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De Götzen, Amalia; Kun, Peter; Simeone, Luca; Morelli, Nicola

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Tensions, paradoxes, and opportunities

Amalia De Götzen, Peter Kun, Luca Simeone, and Nicola Morelli

Abstract: Emerging digital technology could enable communities to benefit from the diversity of their members mutually. This chapter explores the process of designing a chatbot application aiming to mediate people interaction through diversity-aware algorithms. In particular, we focus on designing a specific chatbot application that builds on the diversity of university students—the envisioned end-users—to accommodate their diverse needs and preferences while leveraging the diversity represented in their community.

Keywords: AI, diversity, service design, chatbot, communities

Introduction

The case discussed in this chapter is part of the EU-funded WeNet project (www.internetofus.eu), which aims to develop the culture, science, engineering methodologies, algorithms, and the social interaction protocols that will support the design of a new generation of applications, in which diversity is learned by algorithms and leveraged to benefit a given community. Diversity can be interpreted in many ways: from the superficial meaning referring to apparent physical characteristics or demographic categories to a deep-level meaning referring to different routine behaviours or worldviews. For example, someone who approaches cooking as an art differs from someone who looks at cooking as a chore and a meal as sustenance. Within our specific case study, we refer to this latter, deep understanding of diversity, which is articulated in terms of social practices, that is, the activities that shape people's everyday lives.

Despite such an approach's promises, engaging with diversity requires addressing important ethical aspects and continuous reflection. In this chapter, we discuss how to ethically operationalise this definition of diversity in the design of a very simple chatbot application that connects students to reinforce their sense of community. In the following parts of the chapter, we first define diversity based on social practices, together with the rationale for its adoption in a chatbot application. Then we present the experimental setting and discuss the preliminary analysis of the qualitative data collected from the different pilot sites.

Characterisation of diversity in the WeNet project

Diversity exists only between individuals and emerges through their interaction: we can recognise and qualify diversity when we compare ourselves to others. We actively use

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our diversity-awareness in our social interactions (Harrison et al., 1998). Our awareness evolves in time as we acquire more information, and our perceptions are based more on observed behaviour than superficial classifications, that is, stereotypes (Jackson et al., 1995). What if the observations were instead made by a machine that mediates human interactions? The WeNet platform (Miorandi et al., 2021) has been designed to develop this kind of application, like the chatbot, under discussion in this chapter.

The diversity-aware algorithms and applications running on the WeNet platform, like our chatbot, form a socio-technical system aiming to connect people who could benefit from each other's competencies and skills to address their everyday challenges. The platform must understand people's needs and identify the right individuals who could handle them and possess the set of characteristics—a shared practice—that are recognisable on a social level and respond to the expressed need to address these challenges. Another challenge for the system is identifying the diverse elements of users' social practices. Alongside the demographic characteristics (here understood as superficial diversity), we suggest conceptualising the diversity of users based on their "social practices". The theory of social practices (Shove et al., 2012) is proposed to consider both surface-level and deep-level characteristics of a person, that is, to respect both the individual characteristics (e.g., gender, age, and other characteristics) and that of the individual as part of a collectivity (their skills, abilities, and competencies). Social practice can be further specified through three fundamental elements (Shove & Pantzar, 2005): (i) competence, (ii) meaning, and (iii) material.

- *Competence* incorporates skills, know-how, (background) knowledge, and social and relational skills required to perform the practice.
- *Meaning* incorporates the issues relevant to that material, that is, understandings, beliefs, values, norms, lifestyle, and emotions.
- *Material* covers all physical aspects of the performance of the practices, encompassing objects, infrastructures, tools, and hardware, including the human body.

These three elements exist on a social level (i.e., separated from the individual). In different combinations, they form various practices. However, material, competence, and meaning can be traced back to the individual. The way an individual combines the elements of a specific practice reveals their belonging to that practice. In this sense, individuals are not merely described with skewed attributes, but they are seen as members of a collectivity, also called a community of practice (Wenger, 1999). They develop a shared practice, which becomes a repertoire of resources: experiences, stories, tools, and ways of addressing recurring problems. The platform can then help the collectivity of practitioners to improve their performance and explore their community by leveraging and connecting their different competencies, meanings, and material aspects of their practices.

The data collection

Multiple qualitative and quantitative data collection activities were conducted before and after the pilot to explore the different contexts and communities of practice represented in the different universities involved in the pilot. The four main activities were

- field research, through interviews and focus groups conducted in fall 2019 (D'Ettole et al., 2020) to better understand the ecosystem of the different pilots' locations;
- data collection performed through an online survey to explore the represented social practices (Bison et al., 2020);
- sensors data collection achieved through an online application (Zeni et al., 2014) aimed at understanding students' habits; and
- an exit survey and focus groups designed as instruments to evaluate specifically the chatbot experience (Bidoglia & Gaskell, 2021).

In this chapter, we focus on the chatbot experience and the post-pilot qualitative and quantitative evaluation. The pilot described in this chapter is the first of three such pilots. In this first pilot, we used the chatbot as a probe (Hutchinson et al., 2003) to investigate user perceptions of diversity and validate the chatbot itself as a meaningful instrument in students' communities.

The pilot study

Months of lockdown worldwide forced people to rely on online services as it had never happened before. University students have been particularly affected by this situation: students who relocated to a new city needed to start their education remotely in a new place and faced challenges collaborating with peers without many possibilities to meet them in person. In this context, we conducted a two-week pilot study in March 2021, with the AskForHelp chatbot, built on the WeNet platform by the WeNet consortium, to assess its utility to re-connect students otherwise isolated because of the pandemic and to observe how a group of participants reacted to a diversity-driven chatbot.

The designed user-user interaction model is shown in Figure 21.1. User A wants to ask a question triggered with the/question command in the first step. The chatbot invites other community members (Users B, C, and D) to answer the question in the second step. Any and multiple of these users can answer. In the third step, User D answers. In the fourth step, the chatbot forwards User D's answer to

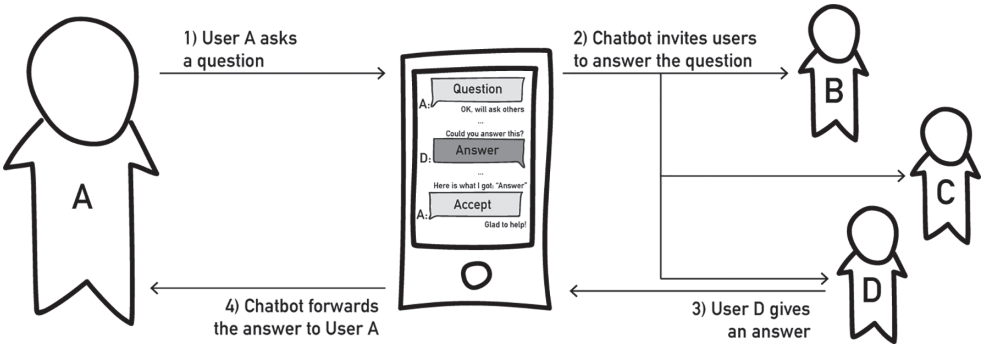

Figure 21.1 The user-user interaction is entirely mediated through the chatbot.

User A, who can then accept the answer or ask the chatbot to invite more users to answer. It must be noticed that the AskForHelp chatbot is not following the concept of interacting with a conversational agent in natural language, like early research on chatbots such as ELIZA (Weizenbaum, 1966) or Alice (Wallace, 2009). The AskForHelp chatbot is a "botplication" (Klopfenstein et al., 2017); a lightweight interface accessed through an instant messaging platform (i.e., Telegram), solving a problem that should not warrant yet another app on the user's mobile device. This design space is emerging since chatbots' social roles, and conversational capabilities are still underexplored but could support richer social interactions in online communities (Seering et al., 2019).

Participants

In total, 195 students participated in the current study: 34 in Denmark, 47 at the London School of Economics in the United Kingdom, 53 at the University of Trento in Italy, 39 at The National University of Mongolia in Mongolia and 22 at the Universidad Catolica Nuestra Senora de la Asunción in Paraguay. All the students were volunteers and were granted monetary compensation for their participation in the study. The participants needed to install the Telegram app on their phones and install

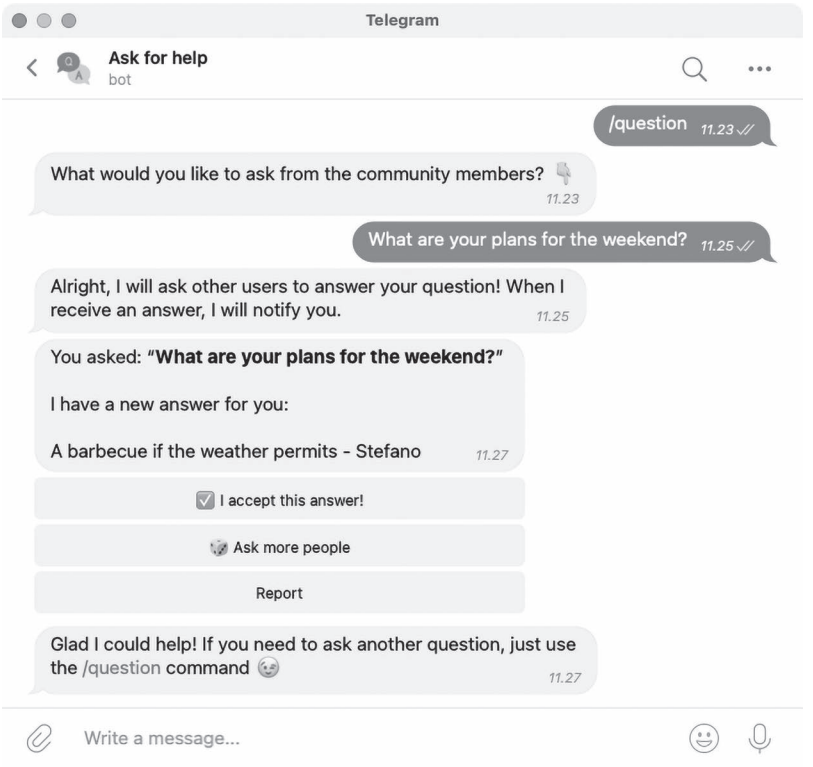

Figure 21.2 The chatbot mediated the interaction between users.

the AskForHelp chatbot. In the following section, we present the testing results with the 195 users over two weeks in the different pilot locations.

Data collection and analysis

We approached the data collection with mixed methods. Besides the log file available from the question-and-answer interactions within the chatbot, we also surveyed users at the end of the study. The survey contained a tailored questionnaire, following the Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2012) to assess the participants' views on the chatbot design and its integration into their everyday life (Bidoglia & Gaskell, 2021). In each pilot's location, two focus groups were conducted and analysed with a total of ten participants.

Results and discussion

Over the two weeks, the questions asked varied over topics related to the university, the city in which the university is located, COVID-19 lockdown, hobbies, recommendations of music and TV shows, and so forth. Without going into the details of the UTAUT2 exit survey, the data across pilot locations showed:

1) The chatbot was easy to use, which indicates that a chatbot approach is suitable for such communities. In general, the participants found that the chatbot enabled a novel interaction with fellow students, which was especially appreciated by first-year students that started education in remote classrooms due to COVID-19 lockdowns.
2) The chatbot was considered useful to know more or feel part of the community and very useful to provide and reach out for help. However, participants found the interaction model limiting when they wanted to follow up with someone who answered them or engage with the same user with many questions and wished to exchange contacts for taking their conversation out of the chatbot.
3) The students felt at ease and enjoyed asking and replying to questions while finding the chatbot experience interesting. The participants unanimously mentioned the limited interaction model they found uncommon and the usability issue of simply receiving too many notifications from the chatbot that they often needed to mute for parts of the day. However, other perspectives emerged as well from the focus group discussions. One focus group participant praised the limited interaction model, steering her to more likely answer questions without the need to engage in a larger conversation, which she found "refreshing", not common on other social platforms. Another user highlighted how she had difficulty giving private answers to sensitive questions. While talking indirectly to a person through the chatbot is intriguing, she caught herself stopping a reply realising that she usually would not share such personal thoughts with a stranger.

In relation to the chatbot intervention, we observed that the chatbot managed to create a real feeling of community in some pilots, addressing the need to connect otherwise distant students. In Mongolia, for instance, the students made a habit of using the chatbot to cheer each other in the morning: the students started to refer to specific users in their questions (even if the chatbot itself does not allow asking questions to a

specific user) and in the last Q&As registered in the application, they wished for the experiment to continue to keep in touch with each other. In other student communities, like in Italy and Paraguay, where the students were mostly from engineering educations, they acted as a community that started to reverse engineer the chatbot itself: they collaborated through the chatbot in ways we did not imagine, leveraging each other's skills and knowledge to understand the inner mechanism of the application they were using. In Denmark, the students explicitly valued the possibility of connecting students with different educations, backgrounds, habits, and ultimately, lives. The chatbot was perceived in all pilots' locations as a safe space, provided by their trusted University, and as a place in which they could freely ask for help or offer it. Nevertheless, specific privacy concerns emerged, the paradoxical need of protecting their own privacy while simultaneously being willing to expose themselves to significant others in meaningful conversations.

Conclusion

In this preliminary study, we proposed to work with their diversity as a resource to a community of students challenged by the COVID-19 lockdown. We asked them to explore it through a diversity-aware chatbot application. We aimed to provide a new communication channel to explore the diversity represented in their communities and benefit from it while building empathy. In the current version of the chatbot, because of the limited data collection and the early design stage of the application, the different social practices had to be fully represented and made visible in the application and to the students themselves. Nevertheless, some reflection should be mentioned about the challenges, opportunities, and tensions of designing to leverage such a multifaceted concept, primarily through a technology-mediated intervention.

To enable algorithms to learn diversity means collecting many data points about the users and quantifying diversity to become measurable and often reduced to a series of numbers. In the WeNet approach, we claim to identify and quantify social practices transversal to people: the task remains quite demanding but possibly not a discriminatory one once the right level of granularity is found. In this first pilot, the users were not profiled yet, but the data collected through the survey and the chatbot experiment will inform the model of diversity that will be used in the next iteration. The coding of the Q&A allowed us to understand better the students' topics of interest and the relevant social practices associated. The next step is to design an algorithm that computes the distances between students' skills and knowledge to provide the right responder to a given question. Agency will be left to the users that will decide how and what type of "diverse" the responder should be with their own profile and the question asked. Considering the feedback, we got in this first pilot iteration. A data minimisation principle will be adopted.

We should be aware that the risk is always to introduce categories and labels that might not fully represent the community we are designing for or that might discriminate against the ones that deviate from the norm (Holtz, 2013). Machines are, in fact, not particularly good to capture nuances (Matzner, 2019), exposing the users of applications like the one we presented in this chapter to possible risks ("threat of invisibility" [Bucher, 2012], "statistical stereotyping" [Cheney-Lippold, 2011], cf. [Schelenz et al., 2019]).

Future research should consider mitigating pre-existing biases through machine learning fairness (Oneto & Chiappa, 2020) and a more participatory process. The users themselves can, in fact, help define their diversity through participatory data analysis and suggest how to use it in diversity-aware services. The final goal is to empower the online community to manage their own data as a commons (Morelli et al., 2017; Ostrom, 1990).

Furthermore, in the current settings of the pilot, the very same application is used in different pilot sites, and we are still in the process of fully understanding local habits and cultural aspects that might have influenced not only the overall experience through the chatbot application but also the machine learning algorithms. Just to mention the more obvious aspect of this point, youth in different countries use smartphones differently (Mathur et al., 2017; Meegahapola et al., 2021), and the data collection needs to take place these differences across cultures and countries into account.

To conclude, our preliminary results indicate that a Q&A chatbot may positively support community members to benefit mutually from the diversity of the community, but the reported study has limitations. First, our intervention was a paid research experiment, which tells limited information whether a chatbot would be persistently integrated into the participants everyday as part of a student community. Second, the envisioned user interactions stretched what is feasible with a chatbot, which resulted in additional user effort. Third, while the chatbot was promoted and communicated as a diversity-aware chatbot, the respective algorithms to connect two users based on diversity dimensions were missing in the current study. In this respect, our diversity-related findings can only consider how the users found the concept in general, but not its effect. This goal will be part of the next iterations of the chatbot pilots.

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