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Analysis and Automation of Remedies for Community Hardships of Non-native Community

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ABSTRACT

Equality among all human beings, as a world community surpassing all the barriers such as religion, language, ethnicity, geographical location, and nationality is an important aspect all over the world. The equality for non-native communities of the country is a more important aspect of human equality. The hardships faced by the non-native community of society due to lack of equality cause irreversible damage to humankind and society. Lately, with the development of many technologies and new implementations, the fact that these technologies can assist in solving social problems came into discussion. Considering the hardships faced by non-native communities in terms of a social problem we explore how technology can assist in solving social matters. Thereby we explore a novel vision for the part that technology can contribute in solving civic matters encompassing frameworks from public engagement, crowdsourcing, and design thinking.

In this thesis, we do a study on background work on how we can solve civic matters by assisting public participation frameworks, crowdsourcing frameworks, and design thinking frameworks. For this purpose, we presented three hardship stories that the non-native community of Finnish university faces which have been collected through a previous study, to collect ideas, and thoughts on how to mitigate the situation. We employed three questionnaires designed based on three conditions the conditions were First one is the baseline where the answers to the questionnaires will not be analyzed anywhere, and the second questionnaire condition is that the ideas will be used in social media and the third is that the ideas will be subjected to a quality analysis by crowd workers. To this end, we have collected ideas from 40 participants for each questionnaire with the aid of a prolific crowd-sourcing platform. Each of the questionnaires included a Questionnaire of Cognitive and Affective Empathy (QCAE) questionnaire section to measure empathy. Further, we Analyse the data that we have collected, through a QCAE analysis, word count, and answer length analysis, analyzing the co-relations between them, doing thematic coding, and doing a tone analysis. Moreover, we implemented an automated pipeline to do tone analysis starting from fetching answers from google forms to output the tone analysis results.

Ultimately, the thesis contributes to Collecting ideas on how to mitigate the hardship experiences faced by non-native communities in a Finnish university. Further enhances the awareness of the hardships faced by the non-native community of a society. And through the analysis of the results we identified different co-relations between different factors like word count and Empathy. Analyze the tone of the participants in civic issues. Finally discussed the part that technology can contribute in solving civic matters encompassing frameworks from public engagement, crowdsourcing and design thinking.

Keywords: Non-native, Hardship, Public participation, Crowdsourcing, Design Thinking, Empathy, Tone analysis.

CONTENTS

FORWARD

LIST OF SYMBOLS AND APPREVIATIONS

CTD	Clear Tone Detected
NTD	No Tone Detected
Q1	Questionnaire 1
Q2	Questionnaire 2
Q3	Questionnaire 3
q1	Question 1
q2	Question 2
q3	Question 3
q4	Question 4
QCAE	Questionnaire of Cognitive and Affective Empathy
SD	Standard Deviation
TD	Tone Detected

1 INTRODUCTION

The idea of equality has become a cornerstone of modern democratic industrialised societies. In today's societies, any attempt to institutionalise or legitimise inequality is often considered as a violation or upfront to human dignity and rights [1]. Moreover, Compared to the past, day-by-day prevailing arrangements or systems that perpetuate inequality are increasingly met with disapproval and resistance. As a result, a growing trend of creating and maintaining systems that encourages fairness, equal opportunity and social justice for all members of the society are being developed [1]. Also, research suggests that in a community which is differentiated by diversity, complete equality is harder to attain [2].

Equality in the sense includes principles of satisfaction gained by fulfilling basicities, equalize respect, economic equalness, political equalness, sexual, ethical and religiousness [2]. In a more general definition, equality can also be interpreted as a specification for being same, in means of having quantifiable attributes [3]. And past work suggests that inequality can be addressed as a need for equality and diversity amidst corresponding attributes [3]. Further, some of the recent work on equality implies that equality can be considered as verifying that all individuals have an equal chance to live to the best of their lives and their talents [4]. It also implies that not any person should possess poor life chances as a cause of the way they were born, their place of origin, beliefs of them, or whether they possess disabilities [4]. Inequality prevails in the society is a form of civic issues. And these so called civic problems are naturally complicated and mutually connected to solve through traditional top-down approaches [5].

However, the modern world has taken many steps to eliminate different limitations and differences that pave the way for inequality. Out of the major goals of the sustainable development goals of the European Commission is to reduce the inequalities that prevail in different countries based on income, sex, age, disability, orientation, race, class, ethnicity, religion and opportunity by 2030. They also propose that reducing these inequalities in society and the economy may ensure no one is left behind and increases social cohesion [6]. It also highlights that inequality is one of the main barriers to sustainable economic growth [6]. Different countries have undergone different changes to mitigate Social inequality. Once, the British minister for Women and Equalities said that they are working towards prioritise the belief that individuals have the fullest support for perceiving their aspiration, to express their dignity honestly and freely by dressing and loving as they wish and finally achieving their goals [7]. The idea of equality is promoted in different means. Some of the common ways are gender equality and equality in professions. Horizon Europe is a project to make commitments to ensure gender equality in research and innovation [6]. Further, it implies another aspect of equality, the equality between the natives and the international community of a country [8]. If Communities of such countries didn't accept immigrants as part of their community, Anxiety, depression and post-traumatic stress disorder may influence their new life, work and many other factors [9].

However, solving this problem of inequality is a long-term process that needs great dedication and commitment from experts, society, governments and the world community. Despite the process being so hard there are tremendous advantages and values gained through this process. According to Ines and Feireira these values will revolutionary effect on economic growth, Human growth mainly in areas of health and education, and Governance with a focus on democracy [10]. Also, it shows that each level of society from lower to higher will benefit from this work towards equality [10].

Lately, there have been many implementations associated with digital technology in the modern world. There arises the fact that this modern technology can help in social problem-solving. It is also stated that if it is used in a effective way, this can lead to the betterment of the society and economy so as to improve the living standards of citizens [11]. Also implies that it can assist in social problem solving [11]. Much research has also explored the role that

technology can play in solving civic matters encompassing theoretical frameworks from public engagement, crowdsourcing [5].

1.1 Approach

In our research, We investigate what could be done to mitigate the hardships or situations that the Non-native Community of a Finnish university faces. Further, we hope to create a study that is authentic and fully immersive. In the beginning of our study, we developed three questionnaires to collect thoughts of people on how to mitigate the hardships or situations faced by the non-native community at Finnish University faces. The questionnaire was differentiated from each other based on the condition that where will we hope to use the collected data. We collected the thoughts of the participants based on three stories that we collected through a previous study covering the areas of interpersonal relationships, financial issues and jobs, and immigration issues. We ran these questionnaires on the Prolific crowdsourcing platform. In the second part, we analysed the results that we got through the questionnaire study to provide insight and clarity to the questions that we are researching. Moreover, this part includes a QCAE analysis, word length analysis, understanding of the patterns between QCAE results and word count, and tone analysis further we automated the tone analysis part as a pipeline from Google forms to tone analysis results.

1.2 Objectives and Research Questions

Taking into account all the things mention above this thesis builds on three objectives and answers two research questions:

1. **Objective I:** Collect thoughts on how to mitigate the hardships that the non-native community in the Finnish university face.

2. **Objective II:** Analysis of the results which indulges a QCAE analysis, Word length analysis, Tone analysis.

3. **Objective III:** Automating a pipeline from Fetching answers from google forms to produce tone analysis results of answers.

Resulting in exploring two research questions:
1. **RQ I:** What kind of actions can be taken to mitigate the hardships or situations faced by the non-native community in Finnish university as a society.

2. **RQ II:** How public participation, crowd sourcing and design-oriented thinking can be used to solve civic problems .

1.3 Thesis Structure

The subsequent sections of this dissertation are ordered in the following manner: Chapter 2 discusses the related topics, concepts, technological aspects and the background of the studies with

similar aspects, objectives and efforts. In Chapter 3 we explain the possible study approaches and the final study approach that we used to collect thoughts on what could be done to mitigate the situations or hardships faced by the non-native community in a Finnish university. In Chapter 4 we present how the data needed for our study is collected and a total descriptive version of data such as: from where, quantity, etc. Chapter 5 presents the results that we collected through our study and analysis of the results. The Analysis is composed of a QCAE analysis to measure the empathy of participants, answer length analysis, and qualitative analysis of participant answers with thematic coding. Also in this chapter, we discuss the co-relations between answer length and QCAE results that we got. And as the last part of the chapter we present a tone analysis with IBM Watson and we also present the automated pipeline from google forms to NLU analysis results. In Chapter 6 we illustrate the discussion of the study reflecting on the Objectives of the study, research questions and other indulged topics. Ultimately, chapter 7 of this thesis concludes with the Conclusion section.

2   RELATED WORK

In this section, we introduce some of the preliminary concepts that lead the way for our study. Also, these concepts are important in going through our study as it promotes a clear understanding of the study's different aspects. Further in this section, we are going through some of the related previous work based on preliminary domains. Also, this section introduces some of the related domains in our current proposed study. Finally, we introduces and define some of the technical topics that we will be using in our study.

2.1 Civic Design

Most of the decision-making problems are preferred as real-world "wicked problems", where there is no single computational formula to solve them and where there is no specific wrong or right solution for the problem and it only depends on the personal viewpoint [12].As a solution, with time many of the studies have a biased in using community-driven methods and strategies in which citizens actively involve in a in defining the problems and inventing solutions. These civic problems are referred to be wicked for many reasons. For instance, if we consider a newly imposed urban design project, firstly there are many stakeholders such as the public, and government officials, for it with different perspectives where more often these perspectives are different and conflicting. Secondly, there are many rules and regulations related to following when continuing the work and thirdly If we consider such an enormous project there can be large volumes of data that are difficult to handle, unstructured [13]. With all these being the reason exploration of more community-driven approaches came into action. Public citizens have the best view on civic issues and they have the potential to provide ideas for new solutions [14, 15]. Past work based on civic issues suggests that a collective effort can generate more effective and accurate decision-making [16]. Failing to grasp this collective creativity may lead the way to a missed opportunity, further to the disappointment of citizens. Also, it is suggested that involving citizens in such civic decision-making processes is more important and legitimate Public citizens have the best view on civic issues and they have the potential to provide ideas for new solutions [14, 15]. Past work suggests that a collective effort can generate more effective and accurate decision-making [17, 18]. This kind of citizen-driven approach may lead to financial benefits.

Moreover, We can define most of the work associated with civic design are innovation platforms or innovation ecosystems [19]. It is an organizational setup where it provides the facility to solve problems collaboratively among stakeholders. An important aspect of effective collaboration is establishing a clear framework that outlines stakeholders' responsibilities, establishes protocols for coordinated contributions, and establishes a process for decision-making. Also, an innovation ecosystem can be a virtual or physical system that initiates problem-solving in a more manageable, structured way. Further, It partitions the problem-solving process and promotes the interconnections between participants by combining physical resources, infrastructure, and protocols.

However, the approaches for more citizens driven methods face many challenges. The initiatives with public engagement face common challenges of poor organization and facilitation. Additionally, such initiatives face the challenge of managing large-scale participation due to costs and other factors associated. Public have the best view on civic issues, and they have the potential to provide ideas for new solutions]. Past work suggests that a collective effort can generate more effective and accurate decision-making [17]. Most of the time people who are highly engaged are the ones with so-called high socio-economic standards, and the rest of the diverse ideas are neglected with the traditional public participatory ways. Nevertheless, research work suggests

that the attempts made to engage more citizen participation with the aid of digital technology ended up engaging the citizens in roles of "Consumers" or "sensor network" [5] and without engaging people in the whole procedure of designing, developing and implementing of civic problem answers.

B.Reynante et al. suggest a framework accumulating three parts public participation, crowd-sourcing and design thinking aiming a more participatory process in civic designing [5]. Fung's democracy model which is a framework for public participation intends to promote different ways for citizens to participate in civic decision making yet it being indulged with traditional forms of public participation such as face- to face meetings which are known that the ability of these methods is limited when comes to scale and the complexity. Some frameworks of crowdsourcing suggest methods to increase and differentiate participation utilizing different technologies to decrease expenditure, outline and set boundaries, to promote accuracy and steadiness. Dennis Hilgers and Christoph's Citizen Sourcing [20] and Taewoo Nam [21] bring some of the initiatives where crowdsourcing has leveraged in civic matters. Often, they have to bring single-step solutions without considering that effective and most acceptable solutions come through a lengthy and interactive process. literature work proposes that design thinking frameworks can be used as an organizing principle in civic because it is armed with systematic ways to tackle the complexity of civic issues by observing a broad scope of problem-solution space and through testing and prototyping [5].

The literature indicates that there have been numerous compelling studies conducted on civic issues, which have employed various study designs tailored to investigate these matters in depth. CommunityCrit [22] is one of the civic design initiatives developed with a focus to engage the urban community of a specific area for designing Urban designs. Many of the tools developed earlier are limited to early-stage ideation and collecting complaints. Specialty seen in communityCrit [22] is that it engages citizens in more deep and complex stages of urban design which is beyond just idea-ting. It provides micro activities for the public to engage in, evaluate and share ideas. Climate CoLab [12] is another civic design initiative that is aimed at generating significant, high-quality plans for overcoming and addressing climatic changes as a world community. Climate CoLab [12] system works as a combination of planning based on model, debates activated online, and voting activated electronically. The software platform(www.climatecolab.org) allows people to develop proposals and each of the proposals contains own discussion forum where users can discuss in-detail. This also includes roles for advisors to provide inputs to proposals. It includes design process which runs multiple times include the steps of planing, judging the submitted proposals, and collecting votes for proposals. Colab [12] also functions as a new scientific paradigm known as Science 2.0, [23] which elaborates collaborative and open research practices. Moreover, NextdStopDesign.com [24] is an initiative designed to engage the public in designing bus stop design. It Conveys a challenge to a visitor to the site and then as the solution to the challenge they submit a suitable design to the gallery. Also, users can view peer designs and comment on them. Conclusively many studies in literature has developed different types of initiatives to solve timely civic matters.

Lately, some work advocates civic design by attempting to develop tools and technologies that can facilitate civic engagement by decreasing participatory costs and supporting interconnection between varied individuals. Advancement in new technology has pawed the way to new paths in networked communication among stakeholders surfacing past barriers. Though the digital divide is still prevailing promoters of digital civics have the opportunity of reaching more people than ever before.

2.1.1 Public participation

Public participation in civic design initiatives is an integral feature for creating more responsive, efficient, and inclusive communities. This involves engaging community members of society to design, solve and ideate solutions for community hardships, accounting for their perspectives and needs. This perspective has been extended to the level where finding solutions as a world community to burning typical civic problems. Climate co-lab [12] is a fine example of such an initiative. Public participation can take different forms such as collaboration, Co-designing, ideation, and empowerment and further it can be achieved through a range of methods such as town hall meetings, workshops, online platforms, social media, etc. Involving the public in the design process, ideation, consulting, and commenting can ultimately force to efficient outcomes or solutions.

One foremost feature of public participation is that it includes a realistic expectation of impact and a process where it brings all the stakeholders to a single table [25]. Though out the literature many public participation frameworks are prevailed. Ladder of citizen participation [26] is among the most dominant frameworks. It specifies the extent of public participation according to the power allocated to people. Rungs of Arnstein's [26] ladder, Bottom, middle and the top respectively indicates, non-participation, tokenism, and citizen power (including the relationships). This was developed in 1960 to study the engagement of marginalized communities in United States social programs [27]. Even though this intends to possess more control over the Public, Fungs Democracy cube [28] shows that not everyone has the ability or the likeness to involve at the top level. Fung's democracy cube is another significant public participation framework. It is built based on the Arnsteins ladder. It accentuates various participation modes at different extents of contribution. Also, it evaluates participation among three main dimensions namely, extent of participation, way of communication, and decision making with low intensity to highest intensity, level of authority. It is identified through empirical research that more successful and efficient civic outcomes can be yielded by providing more forms of public participation [29]. Most of the frameworks of public participation from literature function aiming that people may attend physically without considering different novel techniques and levels that can be attained with developed digital technologies. Current initiatives to develop these frameworks with different digital domains have pawed the way to different technology entitled participatory platforms. But some studies show that these initiatives don't provide opportunities for people to engage in the upper rungs of Arnstein's ladder. A handful of these initiatives are empowered with different modes of participation and it is difficult to find any work that promotes different levels and types of participation [30, 31]. Moreover, it is not exactly what comprises public participation, Crowd sourcing to a level can figure out ways to manage the participation of different people with a variety of skills, capabilities, and levels.

However, combining technology with public participation can pave the way for the next level of development. Technology minimize the barriers for people to engage in civic design, especially for people who are in difficulty attending physical gatherings. It promotes accessibility through methods such as virtual meetings, online surveys, etc. Also, another role of technology in public participation is that it promotes more interactive participation. It provides a better engagement experience through visualizations and simulations where people may understand demonstrations more clearly. Further Online forums and social media can facilitate to provide more engaging discussions and feedback. Transparency and liability are among the main benefits of technology-enabled public participation. For example, if we consider a civic design, all the proposals, designs, and legal documents can be accessed easily. Moreover, It enables more accurate data collection and analysis. Online surveys enable the collection of large volumes of data and they can be easily analyzed through data visualization tools. Technology-enabled

public participation increase efficiency. It reduces time and resources more efficiently.

There are many attempts at public participation initiatives that succeeded in enabling technology. Reimagine RTS [32] is a project where it utilizes community inputs to design the city's bus systems. An online platform called MindMixer was developed to share ideas, comment on ideas, vote for a specific design, etc. This engagement method enabled an efficient redesign of new bus systems which also caters to community needs and ideas. Another project carried out in Australia namely, "Our City, Our Future" uses a virtual reality tool for the community to engage in planning and designing of the city's future appearance. This virtual reality tool gave the opportunity to the people to explore the designs and provide feedback on the proposed designs. The engagement process elaborates on a more engaging and inclusive participation [33]. PlanIt Calgary project uses an online platform to collaborate community to create a new municipal development plan. This platform had different criteria to collect ideas such as transportation, housing, and economy. This causes in better capture of the needs and preferences of the community in a more clear way. Finally, another famous initiative is the "Glasgow 2014 Commonwealth Games Legacy Plan" [34] where they developed an online engagement platform namely Citizen Space for gathering feedback from the community based on the legacy plan for the 2014 common wealth games. It also uses different criteria to capture community feedbacks more specifically.

Civic engagement and Online Technologies

Lately, with the development of online technologies, they could replace traditional physical, face-to-face methods. Many of those technologies are ideated with the ability for the people to communicate their ideas, and report any problem directly to the respective bodies. As an example, In the design of the mobile application 'Fixing the city one at a time,' Foth et al [35] uses the built feature of smartphones such as Camera and GPs to make citizens to capture geo-tagged pictures of broken street items and create request for repairing to authorities. Other mobile applications such as Waze [36] facilitate participatory sensing and sharing between users. Tiramisu [37] provides the means for transit passengers to report the tome of waiting and capacity of bus, Cyclopath [38] which is another app helps cyclers to share cycle paths. Cycle Atlanta [39] tracks the paths of the cyclists further it helps the urban authorities to take decisions associated with cyclists.

Another popular way to gather citizen thoughts is through Polls and online forums. Many explorations have been done based on how to perform quick surveys, more scalable and accessible to a broader community [22]. Wikisurvey [40] facilitates a way for the respondents of a survey to contribute to different effort levels through pairwise voting. However, though surveys provide a way for officials to gain the knowledge they seek, they don't help the participants to be aware of other members' opinions, and ideas. Online forums are also providing a means for people to interconnect. For instance, NextDoor.com [41], a social network was designed to build strong neighborhoods. Another such online platform is PlaceSpeak [42], it connects people in local communities to solve issues related to their area. Online platforms such as Deliberatorium [43] , OpenDCN (Deliberative Community Networks) [44], and Open Town Hall [45] offer individuals the opportunity to participate in discussions about policies through virtual forums, which can complement face-to-face gatherings.

Further, some online tools are built to support community engagement in urban design. [46] is an online tool to help authorities to exchange ideas with citizens and to search for the effect of designs in city area. PlanYourPlace [47] and Urbane [48] are online tools that facilitate the authorities to inform about new design projects by posting news and images. Likewise in Literature, there are many initiatives where online tools are built to promote civic engagement.

2.1.2 Crowdsourcing

The growth of Web 2.0 has pawed the way for the evolution of novel concepts for business, communication, interpersonal relationships, learning, etc. From these new emerging concepts, a concept associated to business and innovation is known as crowdsourcing [49]. The term itself was initially emerge through an American Jeff Howe who is a journalist in 2006 where he defines it as "The action of a certain institution considering a certain task which was fulfilled by the company employees in the past and outsourcing the work to a unknown network of people in the mode of an open invitation. This can be performed in as a collaborative task or as a sole task." [50]. Although this model was originated in business environments with the time and resourcefulness of the model it has evolved and expanded over different fields for different purposes such as medicine [51] and geography [52]. For instance, it also has been seen as a way of dispensing tasks among a large group of people known as to be a crowd and this can be from inside an organization or any other outsiders, to succeed in decision-making processes, in a different task and co-designing, etc [53]. Some research work suggests that crowdsourcing is a procedure where different work of a specific organization is outsourced by the public and the general public here refers to crowd [54]. Tong defined crowdsourcing to be a service with a defined common framework where one person acts as the publisher and generates a task that will responded by an unknown community known to be a crowd employee. Further Tong shows that the task and it's response pair is a identical attribute of crowdsourcing data [55]. Not Lately that crowdsourcing has also been identified as an emerging, promising approach for solving tasks and also as an accessible innovation equipped by the web [56]. However, crowdsourcing also refers to a collective effort [51] or a large-scale collective intelligence system [57]. Moreover, it is shown that crowdsourcing is more of a process where one is asking for a hand for solving a problem which is unable to solve themselves due to lack of resources, skills, and other factors like time [58]. Once a work has suggested that it is an online problem-solving model that utilizes the collective intelligence of a networked crowd for solving a unique problem [59] and also as a problem-solving method that focuses on the knowledge, capability, and creativity of world, online community [60]. However, after going through many meaning of crowdsourcing Estellés-Arolas and González-Ladrón-de-Guevara were able to extract all the key elements that differentiate crowdsourcing from any other internet initiative. They developed a definition that defines the concept in depth, It is a way of an online activity that promotes participation, an which a certain institution or organization make an open call for a set of individuals with a diverse knowledge and heterogeneity to acquire a task voluntarily. This acquiring of tasks with different complexity levels and in which individuals have to participate utilizing their work, costs and knowledge for the mutual benefit. The user will benefit with the satisfaction, self-esteem and recognition from the society while developing own skills. Also the crowdsourcer gets the benefit from what user has done to the work. [61].

One of the distinguishing crowdsourcing platforms is Future of Crowd work by Kittur et al [62]. It suggests some of the key features that a successful crowdsourcing platform should possess like, a successful crowdsourcing platform atomizes complex tasks into multiple small tasks since it is easier to allocate the tasks to multiple individuals and solve them simultaneously, and quickly. Also, it suggests that the workers should be selected accordingly based on skills, hierarchy, and incentives. However, crowdsourcing platforms also have their limitations. For instance, first crowdsourcing platforms considered workers as sensors, and ideators but very rarely as true collaborators. Also, another fact is that though many civic initiatives employed crowdsourcing they often consider a linear, straight workflow and they are unable to identify that effective civic initiatives can also be generated through iterative processes like design thinking.

However, through all these key elements from the combining paw the way evidence where

that we are on the way to the creation of a collective intelligence platform where enormous, diverse communities collectively participate in solving a single problem [12]. As a fact "no one knows everything, everyone knows something, and all the knowledge resides in humanity" It is negligible that we are continuously adapting to technology that tackles this. research suggests this model as collective intelligence, a way of worldwide distributed intelligence, that is frequently developed, real-time, and pawing the way for effective collection [63]. Interesting, developed solutions occur when talent is collected in efficient ways, in history even without the help of the web to tackle all the ideas participants become smarter as a collection.

2.1.3 Utilising crowd sourcing in solving civic problems

Recently it is identified a trend to develop technologies that promote democratic civic participation [64] [65]. Digital technologies can promote this by decreasing participation costs and by supporting interconnection between different individuals. It is also shown that digital technologies should go beyond just an open call for participation rather they should match the opportunities with the right talent [66]. One such promising model for scale-up participation is crowd-sourcing, where it utilizes the collective intelligence of a considerable number of individuals staying distributed to do minor tasks [67, 68]. Often aggregating inputs from many individuals yields more than a single individual, crowdsourcing taps being this an advantage [68].

Research studies have shown that using several methodologies of crowdsourcing has enabled the public to engage without sparing too much time or commitment or proficiency [69]. For example, a study has aided a crowdsourcing system to collect ideas to enforce a law associated with off-road traffic [69]. Another is a work by the Environmental ministry, this study illustrates extended participation and it developed an educational task for about 700 citizens. In this method, they yielded a massive number of contributions which is nearly 4000 contributions, and through the study, they identified how this paved the way for creating a new problem, and how to incorporate all the ideas to come with an unanimity.

Further, lately, some research work has identified new interaction mechanisms and motivational structures to yield more creative and aggregate outputs from crowd work [62]. The specialty of this structure is that it allocates micro tasks for many independent workers [70]. From the early stage of the research, researchers explored a way to make up the crowd into complicated workflows [71, 72]. In a way, it is also suggested that this kind of method considered people as replaceable, invisible modules and also covered worker conditions [73]. But now with time, this kind of formalities has been overcome, and for instance, the platform CrowdCrit employs workers from the micro/task marketplace to assess visual designs and also on the other hand supplement the knowledge barriers with structured rubics [74].

Moreover, there have been identified situations where crowdsourcing has interfered with prevailing community structures to boost participation in several project works. For instance, in a project called Cobi, they have developed author sourcing [75] and attendeesourcing [76] to improve scheduling in conferences. Also in some universities, they have employed learnersourcing [77] to improve educational materials. Crowdsourcing introduces the application of these techniques to civic processes [78] and to find solutions to complex societal challenges [79]. The BudgetMap project introduces the public to the method of classifying budget items according to the microtask approach [80]. In CommunityCrit they are analyzing how crowdsourcing techniques can be utilized to improve public engagement in the urban design process.

In this study, we have used the crowdsourcing platform Prolific to collect the viewpoint, comments, and ideas of the general crowd based on the stories themed on community hardships

that the non-native community in Finland faces.

2.1.4 Design thinking

Generally design thinking is known as process that is creative and includes the opportunity for a individual to experiment, develop and prototype models, collect feedback and also redesign [81]. In another way, design thinking can also be defined as a term that includes the thinking pattern of design practitioners and their way of systematic, human-centred, creative way of problem-solving [82]. Also, it is defined as the science of developing and maintaining the artificial world by solving specified problems [83].

Also, lately, It is been identified that most of the problems solved by designers are highly complex problems and they are not dependent on social factors to handle them through rational scientific approaches [84] One of the prominent design thinking frames works are from Stanford's d.school [85]. It defines a process with 5 phases related to design thinking. namely, 1."Empthatize" with humans- through observations and other methodologies to collect data about people's ideas, and needs, 2."Define" the problem by using the collected data, 3."Ideate" a wide variety of possible solutions ideas, 4."Prototype" relic that encompasses the best ideas, 5."Test" prototypes to collect feedback. Here each step as well as the whole process can be iterative. Further, the solutions to complex civic problems can be developed through systematic, iterative processes. The frameworks of design thinking assume that the design process is carried out by professionals but, when it is considering the civic domain a problem arises in terms of how to ensure fair and meaningful engagement. As a solution community-based and participatory methods of designs have loomed with the intention of how to improve the openness of design process to leverage the awareness of community members to ensure the active and fair participation in the process. Design is similar to problem-solving. Both are ubiquitous human activities. It needs dissatisfaction with the prevailing situation in combination with strong thoughts that some kind of action should be done to overcome the situation is the beginning of the design process. One drawback of participatory design is that usually, they have engaged in physical participation methods which in turn limit the number of participants. So now it seeks the help of crowdsourcing methods that can scale up the participation.

Moreover, design thinking also can be defined as a approach of problem-solving that encompasses empathy, experimentation, and iterative thinking. In-depth design thinking engages in understanding the needs and opinions of users, developing creative ideas, prototyping, and testing possible solutions, and correcting those solutions based on the feedback. This is commonly used in areas such as product design, technology, and business strategy. However, this approach can be applied to different complex ranges of problems and contexts such as civic issues. This mainly facilitates collaboration and willingness to iterate and refine ideas according to the feedback gained. This in return paves the way for more effective and innovative solutions. Especially with the features of design thinking such as prioritizing the requirements of the users and the iterative process that follows in development, it can lead to solutions and products that truly meet the needs of the users. This also can be applied to the process of solving civic issues as it may help to build solutions that meets the needs, opinions of civics.

the extent of ability to understand or

2.2 Empathy

Wikipedia defines Empathy as the capacity to understand or feel what another person is experiencing from within their frame of reference, that is, the capacity to place oneself in another's position [86]. Also, the dictionary meaning for the term Empathy is the ability to share someone else's feelings or experiences by imagining what it would be like to be in that person's situation [87]. However, according to Stotland, the term empathy has pawed the way for discussions even dates back to the "emergence of philosophical thoughts" [88]. Even with its broad history, Empathy is not a well-defined term.

Research work has defined empathy in different ways. Albireo refers to empathy as the extent to which a person can emotionally connect with the feelings and experiences of others, this may often cause the reply that is initially directed towards their situation and emotions more than one's own, which can be distinguished as empathy. This response may be the same or go on par with the other person's emotion and the situation [89]. Another article suggests empathy to be a cognitive and emotional understanding of another's experience resulting in an emotional reaction that is concurrent with an idea that every person deserves compassion, self-respect and has their inherent values [90]. Although all these give an understanding of what empathy means, there is no any defined definite definition for empathy, and from time to time different definitions and arguments on the topic have emerged. In developing a widely accepted definition of Empathy, a problem arises in whether it includes identifying emotions and experiencing them or the both [91].

The concept of empathy has undergone a long time of continuous development with the focus on affective Empathy and Cognitive empathy as single dimensions or as both dimensions [92]. Davis proposed that it is a trait of personality that is distinguished by stability to perceive and comprehend the emotions of other persons encompassing both the affective and Cognitive factors. Affective empathy includes sharing of emotional experiences of others whereas cognitive empathy includes the ability to identify and understand the emotional states of others [93]. But some other researches suggest that prosocial behavior affecting affective and cognitive empathy is also included in the term empathy [94].

Further research work also suggests that empathy can be divided into two states empathy and trait empathy [95]. The former is a result of a situation that occurred and the latter is a somewhat stable individual difference. Nevertheless, the view of empathy, consisting of Affective and cognitive sections is widely accepted [96]. Reniers et al. proposed a revised definition for empathy which includes cognitive and affective components. They also specified empathy from sympathy since it is considered as an output of empathy and not a component of it [97] Their definitions of empathy consist of cognitive empathy, which includes perspective-taking and online simulation, and affective empathy, which includes emotion contagion and proximal and peripheral responsivity [97]. In this thesis, we have used Reniers et al's definition of empathy and the defined components as discussed in section 5.2.

2.3 Tone Analyzer

Modern research studies about tone run back to early 1922, a time when scientists obtain patterns of changes in pitch(frequency) that occur throughout a syllable or word in lexical tones of the language Mandarin which is very close to the language that we use nowadays [98]. Also past scientific work suggest that if the true purpose of research-related tone is to increase the understanding of speech, true insights about it can emerge with reveling of casual relations behind the tonal phenomena [98].

Tone analysis is identified as a process to study the language, style, and many other textual features in a text which is in different forms like written or spoken to understand the emotional or rhetorical impact of the language used. Also, the tone refers to the viewpoint, emotion, and mood expressed by the language of the text and further tone analysis intends to identify and explicate how the tone of the text impacts its meaning.

According to Russell et al's circumplex model depicted in figure 2.1, the emotional state is divided into four main parts anger, fear, joy, and sadness as referred to as the arousal and valence axis [99]. This circumplex model reflects many emotional states as amused, proud, satisfied, sympathy, stressed, depressed, confused, nervous, etc. And these are a combination of the four vital emotional states. This work also mentions that emotional states can be found and visualized from different data representations such as spatiotemporal facial images, whole body image data sets, etc. Identifying emotional states such as happy, sad, anger, surprise, fear, and disgust is proved to be a challenging task. However, an automatic classification model for understanding specific emotions ha being introduced by Alm et al [100]. He has used it for classifying sentences from fairy tales. Alm et al. also showed that machine learning-based models can be used to activate prediction tasks [100]. It used 14 features that are prior defined and they are extracted from the stories themselves.

Past research work has identified different means to analyze the emotions and tone of texts. test analyzing of short stories are done by simply reading and classifying them [101]. Also, common-sense knowledge based is utilized to present real-world knowledge on emotion. Although there are several ways that researchers have identified text-based tone identification there are some limitations of text-based tone identification [102]. The imprecise nature of keyword definitions leads to uncertainty, the inability to identify sentences lacking specific keywords, the absence of pertinent linguistic data hides the ability to fully identify and analyze language, and the hardness of identifying emotion indicators. Further examining spontaneous speech has been a popular way of identifying tone and intonation [98]. Tone analysis includes different undertone aspects of a piece of text such as emotional, social and psychological, etc.

Lately, machine learning-based tone analyzers are heavily used for the psycholinguistic analysis of texts [103]. Trained machine learning models can be used to identify and categorize different tones based on the analysis of patterns in the language used. One such commonly used machine learning-based approach in tone analysis is used in sentiment analysis, which is a process that includes checking whether a text includes positive, negative, or neutral tones [104]. Also, the same procedure can be used to analyze social media posts and many other user-generated content. Further machine learning models can be trained for identifying more refined tones such as sarcasm, irony, humiliation, etc. This approach requires more complex, sophisticated algorithms and a broader understanding of nuances of language. Also, it is noticed that the machine learning-based tone analyzers are not perfect and rarely they can misinterpret a tone of a text. Another cause for this is that the decisions can be biased based on the training data that the specific model has trained. It is also discussed that as with any of machine learning model, it is necessary to validate the outcomes and refine the algorithm continuously to improve accuracy.

The usage of tone analyzers based on machine learning for psycholinguistic analysis of text is increasing day by day. For instance, the IBM Watson Tone Analyser measures tones such as confidence and joy that might be more common in commercially funded studies if they are more promotional. [103] .
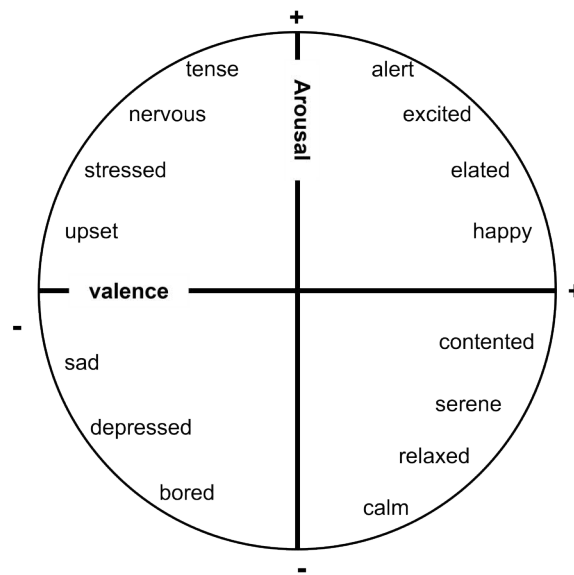
Figure 2.1: Circumplex model of affect

2.3.1 IBM Watson Natural Language Understanding

IBM Watson tone analyzer is a machine learning-based tone analyzer based on psycho-linguistics. Further, it explores the relationship between behavior and psychological theories [103]. It has been trained with 96,000 Twitter conversations based on customer service and is rated by five annotators [103]. The service uses linguistic analysis to identify three types of tones from a text snippet, emotion, social tendencies, and language style. Emotions include identification as sadness, joy, anger, fear, disgust [105] and social tendencies include the identification of openness, conscientiousness, extroversion, agreeableness, and emotional range which are the facts from the big five personality traits used in the past work by psychologists. Identified language styles included confident, analytical, and tentative [105].

Table 2.1: Tones and definitions

Tone	Definition
Anger	"Evoked due to injustice, conflict, humiliation, negligence, or betrayal. If anger is active, the individual attacks the target, verbally or physically. If anger is passive, the person silently sulks and feels tension and hostility" .
Fear	"A response to impending danger. It is a survival mechanism that is a reaction to some negative stimulus. It may be a mild caution or an extreme phobia" .
Joy	"Joy or happiness has shades of enjoyment, satisfaction, and pleasure. There is a sense of well-being, inner peace, safety, and contentment"
Sadness	"Indicates a feeling of loss and disadvantage. When a person can be observed to be quiet, less energetic, and withdrawn, it may be inferred that sadness exists" .
Disgust	"A feeling of strong disapproval aroused by something unpleasant or offensive" .

It is also mentioned that according to IBM performance of the analyzer showed a high

accuracy compared to benchmarked data [103]. Still, there is no actual reported measure of its performance. However, lately, the Watson tone analyzer service was moved to Watson Natural language understanding [105]. It uses deep learning to identify and extract meaning and metadata from text snippets. It extracts the meaning of data in terms of categories, classification, entities, keywords, sentiment, emotions, relations, and syntax [105]. In our study we have used IBM Watson Natural language understanding's emotions to perform the tone analysis of the participant answers as discussed in section 5.6.2. In terms of emotion, it analyses five main tones namely, joy, anger, sadness, disgust, and fear. The definitions for the tones are described in table 2.1 [103].

3   Study Design

In this chapter, we discuss the study approaches we had for the study design and the final questionnaire design for the study. In the first section, we go through the different options we had to design our study with the help of literature. Also, we discuss some of the current possible study design approaches. Further, in the second section, we present the final study design of the questionnaire. Subsection one highlights the conditions of the questionnaires. Further, it describes the basis of the questionnaires. Subsection two describes the story collection procedure. The stories subsection highlights the stories that we have used in our study design questionnaire from the stories that we have collected. Conclusively as the last subsection, we discuss the QCAE questions section from the questionnaire.

3.1 Study Approaches

The possible study options for the study design is discussed in this section. Community participation is one of the main concerns in addressing a typical Social concern. This has to be effective and timely on the other hand. Traditional approaches to community discussions such as public workshops, and public meetings come with many limitations of their own [5]. In the traditional forms of public gatherings, people had to spend a significant time off their schedule and also they had to put some effort into participation such as a devoted transportation method. This kind of physical participation limits the number of active participants.

When engaging decision making as a group, physical means of communication tools such as face-to-face meetings, telephones, and paper-based communication are involved. Through it prevailed a long period it is difficult that all members to be engaged at the same level of commitment and engagement in analyzing and decision-making. Even with small groups of people, it may experience inefficiencies and output losses. Group decision support systems have quested to struggle with these problems [12].

Further, these kinds of gatherings are more often dominated by outspoken community [5] and always the idea of a whole lot community is kept silent. It also brings out the fact that the participants in traditional public participation cannot be the representative of the wider community [24]. Also, various diverse needs of a community are hardly captured and it paves the way to the poor addressing of community concerns. Another critical concern in public participation activities is that the contextual factors may avoid participation and the varied input in traditional settings [24].

As a result of the limitations in physical public participation activities, frameworks suggest intensifying these existing physical participation modes with prevailing technologies [5] such as online platforms, mobile applications, and hybrid technologies. examples for hybrid technologies are Kioski [106], Public displays [107] and iClickers [108]. Much of the research work has introduced more scale-able and effective public participation options, which include novel online technologies for public engagement [5]. These technologies could surpass the limitations of physical public participation by being more accessible and scale-able to the public [5]. Also, research suggests that the flexibility and the adaptability of online tools allow the users to engage in them at their own momentum [24].

Furthermore, some prevailing work suggests decision support tools like online forums where one person can share their opinion on the other person's thoughts, ask questions, create a debate, make an argument, and present their point of view [5]. Questionnaires are also an even-handed means to collect information on people's perceptions, acceptance, and behavior.

3.2 Questionnaire Design

In this section, we present the pathway of the choice for designing a questionnaire as our final study approach. In proposing a design option for the study we considered the work from literature. We went through some of the prevailing platforms that we could use to design our study. crowdicity.com [109] and Zooniverse [110] are some of such platforms that we found as possible tools for designing our study. But lately, we found that it is too complex to design with this kind of platform. Another design approach that was considered was miro boards [111]. Miro boards paved an interactive way to collaborate with groups of people surfacing the physical location also people can simply showcase their idea on a sticky note and the other party can comment, vote, and debate about the idea [111]. For the moment it appears to be a good approach to design our study. We planned to create three miro boards [111] where one board acts as the baseline and two other boards with two other conditions. Still, when continuing the work we found that it is hard to do it with miro boards [111] since there were some hardships in synchronizing the work when two people do it at one time and many other reasons. Limited time was another difficulty we had in this approach. lastly, we decided to do our study using a questionnaire.

We developed a questionnaire in Google Forms as Our study design. As mentioned in section 2.2.1, We used three questionnaires where the first questionnaire acts as the baseline and the second and third questionnaires with two other conditions. All three questionnaires are identical except for the conditions that we used in the questionnaires. In all of three questionnaires, we mention the headings as :

"In a previous study we have collected authentic stories of hardships experienced by the non-native community in a Finnish university. In this short questionnaire, we want to hear your thoughts on what could be done to mitigate the situations or hardships experienced in three of those stories. Feel free to express any ideas freely and as in-depth as you wish: The content of your responses will not affect the acceptance of the task itself on Prolific."

The questionnaire is composed of two sections, in the first section we present three hardship stories, and in each of the hardship stories, we asked the participants to suggest their ideas to mitigate the situation relevant to the story. Also, this section contained another part "Free thoughts" which includes a fourth question to express free thoughts. Here we also mention the usage of these free thoughts to get genuine, in-depth ideas as *"What are your free thoughts after reading the stories? (Note: These thoughts will be used only in academic dissemination and nowhere else)."* Second section is the Questionnaire of Cognitive and Affective Empathy as mentioned in Section 2.2.3. QCAE is a valid tool for assessing cognitive and Affective Empathy [97]. Our aim of this section of the questionnaire is to measure the Empathy of the participants.

3.2.1 Questionnaire Conditions

As mentioned in the above section we used three questionnaires in Our study design. These three questionnaires are differentiated based on three conditions. The first questionnaire we used as the base questionnaire where we didn't mention any condition. In the second questionnaire, we used the condition that we will be using the participant's ideas on Social media. Further, we mention this on the questionnaire as, *"Please be informed that we will be using your ideas in social media"*. Moreover, in the third questionnaire, we mention the condition that the participant's ideas will be assessed by crowd workers. It is mentioned on the questionnaire as *"Please be informed that your ideas will be subjected to a quality analysis by crowd workers"*.

3.2.2 Story Collection

As mentioned above In this section we discuss the story collection procedure more descriptively. We aim to collect the true intimate stories related to hardships that the non-native community of a Finnish university has experienced without any exaggeration or underestimation. For this purpose, we created a survey and share it among some possible participants. We mention the project details and purpose of this survey. Further we instructed the participants to give their consent while participating the survey anonymously.

There were two main sections in the survey that we use to collect data. In the first section, we asked the participants to state any of the hardships that experienced throughout their life in Oulu or in university life. Also, in the first section there were questions related to background and demographics of the participants. Here we questioned the participant's ethnicity, gender, current status about higher education system of Finland, and their experience of living in other countries and these questions were presented as multiple choice questions. Short answer questions were used to collect the information regarding the age and the number of years spent in Finland. Also asked the nationality as a drop-down question. Finally, we asked to compare the Finland's life with any other Countries they have stayed, this also included home country. This was depicted in the form of a linear question which included 1 for extremely unsatisfied and 5 for extremely satisfied.

In the second section, we asked one question and we request them to use their own tone and wording style to collect an intimate answer. Here we asked them to write their hardship in the form of a story to engage with tone and original wording. As mentioned in section 3.2.2, we use some of the selected stories to employ in our main study design. Conclusively a total number of 40 participants participated in the survey.

3.2.3 Stories

In this section we present the selected stories from the survey that we use to collect stories which are mentioned in section 4.1. We selected these three stories to cover the three main perspectives of hardships namely, Interpersonal relationships, Economy (financial status), and immigration-related hardships. Also, we choose longer stories, since they provide a detailed description of the hardship. Some of the stories that we used in the questionnaires are a collection of relevant, same-kind stories. Moreover, we kept the wording and the tones of the stories the same to get the right insight. and grammatical errors and typos were corrected in the stories related to hardships. The employed stories for the questionnaires are as follows:

Story 1: This story is a combination of two hardships that we collected from two participants and this represents the hardships faced in the perspective of Interpersonal relationships which also includes the social, language, and racism perspectives. The story is as follows:

"Connecting to Finnish people is hard, especially since they switch back to Finnish even with having non-Finnish speakers around. However, hobbies might help in the end to get closer to them.

Once I had an experience when a bit older Finn was calling me a Nazi behind my back for being from Germany. He refused to talk to me in English during all future meetings after he heard me saying that I was from Germany. After talking to the other teammates, they told me that he has strong prejudices toward me for my origin."

Story 2: This story is from another participant and it addresses the Economy (financial status) which also includes the areas of job seeking, language barriers.

"My biggest hardship was financial. While I could find work at a strawberry farm, a

chocolate factory, online tutoring, and several other odd jobs, money was always a concern. The pandemic made it especially difficult to find an internship, which is a core part of our program and a primary reason why I chose the program in the first place.

Originally I had planned to go to India in June 2020. This would have been paid as it was overseas. But being unable to go overseas meant that I needed to find an online one or one within Finland. The problem with needing to find an education internship within Finland is that mastery of the Finnish language is often a prerequisite.

Another problem is that, mostly, they are unpaid. This was a massive problem for me as I had factored into my finances pre-application that I would be getting paid for my internship. Ultimately I was left to complete my internship online and unpaid. At the same time, I was writing my thesis and working part-time. A further complication was the fact that I needed to complete it before the July 31 deadline. This period was tumultuous for me. I was unable to complete my thesis the way I wanted to; instead just submitting for the sake of submitting.

By the end, I was completely run down and my mental health had suffered severely. I was in a foreign country without any financial or familial support, unable to return to my own country due to border closures. However, I was very grateful that my faculty permitted me a 3-months exception to resubmit my thesis."

Story 3: This story is based on participant's personal experience on immigration issues he faces and the issues related to the residence permit.

"While my husband was a staff member of the University of Oulu, I was waiting so long for the final decision on my resident permit, which lasted two years! The university did not support my husband and me in this matter. They even did not bother themselves to contact the immigration service and follow up on the permit application.

At the same time, we were under severe mental pressure while seeing others can enter Finland without any problem, and their decisions were made in less than a month. My husband could not focus on his studies and tasks because he had to focus on writing requests to the immigration service.

In the end, my decision was released without any interference from the university. So there's no support for their employees."

3.2.4 QCAE section of the questionnaire

The behaviour of a human being is impacted by the way of the interpretation of the behaviour or actions of other human beings, thereby mirroring that person's flexibility in society [97]. One of the most important mechanisms employed by social cognition to ensure adaptability and survival is empathy [112]. Empathy can be seen as the understanding and compassion of emotional condition or situation of another individual [113]. Recently it was mentioned that empathy is composed of partly detachable neurocognitive mechanisms, indicating a differentiation between affective and cognitive empathy [97]. According to Spinella [114], the capability to mentally illustrate other individual's mental processes is regarded as the cognitive component of Empathy and the true emotional reaction belongs to emotional components [114].

Conclusively, according to the above facts it is identified that empathy has to encompass an understanding of other individual's experience(cognitive empathy) and also the capability of vicariously imagining the emotional experience of other individuals(affective empathy) accounts on the sub-components of the QCAE were gained by summating the relevant item scores [97].

In the second section of our questionnaire, we included the QCAE questionnaire aiming to calculate the Empathy of the participants. This section is comprised of 31 item questionnaire [97] assessing cognitive and affective Empathy. As mentioned in section 3.2, we obtained the affective

empathy score by the addition of the values to peripheral responsivity, proximal responsivity, and emotion contagion. Also, the addition of perspective-taking and online simulation gives the affective empathy score. Further the summation of the cognitive and affective empathy scores provides the total empathy score [97].

4   DATA COLLECTION

In this Chapter, we discuss How the data that is needed for our study is collected, from where we collected the data and the quantity of data that we can collect. In terms of data that is needed for our study, we had to collect two sets of data namely, collection of the authentic stories related to the hardships that the non-native community in a Finnish university faces and Collection of thoughts on what could be done to mitigate the situation. The story collection is discussed detailed in Chapter three. We discuss the Collection of thoughts on what could be done to mitigate the situation in the first section.

4.1 Collecting thoughts on how to mitigate the situation

We designed a questionnaire including three of the stories that we collected to collect thoughts on what could be done to mitigate the situations. As mentioned in section 3.2, we had three questionnaires. These questionnaires were differentiated based on three conditions namely, the Base questionnaire, with the condition " we will use your ideas in social media", third questionnaire with the condition " your ideas will be subjected to a quality analysis by crowd workers". The questions were identical in all three questionnaires and we also included a section of QCAE questions intending to measure empathy.

In the questionnaire, we only asked the participants to enter their prolific Id numbers. The questions section included three stories as described in section 3.2.2 and we asked the participants to write their thoughts on how to mitigate the situation in each of the stories. and the other section included the QCAE questions.

We conducted our Study in the Prolific crowdsourcing platform. A number of 40 participants participated in Each of the questionnaires. and altogether 120 participants participated in the whole study. An hourly compensation of 10.42 euros was paid for each of the participants in the study.

5   Results and Analysis

In this chapter, we will discuss the collected results through the study design and we will analyze the results further. In the First section, we present briefly the demographics of the participants of the study. and Then in the second section, we analyse the collected data of QCAE. After that, we present a word count and answer length analysis of the answers based on the three conditions of the questionnaires. In the fourth section, we analyse the co-relations between the Answer length and the results through the QCAE. Finally, as the last section, we present a qualitative analysis of participant's answers with thematic coding.

5.1 Demographics

Three questionnaires were based on three different conditions as described in section 4.1. Each of the questionnaires was answered by forty crowd workers and they included both the immigrant community participants and native participants randomly. During the study participants only had to provide a prolific ID and no other personal information was collected, so as to provide the user with the ability to express any idea freely and as in-depth as they wish.

5.2 QCAE Analysis

In this section, we present the results of our participant's responses to the QCAE part of the three questionnaires. As mentioned earlier, all three questionnaires included a QCAE as the last section to measure the empathy of the participants. The QCAE section of all three questionnaires was identical. For clarity, we consider the base questionnaire which is without any condition as questionnaire 1 (Q1) and the questionnaire with the conditions that the participant's ideas will be used in social media and the participant's ideas will be subjected to a quality analysis by crowd workers are considered as the questionnaire 2 (Q2) and the questionnaire 3 (Q3) questionnaires respectively.

First, we identified all the required metrics that are needed to calculate the empathy of the participants according to the article. We also followed the guidelines given in the article to calculate the values separately for all three questionnaire answers. First, we calculated the

Table 5.1: Values for subcomponents of affective empathy, cognitive empathy and total empathy (SD= Standard Deviation)

Questionnaires	Q1		Q2		Q3	
Mean and SD	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Perspective taking	30.15	6.97	29.2	6.89	30.0	5.83
Online simulation	24.4	4.73	27.42	4.03	27.15	4.61
Cognitive Empathy	**54.55**	**10.45**	**56.62**	**8.67**	**57.15**	**9.59**
Emotion contagion	12.2	2.86	10.92	2.92	11.3	2.44
Proximal responsivity	11.72	2.81	11.55	2.89	11.65	2.40
Peripheral responsivity	10.52	2.33	10.9	2.80	11.2	2.07
Affective empathy	**34.45**	**6.71**	**33.37**	**7.35**	**34.15**	**5.47**
Total empathy	**89**	**15.24**	**90**	**13.77**	**91.3**	**12.76**

perspective taking value for all three questionnaires by getting the of the participant's values to the questions of the QCAE: 15, 16, 19,20, 21, 22, 24, 25, 26,27. Similarly, the Online Simulation score per each participant of the three questionnaires is calculated by the summation of the participant,s responses to the questions of the QCAE: 1(reverse), 3, 4, 5, 6, 18, 28, 30, 31. Definitively Cognitive Empathy scores of the participants are calculated by summating the Scores for Online Simulation and Perspective taking.

The affective Empathy scores of the participants are calculated by the summation of scores for Proximal Responsivity, Emotion Contagion and Peripheral Responsivity. The emotion contagion score is determined by totalling the scores from items 8, 9, 13, and 14 on the QCAE survey completed by the participants. Further, the Proximal Responsivity score is calculated by adding together the responses of the participants on items 7, 10, 12, and 23 of QCAE. The Peripheral Responsivity score is determined by adding together the responses to items 2(reverse), 11, 17(reverse), and 29(reverse) on the QCAE. Finally, the Total Empathy score of a participant is calculated by summating the Cognitive Empathy score and Affective Empathy score. All calculated values for the subcomponents of empathy and total empathy values for Q1, Q2, and Q3 is depicted in table 5.1

Conclusively according to the results of QCAE analysis depicted in table 5.1, participant answers of Q3 has the highest empathy value which is 91.3. This value is obtained for the questionnaire with the condition that the participant answers will be analysed by crowd workers. Q2 with the condition that the participant answers will be used in social media, had the second highest empathy value for participant answers which is 90. Q1 participant answers obtained the lowest empathy score of 89. Q1 is the base questionnaire.

5.3 Word count and Answer length Analysis

This section carries the word count and the answer length analysis. First, we present the word count analysis. In the analysis, we count the number of words in answers of participants per each participant in the questionnaires. In the analysis for clarity, we consider the base questionnaire which is without any condition as the Q1 and the questionnaire with the conditions that the participant's ideas will be used in social media and the participant's ideas will be subjected to a quality analysis by crowd workers are considered as the Q2 and the Q3 respectively Also We consider the Question related to story one as the question 1 (q1), a question related to story 2 as the question 2 (q2), a question related to story 3 as the question 3 (q3) and the last question which is to express free thoughts about the stories as question 4 (q4) in all the three Q1, Q2 and Q3.

First, we consider Q1, The average word count per participant for q1, q2,q3 and q4 is 31.3, 33.22, 30.32 and 24.62 respectively as depicted in Figure 5.1a. In total the average word count per participant for all the questions q1, q2, q3 and q4 in Q1 is 119.47. For Q2 the average word count per participant for q1, q2, q3 and q4 is 46.87, 48.12, 41.32 and 36.35. Figure 5.1b presents an overview of the word count for Q2. Conclusively the average word count per participant for all four questions of Q2 is 172.67.

Moreover, the average word count per person for questions q1, q2, q3 and q4 for Q3 is 40.6, 41.2, 31.72 and 26.9. It is depicted in the Figure 5.1c. The total average word count per person for questions q1, q2, q3, and q4 for Q3 is 140.42.

Finally, Figure 5.1d, represents the overview of the total word count per person for all the four questions q1, q2, q3, q4 of the three Q1, Q2, and Q3.
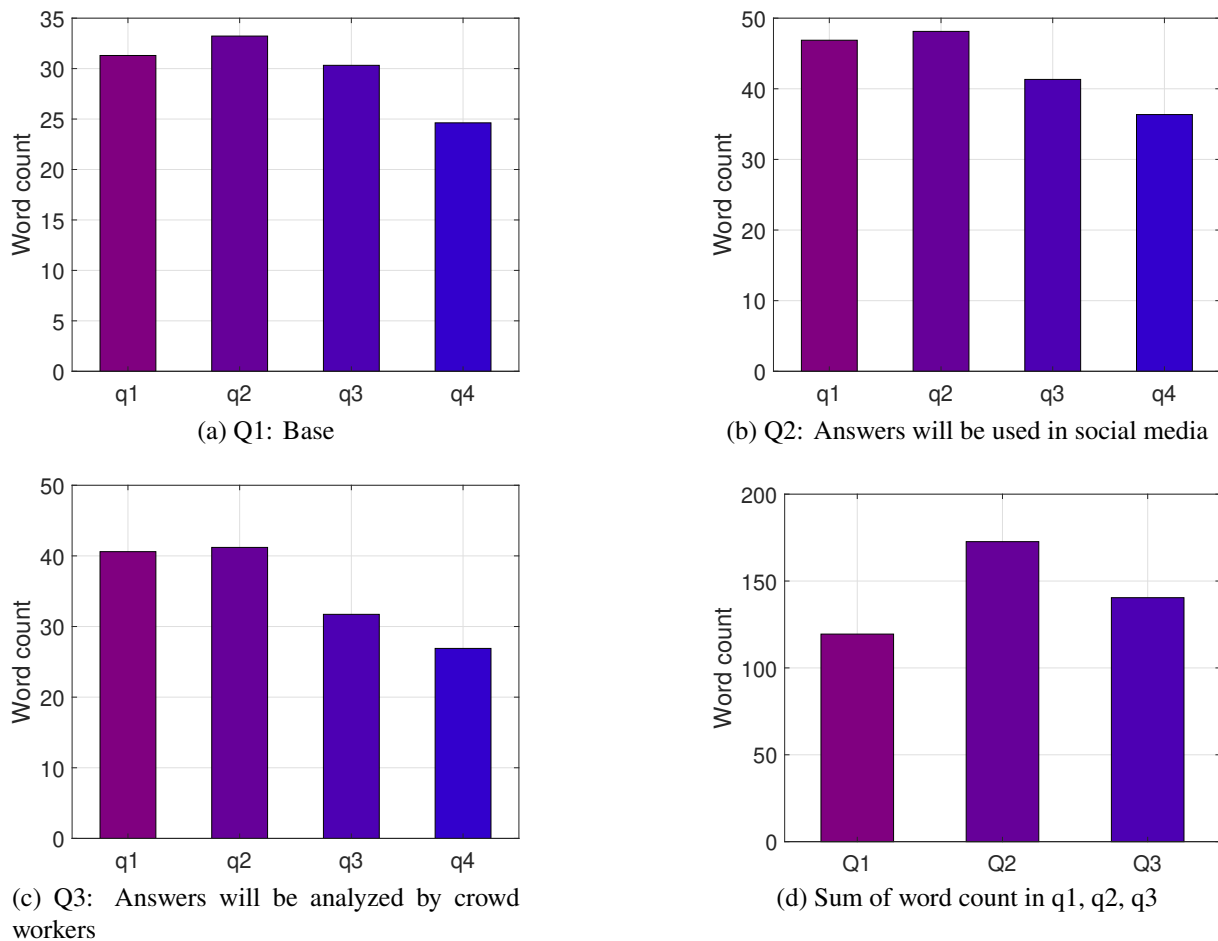
(a) Q1: Base

(b) Q2: Answers will be used in social media

(c) Q3: Answers will be analyzed by crowd workers

(d) Sum of word count in q1, q2, q3

Figure 5.1: Answer length analysis of questionnaires.

5.4 Co relation between Answer length and QCAE results

The following section outlines the patterns and co-relations between answer length and QCAE analysis. Answers length analysis is discussed deeply in section 5.3 whereas QCAE analysis is discussed in section 5.2. Here we compare the value for Cognitive empathy and values for Effective empathy separately with each of the total word count per person in Q1, Q2, and Q3.

First, we consider Cognitive empathy values, Figure 5.2a describes the Cognitive empathy values and respective word count per participant in Q1, Q2, and Q3. According to the figure, the lowest Cognitive empathy value and the lowest word count are identified for Q1 which is 54.55, and 119.47 respectively. But there is no any pattern for the highest values of word count and Cognitive empathy value. The highest word count has the second highest cognitive empathy value which is 172.67 and 56.62 respectively. Also, the Highest cognitive empathy value has the lowest word count as seen in figure 5.2a of Q3. Decisively, there is no clear pattern identified between the Cognitive empathy values of participants and word length of them.

Secondly, we analyse the Co-relations between affective empathy and the word count of the participants for Q1, Q2, and Q3. Figure 5.2b illustrates the values for Affective Empathy of the participants with each of the word counts for Q1, Q2, and Q3. According to the figure the highest Affective Empathy has the lowest word count per person which is 34.45 ,119.47 respectively and the lowest Affective Empathy values have the highest word count per person which is 33.37, 172.67 respectively. So there is an inverse relationship between Word count and Affective

(a) Cognitive empathy
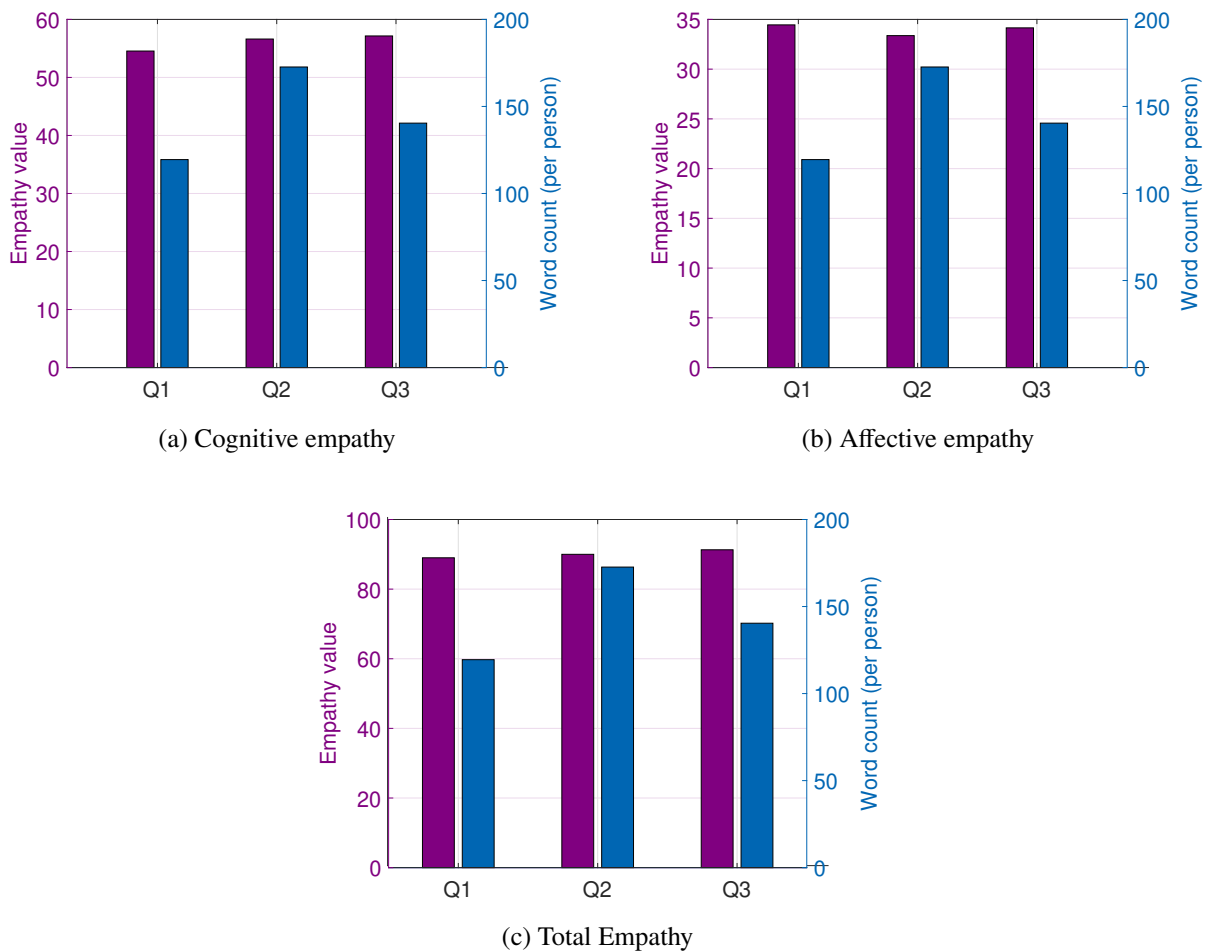
(b) Affective empathy

(c) Total Empathy

Figure 5.2: Co-relations between answer length and cognitive empathy.

Empathy values per person in the Q1, Q2, and Q3. Lastly, we discuss co-relations between the total empathy values and word count of Q1, Q2, and Q3. The lowest total empathy has the lowest word count for Questionnaire 1 which is the base questionnaire without any condition. Q3 has the highest total empathy value and the second-highest word count per participant.

Conclusively, We identified an inverse relationship between word count and Affective Empathy values of the participants. Descriptively Q2 which has the highest word count per participant has the lowest Affective empathy value. Q2 is with the condition that we will be using the ideas in social media. Q1 which has the lowest word count has the highest affective empathy value. Q1 is the base questionnaire. Further no any patterns were identified with Cognitive empathy values and word count of participants, Total empathy values and word count in Q1, Q2 and Q3.

5.5 Qualitative Analysis

In this section we present the results of deductive thematic data analysis [115] for the participant's answers of the Q1, Q2, Q3. To this end we have used the instructions and steps given by caulfield [115] in the analysis.

For the clarity in deductive thematic analysis, the answers of the participants for the study is categorize in to two as short answers and long answers by imposing a threshold to the word

count. Here we assume the threshold to be 30 words based on the collected answers [116]. All the three questionnaire answers are divided accordingly. For the Q1 32.5% of the answers of the participants are long and 67.5% of the answers are short answers. In Q2, the percentage of short answers from the participants is 46.88% and 53.12% are long answers. Finally Q3 posses 37.5% long answers and 62.5% short answers.

5.5.1 Reflection on the participant's answers

The themes for deductive analysis are selected on the basis of the idea that is reflected amidst the answers given by the participants.

Optimistic

In terms of the theme, Optimistic Participant's ideas elaborate that, they have a hope for a better and positive future. also, the participant's ideas suggest a more confident attitude that things may work out in a acceptable way. For an example, one participant has mentioned that *"use hobbies or other similar interests to get closer to the person"*. Another participant elaborates that, *"Sitting down with one another and communicating about differences is truly the best way to solve a situation such as this. It is necessary to find out a similar ground and come to an idea of each other's backgrounds to see one another as unique individuals rather than making assumptions about who they are based on where they are from"*. Commonly most of the participant's ideas have suggested Constructive, favourable positive ways to overcome and improve the relevant situation. One participant has mentioned that *"Get them to meet the real you and show them how wrong they are"*.

Pessimistic

The theme pessimistic brings out more of the opposite of the participant's ideas themed under Optimistic. In terms of pessimistic the ideas of the participants commonly implies that the participants are more likely to expect a bad outcome. moreover, they believe that bad things are more likely to happen. For instance, one has mentioned that *"I don't think this person will gain much from trying to gain favour from people with strong prejudices such as the older Finn who refuses to talk to him/her and prefers to think of him/her as a Nazi."* This clearly shows the hesitant and doubtful thoughts of the participants about the situation. Furthermore one has stated, *"I personally think it's not worth my time or energy trying to make amends with someone who discriminates me like that. I will try to be polite with them, but I wouldn't actively try to accommodate them. I'd just work with other teammates who treat me better"*. To some extent it also implies the hateful nature of feelings towards the situation. For example *"Someone who has already made up their mind about you should be ignored. He, openly, is looking for a reason to pour forth poison so get to know the rest and perhaps he will see you are different than he thought when interacting with his friends"*. lastly one of the participant's ideas is that *"Just ignore it. And don't speak to him ever again. You cant change people's mind"*. It emphasises the hopeless and distrustful view of the person towards the situation.

Active

In terms of the theme active participant's ideas highlights some kind of action or an activity that can be done to improve the situation according to the story. Some of the ideas of the participants

are *"I would talk to the older Finn and see from his point of view of his experiences growing up"*, *"educate the Finn and allow for activities to connect people"*, *"Look for peer tutor within the program. Use some paid-time-off hours to work on the thesis"*, *"Have your friends talk to him and suggest you can discuss a middle ground to solve the problem"*.

Neutral

Some of the participant's answers didn't imply any strong feeling of positiveness or negativeness. For instance one of the participant's answers is that *"The people in the story has some challeging times and situations that will need to have hard choices made to change there circumstances"*. It is identified that most of the neutral answers are found as answers for the fourth question of the questionnaires which is to mention their free thoughts about the stories. In terms of neutral another participant's answer is that *"It honestly puts me a little at ease knowing that I am not the sole individual going through struggles and that others are struggling if not more than I am. It was very humbling"*.

Aggressive

Cambridge dictionary [117] has narrated the term aggressive as, "showing anger and a willing-ness to attack other people". In the analysis answers with a nature of expressing an aggressiveness towards something we themed as aggressive. These answers commonly express a hatred feeling towards something. For example, one participant mentioned that *"sue the university"* as the answer for the third question. Another answer that belongs to this theme is that *"Grill the university for follow-ups and such"*. The count of aggressive answers was very low compared to answers belonging to other themes. None of the short answers in Q1 contains answers belonging to the themes Puzzled and Neutral.
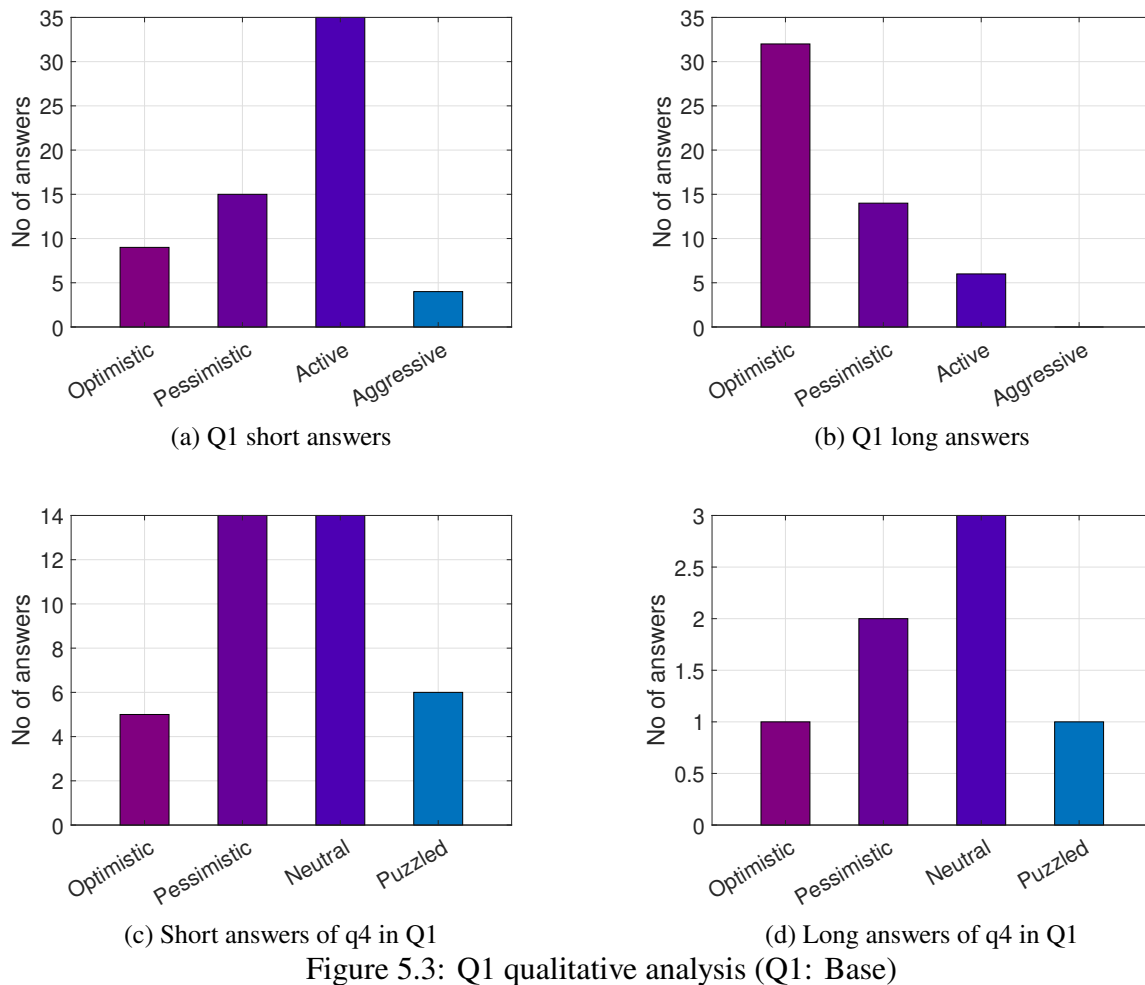
Puzzled

Several participants' answers expressed a doughty thought they had about the stories and the situation. Also, they were unsure what exactly to write as the answers. Such participant answers are themed as puzzled answers. For instance, some such participant answers are that *"I was unsure of what advice they were looking for or if the stories were just people venting"*, *"I wish I was better at advising people who have career troubles, especially the person who was trapped in Finland during the pandemic. That person seemed almost helpless and I don't know that any suggestions would or could have helped"*, *"Of course it's hard to have a full opinion when I'm not given the full story with all of the gruelling details. When writing my advice, there were a lot of conditionals I had to consider. For example with the last story, I wrote that the husband can work elsewhere even though that might not be a possible alternative for them. When it comes to moving to a foreign country, lot of background search should be done. It would be very helpful to get connected with someone native to that country that can serve as a guide"*.

5.5.2 Reflection on qualitative analysis results

As mentioned section 4.5 above, for clarity we divided all the answers to the questions q1, q2, q3, q4 of the three Q1, Q2, Q3 as long answers and short answers [116].

First, we consider the Q1 which is the base questionnaire and the short answers in it. As depicted in figure 5.3a highest count of answers is active answers, which means most of

(a) Q1 short answers

(b) Q1 long answers

(c) Short answers of q4 in Q1

(d) Long answers of q4 in Q1

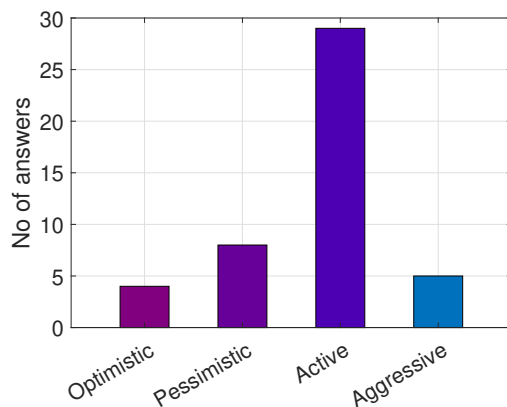Figure 5.3: Q1 qualitative analysis (Q1: Base)

the answers contained an action which could be done to improve the situation. Pessimistic, Optimistic answers have the next highest counts respectively. Further, the Lowest number of answers belong to the theme aggressive which means a very low number of participant's answers expressed hatred feeling.

Figure 5.3b depict the results from Q1's long answers. The highest number of participant's answers in this section are Optimistic. It is comparatively a much higher value when considered to be the second Highest. Pessimistic answers are the second highest count with nearly half of the count of the Optimistic answers. The lowest count of answers is active answers. None of the participant's answers are there for the themes Aggressive, puzzled, or neutral.
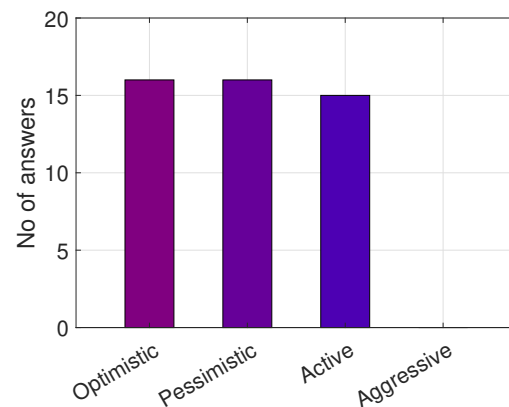
Then we analyse the answers for the 4th question of Q1 which is to express any free thought about the stories. These answers are also separated into two long answers and short answers. Figure 5.3c depicts answers categorised as short answers. An equal count of participant's answers is Pessimistic and Neutral. Further, they also are the highest count of answers. The second highest count of answers is Puzzled and the lowest count of participant answers is Optimistic. In this scenario, none of the participant's answers are Aggressive, Active or neutral. Figure 5.3d represents an analysis of the long answers of Q1. The highest number of answers are Neutral in this section whereas Optimistic and Puzzled answers are the equal count. Pessimistic is the second highest count of participant answers.

Next, we analyse the answers for Q2. Figure 5.4a represents Short answers to Q2. Most

of the answers are active answers whereas the lowest count of answers are optimistic answers. Pessimistic and aggressive obtain the next highest count of answers respectively while none of the answers belong to the themes Neutral and Puzzled. Moreover, Figure 5.4b represents the long answers of Q2. An equal number of participant's answers are Optimistic and Pessimistic while them being the highest as well. The second highest number of participant answers is Active and this value is very close to the highest number. None of the participants answers are Aggressive, Puzzled or Neutral.
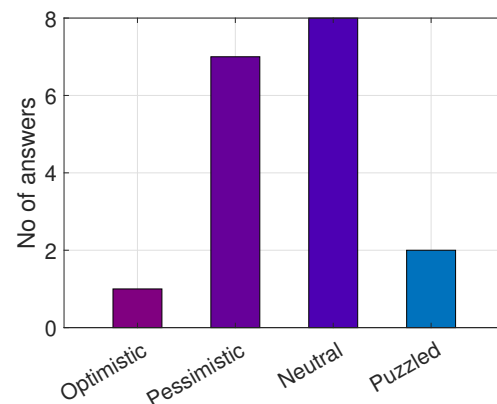

(a) Q2 short answers

(b) Q2 long answers
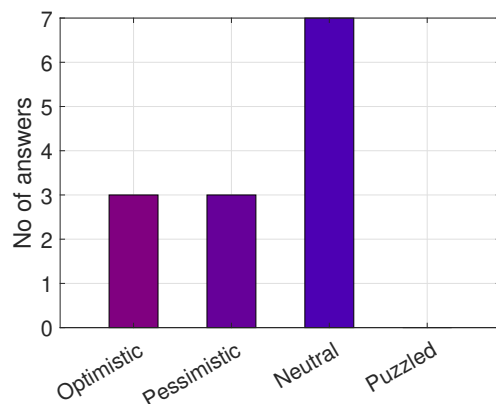
(c) Short answers of q4 in Q2

(d) Long answers of q4 in Q2

Figure 5.4: Q2 qualitative analysis (Q2: Answers will be used in social media).

In addition, we also have analysed the answers to the 4th question of the Q2. These answers are also divided into two long, short answers. First, figure 5.4c represents the analysis of the Short answers. Most of the answers in this section are Neutral. An equal number of answers are Optimistic and Pessimistic. It is a low count than neutral. None of the answers in this part are Puzzled, Active or Aggressive. Secondly, we consider the long answers in free thoughts question of the Q2. The highest number of participant answers are neutral and the pessimistic answers are the second highest number of answers. Puzzled is the third highest while optimistic is the lowest number of answers. Figure 5.4d represent the analysis of the long answers of q4 in Q2.

Finally, we discuss the results of the thematic analysis of the answers to Q3. Figure 5.5a the

(a) Q3 short answers

(b) Q3 long answers

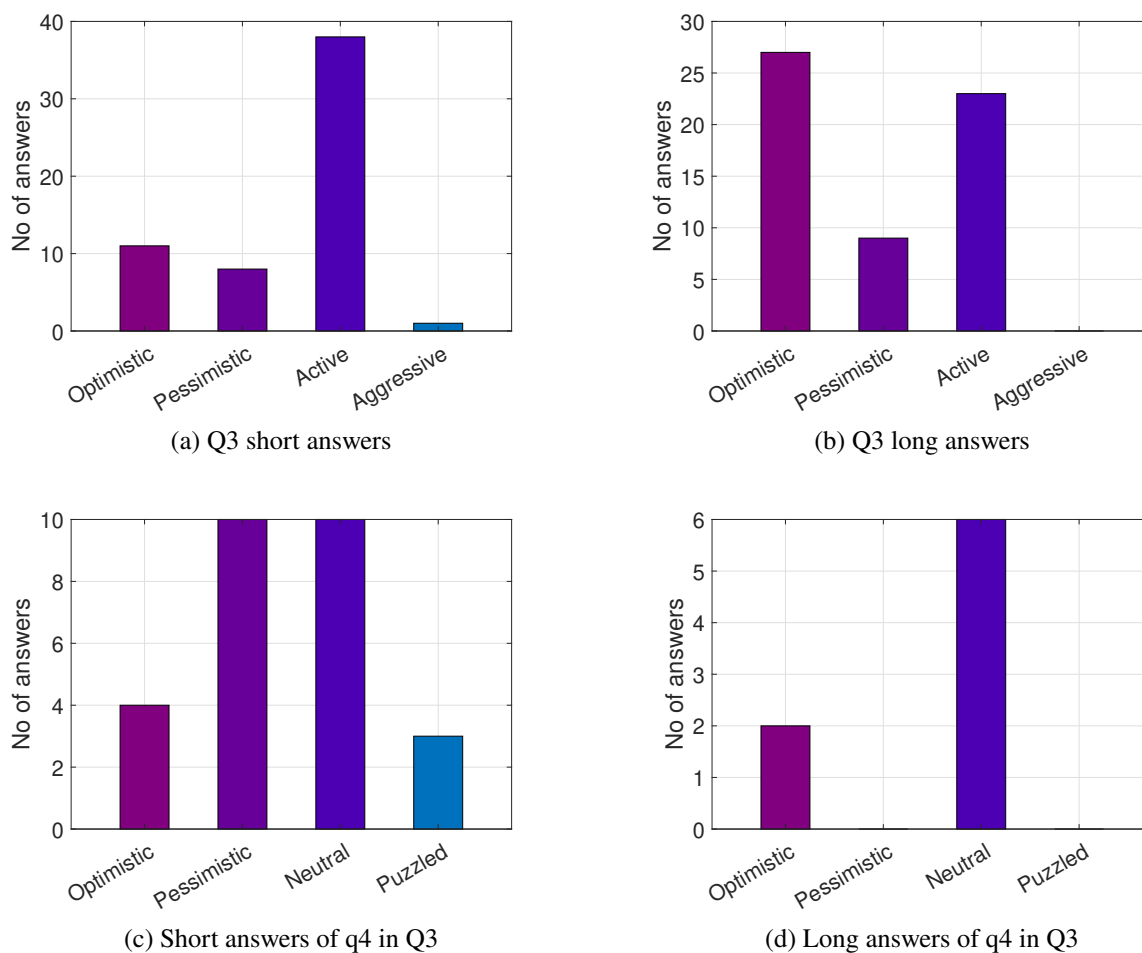(c) Short answers of q4 in Q3

(d) Long answers of q4 in Q3

Figure 5.5: Q3 qualitative analysis (Q3: Answers will be analyzed by crowd workers).

Short answers of q1, q2, q3. The highest number of participant answers are Active whereas the lowest count of participant answers are Aggressive. It is comparatively a very low number. second and the third highest number of participant's answers are Optimistic and Pessimistic respectively. None of the participant's answers belongs to the themes Neutral, Puzzled. Further, we have analysed the Long answers in the same section of Q3. The highest number of participants' answers are Optimistic and the Lowest number of participants' answers are Pessimistic. None of the participant answers in this section of Q3 belongs to the themes Aggressive, Neutral, or Puzzled.

5.5c and 5.5d represent the answers of the analysis of the fourth question q4 of Q3.5.5c depict the short answers of the section whereas 5.5d represents the long answers of the section. In the short answers, the Highest number of answers are neutral and pessimistic. Also, they are equal in the count. The lowest number of short answers is Puzzled. The second highest number of answers is Optimistic. None of the short answers of the participants belongs to the themes Aggressive, and Active. In the long answer section Highest number of answers are Neutral While optimistic is the second highest. None of the long answers of participants are Pessimistic, Puzzled, Active and Aggressive.

Conclusively a common trend seen in the analysis is that in all Q1, Q2, and Q3 of questions q1,q2,q3 many of the participant answers express Neutral or Puzzled answers. On the other hand For all the Q1, Q2, and Q3 for question q4 which is to express free thoughts about the

stories none of the Participant answers are Active and Aggressive.

5.6 IBM Watson Tone Analysis and Pipeline from google forms

In this section, we describe the Tone analysis results of our study using IBM Watson Natural language understanding. Further in subsection 5.6.1 we describe the python agent which is an automated process that begins by extracting Google form answers and finally ends with the tone analysis results of the answers. And in subsection 5.6.2 we present the Tone analysis results of our study with the aid of this automated pipeline mentioned above.

5.6.1 Python Agent

In this section, we describe the implemented automated pipeline from Google Forms to IBM natural language understanding. The overview of the process is depicted in figure 5.6. It presents the process of the automation pipeline from fetching the answers from google forms to outputting the tone analysis results.

As the first step which is denoted by 1, the Python agent needs to access Google from responses. At this point, it creates an OAuth 2.0 access token for authorisation. Then in the next step denoted by 2, It uses the Google form API from the service forms.googleapis.com to retrieve the Google form responses. We use the form Id for this purpose. Google from API is an API which enables reading and writing Google forms and responses. As the 3rd step depicted by 3, the Python agent passes the fetched answers to IBM Natural Language understanding. Here the answers are passed in a form of a dictionary data structure. At the IBM Natural Language Understanding, the tone analysis is done by using a pre-built classification model. We used the emotion request options for our analysis. At this point, the form response's tones are analysed based on five main tones namely, Anger, Fear, Joy, Sadness and Disgust.

These analysed answers are again passed into the python agent at the step denoted as 4, We further analysed the tone values that we received from IBM Natural language understanding and prepare the results in a presentable form at the step denoted as 5.

In the analysis part, we identified the tones as No Tone Detected (NTD), Tone Detected (TD) and Clear Tone detected (CTD) according to the conditions mentioned in the documentation, we considered the tone value > 0.5 as no tone, and tone value between 0.5–0.75 means there is a tone detected and tone value > 0.75 means that a strong tone detected [103]. All the tone values varied between 0 and 1. We used a colour code to differentiate the answers in the finally generated Excel sheet. The answers with tone values belonging to NTD are coloured in green whereas the answers with tone values belonging to TD are coloured in blue and the answers with tone values belonging to CTD are coloured in red. And the tone is identified as, if the answer has values that belong to TD or CTD they become the tone of the participant answer and Answers without such values are categorised as "no emotion". We write the participant answers and tone analysis results to Excel in the step denoted as 5 to present the results. Finally, it is the outcome of the automated pipeline.
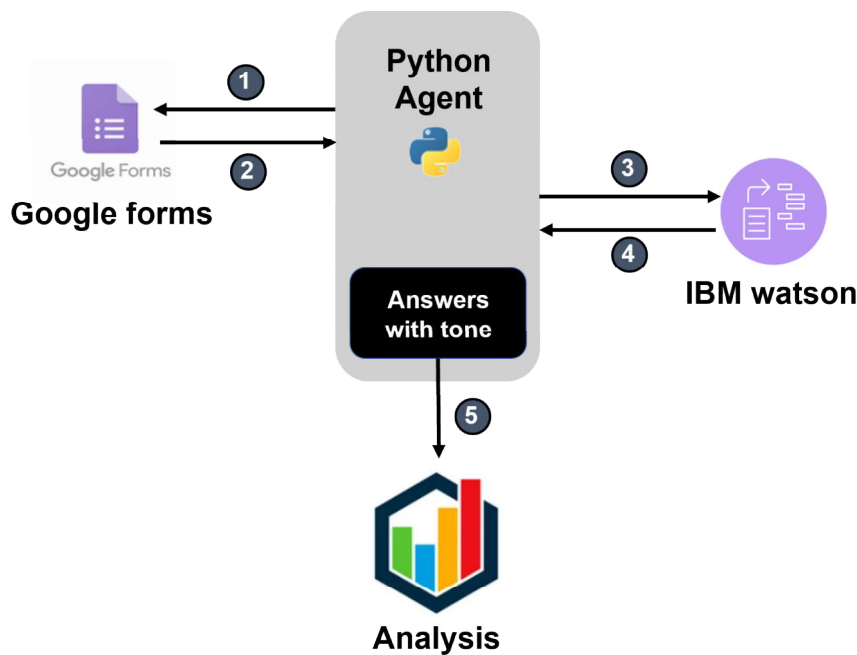
Figure 5.6: Overview of the python agent

5.6.2 Reflection of Tone analysis Results

As mentioned above in this section we depict the tone analysis results and discuss the reflections of the results. We have done the tone analysis of our study with the aid of the automated process that we developed and described in subsection 5.6.1. For the tone analysis part of our study we have used IBM Watson natural language understanding service.

We extracted the Google form answers for the questions q1,q2,q3, and q4 of Q1, Q2, and Q3 and we pass these answers to the IBM Watson natural language understanding service to analyse the tone of the answers of the 40 participants. All the resulting scores varied between 0 and 1 and according to the documentation we considered the tone value > 0.5 as no tone, a tone value between 0.5–0.75 means there is a tone detected and a tone value > 0.75 means that a strong tone detected [103].

Figure 5.7 reflects the tone analysis results for Q1, Q2 and Q3. As the primary analysis, we divided the results into three sections as Participant answers with CTD, TD and NTD based on the above-mentioned conditions. Also, we calculated the participant answers belonging to each category above mentioned as a fraction of the total participant answers for each questionnaire and then converted the value to a percentage. According to the tone analysis of Q1 depicted in figure 5.7a 92.2% of participant answers belong to the category NTD and TD, CTD is 5.8%, 2% of the participant answers respectively.

The tone analysis of Q2 is reflected in 5.7b where the highest no of participant answers are with NTD and it is 93% of the total answers in Q2. 5.5% of answers are TD whereas 1.5% of answers are CTD. Further Figure 5.7c illustrates the results of the tone analysis for Q3. The highest percentage of participant answers are with NTD and the lowest percentage of participant answers are CTD with values of 91.37% and 1.5% respectively. The percentage for TD is 7.13%.

According to the primary tone analysis Conclusively, the Highest percentage of participant answers of all three Q1, Q2 and Q3 are NTD followed by TD as the second highest and CTD being the lowest percentage. There is a drastic difference in values for the Highest and second highest which are the answers with No tone and Tone Detected. Q3 has a slightly high value

(a) Q1 Tone analysis
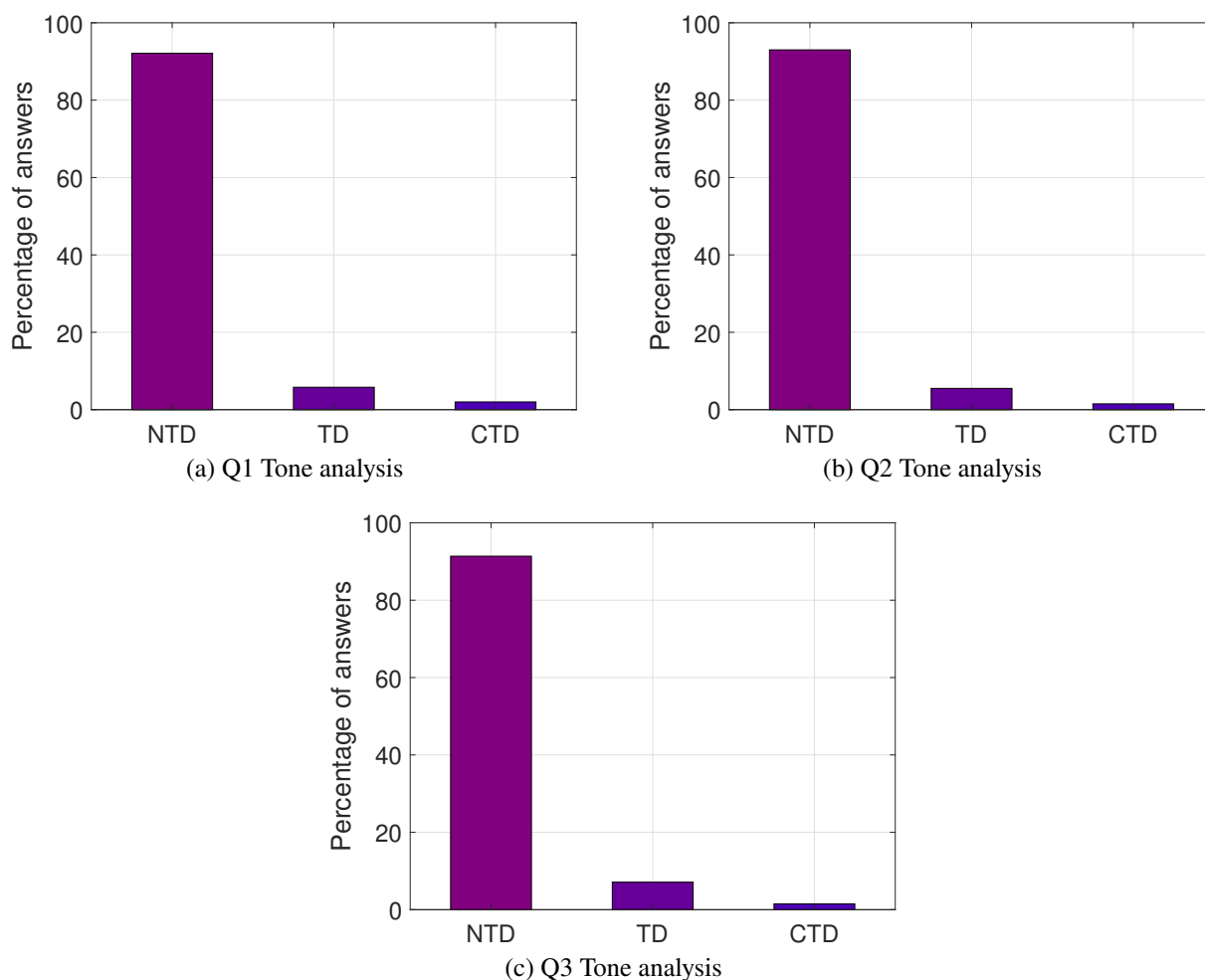
(b) Q2 Tone analysis

(c) Q3 Tone analysis

Figure 5.7: Primary Tone analysis.
(NTD=No Tone detected, TD= Tone Detected, CTD= Clear Tone Detected)

of TD answers which is 7.13% Compared to Q1, Q2. Commonly a value of 90% and above of participant answers of all three Q1, Q2, and Q3 are NTD and the values for TD and CTD are very low compared to NTD.

In the second part of the analysis, we analysed the tones of the answers with a tone. We considered the Participant answers of categories TD and CTD for this analysis. Also, we calculated the answer percentage for each as a fraction of the total answers with the tone, where total answers with tone are a summation of CTD and TD. As mentioned in section 2.3.1, IBM natural language understanding detects anger, disgust, fear, joy or sadness in participant's answers to the questions.

Figure 5.8a depicts the analysis of Q1, A highest percentage of answers has joy as their tone. It is a value of 47.61%. sadness conquers the second highest with a value of 41.26% and the percentage of answers with the tone anger is 6.34%. None of the answers with tone in Q1 expressed Fear or Disgust tones. Further Figure 5.8b reflects the analysis of Q2. A percentage of 53.57% of answers expressed joy, being the highest. Sadness obtained the second highest with a percentage of 42.85%. The percentage of answers with a tone of anger is 5.35%. Same as the Q1 none of the answers in Q2 too didn't express fear or disgust.

Moreover, Figure 5.8c illustrates the analysis of Q3. The percentage of answers that express joy is 69.56%. 50.72% of participants answers with tone expressed sadness. The same per-
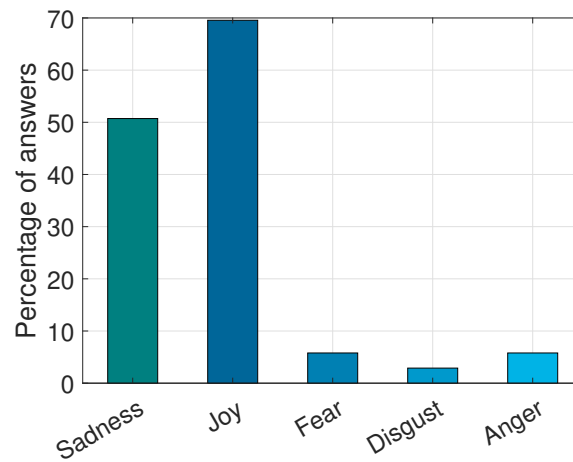
centage of answers expressed anger and fear which is 5.79%. The lowest count of participant answers expressed disgust and it is 2.89%.
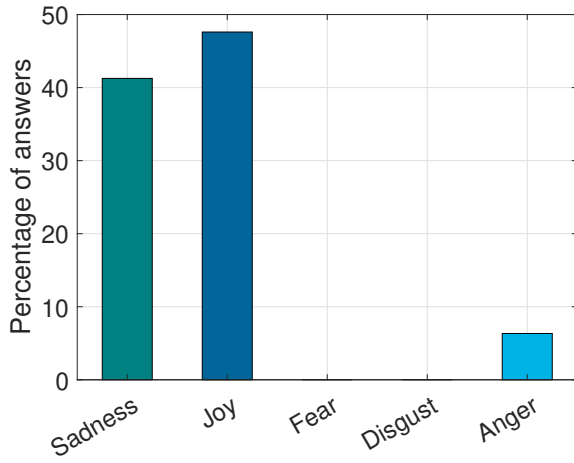
(a) Analysis of Q1
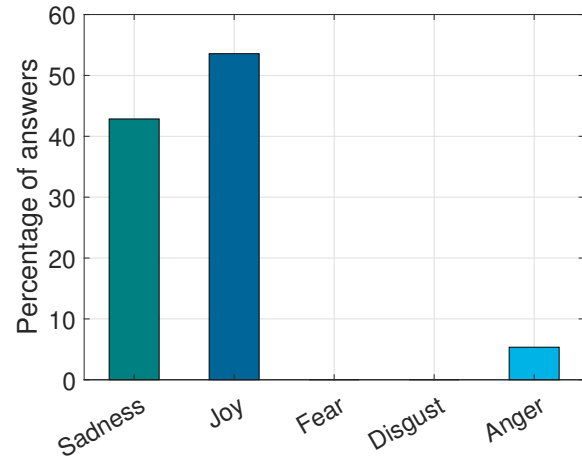
(b) Analysis of Q2

(c) Analysis of Q3

Figure 5.8: Further analysis of tones.

6 DISCUSSION

In this study, we utilise three authentic stories of hardships experienced by non-native community in a Finnish University and Collected thoughts on what could be done to mitigate such situations. These ideas are collected through three identical questionnaires based on three different conditions. Namely, base questionnaire, As the second condition is that ideas will be used in social media and the third condition is that ideas will be subjected to quality analysis by crowd workers. QCAE being described as a valid tool for accessing Cognitive and Affective Empathy [97] we use the QCAE questionnaire as the last section of our questionnaire to measure the empathy of the participants. we then do a qualitative analysis, word count analysis and tone analysis for the above-mentioned study design answers. Further, we also discuss solving civic problems with the aid of prevailing frameworks for crowdsourcing, public participation and design thinking. We also implemented an automated pipeline from fetching answers from google forms to the outcome of the tone analysis of the answers.

In this chapter, we revisit our objectives of thesis and research questions as the first subsections and secondly, we discuss the stakeholders of the thesis and it's importance to society. As the third subsection of this chapter, we present discussion design and implementation issues. Then we discuss the limitations of the thesis and Conclude the chapter by giving a briefing the future work.

6.1 Revisiting Thesis Objectives and Research Questions

Objective I: Collect thoughts on how to mitigate the hardships that the non-native community in the Finnish university face

A common problem identified in surveys is the problem of, whether the participants will answer in a trustworthy, truthful manner [118]. Especially when the questions included in the surveys are socially considerable in their own aspect and this becomes more serious when these questions become socially loaded in individual aspects [118]. Hardships faced by the non-native community are such a socially loaded matter that affects many individuals in their own ways and means. As a solution for this, we presented some authentic problems that the non-native community in Finnish university face in the form of a story and tried to view the problem by putting their shoes on. And also tried to imply the importance of honest opinions for these problems as a human beings.

Also, another problem is the conditions that we used in the Q2 and Q3 questionnaires. We used the condition that "we will use your ideas in social media" in Questionnaire Q2. Since we thought that this could build some kind of hesitation to provide truthful thoughts, As a precaution we mentioned that "Feel free to express any ideas freely and as in-depth as you wish: The content of your responses will not affect the acceptance of the task itself on Prolific." and also to protect the privacy of the participants we didn't collect any demographic facts about them and only collected the Prolific ID. In questionnaire Q3 we used the condition that "your answers will be quality analysed by crowd workers". In this aspect, we hope that the participants will provide more meaningful and effective answers. And to decrease any hesitation that the participant may face we described that the provision of answers to the questionnaire will not affect any other acceptance of work in a prolific platform. In all three questionnaires, we only collected the prolific Id of the participant and not any other demographic information.

However, we collected ideas from 40 participants for each of the Questionnaires on how to mitigate such hardships faced by the non-native community in a Finnish university face. Altogether 120 participants participated in our Questionnaires.

Objective II: Analysis of the results which indulges a QCAE analysis, Word length analysis, Tone analysis

In analysing results we mainly did it under three criteria namely, QCAE analysis, Word count or answer length analysis and Tone analysis. According to research empathy encompasses both the feeling of how other person feels in the situation and the ability to eventually experience the emotional experience of others [97]. QCAE is a 31-item questionnaire which is used to assess the Cognitive and affective Empathy of people [97]. Researchers have identified QCAE as a valid tool to measure empathy. We have used this questionnaire as the second section of our Questionnaires Q1, Q2 and Q3 with the purpose of measuring the empathy of the participants compared to the different conditions that we used in three of the questionnaires.

Secondly, we did a word count or an answer length analysis. When considering responses, some of the findings in past work suggest that it may affect the question type, the question of whether the data is quantitative or qualitative [119]. Also the suggested answer format may have a clear effect on the quantity and the quality of the answer. Also, several pieces of evidence suggest open-ended questions in online surveys carry answers that are longer, more detailed and more revealing [119]. In this scenario, we have presented our questions in the form of stories and we have instructed the participants to provide thought in a way that is meaningful and descriptive. We have got the word count analysis of participant answers compared to each of the questionnaires Q1, Q2 and Q3.

In the tone analysis, we aimed to find any emotional tone associated with the participant's answers. Some work suggests that IBM watson tone analyser can be used to analyse the emotional, writing and personality tone of the texts [120]. we used IBM Watson natural language understanding to analyse the tones of participant's answers to three questionnaires with the assistance of the automated pipeline that we developed. To this end we have done the QCAE analysis, Word count analysis and tone analysis of the participant answers to the Questionnaires Q1, Q2 and Q3.

Objective III: Automating a pipeline from Fetching answers from google forms to produce tone analysis results of the answers

It is said that Automation projects release humans from tedious tasks while making time for more interesting things. The tone of a text can be analysed using IBM Watson tone analyser. The usual process of tone analysis includes passing a text to the IBM Watson tone analyser and getting the tone of each text one by one manually. However, our objective was to automate this process and built a pipeline that fetches answers from google forms and then passes the answers one by one to IBM Watson Natural language understanding API and outputs the tone of each answer in the form of a table. It is a machine learning model that has trained to analyse the tone of the texts. As discussed earlier this process identifies 5 main tones as Anger, disgust, joy, sadness and Fear. It gives tone scores vary from 0 and 1, where tone values tone value > 0.5 as no tone, a tone value between 0.5–0.75 means there is a tone detected and tone value > 0.75 means that a strong tone detected [103]. This automated process outputs the tones of the answers separated as no tone, tone detected, and strong tone and moreover for tone detected and strong tone the tone is output as if it is Anger, Fear, joy, sadness or disgust. To this end, we have implemented this automated pipeline and we utilised it for the tone analysis of the participant answers.

RQ I: What kind of actions can be taken to mitigate the hardships or situations face by non-native community in Finnish university face

we presented three stories with the aim of covering all kinds of aspects of hardships faced by non-native communities in Finnish university faces such as Interpersonal relationships, daily interactions, language barriers, cultural barriers, racism, Immigration issues, Job searching and Financial hardships. After the collecting phase, we carried out a qualitative analysis of participant answers with a thematic coding method to find out what kind of thought the participants had to mitigate the situation. Some of the answers are Optimistic and they however hope that something positive may happen and some of the answers are Pessimistic that they have a negative viewpoint and most of the answers mentioned some kind of action that can be done to mitigate the hardships. while some participants answers didn't imply any strong feeling of positiveness or negativeness. Some participants are puzzled that they are unsure what actions to take and how to answer the question while some of the participant answers are aggressive and implies a hateful situation. It also revealed that the person itself has faced the situations and some have put their selves in other's shoes and described their viewpoint and the solution.

As mentioned above most of the participant answers suggest activities or actions to do to mitigate the situation. As an example, For building good relationships participants suggest connecting to them through sports, hobbies other leisure activities and suggest that working with a good knowledge of language and culture may reduce their barriers. For surfacing any kind of financial barrier participants suggest doing paid internships and handling the good mental health on par with it. Overall participants suggest doing some kind of activity to mitigate the situation and also participants imply that most of the hardship situations occur due to uncontrollable factors such as cultural barriers. Finally, we have Collected different ideas from 40 participants for each of the Questionnaires on how to mitigate the hardships non-native communities in Finnish university face.

RQ II: How public participation, crowd sourcing and design thinking can be used to solve civic problems

Social issues that are associated with civic problems are usually identified as complex problems to solve through traditional methodologies. With time many government bodies associated with different civic initiatives practised more community-centred methodologies where citizens were involved in identifying the problems and then proposing solutions for those[5]. Though this method was a successive way, some groups of people were fully empowered with engaging in these tasks while others may not that empowered in engaging these tasks. Most of the public participation frameworks suggest face-to-face participation and it is shown that this method has even failed to identify the barriers faced by most engaged citizens[5]. Further, some work discusses integrating frameworks from public participation, crowd-sourcing and design thinking and sees the role that technology can play in decreasing the barriers in mass participation, initiating flexible options to fulfil skills, interests and accessibility[5]. To this end, we have discussed how public participation, crowd-sourcing and design thinking can be used to solve civic issues by integrating new technology in relation to some similar studies.

6.2 Investigating the Stakeholders and the importance of the Thesis

Generally, this thesis improved the awareness of the local participants on what steps should be taken to mitigate the hardships faced by non-native communities in Finnish universities. Also, this work paved the way to think more and increases the inclination to be open and talk

about the hardships faced by the non-native community. Also, we suggest that international participants may understand the barriers that non-native community face and will act in a more understandable way in the process of integrating the non-native community into their own society and both sides will be able to see their sides in a more transparent manner. Moreover, some points and actions suggested by the participants will be much effective in overcoming this barrier to non-native communities and this may assist both the native and non-native communities to view this issue in a different view point.

Moreover, we have done Qualitative analysis, QCAE analysis, tone analysis and word count analysis for the answers, though we emphasise the attitude, empathetic feelings, and tones that the participants process when discussing such civic issues. Also, through word count analysis we try to imply the eagerness to participate in discussion of such social issues. Also according to the thought that we collected from participants for the issues related to immigration, they suggest that this could have been solved easily, with immigration authorities increasing their speed of issuing residence permits and also participants suggest that the university can assist in this matter more easily. Also, participants suggest that respective bodies can hold more programs to integrate the non-native community with the native community.

Overall, if we consider this matter in the bigger picture these kinds of proposed approaches and enhancements will lead to attract more and more workers, students, and experts to the economy, public services, industry etc of Finland. And also on the other hand this will lead to the advancement of the quality of life of native people.

6.3 Discussion on Design and Implementation Issues

In this section, we discuss the design and issues of implementation that we had to face in this study. One of the issues that we had to face in the implementation of the automated pipeline is that, in order to fetch answers form google forms we had to enter each question number manually and we obtained the question numbers by going through the dictionary data structure so it is an implementation issue in our automated pipeline.

Another main issue that we had to face is the limitations we faced with Watson tone analyser. Initially, our plan was to do the tone analysis using Watson tone analyser and since the IBM company has decided to discontinue the service and move the service to the same tile with IBM natural language understanding for the usage of their long-term clients. So instead of IBM Watson tone analyser we user IBM Watson natural language understanding's categories of emotions for our tone analysis process in the automation pipeline.

6.4 Limitations of the Thesis

In this section, we discuss the limitations we face in the study. Firstly the no of participants are limited we Only could collect answers from 40 participants per each of the questionnaire and if we could have able to increase the sample the results accuracy and validity of the result go high. Further considering the participants we couldn't identify the participants separately as native or non-native since we only collected the prolific id of the participants. So if we could have been able to collect any other demographic details about the participants we could have gained a knowledge on details about the participants.

6.5 Future Work

As future development, we have some ideas on improvements mainly in two aspects namely, technical and non-technical sides of our study. First, in the data collection phase, we used a Questionnaire to collect data. instead of that, we would like to develop some kind of an online portal or website which describes the purpose of our work to collect the data and we would also employ a crowdsourcing platform joined to the proposed website or online portal to gather participants for our study. Also, we would like to implement some participation modes for this platform to ensure inclusive and sustained participation, to effectively manage large-scale participation and to provide options that compromise to individuals' availability, interests and skills. This would have helped us to find a more effective solution for our research question 2.

We would also like to try to collect demographic information of the participants to get clear knowledge about participants. Also to present the conditions that we used to collect participant ideas in a more trustful manner, So that the participants may encourage to give their true idea about the remedies for the hardships faced by the non-native community.

Also since in this study we have done a deep background study on how we can use crowdsourcing, design thinking and public participation with the assistance of technology to solve a social, civic matter. We would like to implement some such solutions for the hardships faced by the non-native community in the Finnish university taking it as a Social matter. Further, we also like to do the same study taking with another set of participants by broadening the content as How to minimise the hardships face by the non-native community in a certain area without bounding to a certain institute like a university.

Finally, we would also like to suggest some more functionality for the automated pipeline that we implemented. It would have been better to implement a thing to get the word count of the participant answers in the same pipeline and compare the relations between the word count and the tone analysis of the answers which we have done as two separate steps manually in this study.

7 CONCLUSION

In this thesis, we explore the thoughts on how to mitigate the hardships faced by the non-native community in a Finnish University and we did a full analysis of the results that we collected such as word count or answer length analysis, quantitative analysis with thematic coding, tone analysis, QCAE analysis and we explore the correlation between each of the analysis such as the correlation between the answer length and the empathy of the participant answers. Further, we implement an automated pipeline from google forms to tone analysis for the tone analysis process. Moreover, we also do a study on the back groundwork on how we can solve civic matters by assisting public participation frameworks, crowdsourcing frameworks and design thinking frameworks.

First, we created three questionnaires based on three Conditions and conditions are First one is the baseline where the answers to the questionnaires will not be analysed anywhere, the second questionnaire condition is that the ideas will be used in social media and the third is that the ideas will be subjected to a quality analysis by crowd workers. This study phase involved collecting ideas on how to mitigate the hardships faced by the non-native community. 40 participants were involved in each of the questionnaires. Here we presented the hardships faced by the non-native community of a Finnish university faced in the form of stories. This phase reveals different ideas, and thoughts on mitigating the hardships which include actions to be taken, remedies and many other solutions from the participant's opinion.

Then as the next step, we analysed the participant answers we collected in the first phase. At this phase first, we analysed the result's QCAE analysis. As mentioned previously the Questionnaires had a QCAE section to measure the empathy of the participants. Through this, we explored the empathy of the participant's answers. Then we did the answer length analysis and this reveals the differences between the participant answer length concerning the questionnaire conditions. As the next step we analyse the co-relations between Empathy and word count of participant answers and the results we got are presented in section 5.4. Qualitative analysis of participant answers is carried out as the next step. It gives a reflection of participant answers as Optimistic, Pessimistic, Active, Neutral and Aggressive.

As the next main step, we implemented an automated pipeline for tone analysis with IBM natural language understanding. Further, the results of the background study we did on how we can solve civic matters by assisting public participation frameworks, crowdsourcing frameworks and design thinking frameworks reveal that Combining public participation frameworks, crowdsourcing frameworks and design thinking assisting with novel technology can provide effective solutions to Social, civic matters such as Hardships faced by the non-native Community.

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