of your reputation score right now without looking at it?

37	Interviewee 1	Well, I'm sorry. It's just here. I think I would have said lower. I would have said something like 30-35.000, but I actually have 40.000. But yeah, I'm aware.
38	Patrick	Do you hunt for bounties?
39	Interviewee 1	well, I tried a bit. I have offered two bounties and earned three. I am just looking at it now.
		I'm not really. Sometimes I do it when I have time.
		So, my first thing to do is look at the recent questions, not the bounties.
		The bounties usually are either too hard for me to answer or too specialized so I don't have the skills. I'm more into that data wrangling for instance. Usually, the bounties are really specific questions. It is a lot about optimization. It's a lot about really like the cogs and wheels of how the software works.
		So I would say I did some of them but I would I wouldn't say I hunt for it.
40	Patrick	To generalize it, do you from various perspectives think that gamification elements like badges which we talked about, reputation scores or other elements, do they affect your motivation to share knowledge? Does this happen?
41	Interviewee 1	That's a good question.
		I think I think sometimes yes, but not all the time. But let's say I start the day, I see some question that I can answer. I answer them.
		If I answer maybe four to five questions and I didn't get any upvotes on all of them or maybe just one or like doesn't meet my expectations. Because, you know, I have a 1500 answers. I kind of know what is an answer that will get more or less upvotes. So sometimes I there is a discrepancy or like a difference between when I thought I would have and what I do have and I think that can lead me to stop for the day or just not answering anymore for the day because it's a bit of a disappointment.
		On the other hand, you have a 200 reputation cap. So if I get to more than 200, I stop usually. So that means that the game is really important.
		I feel that I got like a lot of votes for a few questions then I usually stop as well because I'm satisfied with like the game part of it. Right? So I feel like I had good scores and I still have other things to do.
42	Patrick	Did you sometimes maybe even drop some other work to answer some high profile question?
43	Interviewee 1	Honestly, I'm working on me sometimes to stop answering because some of the questions sometimes are super, super interesting.
		And I feel like I have a problem-solving personality. I like to solve problems.
		It's like a bit like when you were in high school and you had mathematical problems and you just had to, to fill it in and just go over it. I think that works on me. And so when there are lots of good questions, then yes, it happened that it took too much time. And I couldn't stop really. So that feels a bit like an addiction, but maybe a good one. But it happened, that it was refraining me from working. So I'm actually a bit working on that to myself I'm saying, okay, I should stop sometimes.
44	Benedikt	I've also got a follow-up question.
		Maybe to the bounty hunting. You see how much is missing for the next badge on your profile. Do you hunt badges?
45	Interviewee 1	I think that works a lot when you were in the beginning to me. I was a bit hunting badges.
		So now I'm not at all anymore, but that works a lot in the beginning. I think I feel satisfied with my badges now. I feel satisfied with my reputation score. I, for instance, I think the threshold was when I hit 10,000. When I hit 10,000 reputation when

		I hit a gold badge, then I was satisfied with it. Then I was satisfied with it. And now the badges are not important as they were before. So the next badge thing, I have a very easy badge to get. And it has been here for maybe a year. I just have to approve or reject edits. I have nine suggested edits to approve or not. I could do that in one minute. And it's still there. I don't think it matters to me, but it mattered a lot before. Especially getting the first gold badge. From the game aspect that was my objective, basically.
46	Patrick	We talked about that this can even be some, some kind of addiction. But do you think that there can be other negative aspects of gamification elements?
47	Interviewee 1	Yeah, I have to think about this though. So addiction would be one but it's part of the game but it might not only be because of that. Maybe valorising the answers from people with high reputation. But from what I see, it's not really happening, at least not in R.
		It's just that it happens that people with high reputation have better answers. It's not because of the high reputation. I mean it's linked because they answered a lot of questions. So they got used to how to answer a question. It's also about framing it and everything.
		I don't think anybody does that, but you have those serial downvoting, that's because of gamification. You might have some people that do not want to upvote someone because you, he has done something against you. That leads to not upvoting and the answer not being in the top although the answer is good.
		There's also one thing that is quite interesting. Sometimes you have back-to-back upvoting. That's a new thing. So let's say I answer question and then there's another person - usually it's with someone that answer a lot of questions as well - and then you signal want to guide people to see your answer by giving them upvotes. So you have those kind of weird things that happen sometimes. So I know that's something what some users do. So if you do that to some users, you will receive an upvote, and with other users, it does not work.
		So there are two things about it. It could be good because it could be that you have a good answer and then it's normal to about a good answer. It could be bad because it might be too automatic.
		And then you won't upvote it. I think that I do it in a way that is still ethical in the sense that I still look at the answer from the other person and if it's a bad answer then I don't upvote it.
		Although actually, that happened quite recently where I upvoted another person's answer. Because I know this guy and so usually with this guy it happens that we do the back-to-back upvoting and he has good answers. So I'm quite confident. Last time I was looking at one of his answers, I upvoted it because I thought it was good. I was on my phone and I just saw that someone else replied because it was a question, I was interested to see other people's answers because mine was a bit sloppy and so I upvoted his answer. But then I realized that his answer was not good. So it didn't work in this case of the question. The only thing I could do – because you cannot un-upvote – if the answer has not been edited. So I just commented that the answer does not work. That's a downside in a sense, that there might be automated upvoting because of regular interactions between active users. And this guy – I know he is doing a bit like that – if he answers a questions and all the questions that has been done, he upvotes all the answers. I don't say it's not good, because the answers are mostly good, I just say that it might be problematic if it happens automatically.
		And, I think that's it for the downsides.
48	Benedikt	Super, that's it with our questions so far
49	Interviewee 1	Great.

50	Benedikt	Thank you so much for your time for your participation. We have got very interesting insights.
51	Patrick	Yeah, you have any further thoughts or comments you would like to add and share regarding?
52	Interviewee 1	Well.
		I think it's good that you're doing that. I would be happy to see the results.
		It will be interesting to see how other people think. I know other users that are really into the game thing. You can tell if people are or not.
		Some of them are really knowledgeable, at least in our community. They were inventing some interesting tools and reply a lot. I am just a lame man that got into it because of the game,
		Because of the, of the way that I could learn stuff. So yeah, there are really different profiles.
53	Patrick	Great. Yeah, looking forward to sending you a results.
54	Interviewee 1	Thank you for, for the question. That was that's interesting. I never really reflected on that. So that was nice for me as well. Like a therapy.
55	Patrick	We thank you.

Transcribed Interview with Interviewee 2 - May 2, 2023:

1	Benedikt	If you want I can start with the general questions like about you and Stack Overflow and then we go into the gamification elements even more.
		So, can you recall when did you join Stack Overflow? And why did you join the platform?
2	Interviewee 2	It must have been 2014, maybe 2015. I actually started with one Stack Overflow account and I burned through that account because I asked questions they considered bad and I got blocked and I still need to ask more questions, so I just created a new account with a new email address.
		The new account is the one you see. The old account I just don't use anymore.
		Yeah, I burned through that first one fairly quickly just from asking bad questions, and it was a pretty bad experience.
		But so I was making a mobile app and I'd done a little bit of programming many years before Stack Overflow probably before I had much internet. But then 2014, I was making a mobile, mobile app and didn't know how to do it. So basically just needed Stack Overflow to answer questions. And so that's why I started questions. Yeah, so I started making a mobile application not knowing how to do that. And so that was with Android and so just Googling a lot and Stack Overflow often came up and I had more questions than Google could answer me.
		So I ended up creating an account on Stack Overflow, burned through that one just because I asked questions that got flagged and then created a new account with a new email address, which is the one you found.
		So that's how I first signed up for Stack Overflow And first answering questions….
		The reason…
		I had a hard question and I needed extra help with it. So I wasn't getting an answer. So I post a question not getting an answer.
		So I heard about these bounties and I thought if I had enough points to put a bounty on a question, then I could get somebody to answer my question and I figured more points - more likely to get an answer. So I saved up - I don't know - like 200 points or something and put a bounty on a question. So basically I think I put most of my rep at that time on the question.
3	Patrick	Did it work?
4	Interviewee 2	I think. I can't remember but I think it worked. I realized later that the amount of bounty doesn't matter so much. So putting 50 on or putting 200 on is more or less the same.
5	Benedikt	okay, that's interesting.
		So we've read your articles.
		So you reduce the amount of time spent on Stack Overflow if I, we call that correctly, but how often did you use it in your peak times? What would you say?
6	Interviewee 2	I'd say I was on every day pretty much - at least checking.
		Just getting more rep every day is kind of like like a dopamine hit or whatever.
		So, [I would] often check that so you just kind of scroll through which answers are getting the most hits.
		Yes, a check-in every day
		I didn't ask a lot of questions or answer a lot of questions compared to other people with similar rep as mine.

		Because, if you read that one article, I went by to give really a canonical answer.
		And so those kind of just keep generating rep long after I write them. So I would write those every now and then so I wouldn't answer so many questions and I usually wouldn't answer any new questions. I just answer old questions that were, what I felt was missed. We're missing some good answers.
		So I don't remember how often but maybe…
		Whenever I'm tackling a new topic in programming, I'd often write an answer about that topic just to teach myself how to do it, to teach other people how to do it and at the same time get better at Stack Overflow points/results and all that.
7	Benedikt	And how often do you use it now? And, and why do you use the platform? So what's the points where I check in…
8	Interviewee 2	So I still use it now.
		I would say I check it several, several times a week. Anyway, I don't post a lot of answers anymore. But sometimes I'll edit an answer or get comments or people will just reach out to me through Stack Overflow or ping me on Stack Overflow and ask a question. So sometimes I reply to those.
		Or sometimes people ask me on Twitter or just send an email asking a question. I'll say why don't you post a question on Stack Overflow and I'll look at it. If I don't know the answer I can put a bounty on it because I've got all these points that I don't care about so much anymore. I can spend them on bounties for other people. So that's happened a few times.
9	Patrick	So you started - like most of us - having a question. But what was the point when you answered your first question? How did this happen? And why?
10	Interviewee 2	As I think back I think it was partly to gain enough rep to put a bounty on a question
		Partly, it's because I enjoyed teaching. In college, I was a math tutor and later I was an English teacher and just enjoy helping people solve difficult problems. Just kind of having that aha moment of "Oh, now I understand". So I've always enjoyed that.
		so, it's kind of a way to help other people but also a way to learn myself. All those things all work together, I think.
11	Patrick	So this is the way you see how you can contribute to the community on Stack Overflow?
12	Interviewee 2	Yes, that was definitely one way.
13	Patrick	How do you think you benefited from Stack Overflow?
14	Interviewee 2	By teaching other people I learned myself. Because sometimes if I just Google an answer just to solve my own question I'll just solve the minimum amount to solve that problem. But if I'm teaching other people, then I have to deal with some edge cases and consider other things that I would normally think about if I were just doing it answering for myself. And so that expanded my knowledge in a way that wouldn't have happened if I hadn't answered questions.
		Also with answering questions, the answers are out there in public. And so if I write something that's wrong, people will leave a comment. So that's like an error checking for me. And so that's helped me learn many times.
		Yeah, so I think those have been several benefits.
		Another is, like I'll write an answer two years ago or four years ago and then I'll forget how to do it. So then I'll remember: Oh, I think I wrote an answer about that and go look it up and then so it's kind of writing a tutorial for my future self. Even just today I googled something on Stack Overflow - how to change a button colour in Flutter, like the text colour. And somebody had this question and I went to up-click it. But then it said you can't up-click your own posts. It has happened on answers today but in the past, it was

		actually a question. I posted a question-answer pair. So I was trying to upvote the question because I had the same question again today.
15	Patrick	So how do you think your contributions have benefited the community?
16	Interviewee 2	Having canonical answers are kind of like mini tutorials.
		And so I've gotten lots of feedback from lots of different people like even just like short comments on posts like "great answer" or "this should be the accepted answer" or all that the kind of comments that often get deleted - and should get deleted - but lots of feedback like that.
		So, yeah, that has helped. I think now with AI and early ChatGPT training itself on these... these answers have gone into the large language models too.
		So, I mean, I'll never know what the result of that is.
17	Patrick	And you just mentioned that you enjoy the educational teaching aspect and just wanted to know, are there other platforms where you contributed in the past?
18	Interviewee 2	Medium, quite a bit.
		It was actually through Stack Overflow some of the answers there. I was reached out to by the company named Pusher and they wanted me. They asked if I would write some tutorials for their site. And so at that time - this was by 2018 or 19 and so - Flutter was just coming out. I was looking at Flutter. I didn't really know much about it, but (they asked) Pusher asked if I'd write articles and I said well, will you let me write articles tutorials about flutter. So basically what they agreed?
		I chose topics I wanted to learn about and then I would write an article about that. So basically the same strategy I used on, on Stack Overflow. But again just writing the article I wanted to have if I were learning some topic and so through that it basically paid me to learn Flutter.
		That was also a little bit nicer than, than Stack Overflow because in Stack Overflow you just get imaginary internet points, but for writing articles you get paid real money. So that was that was helpful. But it's still the same same thing writing canonical short tutorials that type of thing. So that was a push here. And then about the same time I started writing articles for Medium because when I write for a company, then they have specific requirements, but when I write on Medium, I can just write about whatever I want.
		So, I also started making money from writing through that. Then later, I moved on to Writing for Ray wenderlook.com which turned into Kadeco and I still write for them.
		But yeah, all of that pretty much came out of writing for Stack Overflow
19	Benedikt	So let's let's talk a bit about the gamification elements on Stack Overflow.
		So what were the gamification elements in general, what gamification elements did you encounter on Stack Overflow? And what were your favorite gamification elements? So, which elements did you value the most or did you look at the most?
20	Interviewee 2	So, the elements were like the, the rep points, 10 points for answer, five points for question.
		There's a 10 points. It was five points, in the beginning, might be 10 points now for questions.
		And so in the beginning it was mostly that.
		When I started all these people had hundreds of thousands of points, and I just had small points.
		And I didn't even think about trying to catch up with anybody really.
		Then, they also had badges.
		Badges were bit of motivation too.

		There's one badge called Necromancer.
		I forget exactly now how you get it but basically writing canonical answers to old questions that start taking over, and then you get that badge.
		I forget the exact requirements, but I ended up getting lots and lots of those badges.
21	Benedikt	Did you hunt for those badges? Like, "I want to have this badge, and that's why I'm doing or writing a specific answer"
22	Interviewee 2	The badges I eventually started hunting for were the gold topic badges.
		So I got the golden Android first, and I think I got it in IOS second and then Swift third and then Flutter and Dart.
		I think I got those five golden ones.
		So yeah, I would specifically trying to answer questions that had those, those topics/those tags to get those badges because once you had the gold badge you had more power in that tag, you could automatically close questions.
		I think I did do a lot of close voting.
		But it was more status to have a gold badge and the rest were just kind of interesting but not that much.
		So yeah, then I guess later the total number of gold badges I started pursuing a bit.
		Not pursuing, but looking at the ranks, because I think I was probably in the top 10 now of all the people in Stack Overflow with gold badges.
		And then the total rep score eventually.
		Even though I wasn't answering many questions, just because all my old answers were getting lots of votes all the time moving that to the top 100.
23	Benedikt	You were mentioning the privileges that come with higher reputation scores and certain badges. So what, what role did that play in your motivation? Did you hunt for specific patches to get those privileges or hunt for points?
24	Interviewee 2	I don't think badges give any of those privileges besides the close vote I was talking about.
		Mostly it's based on rep points.
		So, the more rep points you get the more privileges you have on the site.
		I found the last meaningful privilege I found was at 10,000 where you could see deleted answers. Because when you can see deleted answers, those are sometimes helpful. They got deleted maybe for plagiarizing or just because they weren't quite according to Stack Overflow guidelines, but they still sometimes include helpful content or sometimes just interesting content. And so that that's really helpful to be able to see those.
		But at 20,000 I can't even remember what the privilege is and I think that's the last one at 20,000.
25	Patrick	I think you get access to the Google Analytics of Stack Overflow. I think that at the highest reputation score.
26	Interviewee 2	I see.
		Overall though I'd say those privileges weren't really something I was working for. They were just nice extras as time went by.
27	Benedikt	And in general, how do you think these elements would contribute to your motivation to contribute on the platform?
28	Interviewee 2	Rep for sure did because it motivated me to keep writing answers. Also, the gold badges motivate me to keep writing answers.

29		I think there were certain times that I wrote answers just to get those gold badges. Maybe when I was getting close to it I'd do a few more answers than I would have normally done. Anyway, just to get the gold badges.
		And the regular rep points…
		There was a time when I was almost most days hitting the 200 rep and so for my strategy it doesn't really help to get any more because it just cuts it off right there. So I wasn't really motivated to answer. It was kind of like demotivating to answer any more questions at that point because it would not do any better.
30	Patrick	Just out of curiosity – do you know your reputation score by heart or is this something you always have in mind?
31	Interviewee 2	I always knew approximately what it was. I mean I was getting around a thousand per week. But I knew as I hit the 200,000 and 400,000.
		Also at 100,000, they sent me a T-shirt and something like that.
		I think at 250,000 they were supposed to do something too but at that time there's a bunch of internal conflict in the organization, so it never happened.
32	Patrick	And how do you perceive other users' reputation score?
33	Interviewee 2	I remember at the beginning seeing people with 200 or 300,000 like "Well, they're amazing!".
		But also I kind of felt like they were kind of distant.
		Some of the higher-rep users had a reputation of not being very friendly
		The kind that would close your questions and.
		Just kind of the whole reputation Stack Overflow has for not being very friendly to new users.
		But there were several in my tags that helped me a lot when I would ask questions they would they would give answers and that was super super helpful.
		I admired those people.
34	Patrick	And to what extent did you look at the badges? How did you perceive the batches of other uses?
35	Interviewee 2	Pretty much I only saw the gold badges about the users because they were the ones who could just with a single vote close the question as a duplicate. A duplicate hammer, I think it's called.
36	Patrick	I see that you sometimes use the bounty system. Do you hunt for bounties yourself as well? Did you hunt for them?
37	Interviewee 2	Not much. Every now and then I'd look at it.
		It's just it didn't really fit my question-answering strategy.
		So if you're trying to answer questions quickly or just get immediate points, that could be a way to do it.
		But I just found over the long run answering questions that had high traffic/that had lots of mediocre answers already but really needed a good answer…
		I found it's kind of like investing in the bank or in the stock market. There are returns over the long term whereas bounty hunting or just trying to give a really quick answer that gave good points for the day, but then after a while then it would turn to nothing.
38	Patrick	Can you consider whether some aspects of this elements – the reputation, the badges, demotivated you to, to share knowledge/ to contribute? You just mentioned the, the cap the daily cap was one aspect, but are there other things you have in mind?

39	Interviewee 2	The demotivating thing to answer questions are the downvotes, for sure.
		There were many times I knew – because I'd often post question-answer pairs – like I'd Google something and there wasn't even a question for it.
		But then I would research my own answer and write a question and answer and post them together.
		And there was several times I know, people might gonna downvote this question and maybe the answer just because it seems too easy.
		But it just didn't exist on Google. So, it seemed too easily so I just have to brace myself. Okay? Okay, just post it, get through the first one or two downvotes.
		And then after that people will find it on Google and upvote it. So that happened many many times.
		So the downvote thing was definitely "Okay, let's think. Do I really want to post this answer/ this question?
		One downvote is much more powerful than 20 upvotes.
		Even, especially when I was way back with low points – a single downvote was terrible.
		I remember it would ruin my whole day just to get a downvote.
		Later, after a few hundred thousands, it didn't matter so much.
		But it's still – if I check. What's my new rep and I had a single downvote I'd ignore all the other votes and go look at that one and wonder why they downvote.
		And often people don't leave a comment.
		No, I definitely pay more attention to the downvotes.
40	Benedikt	How has your focus on this gamification elements changed over time? You mentioned some effects already, but maybe can you explain it or elaborate a bit more on that.
41	Interviewee 2	If you read my medium article, that's the biggest change in my involvement in Stack Overflow.
		I grew up in a Christian family and I went through a period of time where I didn't really know "Is God real? Is he going to be part of my life?"
		Eventually, I came to realize that "yes, God is real".
		But then I didn't know, what does he want from my life and am I going to follow him? Because I've made all these other parts of my life the main centers of my life and Stack Overflow was a big part of that.
		I loved/I love programming more than more than God.
		It was empty: those rep things, the badges.
		They gave a short little bit of happiness when I got those but later just life was empty. It was meaningless.
		And so I was looking for something more in life.
		So beginning of last year, I finally wanted to say "Okay God, you can have my life. I want to follow you."
		After that, it was much much better. I finally had a meaning in my life and purpose.
		And so I wasn't looking to things like Stack Overflow and other things that have been looking to in my life.
		But also going through this whole process of this last year, there's like "Well, God's given me this ability to program."

		I am not the best programmer in the world, but it has allowed me to the program. So can I use that for him now and not just for selfish motivations myself?
		Some of the comments on the first article I posted after that, people said "Well maybe you think (I forget exactly what they said that) maybe you think that they're meaningless internet points, but they've helped a lot of people.
		And so they were right about that.
		And so I kind of see now. My programming work can be used to help other people. I don't, still don't write so much. I don't participate so much on Stack Overflow, but I think programming whether it's apps and working on the hour or even articles I write now – it's used to help other people.
		I think that's following Jesus' words of loving your neighbour as yourself. So a way to love God, a way to love people.
		So I still see that as meaningful beyond just getting something for myself.
		Although even now, helping other people is still a great way to have a meaning in my own life.
42	Patrick	Great. Thank you so much. Thank you.
		Thank you for your participation and your time.
		Do you have any further thoughts, any comments that you would like to share regarding the gamification elements? Something we might not have covered now. Is there anything left from your side?
43	Interviewee 2	I think we covered most the things I was thinking of before.
		When you, when you published your paper, I'd love to read it if it's if that's okay.
44	Patrick	Yeah, absolutely. Looking forward to sending it to you when we're done.
45	Interviewee 2	Hey, thank you.
46	Patrick	Perfect.
		So thank you again. Please note, you always have the right to withdraw from participation. Just wanted to let you know once again, but I'm really looking forward to sending you our results.

Transcribed Interview with Interviewee 3 – May 9, 2023:

1	Benedikt	when did you join SO and what was the reason?
2	Interviewee 3	So, this is my Stack Overflow thing.
		So I think I started it…
		It's hard to tell…
		All right. I joined 13 years ago, but that doesn't mean that was when I first did things, I started getting involved.
		So about 10 years ago I started working for AWS Amazon web services.
		And as a trainer.
		And so I had this knowledge
		and I had a... reverse the oldest you know, I can find my oldest answer here and here this might be.
		For real, I started in 2014 and I just really do aws-related questions with some, some side things.
		So as a trainer, I had knowledge that I could share. I've always looked for things that I could contribute back like open source projects.
		But I'm not the world's best developer one time. I tried helping with an open-source project doing documentation, but that wasn't too fun.
		And then I realized oh, this might be a way that I can contribute back.
		And it also build up my knowledge because I found by answering questions I actually learned a lot in that.
		Somebody says "How do you do this?" And I go: "That's easy". I go to the documentation page to get a link and I discover it's something not what I thought
		and my favorite things that I answer actually, when I write code Snippets that helps people solve problems or
		somebody says "I couldn't deploy this". And so I go through and I step by step say what I did to try and reproduce their problem.
		So I learned a lot for the presence.
		So to answer your question, yes, 2014.
3	Benedikt	So how often do you use the platform today?
4	Interviewee 3	So, you asked, you know what gets people to use it and one of the things I think that happens is while gamification is an early thing to get people interested in use it, it's become a habit.
		So first thing in the morning, I hop in - I have a shortcut. I just type "s" in my browser and it takes me to the latest questions for Amazon or AWS where nobody has an accepted answer.
		And so this is my and starts with the newest ones. So in the morning.
		When I hop on my computer at home typically before I go to work, I will have a look through and look for any interesting questions that I can answer.
		I can't answer on every topic. But if you're heading will catch my interest, I'll go through it.

This red thing. I also have some scripts installed using something called Tampa Monkey or grease monkey and

What this does is…

I've got it to automatically highlight tags that are badly done. So on this page, the tag for "Lambda" should not be used for the AWS service.

And so I will actually go into this question.

And I have a script that has already fixed this if I refresh the page. it'll show you it's replace that tag with AWS Lander.

So I've automated some of my work.

I don't just answer questions. I try and clean up.

Sometimes when people ask question the formatting is bad.

I will go and I will clean up the formatting just to make it easy for people reading in the future.

So I go through all of this.

You might also notice I've got a script that removes the ads on the page and makes it bigger. Just easy to look at and I'll look through for some questions that I think I can answer and that typically involves asking a question.

First of all, trying to find one that I've done here today.

And I can generally recognize what I've looked at here.

Okay. So this question has a comment that I added.

Where somebody was asking "How do I get into my account?" And I had a comment saying you're best off contacting customer service.

I participated with other people to close the question which basically means it'll disappear if it's not reopened again.

so a bit of cleaning up and things.

Another thing you'll notice up here is I have a little Stack Overflow icon with a number "1".

And this is telling me "Oh, there's a response waiting". Somebody has responded to something that I've asked or

the person asking the question has responded on a question in which I am participating.

So, might not be that responded directly to me.

And that is also reflected here on this icon so I can see "Oh, somebody has asked a question".

So, here it looks like something that I answered in 2018. Somebody had a comment on there saying my answer was better than the other person's answer, but they got the official thing.

So whenever I see something in that icon, it's this desire within me to go "Oh somebody's contacting me." It's like you've got an email. That's like you've got a text message on your phone.

It's like, "Oh, I better hop in here very quickly and respond to that."

So notice that during the day, but otherwise I'll do it in the morning, I'll do it at night and when I'm trying to avoid what I'm working on during the day

 a lot of popping and having a look. So several times a day I go in

		There is something in here where I can see how many days I have connected in
		So I've connected for the last 114 days.
		and it looks like, I was away on a holiday in December and January so I missed a few days there.
		But I had got... oh look, I missed the day in September as well. This isn't terrible.
		I must have been doing something that... but yeah, it becomes a bit of a habit.
		I think back in May last year was when I tried to stop doing the habit.
		But that didn't last long.
5	Benedikt	Okay.
		Has the reason for using Stack Overflow changed for you?
6	Interviewee 3	Yeah, so I was trying to figure out here when I started using SO I would... if somebody accepted my answer I will be like "Wow. This is fantastic. Somebody thinks I'm good and useful."
		Um, and then the points kick in and it's like, "Oh, I just got points"
		Because I get points if they hit the tick, I get 15 points and if somebody gives it an upvote I get 10 points.
		and so here is a listing of this.
		Somebody's... it's all the reputation of things that I get. So I used to look at that a lot.
		Now I don't bother pulling it down because I get a lot of points every day and what's interesting is the points that I get and not so much for what I'm doing. today…
		And they can be for things that I've done in the past. So this question here. I got 10 points. Let's have a look. This is something I did in 2017.
		So it's like getting royalties or I get credit for things that I've done in the past.
		And if I have a look at my reputation.
		This bar is showing how much reputation I earn each day. There is a limit of 200 reputation each day for all questions where people upvote.
		But I can get above 200 if I'm answering questions and people are accepting it.
		There's no limit on that.
		So if I'm looking my history back. here I can see there are some days where I got over 200 points because I had answered questions and got some old reputation in there.
		And so reputation came in nice
		after reputation... it's like yeah, I'm getting all these points. It's no longer exciting... I've discovered badges.
		And badges are where I get rewarded for doing certain things, such as... these gold badges are if I answer a certain number of questions on a particular topic then I get a gold badge to say "Yes. I'm an expert in that"
		And sort of starts with bronze and they move through silver and then moves up to gold.
		Of these black ones are ones that Stack Overflow grants. For example, six times I got a badge for answering a question more than 60 days old.
		Or a question with a negative score then changes… is positive and various things.
		And there's one badge in particular that's really interesting
		and that is this legendary badge.

		So I mentioned before I can get a maximum of 200 points a day. So I miss out on reputation if I hit that limit, but this badge gives me a credit if I earn 200 Points 150 times.
		So instead of missing out a reputation every time that I miss out, I sort of go, "Yes, that's another day hitting me towards this badge".
		So it's another encouraging mechanism.
7	Patrick	So are you really looking at these badges and you try to hunt them kind of?
8	Interviewee 3	These days not.
		Okay, because I've sort of progressed past that.
		And it's now just a daily habit where I go into… if I…
		I'm wanting to cut down my habit because I no longer work for Amazon and it takes time out of my day and there's better things I can probably do with my day, but it's a habit and I just go in there in the morning.
		I go at night if I'm a bit bored during the day, I'll go in and have a look.
		and breaking a habit is very hard.
		I want to lose weight and I want to stop using Stack Overflow
		And then as I was stopping actually. When I took my holiday in December/January, I thought this is the time I can now stop doing it.
		They've introduced a new feature called "Collective".
		So there is a thing called an "AWS Collective" where things with certain tags are recognized to be part of the collective and people can get rated for contributing to the collective.
		So, this is showing in the last seven days who has contributed most of the collective.
		Someone, I know because I dealt with him when I was working in AWS. He's very good at answering I think so. He's beating me of the last seven days and over the last 30 days up he's also beating me.
		When they introduced this feature, I was reinvigorated and excited and I went back to answering questions.
		I thought I would stop Stack Overflow, but I did it just that I could compete against this smaller group of people rather than the whole world.
		It's like "Oh amongst AWS people, who can do it". And there's not many of us doing a lot.
		So here we can see people getting points.
		This person has not answered a question recently and yet he's number seven and simply because of his old questions giving lots of points in there.
		So, It drops off pretty quickly.
		And then for the group… and then there's the global thing and I've been looking at this recently.
		So it says I'm in the top 0.1% for the year.
		I can go in and see that for this year. I'm number 60 in terms of reputation that I've earned. 11,000.
		But I've been ignoring that and I've recently been looking at this "all time". So apparently "all time" I'm number 294 in terms of reputation.
		and not that long ago that was 300 and something.

9		And I thought, I just want to get past 300 so I set myself a goal and I'm getting up to 300.
		And I sometimes look at what is the reputation of the next person?
		294, so here I am... if I get another 300 points I'll be one further up. So maybe I'll keep doing it a little bit more.
		This will never end.
		So some of these people are also answering questions.
		So we all move up.
		Some people have stopped answering.
		So we're just sort of overtaking the dead people on the road who have given up and keep going.
		So it's the gamification - you know - in the beginning, created a habit, then it came back with the collective and now I'm sort of looking at "all time".
		But I'm not trying to reach number one. It's just, just a bit of fun now.
		So yeah, I sort of saw that progression how it gets there.
		And I don't even notice my... well, I didn't notice my reputation except now I'm looking at the all-time scores.
		So yeah, I guess I am.
10	Patrick	Hmm. Absolutely,
11	Interviewee 3	I should mention to you…
		I just really good video here by Jeff Atwood who's one of the people who created Stack Overflow and this video is all about how to create a good... how to be a good citizen - how to create a good question.
		But he does a very interesting job of explaining what Stack Overflow is for
		And if you really think about it, Stack Overflow as a site where people who have a question can hopefully find somebody has already given an answer.
		So think of it like an encyclopedia or a Wiki with lots of useful answers.
		To get those useful answers, they have to allow people to ask a new question that might already have an answer.
		and the job of the person asking a good question is to put it in a way that a future reader who has a similar problem can find an answer for themselves.
		So I will often go through and if there is a question with a bad heading - somebody might just say "I'm getting this error"
		and I might change that heading to specify the name of the error so that future readers can find a question that relates to what they're doing.
		So I'm also like a librarian improving the quality of the questions that are on there.
12	Patrick	Yeah, we talked a lot about the reputational aspect. How do you perceive other people's reputation?
13	Interviewee 3	Interesting questions.
		So I guess in that thing that I just showed with the collective that's a time that I can look at other people's reputation.
		There are some people out there who I respect greatly for their knowledge.
		One person knows a product called Amazon Redshift very well.

		And if he ever asks a question or answers a question, I will often give him an upvote because I trust them greatly and I'll give an "upvote".
		sometimes I see new people coming through and asking and answering questions and I like to encourage them by giving them an upvote on this system.
		Especially when they're fairly new I think, giving them those few extra points will encourage them to keep going.
		And so I like to do it. Stack Overflow always encourages us to upvote things so I could go in here and I could upvote the question or I can upvote an answer.
		I really don't upvote questions unless I find a question that is particularly well-written and well-researched because it says... the question shows research,
		But I find most people asking questions on Stack Overflow haven't really put enough thought into what they're doing.
		So it's rare that I upvote a question, although Stack Overflow often reminds me that I should upvote questions as well, but I will often go and upvote an answer.
		So here is somebody who might have given a good answer, I could upvote it.
		Today, however, I'm a little bit scared of sometimes upvoting things because people are starting to use ChatGPT.
		It is officially not allowed on Stack Overflow, but I can sort of pick them up.
		Sometimes by well-formatted things like this. These are bullet points, with questions and full stops and that often indicates a ChatGPT answer.
		and in this solution, "we'll use the CLI to create…" and that to me sounds like somebody's copy and pasted that from somewhere else on the internet.
		It doesn't sound like GPT, but "we'll use the CLI" seems a bit wrong to me.
		And yeah, I can tell that's a genuine answer. So, [another user], I dealt with him a lot while I was doing things at AWS, I respect him.
		and so sometimes just because I know them I'll give them an upvote because I, I trust them and it's good.
14	Benedikt	we've talked about the reputation score so far.
		Do you look at the badges, when you look at an answer? Do you look at the badges that the person has got or how do you perceived the badges of others?
15	Interviewee 3	Oh, the badges all people's badges.
		No, because they don't really appear.
		So in this sort of interface, I see very little
		I can see…
		Okay, it does have the badge counts here.
		But that's typically aligned to how long they've been on the servers.
		I'll pay attention to their reputation and I'll use that as a indication of how reliable their answer is.
		So if I'm seeking information, I do happen to notice that score. Yes.
16	Patrick	No, okay. So we now covered most of the gamification elements. There's one more thing I want to ask. Do you care, do you hunt for bounties?
17	Interviewee 3	Bounties, I don't care, because... somebody will often offer a bounty and... see if we can find one here.

		I don't even know how to search for a bounty.
		The whole meta thing is something that is worth understanding. Having to explore the depths of Stack Overflow and the whole community that runs on, on the Meta Stack Exchange services.
		I can look for bounty. So if they just go to….
		So if you haven't looked… here, 50 points. Yeah, I earn 50 points by not login in.
		And you know, I can hit my 200 limit a day without doing any work.
		So, the points really don't matter to me.
		maybe in the early days, I thought I could... I think I answered one and they didn't give me the points.
		If it's really irrelevant.
		downvoting questions and answers loses me a point.
		So it's a way to stop people being evil to people.
		I tend not to downvote. Not because I don't want to lose the points but because it's a big negative.
		Instead, I would add comments to people asking them, so they can improve their question,
		but I don't care about trying to earn the points through bounties, really.
		And they're tiny, you know.
		if I was to ask a question, I really needed... No, I'd probably create several thousand points as a bounty if I wanted a good answer
		but 50 points - who cares?
18	Patrick	I have one more question about the limits/ possible limitations by gamification elements. We talked about the reputation cap, are there other aspects on Stack Overflow that might hinder you to answer even more today? Or certain other aspects that demotivate you to share knowledge?
19	Interviewee 3	So the biggest limitation is not having questions that I can answer.
		So I mentioned that every day I have a look through.
		And I'll do it in the morning. I will do it at night being in Australia.
		And Americans have had their daytime and I get them towards the end of the day. So there's lots of sort of questions left over.
		I can try and answer on weekends. I feel very sad because people don't ask questions on the weekend.
		And American Saturday and Sunday, which is my Sunday and Monday is very slow on Stack Overflow.
		So I often go there Monday morning and there's like three questions since I looked at last night and I get disappointed.
		So my time zone limits me in that. Maybe there's some questions an American ask.
		Oh, I did a study one time on AWS questions that do receive an answer.
		So of the AWS-related questions that have received an answer, How long do you think it is until the first answer is received?
		Is it one minute, one hour, one day? What do you think?
20	Patrick	Maybe an hour? I would say something like that.

21	Interviewee 3	Yeah, half an hour on average.
		If the question is going to get an answer it gets one within half an hour.
		And sometimes during the day, I would just randomly log on and I like answering within the first hour.
		It's sort of like it's a sign of good feedback.
		And so yes, there's probably lots of questions that I didn't get to do because I was asleep at the time.
		So that's a bit of a limitation there as well.
22	Patrick	What we didn't yet cover is the topic of privileges. There are a lot of privileges that come with your reputation score. What's the effect of them?
23	Interviewee 3	None for me, because I got them fairly quickly.
		I've got... the biggest one is 25,000 and that's nothing.
		So, some of the low ones are good, because it stops spam or it stops people asking…
		Low reputations some of them create problems because people can't…
		add comments…
		So "50" to get to comment and that hinders some people about being able to provide some information back.
		What's interesting is, if I go to a different stack exchange site... so Stack Overflow is part of the stack Exchange Network.
		And they have many of them so I might go and say "theoretical computer science"
		and I've never used this community.
		But what I can do is I can join and I can join using my stack exchange account.
		and what it does is it immediately gives me a hundred reputation points.
		And the reason for that is, I can then start doing some of these useful things on that site.
		So it's a way of saying "Okay, we recognize he was a value member for the community and come to our community and we'll start you off."
24	Patrick	So, if I get it, right you were never aiming for a certain reputation score so that you're able to do certain things? That it just came with doing the stuff you were actually doing.
25	Interviewee 3	Yeah, I was earning points pretty quickly
		and aside from the, the early ones that stop you from "upvoting" and "commenting", the rest really don't matter.
		Can you create tags? Can you edit? So, I do an awful lot of editing.
		And, but I'm sure I had the points before I even worried about doing that.
26	Benedikt	Have you ever contributed to other platforms? So have you ever shared knowledge on other platforms?
27	Interviewee 3	So when I was working at AWS, I took on a particular role as a technical evangelist whose job is like to market AWS online because of my Stack Overflow work.
		They say "Hey, you do a lot of Stack Overflow, do this".
		I made a lot of videos on YouTube.
		I can find them.
		so twitch is a property owned by AWS.

		And has real-time streaming interactive things. I've then took a lot of the streams and put them on YouTube.
		And I created something called the AWS certification quiz show
		So a bit of... a show where people could test their knowledge of AWS.
		So that in a way is giving back to the community of what I was doing there.
		AWS created something called "repost" which is I guess their version of Stack Overflow.
		and it sucks. The interface is not very good
		The…
		and I, I didn't get far with this thing, because maybe I'm too used to Stack Overflow and it didn't have some of the features that were there.
		I tried to do questions on here and they have some similar gamification,
		But frankly, it just didn't work a number of years back.
		I was looking at... is Stack Overflow good place for AWS questions?
		Because Stack Overflow is officially a site for programming question and answer
		So you want to write Python "fine", but you want to use "cloud computing" It's you can program cloud computing but it's a fine line
		and so I…
		Area 51 and stack exchange has a thing where you can recommend new sites to create within the stack exchange Network.
		And I propose creating a new site just for AWS and it didn't get enough support to move forward.
		In fact, they're adding very very few sites on here.
		And these are showing their age of things they put on so…
		And I also discovered that a lot of people who would participate in such a forum would prefer to get Stack Overflow points rather than points on a new site.
		So being part of Stack Overflow had a lot of credit.
		On my resume, I put in a "Top 300 contributed Stack Overflow" and people always talk about it.
		So it is a badge of honour. It does help me get a job.
		Whereas if I just said I'm top contributor on this unknown site, nobody would care.
28	Patrick	Absolutely.
		So we were hopping a little bit left and right, but that's fine. That's perfect because most of it just came out of talking about the aspects and that's great.
		Yes. We covered so many of our questions already along the way. That's great. Yeah,
29	Interviewee 3	I even have to share... I've got some standard answers that I can type in for things that people often ask.
		And it could be things like "Sorry. Your question is hard to understand. Here's a link to how to ask a good question" or
		"Here's a series of articles about an AWS thing that is worth referring to".
		So whenever I find myself doing things a lot I will have some standard answers that I've created there.
30	Patrick	You mentioned "giving back" by answering questions.

		What role do gamification elements play in the learning part, like learning for yourself? Is there a connection?
31	Interviewee 3	So,
		I'm relearning Japanese at the moment. Just how to read and write Japanese Hiragana Katakana.
		I learned it many years ago and I thought "Oh, I should refresh it"
		and I found a YouTube video that's good at teaching and I found an app where I can practice
		and it gives points and I guess it's gamification as well.
		So, my goal is to learn Japanese, but the, the mechanism sort of encourages me.
		So there's a lot of…
		I don't do them. And I know some language learning things, you know,
		you get points if you come back every day and practice and that gets going so just like I said with Stack Overflow.
		I think the route the gamification is good for building the habit.
		Once the Habit is there, it's no longer important.
		So it's more important early on.
		It's effectively like somebody saying "That was really great work. Keep going."
		Except you don't have a human doing it. You have a number on the screen.
		My wife goes mad at me when I do not upvote her Facebook posts, and I don't go on Facebook and but she's upset that I don't give it a thumbs up when she put something on Facebook.
32	Patrick	Yeah, there is a need for upvotes. Absolutely.
		Great. Okay. Um great. I think we've covered all our questions now. Oh, thank you so much.
33	Interviewee 3	Recently... Stack Overflow...
		A year ago SO send everyone with a reputation above 100,000... I got a T-shirt and a pair of socks.
		For my hours and hours of work. I have T-shirt and pair of socks.
34	Patrick	That's yep all the part of motivational aspects…
35	Interviewee 3	we are effectively unpaid workers who I help him build their website.
		They can sell advertising
		the community is very difficult and there's been times in the past where people have left Stack Overflow due to...
		if you look up Monica... if you look at Stack Overflow Monica, you'll see a whole history of unrest in the community and the way that SO treats people.
		But I don't go in that politics. I just do it because it's fun.
36	Patrick	Yeah, absolutely. Yeah, but thank you.
		And do you have any further thoughts or comments to would like to share? Something regarding the gamification elements especially and your motivation to share on Stack Overflow. Is there something we didn't cover yet?
37	Interviewee 3	No.

38	Patrick	Great, so we're here.
		Thank you so much
		We're done from our side.
		And again, please note you have always the right to withdraw from the participation at any time. Just let us know if for whatever reason you don't want to participate anymore.
		Thanks again. Thanks for participating [Interviewee Name]. It was, was a pleasure talking to you and having your insights and especially seeing how you work and how you progressed over time.
39	Interviewee 3	And good luck with the thesis.
40	Patrick	Oh, thank you so much [Interviewee Name].
41	Benedikt	Thank you.

Transcribed Interview with Interviewee 4 - May 9, 2023:

1	Benedikt	So I'd start with some general questions about you and Stack Overflow. Do you remember why you joined Stack Overflow?
2	Interviewee 4	There was someone on software newsletter. He mentioned this and it sounded intriguing so that was in probably summer of 2008 and then it became public available in September 2008.
		So I signed up and got hooked.
3	Benedikt	You how often do you take overflow right now?
4	Interviewee 4	I don't know. N time today where N is a rather large number.
		I only have seen anyone turbo which would be the c questions to have.
		Which is unusual, I usually have a half a dozen Stack Overflow tabs of various thoughts. one question. I think I might get around to answering our questions. I'm having a dialogue with someone on, even though you're not supposed to use comments for dialogues.
5	Benedikt	What's your main reason to use the platform nowadays?
6	Interviewee 4	I am primarily contributing in c, the closing shell, SQL and one or two other places
		Basically, I quite enjoy helping people understand what problems they are running into. C is a tricky language to learn. Trickier than still some of the more modern ones.
		And especially it's tricky for people who come from a Python or Java or C# background.
		Yeah, so it's a bit of culture shock for people. So I enjoy doing it. I, you very often know the answer. I don't always give the answer because someone else has got there first, but I can guide people generally. I think I'm still one of the top contributors around the c tag.
		Let's start with the one that I concentrate on but I look around and they're occasions when I actually use Stack Overflow as a source of information rather than me providing the information. And it can be, you know, quite useful even then or then as well. So I do both the answering and occasionally more less frequently. I do searching for an answer to my own problem.
7	Patrick	How did it happen that you created your first answer to the question?
8	Interviewee 4	I would have to go back and have a look see what person it was, but basically, I saw a question that needed an answer managed to get an answer in.
		You probably are familiar with the FGITWS - fastest gun in the west syndrome. Sometimes getting your answer in quickly is the way to earn reputation on the thing as such.
		And then the part with the gamification started.
		But I don't remember, it was probably day one or day two when I did it. I'd have to go and hunt through my answers of this to find out what it was.
		I may have deleted a couple of the oldest ones, but I haven't had deleted very much.
9	Patrick	I want to follow this up you just there was a question that needed an answer. Why do you answer questions? I want to into pinpoint it.
10	Interviewee 4	Basically, I can. There's an element of showing off. Of course.
		There's also making sure that people are getting the right answer or a sufficiently good answer. I sometimes have used, which not the same as everybody else's, partly because I've been around the game C programming longer than other people. In these days, I just did one of these Stack Overflow developer surveys and putting in nasty numbers,

		like if 45 years of programming and 40 Years of professional programming, it will be 40 years later this year anyway.
		I've been around a while and most of that time has been programming in c. So I've seen c develop and know what we did in the 80s was quite different from what we do now.
		Okay, some of the code I work on is still last written in the 80s and that voice behaves as if it was last written in the 80s and I'm working on cleaning that up.
11	Benedikt	Impressive
12	Patrick	And how do you typically look up questions to be answered by you?
13	Interviewee 4	I just go to the questions tag C page.
		There is a chat in here so somewhere in the….
		There's a page like which is questions tag C. So it's where you get here you hit on the C tag. My front page, I have a quite a number of things I filter for.
		I filter for C bash, python, oak, there is around 30 others of them I guess. Most of them are not very active but I mostly work with the C tag.
		And so I typically have this page and basically I look through there for questions, that have not got an answer.
		In particular, I sometimes look for questions where I think people may have given the wrong answer.
		So go look and see whether there's something you know, whether anything needs doing all sorts of. There are spelling mistakes or whatever in the text. I can see that I'll go in and edit that. I am a horrible nitpick when it comes to spelling.
		I do manage to accept English vs American but I do try to get things correct.
		I don't know if you come across tool called Grammarly - GRAMMARLY.
		I have that running on my browser and I get very low accuracy scores because I'm forever correcting other people's horrible mistakes. Very wide vocabulary but horrible accuracy.
14	Patrick	It's really impressive to what extent you're contributing to the platform.
		Do you see some things where you benefited from using Stack Overflow?
15	Interviewee 4	Oh, yeah, I've asked questions, I don't see it as well as answer them. I have answered many more and I have asked.
		One of these days, I'd get a badge for asking questions about 50ish questions asked, but yes, I've definitely benefited from it. Sometimes working out the answer has taught me things.
		Often seeing what people are doing is educational. Oh, you can abuse it like that?
		Oh, oh, you can try that. So, I definitely learned from answer questions on Stack Over. It has definitely has also helped me with my understanding in C. Yes, the other people's opinions on how things could be done and I don't always agree with them, but I get to see alternative viewpoints and that's helpful, too.
		And that goes in particularly anything other some of the lesser areas which I'm not quite so expert in or don't answer so much in shell or so on.
		So they depends how you use it. But I definitely learned a lot from Stack Overflow as well as I hope contributed quite a lot.
16	Benedikt	So I'd like to go into the gamification elements.
		What are your favorite gamification elements or what are gamification elements you focus on?

17	Interviewee 4	Normally you are looking for reputation. You're hoping to get accepted answers. So you providing answers you're hoping to get votes for your answers. You're hoping to get your answer accepted
		It's no longer totally compelling so I got enough reputation. I don't know yet today 725k. You know, another 10 points doesn't actually move the needle all that far.
		But it's still you know satisfying to be able to give people help, to get recognized for giving people help.
		That seems to me. That's primary the gamification part that part in speed of getting the answers in.
		I wish there was more recognition of efforts to close things as duplicates. And there was I would say better ways of handling, allowing people to keep records of what questions are duplicates, of popular duplicate. So I have a whole pile of bookmarks which are questions which I mark things as a duplicate of but I really would like [inaudible] rather than my browsers.
		And to be able to categorize things and annotate things would be you know, whereas with the browser you're limited somewhat how much you can annotate this stuff.
		What else is anyway again?
		I know it sounds silly, but obviously the primary gamification part of the whole business and
		I don't do as much in the review queue although I do a lot of editing, fixing up questions, and answers but I don't go through the reviews and do that, so that's the fact that there is reputation to be gained from that when you're have lesser score on Stack Overflow. It makes it more attractive to people who haven't yet got a hundred thousand points or 20,000 points.
		Guardians are something which I do, do but only occasionally.
		So if someone that goes and edits a question of mine or something. I would review the edit that I get lumped in or I'll review the next two or three questions and I get fed up with it again and go off and look for C questions or go and get over some actual work or something.
18	Benedikt	If I understood correctly, you're satisfied with your reputation scores and it does not really motivate you anymore.
19	Interviewee 4	It is certainly not that it doesn't motivate me. It's just it's not I, it was more important of 10 years ago. I need to check how long I've been on here. Okay. Yeah, every 15 years later this year -you know 13 14 years ago. Yes, it was more important to me at the time because I was trying to make my way through the crowd. Now, to some extent – I'm out there already have been there long enough. I've put enough effort in.
		It's not as important. It is still a benefit. It is still something I look to get – I think one of the things; I like getting the reputation. But it's not the all and the end all.
		I will answer questions, even though I don't get very many points, upvotes for it. So I actually work on the informal database, like, tend to answer questions on the informal database at least when it's not about how to get Windows to talk to it.
		Um, I don't claim to be an expert on Windows.
		So there are limits to even mine knowledge as well. But I do answer an awful lot of questions and try to make sure questions do; get answers so it's helping people
		is a satisfaction, getting thank you comments back and so on it's nice. You know, so the, the recognition is there.
		I know quite a lot of the regular high high-volume contributors on C because we have all been around for quite long a long time.

		So I recognize people who were contributing and see what they're doing and keep them. Feed them the votes occasionally and so on.
		It's just - you know, I just keep powering on. It's a habit now to a large extent.
20	Benedikt	You've talked about reputation score now. Are there any other gamification elements? You said - especially in the beginning that you looked at the reputation score, but are there any other elements than reputation?
21	Interviewee 4	there's a badge badging system.
		again. So okay, I get a badge so often but I got quite a lot of them.
		I have 140 gold, almost 900 silver and over the 1300 bronze. It is because you know, they arrive of their own accord without me paying attention to them.
		I rarely now go for a particular badge. On the profile page, he tells you what's your name the next badge you should go for.
		I don't really bother with hunting down the next badge. I just go on answering stuff and the badges arrive over time.
		Again. I was probably more concerned about that in times past.
		At one point, there was - I don't know whether it's still there - probably isn't, there was a badge for having an answered of the big enough collection at the top badges or tags.
		And I had that badge for having answered questions enough different tags, and that was what I didn't really go try for, but it's an interesting one to get.
		I have a lot to see what other new badges there are. I do pay passing attention to better Stack Exchange, Stack Overflow, but I'm not dreadfully active on either of those. Occasional help with the cleanup of some tag. So if there's a tag being burninated, I will go and help with that or I'll suggest that this tag really should be going.
		But one of the advantages of having enough reputation is if it's a small enough tag you can do with it over time yourself without necessarily condolencing everybody else.
		So if there is a tag that should not be there, you just simply go make the necessary edit and the tag guys day later without having to go through the formal process. I don't do that very much.
		Right. It's but it's an option that I have suggested tags to be burninated and I've definitely helped with a number of tag burnination efforts.
		You don't get particular credit for that anywhere. It's just yes, you've done it. You helped, you know, you've helped.
		And there's a certain amount of you know, just satisfaction from yeah, I've helped the place clean, I've helped.
		You know improve the content over time.
22	Patrick	There's one element we did not yet cover and those a bounties. Do you care for bounties?
23	Interviewee 4	I've collected a few but not very many.
		I don't, I mostly don't bother with collecting bounties.
		Often the questions, especially if you feel that I don't feel like to provide the answer. So I do look at them, right, to bounted questions in the C tag.
		Right now one was about, about Postgresql and c and the other one is about MP4 and ffmpeg coding.
		I might be able to help with the Postgres one, but probably not, it tends to be the way it works, that in fact, most of those bounty questions it tends that I don't have quite the spot-on knowledge.

		When I do, yes, I'd offer an answer and again, you know, yes, it's nice when I get the Bounty.
		It's not something I live and die by.
		Sorry. I don't go out of my way to answer questions as you got bounties on.
24	Patrick	Thank you. And what about the Privileges that come with the reputation score? I think you got them in a couple of weeks when you started, but were they important to you in the beginning?
25	Interviewee 4	Oh, yeah, I certainly, some of them are. The ability to add comments is a very important one to get. I mean you need 50 reputation for that.
		Yes, it was definitely important.
		But I got to sort of the 20,000 mark I don't quite know when but it was probably within the first year. Quite possibly quite a bit quicker than that. I've had not looked at my graph recently.
		And so I now have all the privileges are available – to an ON moderator.
		So yes that was important at the start at start, but that was a long time ago.
26	Patrick	Yeah, absolutely.
		We talked a lot about your reputation. But how do you perceive other users' reputation score?
27	Interviewee 4	There so I look at other people reputation, particularly if it's a name, I don't yet recognize as someone and obviously someone who just joined the site will have a low score and that's fine – you know, it takes some time to get any much in the way of a score.
		And if they provide a decent answer to a question, I will upvote.
		Then I tend to be more stingy with upvotes for people who are
		Well established; if they have, - you know – I will upvote an useful answer, but if there's something I don't entirely agree with I may not give an upvote. Whereas if it was a beginning of someone who has just joined the site and they had a low reputation for I might, will upvote them despite having minor reservations about parts of their answer. If it is anything substantively wrong, sorry, they don't get the upvote anyway, but
		I pay attention to that level. So it sort of encouraging newcomers because Stack Overflow has a reputation for being hostile and I don't like the fact that it has that reputation and I do what I can to ensure that, it's not fully justified, but the C tag is no fairly active, but it's by any means the most active tag on the system and there are other tags where people get dropped down very fast and not necessarily very friendly and so some of the hostility I think is probably Justified. I do see it most of the time, try to make sure that he doesn't have when, when I'm looking at whatever it is that the question that's being asked is primarily get that treatment.
		Answers, they can be upvoted, downvoted and so on but questions tend to get the biggest flag and it's the hardest thing for people to break in on.
28	Patrick	Thank you. And how do you perceive other users' badges? Do you care for them?
29	Interviewee 4	It really doesn't make any difference. I mean Badges and reputation.
		There's a close correlation, even if it's not completely linear. So, you know, someone who has a hundred K. They didn't have any badges. I'd be wondering what on Earth had happened, but they would have, they would have a decent collection. It doesn't really matter to me, what someone else's badges are and so on. I don't measure them by them.
		It's only occasionally. Mildly curious that I go and check on what badges they've got. So I go and look at one of my gold badges find I not the only person who has that goal badge and you go tag badge who else has got it after all?

		That's okay, but other than that, it's they are useful, they are nice to have, but they are not something I measure other people by.
30	Benedikt	Can you think about any negative effects of gamification elements or are there any?
31	Interviewee 4	The obvious one is the fastest gun in the West syndrome. So they get trying to get some people racing to get some answer out there.
		And sometimes that's perfectly legitimate it. The question is easily answerable. There is just a question, you need to type the answer out again. It typically is a question that has been answered before.
		And one of the problems that side has, is because it is not easy to keep tabs on and find the duplicates.
		It's actually quicker and easier to answer the question. Then it is to find the duplicate and close it.
		And that can be a problem. So there's a danger people answer questions rather than closing them as duplicates when they perfectly well could be.
		Again said that it's actually not all bad to have a fair answer to the question if the question is valid, but there is a duplicate and all of it works.
		I think it's good to have an answer associated with the question. Even if that's also another question, which also has the answer.
		So it's sort of a double-checking and quite often after I close a question as a duplicate, I will add a comment explaining why
		this question is duplicate of the other and pointing out any exact duplicates.
		No, they didn't spell variables are saying okay, but so I say explaining why the duplications applicable to their particular question.
		So by going to this page alone, they get some information about why what the question is about and so on
		as well as having the link to the duplicate and so on. That is I think is a bit choice I feel very strongly about. I think Stack Overflow should help people.
		Close questions as duplicate, more easily by allowing them to have private lists of these questions. Can I call duplicate maybe even for some tags? There will be a system supply list of duplicates of various questions within that tag. Quite often the duplicate questions is the one with the highest score anyway.
		They tend to be good quality. There are some questions in particular in C, where the question turns up, but every time the question gets downvoted and almost deleted. Finally, there are questions, we know they have been asked before, you can't actually find a duplicate for it, because it's the duplicates have got low scores and they're just it doesn't the questions don't survive proper in a good state long enough to become a suitable duplicate.
		Just interesting.
		You just kind of have to live without work around it.
32	Benedikt	Have you ever contributed to other platform before you tried Stack Overflow?
33	Interviewee 4	No, social media; variations on the theme of social media. I pretty much stay off those.
		I used to be involved in the HughesNet newsgroups.
		Two places you could you poke card. You can find a posting from me in, I think it's 1988 on commodore line C I think.
		that was about when my first posting was
		So I had a history contributing there.

		And worked with informants' mailing list and so on as well. So I contributed so after the main public eye if you were really interested in informants databases. Yes, you can find me but alright.
		If the vast majority people know.
		but that I so I contributed there, other than that sort of tends to be nice people contacted me that I contribute back. I've made some vulnerable things at GCC and helped with some of minor ways with other projects, but it's all pretty minor on the mainstream open-source projects.
		But not totally negligible.
34	Patrick	Great.
		I think we covered all of our questions. Okay. Do you have any further thoughts or comments that you would like to share regarding the gamification elements on Stack Overflow and motivational aspects of them?
35	Interviewee 4	On the whole, I think they've done a pretty good job of Inventing a good scheme that works pretty well. They did go through a period where they juggle scores for answers versus questions and you got different numbers of points and a change to way number point to get deducted and so on.
		That's pretty much in the past and probably 10 years in the past at this point, but they did a pretty good job of devising the system.
		There is in some parts anyway a problem or hostility towards newcomers. So people asking the first question tend to be; there is a tendency for them to get shot down fairly quickly.
		I don't feel that's it's always necessary. Yes, as a person who's been around, you know that they're the question is not very good. They have yet fully read the detail, but you don't have to pile on with a downvote. But so, you know, if a question is bad enough, um and hasn't yet got the downvotes I'll give you one but if there's already four or five down on it, I don't go and add more even though it's not a very good question.
		And the whole business of welcoming new people who are new to Stack Overflow, and stack exchange sites, generally, is a bit more though than it should be, and there isn't an easy way. I do know there isn't an easy way to fix that.
		I think it's important that the public service announcements are made that yes, you need to be respectful and gentle.
		but with while also being firmed with so you yes, if someone is abusing the system or not providing information needed yes, they need a downvote. maybe their question needs to be closed before too long. They do need to be given time to adjust the question. not necessarily all that much time, but some time and people shouldn't be they need to worry about how, how people get put off from Stack Overflow. I'm happen to have got involved and got in and go on with it.
		Um, but quite a number of my colleagues are scared of asking questions on Stack Overflow
		and that's sad.
		and that is a problem that
		it's perpetually in the air around the whole Stack Overflow. Yeah a set of websites if
		How do you deal with?
		The newcomers people who haven't done quite as much homework as they ought to have done people would just straight out dumping homework answers or quit.
		Homework question hoping for an answer. Hey, those, those pretty much should get close probably deleted but

		it's not necessarily something that everybody realizes up front. It's only don't do enough of their homework to find out how what how they should ask.
		But equally, you don't need to completely shatter the personal feelings of the people who are asking questions, even though they made a mistake.
		So this is where I think the biggest problem is and I recognize there isn't a simple simple solution to that at all.
36	Benedikt	I do agree. Yeah, absolutely.
37	Patrick	So again, thank you so much for your participation. Thank you for your time. Thank you for your contribution. Thank you for your insights and experience and sharing it with us. Thank you so much.
38	Interviewee 4	Okay.
39	Patrick	Perfect again, I would like to see as you've seen in the content form at any time. If you feel you do not want to be part of this research anymore. Just let us know you have always the right draw from the yeah, just let you know again. Yeah, it's not because
40	Interviewee 4	right.
41	Patrick	Yeah again, thanks again for your participation and your time.
42	Interviewee 4	Okay.
43	Interviewee 4	Good luck with your degrees.
44	Benedikt	Thank you so much.

Transcribed Interview with Interviewee 5 - May 11, 2023:

1	Benedikt	Okay, there we go.
		So, we start with some general question about you and then we can go into the gamification elements. Do you remember, why did you start on Stack Overflow?
2	Interviewee 5	It's hard to remember.
		Because I somehow looked at a question and it was unanswered and I found it fascinating.
		You try to solve it, to find an answer and you start contributing.
		So it's more an accident than really the idea, starting to contribute in this case.
3	Benedikt	Okay.
		And how often do you use Stack Overflow?
4	Interviewee 5	Now at the daily basis but it has been…
		Before - when I was a student - that was more, once a week I guess.
		And for work, I used it often and if you use a lot of things you also often want to contribute something back.
		Answering all those people's questions also sometimes fascinated me because they have a totally different challenge of course
		But most challenges are not that unique.
		So after a while, you also can pick certain things from other people's questions and use it in your own work.
		Perhaps not as a complete copy. It helps if you solve other challenges to become better in challenges you face at your own stuff you are working with.
6	Patrick	Okay.
		Thank you.
		So you just said there was a question that needed an answer. So why did you create your first answer to a question?
7	Interviewee 5	It was while I was a student and I found it a bit fascinating.
		It was how you can swap two values without a third variable, which is not a really advisable way to do.
		But anyway, it's got me thinking and yeah, you're challenged with it technically.
		A lot of questions that are answered are quite super straightforward.
		"You want to do that... you encounter this problem… "
		But - and actually, that's not very often - there are the ones that are technically more challenging
		And that's sometimes also a reward on itself because it takes you some time to do some research and when you find a clever way to do it, this is some satisfaction.
		Let's speak.
8	Patrick	And how do you usually look up questions that you answer?
9	Interviewee 5	well, you can filter.
		So you can create your own filter and then simply produce some kind of feeds where new questions arise and

		And then you can update the list of questions for things that you can answer and things you want to answer as well.
		Unfortunately, there are some people - after a while that you know - you cannot really help and oh that's unfortunate as well.
10	Patrick	What do you mean by "people you cannot help"?
11	Interviewee 5	Well, I mainly do some answers/questions about Django, which is web development on python
		But, if you're lacking the complete technical background of Python -
		and I'm not saying you need to be an expert in it,
		but you have people who try to set up web server, who do not manage to implement very simple things in this.
		Regardless will then, you know, it will take hours and days.
		In the early days of Stack Overflow a lot of people probably would want to have this person and the discussion of this…
		But after some time you start to realize you cannot help everyone.
		That's unfortunate…
12	Benedikt	But understandable
		are there some questions because you're talking a lot about your personal interest in the questions? Are there some kind of questions that interest you most?
13	Interviewee 5	Well as a job, I am a web developer myself so both at the company and also at the small company, I found myself - just not very important. But as a result, you become first I would not say an expert in it but become better in it. So you develop an interest in how to do things and you learn both from questions that you answer but also by seeing other people answering questions. What are a good ways to do that? And well, of course, you can read the entire manual and look for blocks Etc. But often by simply looking at simple questions, well, you'll learn a lot by looking. Okay, that person did some kind of querying for example, how can you do that efficiently and by looking at how other people tackle those problems because well, it's not only a question-answer site. You can give multiple answers on the same question.
		After a while, you improve yourself and that's also reward I think and on the other hand you are helping the person with the original question as well.
		But well, I think people of course answer questions about what they do perhaps not as daily activity, but at least in their spare time.
		Another technology. I often answer questions in this high school, which I do more than is obvious.
14	Patrick	That leads me directly to my next question. You just mentioned that you learn a lot. Are there other ways that you benefit from working with Stack Overflow?
15	Interviewee 5	Yeah, well when you're looking for a job actually, Stack Overflow is also well known by recruiters and also by people at companies as well. Say I don't think I answer questions to really improve a career or anything. But of course, if looking at an answer you often realize if a person is well-skilled for a certain job. At least I know one company where I didn't have to pass a technical interview simply because they looked at let's say 20 questions and well after a while, not because they say okay you answered a lot of questions, but simply if you take a look at a few question and answers you can easily say I guess how the person works in a general environment. I am not saying I am that's an expert in anything but I think it helps recruiters to also look what people have the necessary skills. There also used to be - I think it's gone now - a job site on Stack Overflow. I think that's

		gone now, but I guess some recruiters and companies will take a look at some question answers or at least that's my experience. I'm not saying everybody does that.
		So that's one thing.
		Learning is another one.
		I think indeed because the topic is gamification and so they put in some gamification which reputation points and, and badges etc.
		And I think at a certain point in time this thing is fascinating enough; throughout it becomes a bit boring and it's really that I am not much interested anymore in points, but
		it's likely a good idea to get people used to the site to get some habits of answering questions and after a while, you simply keep answering questions even without any rewards I guess in terms of reputation points and
		badges, but I think it's a good way to build a community.
		So that's my experience. I'm not saying that it is general
		I think that the main reasons so gamification, job, there are other opportunities, meeting people etc.
		It's basically not per se deliberately. But some people you know you somehow online. It's a bit crazy, but unfortunately,
		Okay
16	Benedikt	Um, so you've mentioned that gamification that's our buzzword for going into detail into the gamification questions. So you've already mentioned badges' reputation score or reputation points. Are there any other gamification elements that you looked at or focused on when you cared for them?
17	Interviewee 5	Good question. Well, you have of course upvotes on answers that they often say that's a quality metric - I am not entirely sure if that's correct, because usually popular questions simply get a lot of upvotes but that's not per se because they have put a lot of effort or have a lot of quality.
		I mean a simple questions will probably attract a lot more people in this votes etc. Whereas very complicated questions might attract few dozen people and don't really get well other gamification. There's also a system in place where you gain some privileges so you can for example after a while see what questions attract a lot of traffic Etc.
		That's nice. But as with a lot of things, I guess.
		Well, I think a lot of people at a certain point are interested in gaining a lot of reputation or whatever, but eventually that fades away because also there is a maximum cap I guess of 200 points a day that you can achieve.
		But after a while, if you well collected some points 200 more is not that much anymore compared to what you already have. So that effect fades away.
		Persons who have like 500 points for them 200 is a lot. I mean that's almost half of it extra. Whereas if you have like 10,000 points and 200 is not that much anymore. That's 0.2% if I not mistake it. So the effect is it's dropping away, of course.
18	Benedikt	So, do you know your reputation score by heart?
19	Interviewee 5	No. it's somewhere around 400k I guess.
		Well, it was a time when I knew that more in detail.
		I am not lying about that
		Nowadays. It's well, as I said the interest Fades away to really to go for reputation.

		but you develop some kind of habit to actually keep answering questions. And at a certain time. I think points etc don't matter anymore, but you keep the habit of visiting the site frequently and answering questions.
20	Benedikt	okay and how do you perceive other users' reputation score? Like when you see a question do you care or look at that?
21	Interviewee 5	Do you mean looking at its how much reputation this person owns?
22	Benedikt	Yes, the user has.
		So if you see a question - do you look at the user profile or maybe the reputation score of the user before answering it? Do you care when you're looking at a profile about these things or badges?
23	Interviewee 5	Not that much. I don't think so. It is of course hard to tell if it is not unconsciously or subconscious or whatever, but normally no, I don't think that that happens.
		But what happens is after a while you which is, unfortunately, are quite short of people that you decided you don't want to help him. So well, yeah, I look at that. That's very unfortunate. But as I said before after a while you spend a lot of effort into it and
		some of those people I'm not telling they are fundamentally hopeless, but well if
		it's a problem keeps going on and on and then you know, you will not be of much help for them and they will not be much help and interest of you. Okay, that's nice to say that.
24	Patrick	one more question about the badges. has been a time when you actively collected them - tried to get them?
25	Interviewee 5	Yeah, it has been a time. But usually, you can see which badges are close to being awarded and well if you like 95 97 98%
		then you can of course Focus your efforts a bit to gain them to say but that's not the case, I guess anymore or not very specifically.
		But yeah that was indeed. Well at a certain time in incentive to pursue.
		Getting badges.
26	Benedikt	And do you remember the point where you were not interested anymore? was there like a specific point in time?
		Let's say reputations when you've reached a certain reputation score. I don't know.
27	Interviewee 5	Yeah.
		I think that it's probably two and a half years ago. So that's okay. Don't take its very specifically that's roughly an estimate.
		And it's all I keep answering questions and perhaps not that frequent anymore, but you develop a habit and after a while, you don't really care anymore about points because well, you know, you will get them away. I mean even if you stop answering questions.
		People will still look at your answers and then well, so there is a bit of a drift towards more reputation regardless, whether you're active. That's A and B I said before the impact on a daily basis of reputation on the total is very small after a while.
		You don't care about it anymore because
		It is you always don't gained that much. It's always 0.01% X or something similar, so it's not very much
		And at the same time, you also don't really care much about downvotes anymore. That's for the same reason.
		It was I think five years ago, another user who bullied me a bit.

		So to speak by simply downvoting everything I answered, but and in the beginning, you care all about it, but after a while, you getting used to it. Well, you don't really care about being bullied because you know, they don't really vote you down because of the answer.
		It doesn't make sense or anything if that was the case that perhaps would be.
		Less funny but if they simply downvote you instantly and for all answers, then it's quite easy to do that this is not because they don't think that answers very good. But simply because they somehow don't like you and the beginning you care about it, but after a while well, you stop getting it.
28	Patrick	Um, do you care for bounties?
29	Interviewee 5	Not much. Well, sometimes but I look at Bounty and the questions but that's usually because they are technically more challenging. I mean those are usually about well.
		For example, queries that are very hard to write efficiently. It's well.
		not specifically for the bounty system because again, it doesn't really
		give much bonus anymore.
		But it's also a way to actually see that people really want this question to be answered, not perceive their own question because you can also put a bounty on someone else's question. And another thing is that it is usually quite challenging and quite hard.
		I think those are also questions who usually have some extra value and not oh, yeah everyday question about writing a very boring query or anything of that but things that really can, can make a system a lot better
30	Patrick	Okay. Thank you. And one more question you already talked about the usefulness of privileges, but has there been a point when you were actually aiming to get more reputation to get those privileges?
31	Interviewee 5	No, not much because well in the beginning you get a lot of privileges quite fast and after a while that's very seldomly the case. I think I don't know the thresholds anymore, but I think there was one.
		25,000 or anything. I mean, that's a long journey.
		So that's a long journey so that usually by getting two or three upvotes extra that specific day. That's almost really well advanced of course, and I think that the last ones are also not very well effective in the sense that they offer you some statistics I guess.
		to build that you can contribute to some forums or whatever, but well it's not that this has a lot of impact and
		the first ones are actually the ones that have the most impact.
		Of commenting on people's questions on downvoting and voting etc.
		But it is also nice it actually it's converts the side of it from the question-answer site towards more of a Wiki. So after a while, you can almost freely edit content that you think is wrong and so it's it starts as a forum, but it turns basically to a Wikipedia page. You can also edit small mistakes out of the questions and answers.
32	Benedikt	Are there any elements on the platform that hinder you from contributing or demotivate you to contribute?
33	Interviewee 5	Well since before there was that guy who bullied me a bit.
		I think what is mostly annoying is that you have some people who simply dump their questions there and when you ask for clarifications, they either or are not online anymore or refuse to, to respond and
		that's a bit that makes it the system flow blocking. so that the feedback loop is it's less fluent and

		That's quite annoying. I mean there should be more a system in place for people
		who simply dump their question and hope for an answer by tomorrow simply letting it float in the air
		that. a lot of times people don't really put a lot of effort in asking good questions. So clarifications are often necessary and
		if people fail to respond to clarification requests that's quite annoying and also makes it less effective of answering a question with good quality.
		Because I often well there is famous XY problem that's often repeated at stack flow. That means that you have a certain problem. But instead of asking the problem x, you are asking "I asked and trying y and it does not work" and often times it turns out you don't really need y you need another solution for you X problems. And I don't know if that's the most coined by Stack Overflow, but it's quite popular and then actually people always simply say look "I have this and it's not working" You ask further "Why do you use that one? And what's exactly is underlying problem you need to solve?"
		it turns out the approach they are trying is or perhaps is not a not a really really bad one but not perceive the best one either.
		In improving the quality of questions that well it is still not really working
		good, at least for people who ask their first questions, I often feel they don't really ask a good question I guess.
34	Benedikt	Have you contributed to other platforms like Stack Overflow before?
35	Interviewee 5	Github that's more go to get help.
		And to other platforms [inaudible] that's a long time ago and not really sure if they are still active anymore.
		And then probably be some Ubuntu forums that will be at least 15 years ago. So not much before not really active except for gits.
36	Benedikt	Were there any gamification elements on of those platforms you remember?
37	Interviewee 5	Well, Github has stars. That's quite fascinating also because it shows basically how much your project get picked up. Well, the colleague of me introduced Github to me and he said look, I made a small program I guess for some screen reader or whatever and he said after two months, he got all sorts of requests on it and that's quite fascinating to see that well if you make something that
		it has some effect that people use it and perhaps find problems with it, but then try to fix it or whatever and
		well, I think that's gamification element as well because you normally want to
		Provide some, some go-to or whatever. But well you usually wanted other people use it right? Otherwise, it's a waste of effort.
		That's actually a nice that that's well. Some things are picked up enormously fast, but tons of people who then start contributing and
		while GitHub Stars are again not a very accurate way to see how much people are involved. It's the only thing that's
		somehow works a bit and it's the worst bit that it is the only thing that works really
38	Patrick	We are now done with our questions. Thank you very much.
		Do you have further thoughts comments that you would like to add that you would like to say regarding the gamification elements and Stack Overflow and or your motivation to share?
39	Interviewee 5	I have not prepared anything so no

| 40 | Patrick | So again, thank you so much for your contribution and thank you for your time |

Transcribed Interview with Interviewee 6 - May 16, 2023:

1	Benedikt	Perfect. So I'll start with some general questions about you and Stack Overflow and then we'll go into detail to the gamification elements.
		Do you remember why did you join Stack Overflow? Why did join the platform?
2	Interviewee 6	I created the user a long time ago - 10 years ago. I don't remember exactly the context.
		But I didn't contribute for, for a very long time after that. So I'm not sure.
		Those two events are two separate events for me when I first start.
		Okay, the account… It might have just been because it required an account for something but I don't remember.
		I think I want to upvote a question and I created an account but I couldn't upvote anyway, because I didn't have the reputation.
3	Benedikt	And how often do you use the platform today?
4	Interviewee 6	To look up answers I come across it by Google very often
		To answer questions... I don't know.
		I still ask a questions on occasion.
		But I guess my number of contributions I have daily has dipped in the past two years or so.
5	Benedikt	Okay.
		So why do you use the platform today?
		Mostly it's for getting answers what I understood from your last comment.
6	Interviewee 6	Today? Yes, that is accurate. mostly to get answers.
7	Patrick	What did change back then when you said between the time you created your account and you actually started to work with it?
8	Interviewee 6	So, within the time when I created an account and actually started to contribute….
		Um, so
		At the time I was very interested in, in typescript. I was very excited about the technology.
		But I didn't really have a place - sort of an outlet - for that interest.
		The job I had recently switched to, it promised me I would get the chance... I did not actually get the chance to improve at all in my day-to-day job.
		So I'm not sure how I came across my first questions.
		I just saw that I know the answer to them and I decided to answer.
		Then I found some questions where I didn't know the answer to and I spend time investigating how that would actually work because I thought I had an idea.
		And so yeah, it was sort of an outlet for my interest in, in the topic, even though I didn't have an actual project to work on actively with it.
9	Patrick	So you had the knowledge. So what drives you to contribute to the platform?
10	Interviewee 6	I enjoy teaching generally.
		I've been a teacher at University and for as long as I can remember, I've always explained programming to my peers even as back far back as high school.

		I guess that was part of the reason I first started answering.
		I generally enjoyed doing this, this kind of thing after I started answering.
		I think sort of a big drive was the numbers go up - the kind of reputation thing.
		It is - I know - a very basic instinct, but it just …
		I know, looking at the reputation growing was something that was fun for me for a very long time and it was definitely a driver.
11	Patrick	And how did you usually look up questions that you answered?
12	Interviewee 6	Generally, I had an open Tab and I had this little app that just put the header of the tab somewhere above the rest of everything, so I could see when a new question popped up because the URL changes slightly. In the brackets, it puts the number of new questions that you haven't looked at yet.
		So whenever I saw that I quickly went and saw some new questions someone asked
		Because I think that's kind of the thing. If you don't see the questions right away, somebody else will get to them. So it's it is kind of competitive in that respect. So, yeah constantly looking I guess.
13	Patrick	Great. So you used the platform you still use it a lot. How do you think you benefited from Stack Overflow?
14	Interviewee 6	I think even while answering questions I learned a lot. I mean in some cases I knew the answers but a lot of the time I didn't know the answers. So I would sit down and use my some of my prior knowledge to be able to figure out the answer to the questions. And I would post that so. Yeah, I think I benefited from it by learning a lot about typescript in the process.
		I think I also benefited in meeting people
		At the job I currently have, I got recommended by a person I interacted with both on Stack Overflow and on GitHub and they later recommended me for my current position.
		So that's definitely one way I benefited from from it, you know more direct quantifiable way.
15	Patrick	Thank you. And how do you think your contributions have benefited to community?
16	Interviewee 6	Oh.
		I don't know.
		I guess, It's always very weird to me right now when someone/my colleague say, "Oh, I found your, your answer on Stack Overflow." It's still a very strange feeling.
		I don't know how... they've helped the community and they still help a lot of people that find those answers randomly, just by a Google search, so I think there was definitely a benefit provided to the whole community
		I'm not sure exactly how to describe that more miraculously.
17	Benedikt	It's perfect. So you've talked a bit about the reputation score.
		Are there any other gamification, gamification elements you cared about or you in general encountered on Stack Overflow?
18	Interviewee 6	I think at the beginning sort of a big driver were the privileges because you get privileges every time you pass a milestone.
		I think that was sort of a driver at first
		It was like "Just a few more points and I get - I don't know what other new privilege."
		But those ran out after a while and I don't even think about these now.

		Then badges were also a nice thing but
		I think the reputation itself and sort of the, the general leaderboard – both for the year and for the for all, all time - I think those are all things that I used to keep track and watch
		also the leaderboards for the tags, specifically for the typescript tag. That was all something I watched and sort of cared for.
		I guess for an absurd amount of time for a while. But yeah, …
19	Benedikt	You are always talking in the past about your interest or you cared about that. So, how did that change and maybe when did it change? What is the reason for it?
20	Interviewee 6	I think the trigger was when the pandemic started. I was just overwhelmed with a lot of other things and sort of the amount of time I had for that kind of dipped.
		So I didn't have as much time for it.
		I think also the fact that I sort of switched jobs to jobs that were much closer to my interests in regard to typescript.
		So when I started typescript, I had a job that had no typescript of whatsoever. I think the first sort of dip in my activity happened when I switched to a job where I actually did typescript on a day-to-day basis. I was still contributing back then.
		And then the pandemic started and then I also switched jobs to where I am right now where we're actually get to contribute actively to typescript.
		And if I have any sort of free time, I think that's a much more interesting thing for me to do than just answer questions
		But yeah, so I don't know. It was more than just one thing.
21	Patrick	Um, okay and how do you think these elements contributed to your motivation?
22	Interviewee 6	Definitely a big part of it... So I think the knowledge gap sort of thing is what got me into the platform, sort of the knowledge-sharing part of it and the teaching
		But what kept me hooked for a very long time and contributing as much as I did was the fact that the reputation number was going up and I, I got points.
		Definitely
		I viewed SO at a point more as kind of like a game
		I also used to play a while back sort of massively multiplayer game which was sort of a strategy game which was also basically just you know resources going up on a screen and fights that never actually were anything more than you just and through to somewhere else and, and they would die and you'd get numbers as a result.
		So I think it tapped into the same kind of sort of addiction and the same kind of sort of motivation as those games, so
		I definitely viewed it as being more productive and I justified it to myself as, as you know, I'm not wasting time.
		I'm helping others and I'm sharpening my own skills.
		But a big part of it was definitely just it was basically a game.
23	Patrick	Are there certain badges you can still remember that you actually hunted for?
24	Interviewee 6	Yes, the legendary one.
		There's a legendary badge which is awarded if you have over 200 points on I'm not sure I think 100 days.

		I'm not sure but it was some pretty big number and I hunted for a very long time and that was what get my contributions high for a day
		Because I was "okay. It's just 20 more votes just 20 more points and I have another day for that badge." So that was definitely a big one for me.
25	Patrick	So if I understand you correctly, the daily limitations did not actually limit you? It actually motivated you because it added up on the legendary badge?
26	Interviewee 6	The 200 limitation only applies to upvotes but you can earn more than that if you have a from "marked as answers" so you could you can go above 200 and I did that quite often.
		So the badges if you go over 200 in a day.
		So you can't earn days for that badge unless you're actively answering questions because even if you get an upvote from older questions, you still need to answer more so you have over 200.
27	Patrick	Hmm, did you hunt for bounties?
28	Interviewee 6	For a while. I thought that was productive but I sort of gave up on those because they were usually very high-investment questions
		You know questions you had to devote a lot of time to answering and while the immediate reputation was usually high there wasn't a lot of points associated with that.
		My finding was that those questions were never found and never useful to anyone else.
		So you'd never get a vote for those ever again. you receive like the Bounty and that was it
		while answering much simpler questions tended to give more upvotes because a people could find them later by just by Googling
		And even right on that day usually, you'd get more reputation from those questions for the simple reason that people understood them and understood the answer much easier, so they could upvote
		if it was a very complicated question that required hours of work to answer it was usually so complicated people wouldn't upvote it because they wouldn't understand the answer without investing themselves a lot of time and understanding what was there
		So, they just wouldn't vote
		That was it... and the bounties I mean the largest bounties I think are 500 points, which is seems like a lot but usually those questions turned out most of the time to be almost unanswerable just because there were limitations and you couldn't provide any sort of satisfactory answer.
		And the lower ones - 50 points or 100 - the amount of work was disproportionate to the reward.
29	Patrick	Are you aware of your reputation score?
30	Interviewee 6	Yes.
		Not sure exactly what it is right now, but it's over 200,000 if I recall correctly, somewhere in that vicinity.
		I'm also aware of my ranking on the leaderboard - somewhere around 300 all-time.
		So yeah and for the typescript tag, I think I'm number four. So yeah, I'm still very aware of that.
31	Benedikt	How do you perceive other users' reputation score?
32	Interviewee 6	I'm not sure what you exactly mean.

33	Benedikt	I mean like if you see an answer or a question of a person do you look at the user's profile and reputation score?
34	Interviewee 6	For people asking questions, I don't care that much.
		I will usually sort of more understanding of people who have very low reputation scores and post on a question that's not great.
		You know that's a bad-quality questions. I won't... I generally don't like to downvote unless I perceive that there's actual malice in responses.
		But so generally I will try to be more understanding to people who have low reputation scores that ask questions.
		I think that's generally a good thing. Even if the quality of the question is, is not great.
		I generally know the person by reputation/name/sort of, necessarily not the score itself,…
		but I know the person that are often active on the typescript tag and they usually give good answers.
		I have on occasion upvoted them without reading the the answer fully because I just know that they're good and that that is 99% of probably good answer even if I didn't actually read the whole thing.
		So I do sort of trust the reputation and trust my impression of people based on that reputation when, when they're answering.
35	Patrick	And do you look at other users' badges?
36	Interviewee 6	I used to look at who has the legendary badge when I was hunting that but I can't say I do it anymore.
		I might look at, at how many badges they have. But just on a purely numbered basis, but not specific badges.
37	Patrick	Hmm and so to sum it up: do you feel more motivated to contribute because of the rewards and recognition you received?
38	Interviewee 6	definitely. Yeah. Definitely.
		I mean like as I came there for answering questions, for keeping my skills sharp, but definitely what kept me in there was the numbers go up
39	Patrick	And have been certain elements on the platform that had some negative effects on the contribution?
40	Interviewee 6	I don't know if the platform itself…
		I can't think of any.
		I mean… No, I think so. So my, my stopping…
		My contribution went down for external reasons and I think it was kind of the... you know, whenever you get hooked into any game you might be very passionate about it for a while.
		But any game has its... the amount of time it keeps you hooked and then you just move on to something else.
		I think that was kind of part of why I stop contributing.
		It was just, you know, it was fun for a while. I still sometimes answer. I still sometimes play a game, but it's definitely not as sort of obsessive as I was during my contribution period
		And I, I was pretty obsessed with it. I mean I had it on my phone and I answered questions and I used to code on my phone because I had to, to make sure that the code worked.

		So yeah it was high intensity for a while.
41	Benedikt	Have you ever contributed to other platforms?
		Other Q&A sites?
42	Interviewee 6	Q&A. No, only Stack Overflow.
		I do contribute to, to other open-source projects on GitHub.
		But that's kind of different. I mean, there's no reward system there, but I, I have contributed there as well.
		I've never felt any sort of gamification from, from that side. So I, I can't speak to that.
43	Benedikt	So why do you still contribute to GitHub?
44	Interviewee 6	Compared to SO…
		I mean I still contribute... just not as much as I used to.
		Right now I contribute to GitHub also because I did look for job where I would have the opportunity to contribute to the projects.
		So I contribute as part of my job now, so I turned my... sort of something I wanted to do into something I actually do for my day job.
45	Patrick	Okay, Benedict. I think we are done with all our questions, aren't we?
46	Benedikt	Yes.
47	Patrick	Thank you so much for your time and for your contributions. Do you have any further thoughts/comments that you would like to share regarding gamification elements and the motivation to share? Something we did not cover yet that you had in mind?
48	Interviewee 6	No, I, I just want to say that I think I've already mentioned this but definitely, I viewed it as, as a game from a point on
		a game that had me hooked and I got obsessive about for a while
		and then it sort of ran its course and now those elements don't really appeal to me as much as they used to.
		So there's definitely sort of a curve there and I think that's true of any other game that I would have played
49	Patrick	Absolutely.
		Great, so, thank you. Again. Thank you for your participation for a time and for your contribution.
50	Interviewee 6	No problem, glad to talk.
51	Patrick	Perfect. Okay. Okay. Thank you so much, and thank you. Have a great day you
52	Interviewee 6	Thank you. Bye.