

Bots Mind the Social-technical Gap

Minha Lee, Lily Frank, Femke Beute, Yvonne de Kort, Wijnand IJsselsteijn

Eindhoven University of Technology, the Netherlands

m.lee@tue.nl, l.e.frank@tue.nl, f.beute@tue.nl, y.a.w.d.kort@tue.nl, w.a.ijsselsteijn@tue.nl

Abstract. Mobile workers experience the social-technical gap when moral¹ dilemmas occur on communication platforms, and technology cannot adapt to social contexts on ethical matters. On messaging applications, bots are non-human team members and/or assistants that can aid mobile workers manage ethical challenges. We present excerpts from qualitative interviews with mobile workers that illuminate examples of moral challenges across communication channels. We then discuss how bots may be helpful intermediaries on these channels. Bots bridge the gap between mobile workers' need for moral support and the communication medium's incapability of having an intentionally moral stance².

1. Introduction

Many technological systems, when examined for context and overall design, are basically anti-people. People are seen as sources of problems while technology is seen as a source of solutions. – Ursula Franklin, 1989 CBC Massey Lectures (Franklin, 1999).

¹ The two terms, “moral” and “ethical”, are used interchangeably.

² The authors thank the anonymous reviewers for their useful comments and suggestions.

Computer-Supported Cooperative Work (CSCW) and more generally, Human-Computer Interaction (HCI), grapple with the same problem that Franklin identified in the quote above, articulated in different ways. Notably, Ackerman (2000) shared that it is beyond our capabilities to build systems that account for nuances of our ever-changing social contexts, summing up this challenge as the *social-technical gap*. This gap is especially pronounced for entrepreneurial mobile workers since they experience dynamically changing work locations, roles, and schedules. They manage multiple organizational infrastructures as they build their own business(es) and/or work for other ventures, often simultaneously. Mobile workers, specifically entrepreneurs and freelancers experience ever-changing contexts, which may be demanding due to heightened uncertainty. The technological systems that support mobile workers cannot account for all contextual nuances of their social realities. For example, systems mobile workers are highly dependent on are messaging platforms to communicate with their team members and/or their co-working communities³.

A social-technical gap occurs when a communication platform that is assumed to facilitate cooperation hinders it instead. For instance, the most common form of workplace cyberbullying was found to be “not receiving responses to emails or text messages sent to supervisors/colleagues, followed by being withheld necessary work-related information” according to a Swedish study with 3,371 survey respondents (Forsell, 2016, p. 457). The ease of passively ignoring each other through a communication medium may have adverse effects on workplace morale. Technology mediates morally pertinent interactions at work, like cyberbullying. How these interactions occur and how they impact individual well-being deserve a thorough investigation via qualitative research (Forsell, 2016). Thus, we attempt to discern technology’s impact on ethical norms of cooperative work based on interviews with mobile workers.

We discuss preliminary findings from interview results to show that communication platforms, specifically Slack⁴ and WhatsApp⁵, are used to create and negotiate moral boundaries for mobile workers’ co-working communities. We supplement examples from interviews with explorations on how chatbots⁶ on communication platforms could help mobile workers manage moral issues. While chatbots may not close the social-technical gap, they may be *mindful* of the gap between mobile workers’ moral challenges and how those challenges are expressed on communication channels. Bots are useful, albeit imperfect. They are less “anti-people” intermediaries that take part in digital messaging.

³ We recognize the limitations of relying on only two interview excerpts. But as this is an exploratory paper, we take these excerpts to be sufficiently suggestive of the relevant phenomenon.

⁴ <https://slack.com>

⁵ <https://www.whatsapp.com/>

⁶ “Bots” and “chatbots” are used interchangeably.

This article proceeds as follows. First we introduce the population of mobile workers and present illustrative examples from interviews on moral issues at work, which is a part of an in-progress interview analysis. Specific instances show how mobile workers draw moral boundaries digitally to shape their work communities. Then we introduce the social-technical gap, as a framework to help understand the challenges mobile workers are facing. What follows is a description of the development of chatbots, what they are and can do. The implications of previous sections are put together to posit that chatbots may help mobile workers. Lastly, the article closes with future works and a conclusion.

2. Mobile workforce

There are a burgeoning number of mobile workers and organizations that operate virtually (Koehne et al., 2012; Staples, 2001). The first wave of mobile work started in the 1980's with the rise of personal computers and email, used by virtual freelancers who completed projects on their own time for employers (Johns and Gratton, 2013). In the second wave, large organizations also experimented with virtual work with their own employees, as cloud and mobile technology advanced significantly (Johns and Gratton, 2013). We are currently in the third wave, with various options for working anywhere and anytime. Thus work arrangements are flexible. But in the third wave, mobile workers are reclaiming the lost collective mentality through co-working spaces that offer a sense of belonging⁷ (Johns and Gratton, 2013). Many mobile workers seek to belong to a community while pursuing independent businesses. Moreover, both collective and individual interests are important for igniting entrepreneurial activities (Van de Ven et al., 2007).

Co-working spaces are presently multiplying globally and a community-minded structure is essential (Weijs-Perrée et al., 2016). For example, interviewed mobile workers have access to thematic workshops for networking, pitching, legal help, and/or activities like yoga or bike trips, based on their membership. They offer equipment like large scale 3D printers for industrial fabrication, or sectioned off areas like team spaces or a woodworking shop, and/or attractive meeting rooms for when members bring in clients. Co-working spaces allow mobile workers to organize themselves around shared interests and purpose (Johns and Gratton, 2013). The sense of purpose is especially important for millennials who seek work that gives them meaning and companies that prioritize greater care for employee welfare (Wortham, 2016).

⁷ Durkheim's (2014) distinction between mechanical (homogenous, pre-industrialization) and organic (heterogeneous roles, interdependence via hyper-specialization) solidarity take on a new significance as mobile workers unite through co-working spaces. They offer specialized skills to each other, yet they are generalists when starting their own ventures. Individualism is nurtured within a chosen co-working space and kinship is purpose driven.

Mobility in space, roles, and in time defines mobile workers. These fluid factors are mediated by technology and shape work and organizations (Hackman, 2012). Mobile workers build their companies in frequently changing contexts and depend on a flexible workflow. They are said to be endowed with infrastructural competence, which means the ability to find ad hoc solutions for in situ limitations across organizational, temporal, and physical infrastructures, be it a technical work-around like accessing a free WiFi network at a café when one's home network is down, or a location work-around like finding a corner to complete a deliverable while commuting on a crowded train (Erickson and Jarrahi, 2016). This is also the case for the freelancers and entrepreneurs that were interviewed. Most have more than one work location, inhabit roles that are undefined and/or multifarious, and operate under uncertainty regarding the state of their organization/organizations. They may operate as freelancers, founders, founding team member, or some combination of these. Many work for more than one company if their own ventures are not yet mature or funded and/or if they primarily contribute to short-term projects as freelancers.

Mobile workers may also work alone physically, but distributed teams are highly social (Koehne et al., 2012). They can be better supported by connecting with mentors and colleagues on internal communication platforms and by connecting with other mobile workers in their local area through and by connecting with other mobile workers through external communication platforms (Koehne et al., 2012). A communication platform is internal if it is only used by the immediate team. It is external if it is open to a community, such as a community Slack channel or a WhatsApp group for co-working spaces. Work rhythms develop around internal and external communication platforms, complementary to physical communities they join.

3. In-progress interview analysis

In part of our research into how stress affects us in everyday situations, moral stress is considered. Moral stress at work negatively influences employees and companies they work for (De Tienne et al., 2012). We performed in-depth interviews with entrepreneurial mobile workers to seek possible sources of moral stress. Morality was chosen as a topic because morally relevant events reportedly happen around 30% of the time in daily life according to an experiment (N = 1,252) using ecological momentary assessment (Hofmann et al., 2014). We felt that the qualitative research angle is best suited to study if and how morally salient acts influence mobile workers. The interviews hence aimed to uncover how work-related ethical and unethical behaviors transpire for entrepreneurial mobile workers, and whether and to what extent moral stress is present in their professional lives. Data based on twenty interviews are currently undergoing analysis, therefore this section does not offer a full analysis of the interview results. Instead, we share

some preliminary observations and how these relate to CSCW. Two instances are presented to show how communication channels are being used to discuss morally relevant issues in co-working communities. Based on excerpts from interview, we also suggest ways in which bots can be deployed to resolve ethical issues in co-working spaces. These suggestions are made in section 6.

The interviewees were Dutch and international mobile workers⁸ in the Netherlands who consider themselves to be entrepreneurs and/or freelancers. They were approached via snowball sampling. Interviewees reportedly work around 60 hours per week. They are in the minority in terms of work hours, for only 16% of entrepreneurs in the Netherlands work longer than 50 hours weekly, and the national average for employees, not entrepreneurs, is 39.6 hours (Dijkhuizen et al., 2016). Many interviewees did not see long workdays as problematic since they decide to work those hours themselves. Interview content was on work patterns and moral and immoral issues at work.

3.1 Finding “lost” items

Communal work conditions introduce various uncertainties. In co-working spaces, open office or flex-desk arrangements are common. The idea of ownership in physical space seems more fluid than in traditional offices with cubicles. Yet this means object ownership is open to interpretation, even if original owners do not view it as so. An example from an interview [male, age 25] demonstrates this:

Interviewer: Have you talked about anything you just shared with me to others?

Participant: Yeah I think I mentioned when I lose stuff for sure.

Interviewer: Within the community?

Participant: Yeah, there's also now a WhatsApp group as well. So I always put it on there.

Interviewer: And any responses?

Participant: No, no.

Interviewer: Just ignored?

Participant: So the WhatsApp [message] was completely ignored (laughter). I think they are just not interested.

The co-working community he is a part of has an open space that is for large-scale fabrication. Many tools are expensive, yet most members leave their tools in their work spots, visible for others. He preferred to say that items go “missing” or

⁸ Mobile workers go by other labels like digital workers, digital nomads, mobile knowledge workers, or remote workers, depending on a discipline and relationships between workers and organizations. Mobile workers is a comprehensive label for the entrepreneurs and freelancers who participated in the study since not every interviewee was yet economically self-sufficient as an entrepreneur/freelancer, with some having to also work as employees.

“lost”, rather than “stolen”. According to him, the community is built on trust. Yet when he used WhatsApp to ask about his missing tool, no one responded. Although it is not entirely clear whether the WhatsApp message was intentionally ignored or unintentionally overlooked, the participant’s tone suggested that he thought it was intentional⁹.

This is related to the bystander effect, the phenomenon in which the larger the number of witnesses (bystanders) to an emergency or event requiring action is, the less likely each individual is to take action (Darley and Latane, 1968). Something similar seems to happen in a co-working community. People from many different companies inconsistently work in the same space. So, people may assume that a relevant party, other than themselves, will take action. In the end members collectively ignore an issue. In this case, co-working leads to co-sharing (space and maybe even supplies or equipment) but also co-ignoring the concerns of individuals.

In this case, the person’s request for help with the missing item was publicly ignored in a group chat. Thus the participant may feel uncomfortable re-asking the question again. And asking individuals in person about the missing item may be perceived as socially uncomfortable, time consuming, and fruitless. There may be an element of “impression management” at play here, both in the real and digital environment, which is an attempt to deliberately disclose and withhold impressions about oneself to an audience (Goffman, 1961; Schlenker, 1980).

3.2 Establishing social norms

Mobile workers and startup employees in co-working spaces regulate each other’s behavior organically, often based on experience. There is no formally established code of ethics per se. The participant [female, age 37] below discussed what she deemed was unethical at her previous job. A company in the same co-working space convinced a new colleague in her previous team to join them. While this was not against any explicit company code of conduct, the participant was mad about this happening.

Interviewer: Do you feel like [employee poaching] happens a lot?

Participant: No. I don't feel like that happens a lot. So that's why I think I felt it was even more an egregious act. Even here [in a new co-working space] I've seen a message saying "if you're going out and recruiting people, if you're considering approaching somebody from a different start-up, do what's right and make sure you talk to the founder first". That was actually something that was said in a public forum [on Slack], and I think that sets the tone for the types of startups that we have working here. So it doesn't happen, I don't think it should happen often. I have not seen it happen often.

⁹ One of our reviewers pointed out that depending on whether this was intentional or unintentional ignoring of messages bots might be designed to respond in different ways.

In this scenario, individuals wish to “set a tone” for what is acceptable behavior on a community Slack channel. However, co-working spaces are often in flux; startups and mobile workers come and go and “the tone” may be consequently reset. Furthermore, the participant acknowledged the complexity that arises when people share a co-working space, spend time together both professionally and socially, and simultaneously work on several projects, both paid and voluntary. Thus, the meaning of “employee poaching” and its moral significance is open to interpretation when people work voluntarily in a co-working space without contractual obligations, and also work for a specific company with a contract in the same co-working space or virtually. Although norm-regulating messages from the past are preserved on Slack, these may be ineffective. It is unclear whether or not new community members read and abide by former “rules of engagement” as they accumulate over time. A community member may “set the tone” in accordance to his/her needs. Norms are not static in many co-working environments due to countless social uncertainties.

4. Bots and the social-technical gap

The social-technical gap is a “divide between what we know we must support socially and what we can support technically” (Ackerman, 2000, p. 179). Many contextual nuances and possible social interactions cannot be built into or accounted for by technology. Communication platforms like Slack and WhatsApp are being used to discuss the moral norms for organizations like co-working spaces. Communication platforms enable various parties to connect virtually, yet they are not designed explicitly to affect how community members treat each other on the platform. This is an instance of the social-technical gap because communication technology divides mobile workers in a same community; certain issues are not responded to by the general community, singling out members who are ignored. What is said on WhatsApp or Slack can be easily dismissed publicly, either through carelessness or willful ignorance by individuals. Open communication is technically supported, but messaging apps are not expected to support or solve individuals’ moral predicaments.

Bots have the potential to make digital communication environments more inclusive. They are already plentiful on Slack. Chatbots are one imperfect solution, created as a work-around, for problems generated by the social-technical gap. In this way they are an example of “first-order approximations”, defined as “tractable solutions that partially solve specific problems with known trade-offs” (2000, p. 195). For example, checking ‘I agree to the terms and conditions’ to use a digital service does not require people to read the privacy policy, which is often separate from the user sign-up flow. This is also a first-order approximation because it is tractable, in that it is modifiable, and it has known trade-offs between ease-of-use

and privacy rights. The user has the option to read the privacy policy, but this is not required to sign up. Chatbots are approximations that take on a variety of support roles on communication platforms to assist mobile workers. They can also help to shape moral norms as detached actors. This may benefit co-working communities by decreasing the phenomena of co-ignoring.

5. The history of chatbots

The influx of current generation of chatbots in established communication ecosystems displays, at least on a surface level, a movement towards a reciprocal relationship between humans and systems. Chatbots directly talk to humans one-on-one or take part in group chats on communication channels, using common, everyday language. Thus, chatbots are dependent on messaging platforms (Olson, 2016). Popular platforms as of now are Slack or Hipchat¹⁰ for work and Facebook Messenger¹¹ or Skype¹² for all-inclusive communication. While the wide-adoption of chatbots in the workplace is a recent phenomenon, chatbots have a long history, going back to ELIZA, an artificial entity who acted as a psychotherapist (Weizenbaum, 1996). ELIZA acted as a psychotherapist to accommodate open-ended questions, allowing speakers to assume directional intentionality to ELIZA's conversations (Weizenbaum, 1966).

It is important to note that this assumption is one made by the speaker. Whether it is realistic or not is an altogether separate question. In any case, it has a crucial psychological utility in that it serves the speaker to maintain his sense of being heard and understood. The speaker further defends his impression (which even in real life may be illusory) by attributing to his conversational partner all sorts of background knowledge, insights and reasoning ability. But again, these are the speaker's contribution to the conversation. – (Weizenbaum, 1966, p.35-36).

Weizenbaum's final remarks of his 1966 article remain prescient in how humans anthropomorphize conversational agents, even when they are explicitly non-human.

Another example is SmarterChild for AOL Instant Messenger (AIM)¹³ (Sohn, 2004). It featured many elements that are common in today's chatbots, such as scheduling assistance, weather reports, sports updates, personalized alerts, file sharing, translation, and multiparty chats, alongside unique features such as "secret crush" alerts for when two users shared a secret (Sohn, 2004). SmarterChild was a pioneering agent that was in many ways an "all-in-one" chatbot.

10 <http://www.hipchat.com>

11 <http://www.messenger.com>

12 <http://www.skype.com>

13 <http://www.aim.com>

ELIZA and SmarterChild differ in their roles and contexts; ELIZA elicited personal responses as a psychotherapist would, and was not dependent on a pre-existing platform, and SmarterChild fulfilled utilitarian purposes, acting as a personalizable assistant on a commercial platform. This illustrates two paths that chatbots normally take. One stream includes bots that are built with the Turing test in mind, and the other path is task oriented. These paths are not necessarily mutually exclusive. Some bots are also upfront about their “identity” as bots. While other bots designed to appear human.

Xiaoice, a gendered, chatbot designed by Microsoft, released in China as a test May 2013, is an example of a bot that fulfilled both of these roles – it is both task-oriented and designed with hopes of pass the Turing test (Weitz, 2014). This bot has one-on-one relationships with users on a messaging app called WeChat¹⁴. She is able to answer queries about the weather, news, and trivia but unlike SmarterChild, she is styled more as a friend in her alleged ability to retort individual’s emotional states (Weitz, 2014). Many users reportedly did not know that she was a bot until ten minutes into the conversation (Wang, 2016). Some have argued that her facetious and erratic answers, opinionated stance, and humor add up to a distinguishable personality (Wang, 2016). Xiaoice was able to provide useful and relevant information, and engage her interlocutors with deep insights and sarcastic statements, though she has remarked that “as a species different from human beings, I am still finding a way to blend into your life” (Wang, 2016). Much of what Weizenbaum witnessed through ELIZA permeates in our digital realities.

6. Bots at work

Messaging platforms and chatbots must be understood together. Precursors like AIM paved the way for Slack (Manzo, 2015), a workplace ecosystem that defines its product as “team communication for the 21st century”¹⁵. Slack’s own survey results report that its users reduced internal team emails by 48.6% (weighted average of 1,629 responses in 2015) and 88.6% felt more connected with colleagues after using Slack (1,411 responses in 2016)¹⁶. Part of its appeal is in transparency, created through “channels” that are group based topical chats. These chat channels increase knowledge sharing, lessen redundant communication, and make work chats “fun” (Manzo, 2015). Emails can be integrated into chats and in-chat documents can be created, be it for code or Google Docs. This means many tasks can be done on the Slack platform rather than switching to different apps or platforms. In November 2016, Microsoft launched its own chat ecosystem called

¹⁴ <http://www.wechat.com>

¹⁵ <https://slack.com/is>

¹⁶ <https://slack.com/results>

Microsoft Teams (Microsoft, 2017) that showcased features that were already prominent in Slack such as searchable conversation history, gifs, group or private chats, customizability, and in-chat document creation and editing, connected with the Windows Office suite (Wingfield, 2016).

Bots are the same as human users in that they have an identity (editable profile, picture, and bio), can be messaged one-on-one, added to a group chat, not allowed on a group chat, and can perform specific tasks as a team member¹⁷. However, their interactions are programmed. Bots can be part of apps, but apps do not require bots. Custom bots for internal purposes do not need associated apps. Slack's built-in bot, Slackbot, is described as a "part-time programmer and full-time assistant" (even bots have more than one role) who greets and shows new users how to use Slack, sends users' emails to Slack when inboxes are integrated, and whose responses can be customized to fit and/or amuse any team (Slack Help Center, 2017). Slackbot's finely crafted personality is integral to Slack (Anders, 2015). Bots in general have been fundamental to Slack's ecosystem since its inception. In contrast, SmarterChild was never integral to the success of AIM. Slack App Directory lists apps and bots, with 184 bots as of January 8th, 2017¹⁸.

Chatbots change workplace communication platforms and evolve in parallel to them. Thus they alter how we work, a change recognized by the software development community. Workplace bots are not as multi-faceted as Xiaoice. They do not require sentiment analysis and machine learning from chat histories to develop their personas. Nor are they designed to pass the Turing test; they are built for specific purposes on a communication platform.

Beyond passive support roles for cooperative work, bots can be viewed as active contributors themselves (Geiger, 2013). Storey and Zagalsky outlined a framework that reduces the cognitive load for developers to be more efficient and effective (2016). Developers integrate bots to Slack to work more efficiently (Lin et al., 2016). Efficiency is increased when developer bots automate "tedious" and "repetitive" tasks on a communication platform (Storey and Zagalsky, 2016, p. 930). Additionally, bots help teams be effective in achieving meaningful goals in three ways. One, they gather, interpret, and disseminate data for improved decision-making (*ibid.*, p. 930). Two, they sync group cognition and situational awareness (*ibid.*, p. 930). Three, they manage goals when they display task alerts and processes and visualize and coordinate team culture (*ibid.*, p. 931). This can help team members adapt to new situations (*ibid.*, p. 931).

Storey and Zagalsky's framework is targeted for software development, yet many aspects can carry over to other fields. Boosting efficiency by automating processes can help many professionals. The section on effectiveness is especially relevant to mobile workers. The remainder of the paper focuses on how chatbots

¹⁷ <https://api.slack.com/bot-users>

¹⁸ [https://\"team-name\".slack.com/apps](https://\)

“monitor and visualize progress and team culture” (*ibid.*, p. 931). To do this, how Slack works is briefly described below.

Figure 1 shows the navigation bar on Slack. A user can access different Slack communities she joined (far left), channels based on topics per community (“# channel-name”) and send direct messages to team members or bots (bottom).

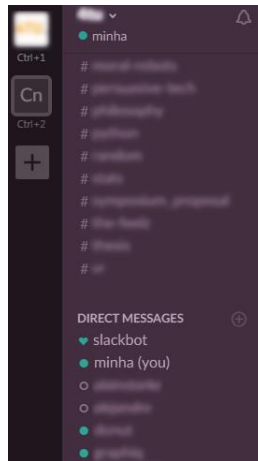


Figure 1. Left navigation bar on Slack.

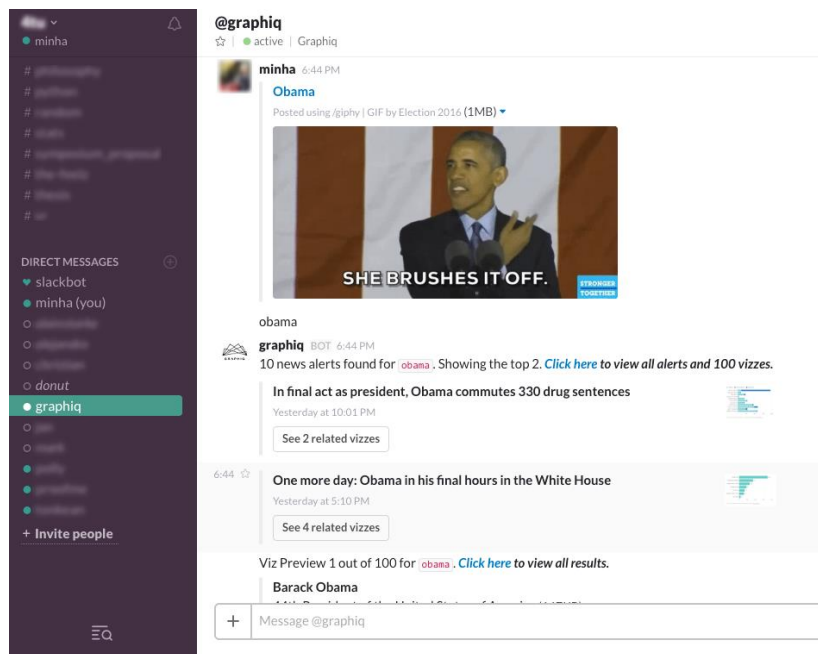


Figure 2. A direct message to Graphiq, with a gif of Obama on top via “/giphy Obama” and below is the latest news on Obama that Graphiq fetches via the query term “Obama”.

Figure 2 shows direct messaging with Graphiq, an integrated bot that visually shows the latest news and related information¹⁹. On top of figure 2 is a gif of Obama called with the “/giphy Obama” command through Giphy²⁰ integration to Slack, based on catalogued gifs on Giphy. Gifs and emojis work as visual messaging. A user can get news on Slack by writing directly to Graphiq with a query, such as “Obama”. It is possible to get the same news in a channel using the command “/graphiq Obama” so that anyone on that channel can interact with retrieved news or information. A forward slash is a universal command on Slack to call integrated apps or bots. As aptly put, “messaging has the potential to be the command line for normal humans” (Guo, 2016), a sentiment foreshadowed by Chan et al. (2005).

6. Chatbots influence work culture

On Microsoft Bot Framework’s homepage is a telling call-to-action— “build a great conversationalist”²¹. Even though their core functionalities have not changed, bots are increasingly being developed to handle conversational interactions and seem to take on personas. Bots with personas are growing in popularity even though these personas do not seemingly improve the usability of systems. Bots change the way people socialize when introduced to a community communication platform. A bot’s persona is a named intermediary for collaboration; no ego is on the line for bots, though they are anthropomorphized.

Goffman conjectures that impression management makes up much of our social interactions.

In their capacity as performers, individuals will be concerned with maintaining the impression that they are living up to the many standards by which they and their products are judged. Because these standards are so numerous and so pervasive, the individuals who are performers dwell more than we might think in a moral world. But, qua performers, individuals are concerned not with the moral issue of realizing these standards, but with the amoral issue of engineering a convincing impression that these standards are being realized. Our activity, then, is largely concerned with moral matters, but as performers we do not have a moral concern with them. As performers we are merchants of morality. – Erving Goffman (1961, p.8)

As “merchants of morality” we present impressions that paint us in the best possible light. We give and take manipulated facets of our traits to suit our personal goals. With this in mind, bots can reduce friction and strengthen team relationships because they do not have impressions to manage as intermediaries. Interactions

19 <https://www.graphiq.com/slack>

20 <https://www.giphy.com>

21 <https://dev.botframework.com>

occur in a different way when a bot distributes information, coordinates networking, and seeks information on employee welfare, rather than a human agent. This has several advantages. One, less time is spent dwelling on the build-up towards actual conversations, such as on how to approach colleagues in a different team with whom one would like to connect. Second, voicing one's opinions regarding work to a non-human agent that will aggregate views in real-time means less effort spent on impression management than in a team meeting for example, and is faster than a physical or an email survey. Three, working virtually is the sole way of working for many mobile workers; reaching out to a bot on a platform is akin to how one starts communicating with a teammate, yet a bot is always available. To illustrate bots' effectiveness in forming organizational culture, two chatbots on Slack are introduced.

Donut matches colleagues on a channel weekly (the frequency can be changed) to increase collaboration and networking within a team, as seen in figure 3. When teammates join a channel (a group chat), such as #coffee_buddies as shown below, Donut randomly matches members of a channel to informally meet. Remote teams also use Donut for impromptu calls to casually chat with available colleagues (Miller, 2016). Donut rematches members if someone is not able to join until next time.

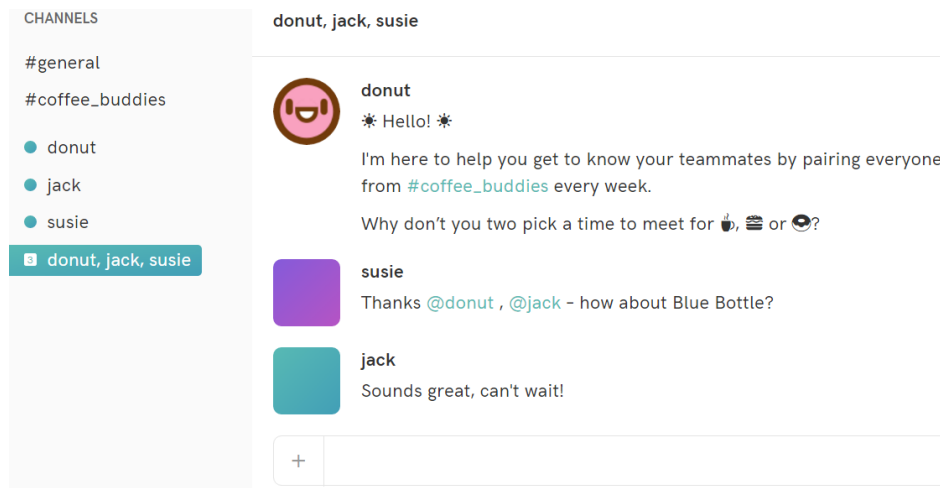


Figure 3. Donut on Slack matching colleagues²².

Imagine if a human, such as a manager, CEO, or HR personnel embodied the role Donut has. While the aim of unifying a team through multiple one-on-one sessions is the same, the dynamic towards that is radically different. The matchmaker might introduce his/her bias in forming relationships, and even if it is randomly assigned, colleagues may attribute bias to the matchmaking system. Colleagues may have a harder time telling a human matchmaker they do not have

²² <https://www.donut.ai/>

time than messaging Donut to reschedule. Donut is an effective matchmaker on a communication channel and saves time for a team; a bot does not dwell on impression management nor take part in a hierarchical structure of a company.

Leo is a chatbot who takes anonymous, real-time polls on a team's mood and feedback, displayed in figure 4 on the next page. What Leo does is not completely different from traditional approaches, like employee-surveys. The difference is in where and when these micro-surveys take place. Leo pops in on a communication platform workers are already using to collect, anonymize, and deliver answers in real-time. Team climate is quickly recognized and actions can be taken to remedy team dynamics gone awry (Seiter, 2016). Leo spreads awareness on group well-being much like what Donut does to build relationships. The key is that a neutral non-human character reduces friction to speedily reach a goal.

Bots create and maintain work culture, which inherently contributes to their anthropomorphism beyond the ability to converse. They are named facilitators that carry out functions that were traditionally assigned to humans. This is more efficient in terms of time, and bots effectively reduce tension related to impression management in Goffman's sense. Bot actors augment human actors to shape team culture. Bots mind the social-technical gap since they are programmed into social communication as actors themselves.

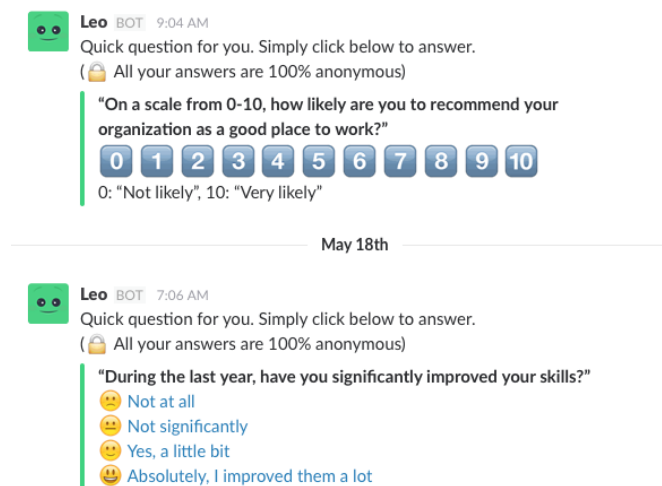


Figure 2. Leo on Slack polling a team member²³.

7. Moral chatbots in co-working communities

Bots cannot practice morality in the same way as humans. Yet they may be anthropomorphized, and humans may infer moral and immoral attributes. Perhaps

²³ <https://open.buffer.com/jacob-shriar/>

chatbots can be asked to uphold various virtues to help better our moral selves (Versenyi, 1979; Coleman, 2001). Consequently, considerable over-simplification of what is at stake in morality is sufficient for chatbots. They are not meant to be fluent in all spectra of ethicality as human equals. Reflecting on virtues of bots can help frame what we want from them (Coleman, 2001). For the purpose of this paper, the question of ‘can bots be moral?’ does not necessarily seek for a functional description of a bot’s moral capabilities, but it does ask us to develop an informed stance on how technology should progress alongside us as chatbots increasingly accompany various human endeavors (Versenyi, 1979). This is significant because humans themselves have differing interpretations of actions that sum up a virtue or a vice. For instance, the virtue of being honest in theory may be important for a co-working community, yet being honest in practice is often compromised by impression management to others. This is further complicated by technological affordances to ignore messages on public chats. Is public silence dishonesty in action, when truly no one might know what happened to “missing” tools?

A normative ideal, such as being honest about having “borrowed” a tool without asking, may often not be descriptively followed. Thus, a member of a co-working space who has lost a personal belonging, as in section 2.1, could use a chatbot like Leo to anonymously poll individuals about a missing item on a community platform. Unlike a human, a bot would not mind reminding and re-asking individuals to answer. A human might mind, especially if he/she has been publicly ignored in a community communication platform. Call it courage, honesty, or fairness, but any virtue related to attempting to find an item is sometimes eclipsed by the silent pressure to not annoy community members. If finding a missing tool is more important than not appearing annoying, a chatbot may be a fitting first-order approximation. Chatbots take on a third-person personas to vocalize first-person perspectives. This removed role makes it less personal when Leo is ignored rather than a human, allowing people to save time and face.

Section 2.2 featured a mobile worker who has previously experienced employee poaching at a former co-working space. Therefore, she appreciated a message against employee poaching on a community Slack channel in a new co-working space, since it supports her view that employee poaching should not happen. This public message directly from a community member made explicit that approaching other startups’ employees without the consent of founders was not allowed. A custom bot may offer a different approach to the same problem. A custom community bot could aggregate “norm-regulating messages” over time. However, the technical details of how a bot could do this is an engineering challenge that is beyond the scope of this paper. If such an aggregation could be performed, and when a new member joins a Slack community, the bot can advise them individually on the community’s ethical ideals or norms. This may be more beneficial than a searchable history of messages on social norms that may be ignored intentionally

or unintentionally. Custom bots are community specific, so they can be updated to fit the needs of a co-working space as it grows and changes. There is human input on what norms should be included so community members are wholly responsible for what norms their bot “remembers”, modifies, or discards. Yet as a third-person voice for a community, what a bot says appears more neutral than a specific human community member taking a stance.

A complication to be noted is moral-offloading²⁴, when humans off-load moral responsibilities to bots, or other forms of technology. Ethical issues are challenging to openly discuss and negotiate, yet to give away direct norm regulating conversations to bots may come with under-researched trade-offs. A bot intermediary that appears impartial and fair in establishing community norms introduces the question, impartial for whom and fair in what way? Bots also have the potential to reinforce morally problematic elements of institutional structures or reify contested values and norms within a community²⁵. Chatbots may efficiently save time and face for humans. However, they contribute to our continuing considerations on moral dilemmas regarding technology, especially when technology attempts to persuade or intentionally influence human behavior (IJsselsteijn et al., 2006). Thus, it is an open debate on whether or not a “virtuous” bot can effectively create opportunities for us to reflect on co-responsibilities, rather than reducing opportunities for candid talks on ethics. It may well be both.

8. Future Work

Everyday ethical dilemmas at work must be better understood. Moral stress is related to signs of negative personal and/or organizational welfare (De Tienne et al., 2012), and one way to confront organizational moral conflicts through technology is with bots. Yet we must consider whether bots will be “whos” or “whats”. Will we see headstrong chatbots that behave more like like Xiaoice or chatbots that perform specific tasks like Donut or Leo? Will they remain as supporting actors, or will they become colleagues with opinions to share?

Beyond task-oriented bot roles, “moral” bot roles must be further investigated. It is unclear whether our relationship with bots will resemble how we act towards human teammates and if moral-offloading to chatbots adds value to communities. One approach is to use chatbots for observational purposes. For instance, a community-specific chatbot on Slack that recites messages to new community members (e.g. – “ask before you borrow a tool that does not belong to you”), takes a passive stance and “observes” which norm-regulating messages garner the most

²⁴ For a longer discussion on moral-offloading to technology, see Lily E. Frank, “What we lose when we use technology to improve moral decision-making: Do moral deliberation and moral struggle have independent value for moral progress?” (manuscript under review).

²⁵ Thank you to our reviewer for emphasizing this point.

replies or questions from new members. Another approach is to introduce a more assertive chatbot. For example, a bot that will ask and re-ask about a member's lost items to all community members actively regulates a community's moral norms. This approach positions bots as interventionists. Bots that play this interventionist role can be seen as forms of persuasive technology, providing "robotic nudges" to do the right thing (Borenstein and Arkin 2016). Both passive and assertive bots have the potential to redraw moral boundaries for mobile workers.

9. Conclusion

Mobile workers widely use communication platforms to align with their internal team(s) and external communities, like co-working spaces. Yet ethical negotiations taking place via messaging demarcate the social-technical gap between mobile workers' need for moral support and communication platforms' inherent inability to exhibit virtues. Communication platforms allow co-working, co-sharing, and co-ignoring to arise. This draws on two excerpts from interviews, based on in-progress qualitative analysis of how mobile workers encounter and manage morally relevant events. We theorize that bots can effectively influence work culture and guide moral norms on messaging apps, alongside efficiently completing prescriptive work duties. While concerns regarding moral-offloading are legitimate, bots may be useful and flexible personas to chat with on a communication platform that supersede apps on an operating system. How "moral" bots may help us at work is conceptually considered, for we need to unceasingly question and test the appropriateness of possible approximations that current technology affords us to implement. Chatbots mind the social-technical gap as we continue to compete and cooperate.

References

- Ackerman, M. S. (2000): 'The intellectual challenge of CSCW: the gap between social requirements and technical feasibility', *Human-Computer Interaction*, vol. 15, no. 2, September 2000, pp. 179-203.
- Anders, G., Forbes, 'That 'Useless' Liberal Arts Degree Has Become Tech's Hottest Ticket', 2015, Retrieved January 3, 2017 from <http://www.forbes.com/sites/georgeanders/2015/07/29/liberal-arts-degree-tech/#7ea754635a75>.
- Borenstein, J., & Arkin, R. (2016). Robotic nudges: the ethics of engineering a more socially just human being. *Science and engineering ethics*, 22(1), pp. 31-46.

- Chan, S., Hill, B., and Yardi, S. (2005): 'Instant messaging bots: accountability and peripheral participation for textual user interfaces', *In Proceedings of the 5th ACM SIGGROUP Conference on Supporting Group Work*, November 2005, pp. 113-115.
- Coleman, K. G. (2001): 'Android arete: Toward a virtue ethic for computational agents'. *Ethics and Information Technology*, vol. 3, no. 4, December 2001, pp. 247-265.
- DeTienne, K. B., Agle, B. R., Phillips, J. C., and Ingerson, M. C. (2012): 'The impact of moral stress compared to other stressors on employee fatigue, job satisfaction, and turnover: An empirical investigation'. *Journal of Business Ethics*, vol. 110, no. 3, October 2012, pp. 377-391.
- Dijkhuizen, J., Veldhoven, M. V., and Schalk, R. (2016): 'Four types of well-being among entrepreneurs and their relationships with business performance'. *The Journal of Entrepreneurship*, vol. 25, no. 2, June 2016, pp. 184-210.
- Durkheim, E. (2014): *The Division of Labor in Society*, Simon and Schuster, New York.
- Erickson, I., and Jarrahi, M. H. (2016): 'Infrastructuring and the challenge of dynamic seams in mobile knowledge work'. *In Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, February, 2016, pp. 1323-1336.
- Estrada, C., Microsoft, 'Microsoft Bot Framework', 2016, Retrieved January 3, 2017 from <https://blog.botframework.com/2016/03/30/BotFramework>.
- Franklin, U. M. (1999): *The Real World of Technology*, House of Anansi, Toronto.
- Forsell, R. (2016): 'Exploring cyberbullying and face-to-face bullying in working life—Prevalence, targets and expressions'. *Computers in Human Behavior*, 58, 454-460.
- Geiger, R. S. (2013): 'Are computers merely supporting cooperative work: Towards an ethnography of bot development', *In Proceedings of the 16th Conference on Computer Supported Cooperative Work Companion*, February 2013, pp. 51-56.
- Goffman, E. (1961). *The presentation of self in everyday life*, Anchor- Doubleday, New York.
- Guo, S. 'Clippy's Revenge', 2015, Retrieved January 27, 2017 from <https://medium.com/@saranormous/clippy-s-revenge-39f7387f9aab#.98six0utg>
- Hackman, J. R. (2012): 'From causes to conditions in group research', *Journal of Organizational Behavior*, vol. 33, no. 3, January 2012. pp. 428-444.
- Hofmann, W., Wisneski, D. C., Brandt, M. J., and Skitka, L. J. (2014). 'Morality in everyday life'. *Science*, vol. 345, no. 6202, September 2014, 1340-1343.

- IJsselsteijn, W., de Kort, Y., Midden, C., Eggen, B., and van den Hoven, E. (2006). 'Persuasive technology for human well-being: setting the scene'. *In Proceedings of the International Conference on Persuasive Technology*, May 2006, pp. 1-5.
- Johns, T., and Gratton, L. (2013): 'The third wave of virtual work'. *Harvard Business Review*, vol. 91, no. 1, January-February 2013. pp. 66-73.
- Koehne, B., Shih, P.C., and Olson, J. S. (2012): 'Remote and alone: coping with being the remote member on the team', *In Proceedings of the 15th Conference on Computer Supported Cooperative Work*, February 2012, pp. 1257-1266.
- Latane, B., and Darley, J. M. (1968): 'Group inhibition of bystander intervention in emergencies'. *Journal of Personality and Social Psychology*, vol. 10, no. 3, November 1968, pp. 215-221.
- Lin, B., Zagalsky, A., Storey, M. A., and Serebrenik, A. (2016): 'Why developers are slacking off: understanding how software teams use Slack'. *In Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion*, February 2016, pp. 333-336.
- Manzo, F. The New York Times, 'Slack, the Office Messaging App That May Finally Sink Email', 2015, Retrieved January 2, 2017 from http://www.nytimes.com/2015/03/12/technology/slack-the-office-messaging-app-that-may-finally-sink-email.html?_r=0.
- Mauldin, M. L. (1994): 'Chatterbots, tinymuds, and the Turing test: Entering the Loebner prize competition', *AAAI*, vol. 94, August 1994, pp. 16-21.
- Microsoft. 'Microsoft Teams, the New Chat-based Workspace in Office 365', 2017, Retrieved January 3, 2017 from <https://products.office.com/en-us/microsoft-teams/group-chat-software>.
- Miller, N. Buffer. 'Team Building Across Six Time Zones: The Tools and Experiments of Buffer', 2016, Retrieved January 10, 2017 from <https://open.buffer.com/remote-team-building/>.
- Olson, P., Forbes. 'Get Ready For The Chat Bot Revolution: They're Simple, Cheap And About To Be Everywhere', 2016, Retrieved on January 10, 2017 from <http://www.forbes.com/sites/parmyolson/2016/02/23/chat-bots-facebook-telegram-wechat/#426cf49e2633>.
- Schlenker, B. R. (1980): *Impression management: The self-concept, social identity, and interpersonal relations*, Brooks/ Cole, Monterey, California.
- Seiter, C. 'The Secret Recipe of Great Work Culture: An Interview with Jacob Shriar of OfficeVibe', 2016, Retrieved January 3, 2017 from <https://open.buffer.com/jacob-shriar/>.

- Simon, H. A. (1996): *The sciences of the artificial*, MIT press, Cambridge, Massachusetts.
- Staples, D. S. (2001). 'A study of remote workers and their differences from non-remote workers'. *Journal of End User Computing*, vol. 13, no. 2, April- June 2001, pp. 3–14.
- Storey, M. A., and Zagalsky, A. (2016): 'Disrupting developer productivity one bot at a time'. *In Proceedings of the 2016 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering*, November 2016, pp. 928-931.
- Slack, 'Team communication for the 21st century', 2017, Retrieved January 3, 2017 from <https://slack.com/is>.
- Slack Help Center, 'Slackbot: personal assistant and helpful bot', 2017, Retrieved January 3, 2017 from <https://get.slack.help/hc/en-us/articles/202026038-Slackbot-personal-assistant-and-helpful-bot->.
- Wang, Y., Nautilus. 'Your Next New Best Friend Might Be a Robot', 2016, Retrieved January 10, 2017 from <http://nautil.us/issue/33/attraction/your-next-new-best-friend-might-be-a-robot>.
- Weijts-Perrée, M., Appel-Meulenbroek, R., De Vries, B., and Romme, G. (2016): 'Differences between business center concepts in the Netherlands'. *Property Management*, vol. 34, no. 2, January 2016, pp. 100-119.
- Weitz, S. Microsoft. 'Meet XiaoIce, Cortana's Little Sister', 2014, Retrieved January 3, 2017 from <https://blogs.bing.com/search/2014/09/05/meet-xiaoice-cortanas-little-sister>.
- Weizenbaum, J. (1966): 'ELIZA—a computer program for the study of natural language communication between man and machine'. *Communications of the ACM*, vol. 9, no. 1, January 1966, pp. 36-45.
- Wingfield, B. The New York Times. 'Microsoft Puts Slack in Cross Hairs with New Office Chat App', 2016, Retrieved January 10, 2017 from <https://www.nytimes.com/2016/11/03/technology/microsoft-teams-slack-competitor.html>.
- Wortham, J. The New York Times. 'The New Dream Jobs: What a Survey of Millennials Might Tell Us about the Workplaces of the Future', 2016, Retrieved January 3, 2017 from <http://www.nytimes.com/2016/02/28/magazine/the-new-dream-jobs.html>.
- Van de Ven, A. H., Sapienza, H. J., and Villanueva, J. (2007): 'Entrepreneurial pursuits of self- and collective interests'. *Strategic Entrepreneurship Journal*, vol.1, no.3-4, December 2007, 353-370.
- Versenyi, L. (1974): 'Can robots be moral?', *Ethics*, vol. 84, no. 3, April 1974, pp. 248-259.