Beyond Human Interaction: A Contextual Review of Conversational Agents to Represent More-Than-Human Perspectives

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Human-Computer Interaction (HCI) is evolving to include more-than-human perspectives, recognising the essential roles of animals, native flora and fauna, and natural systems in sustaining ecosystems. However, practical methods for integrating these perspectives into HCI remain underdeveloped, often sidelined by human-centred, top-down approaches. This paper critically examines the potential of conversational agents to bridge the representation gap of more-than-human actors in community engagement and decision-making. Through a contextual review of conversational agents used in diverse domains, we identify key technical and ethical considerations for their adaptation to represent more-than-human actors. We propose that conversational agents can amplify the voices of more-than-human actors, translating ecological data into actionable insights and promoting a more inclusive, collaborative and ecologically responsible HCI framework. This work contributes to the field by outlining design considerations for conversational agents that address power imbalances and foster equitable participation in decision-making.

CCS Concepts: • **Human-centered computing** → **Collaborative interaction**.

Additional Key Words and Phrases: More-than-human, Conversational agents

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1 Introduction

More-than-human actors include a wide range of entities such as animals, native flora and fauna, and natural ecosystems, as well as technological systems and digital entities [10]. For the purpose of this paper, we focus on the natural dimension of more-than-human actors. Despite their vital roles in maintaining ecological balance and contributing to human well-being, these actors need a direct voice in community engagement and decision-making processes that impact their existence. Traditional top-down approaches, predominantly employed by governments and private enterprises [20], often fail to capture the diverse and intricate needs of more-than-human actors, resulting in significant power imbalances and inadequate representation in discussions that affect their survival [7]. Government organisations, which control regulations, policies, and other governance aspects, play a key role in shaping decisions that affect more-than-human actors [50]. However, these approaches often marginalise more-than-human perspectives, focusing

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primarily on human-centred concerns. To achieve more inclusive and equitable decision-making, there is a critical need to expand existing participation and engagement to include the agency of more-than-human actors, ensuring their voices are effectively represented in community engagement and decision-making processes.

Many jurisdictions have taken steps to safeguard the natural environment by enacting comprehensive environmental protection laws. For instance, Switzerland's constitution grants rights to natural systems to protect the dignity of living creatures and ensure the well-being of the environment [41, 51]. Countries such as New Zealand and India have made progressive changes to environmental law by granting personhood to rivers and forests, providing more-than-human actors with legal recognition and some autonomy in decision-making processes that directly affect them [24]. However, these approaches still depend on human interpretation and struggle to convey the complex, conflicting needs of different more-than-human actors within ecosystems, such as the competing interests of rivers, trees, and wildlife. The challenge is to find ways to represent diverse perspectives impartially and effectively in community engagement contexts, where the power of voice and dialogue is paramount.

This paper takes the format of a critical conceptual analysis of conversational agents as an innovative approach to bridging the representation gap of more-than-human actors in community engagement settings, using both a critical literature review and a contextual review. Conversational agents, designed to simulate human-like dialogue [25], can serve as proxies for more-than-human actors, amplifying their 'voices' in discussions where their interests are at stake. Unlike traditional methods, these agents have the potential to translate ecological data and environmental indicators into actionable insights, providing a platform for more-than-human actors to participate more equitably in community engagement and decision-making processes.

First, we critically review recent works on (1) community engagement and collaboration, (2) more-than-human futures in HCI, and (3) conversational agents to represent diverse voices. This review examines emerging approaches that challenge human-centred approaches and investigates the potential of conversational agents to facilitate a more inclusive representation of more-than-human perspectives. Second, we present a contextual review of different examples of conversational agents currently used as mediators in human interactions. This review highlights the capabilities and limitations of these agents in facilitating dialogue and identifies key technical and ethical considerations when adapting them to represent more-than-human actors. Finally, we outline some initial, nascent design considerations for how conversational agents can serve as proxies for more-than-human actors in community engagement and decision-making processes. These considerations aim to address power imbalances, integrate impartial knowledge, and ensure that diverse more-than-human perspectives are effectively heard and respected within community engagement processes.

Through this critical conceptual analysis, we aim to demonstrate how conversational agents can facilitate more equitable and ecologically responsible decision-making within community engagement, ultimately fostering better outcomes for both human and more-than-human communities.

2 Related work

2.1 Community Engagement and Collaboration

Community engagement is the process of informing, consulting, and collaborating with various top-down and bottom-up actors, including government authorities and grassroots organisations, to gather public feedback and integrate it into decision-making processes. Traditionally led by government authorities, particularly in the context of large infrastructure projects, community engagement has often been criticised as tokenistic, serving as procedural exercises without substantial impact on outcomes [35, 40]. As the importance of securing a 'social licence' has gained recognition [13],

engagement practices have evolved, driven by advancements in technology such as social media, immersive technologies, and large language models. These developments have expanded the methods available for engaging communities and incorporating diverse voices. Scholarly research has highlighted the limitations of traditional engagement approaches and the potential benefits of leveraging emerging technologies to enable more genuine and collaborative community participation [31].

Previous HCI research has extensively explored the role of digital and interactive technologies to enhance collaboration in community engagement processes. Studies have shown how social media and Web 2.0 tools can facilitate digital participation, improving urban planning outcomes by making engagement more accessible and interactive [21, 33]. Other work has focused on situated interfaces, such as a playful full-body interaction application designed for large urban screens, enabling concurrent pedestrian participation in high-traffic urban precincts [28]. Additionally, pop-up installations that blend digital and physical interactions have created temporary interventions in urban environments, fostering engagement in public spaces [8]. Urban robots have also been investigated as mechanisms for scaling up physicalised displays, providing novel ways to engage the public in discussions about their environments [29].

AI technologies, including large language models, are increasingly being explored to enhance community engagement and participatory processes. Previous studies have highlighted the role of AI in automating community planning by analysing social media data [30] and developing AI-powered tools in collaboration with local communities within citizen science projects [32]. Traditionally, AI applications have focused on processing data from smart monitoring systems or user-generated content. However, the rise of generative AI introduces new potentials for community engagement to facilitate creative idea generation [15], support co-creation activities [56], and foster group discussions [14]. These examples illustrate the diverse applications of interactive technologies in community engagement, demonstrating their potential to transform traditional practices by incorporating dynamic, accessible, and collaborative methods. Advancements in AI further enrich these participatory practices by broadening the avenues through which diverse community voices can be included.

2.2 More-Than-Human Futures

HCI has traditionally centred on human-centred design, emphasising the creation of systems and interfaces tailored to human needs and preferences [27]. This anthropocentric approach often brought more-than-human actors into the design process without truly considering their needs or agency [43]. Latour's [37] Actor-Network Theory (ANT) offers a foundational perspective for understanding the role of more-than-human actors in these networks. ANT emphasises that more-than-human actors are not merely passive objects but active participants that contribute to the broader ecological and social ecosystem, which must be considered alongside human concerns in decision-making processes.

There is a paradigmatic shift away from an anthropocentric perspective that views nature as a separate domain, to one that recognises more-than-human actors and ecosystems as co-creators. These more-than-human actors play a crucial role in maintaining ecological balance and contributing to the well-being of human communities. This shift reflects a growing recognition that design should not only serve human interests but also account for the broader ecological systems that support all life [17].

In line with this shift, Strang [48] argues that current decision-making processes often fail to adequately represent the interests of more-than-human actors and calls for a rethinking of governance arrangements that have historically upheld a dualism between nature and culture, effectively separating human and non-human domains. Similarly, Foth and Caldwell [18] advocate for the design of technological interventions that go beyond serving human interests

to consider the broader ecological and more-than-human environment, highlighting the need for a more integrated approach that recognises the interconnectedness of human and more-than-human actors in shared lifeworlds.

Many studies have used design methods to represent more-than-human actors, Frawley and Dyson [19] explored the use of design personas to give a voice to chickens in the context of an egg farm to examine and address concerns related to the treatment of chickens and the ethical considerations surrounding animal rights. Tomitsch et al. [50] introduced a non-human personas framework to help designers broaden their understanding of non-human species, enabling more informed decisions and better assessing environmental impacts. These approaches integrate the interests of more-than-human actors into design processes, shifting away from the traditional human-centred focus of HCI. This shift not only redefines the boundaries of design but also opens up new opportunities for developing systems and technologies that support the well-being of both human and more-than-human actors.

2.3 Conversational Agents to Represent Voices

Conversational agents, often referred to as chatbots or virtual assistants, are software systems designed to simulate human conversation [22], engaging users through speech or text [3]. Early examples of conversational agents such as ELIZA were groundbreaking in their time but lacked the flexibility to engage in dynamic conversations, which constrained their usefulness to predefined scenarios [54]. Early HCI research primarily examined the functionality of conversational agents in task-based interactions, such as checking the weather, setting reminders, or controlling smart home devices [1, 5]. These interactions were often transactional and limited in scope, focusing on efficiency and accuracy rather than fostering deeper, more meaningful connections with users.

Human conversation is often unpredictable, with numerous variables that can affect the flow and meaning of dialogue. A major challenge in developing conversational agents is ensuring they can effectively handle the complexities of human speech. In the last century, there has been a strong focus on enhancing the human-likeness of conversational agents, a concept known as anthropomorphism [34, 53]. This involves endowing agents with human-like properties and characteristics, making interactions feel more natural and authentic. Anthropomorphism is critical as it directly impacts user satisfaction, engagement, and trust [23]. Users are more likely to interact positively with agents that exhibit human-like qualities, which helps foster a sense of connection and empathy [22].

Recent developments in affective computing, a field that focuses on the recognition and simulation of human emotions, have further advanced the capabilities of conversational agents [11]. By integrating affective computing, these agents can track and respond to users' emotional states, creating more personalised and engaging interactions. Affective capabilities are increasingly recognised as being just as important as practical functions, as they contribute to the overall user experience and satisfaction [58].

As conversational agents have become more embedded in various aspects of daily life, HCI research has shifted towards exploring how these systems can function as social partners and integrate into broader social contexts [49, 55]. Recent studies have focused on designing conversational agents to engage in casual and social talk to promote long-term relationships and emotional connection, moving beyond task-oriented interactions to create more natural and human-like conversations [22, 42, 47].

Previous studies have also emphasised the importance of trust, as it determines whether users feel comfortable relying on conversational agents for important information and decisions [38, 45]. Personalising interactions based on the user's preferences, behaviours, and emotional state, has been identified as a critical factor in building trust and fostering long-term engagement[2]. Purington et al. [44] reported that conversational agents in household settings are

often personified and may even be perceived as part of the family, influencing how users interact with them and the expectations they have.

HCI research is increasingly focused on the ethical implications of integrating conversational agents into daily life [26]. This includes examining how these agents impact social relationships, privacy concerns, and the potential for biases in how agents interact with different users [2, 46]. There is a growing recognition that as conversational agents become more sophisticated and integrated into various social and professional domains, it is essential to ensure that they operate in ways that are fair, transparent, and aligned with users' values and expectations.

3 Contextual Review

This review presents three examples of conversational agents: Google Duplex, Mediktor, and Eike. These examples were selected to represent a cross-section of chatbot classifications, illustrating differences in functionality, industry application, and modes of communication. Each example demonstrates how conversational agents mediate interactions and facilitate dialogue across a range of contexts, from routine tasks to specialised support.

While this review centres on these three agents, we acknowledge that other conversational agents could have been chosen. However, these examples were selected to provide a balanced perspective on the diversity within the field, highlighting key distinctions in functionality and user experience across different applications.

3.1 Google Duplex

Google Duplex is an advanced AI assistant developed by Google, initially designed to assist with tasks such as restaurant reservations. Over time, its capabilities have expanded to include checking store hours and managing various online bookings. Google Duplex engages in human-like conversations, using natural language processing to mimic speech patterns, including pauses and disfluencies, to create a more natural interaction. It uses user data such as calendar entries and contact details to autonomously complete tasks, often calling businesses on behalf of the user and performing interactions that closely resemble human communication. These unique characteristics of this conversational agent was achieved through a combination of a concatenative text to speech (TTS) engine and a synthesis TTS engine, specifically using Tacotron and WaveNet. This is how the agent is able to mimic human natural pauses while the system is processing in the background [39].

3.2 Mediktor

Mediktor is a chatbot developed in Spain that provides medical advice to users in a triage or pre-diagnosis setting. It quickly analyses symptoms to offer guidance on potential next steps, aiming to save users time and provide a more efficient healthcare experience. Designed as a multilingual tool, Mediktor enhances accessibility and promotes health equity by delivering expert medical advice through various digital channels. The system draws on multidisciplinary expertise to offer a user-friendly and inclusive approach, supporting individuals in making informed health decisions across different contexts. The unique feature of this chatbot is its symptom assessment nature which provides an omnichannel format for users to be able to make an informed decision based on their symptoms of their condition. This also extends to the ability to implement social cues in conversational agents to engage with their users, such as the use of avatars and human names for doctors and nurses [36].

3.3 Eike

Eike is a conversational agent developed through a co-design process with migrants in Finland, intended to assist users with challenges such as language learning, employment, childcare, and housing [9]. The agent takes the form of a pigeon-like avatar, symbolising values of peace and trust, and aims to make information more accessible in a friendly, efficient format which is the salient unique feature of this chatbot. The co-design approach involved direct input from the intended users, ensuring the chatbot was tailored to their needs and preferences. Eike's anthropomorphic design was particularly noted for fostering trust and aiding communication, helping users navigate complex information despite potential language barriers.

3.4 Integration and Insights

One of the primary challenges in representing more-than-human actors is their lack of a voice in decision-making, often resulting in their interests being overshadowed by human concerns. Google Duplex, with its advanced natural language processing capabilities, illustrates how a conversational agent can simulate human-like dialogue, including mimicking disfluencies and pauses, to create a more authentic interaction. This ability to sound convincingly human could be leveraged to give more-than-human actors, such as endangered species, a "voice" in discussions where their survival is at stake. By simulating the concerns of these actors, Google Duplex could help evoke emotional responses from decision-makers, potentially leading to more empathetic and conservation-focused policies.

Similarly, Eike's design, which incorporates anthropomorphism to create a friendly and trustworthy avatar, demonstrates how visual and behavioural cues can enhance the user's connection to the agent. This approach could be particularly effective when adapted for more-than-human representation. By using anthropomorphic designs, conversational agents could give more-than-human actors a more relatable and impactful presence in discussions where their survival and well-being are at stake. Both Google Duplex and Eike show how human-like interaction, whether through voice or visual representation, can bridge the gap between human users and the more-than-human actors they represent.

On the other hand, Mediktor's design emphasises the role of conversational agents in providing unbiased, data-driven advice, which is crucial when representing the diverse and sometimes conflicting needs of more-than-human actors. Unlike the more humanised designs of Google Duplex and Eike, Mediktor focuses on delivering accurate, objective information that users can trust. This impartiality is essential when navigating the complexities of ecosystem management, where the needs of different more-than-human actors, such as animals, plants, and habitats must be balanced against one another. Mediktor's success in delivering health advice in multiple languages and across diverse populations illustrates how a similar approach could be used to ensure that the interests of more-than-human actors are represented fairly and without bias in decision-making processes.

Another shared strength of these conversational agents is their ability to address power imbalances, which is a critical issue in the representation of more-than-human actors. Mediktor's capability to provide equitable healthcare advice to underserved populations highlights how conversational agents can level the playing field by offering consistent, accessible, and accurate information. This principle can be applied to more-than-human actors, ensuring that their voices are not drowned out by more powerful human interests in community planning and policy discussions. Google Duplex's neutral, task-oriented design also suggests that conversational agents could serve as advocates for more-than-human actors in complex discussions, such as those surrounding urban development, where the needs of natural habitats often conflict with human economic interests.

Despite these commonalities, there are also differences in how these agents approach interaction and representation, which offer valuable lessons for their potential adaptation to more-than-human actors. Google Duplex and Eike focus on creating a seamless and intuitive user experience, leveraging anthropomorphism and natural language to foster social connections and trust. This approach is particularly effective in contexts where emotional engagement is key to influencing human behaviour, such as in advocacy for environmental conservation. In contrast, Mediktor's more clinical and data-driven approach is better suited to scenarios where impartiality and accuracy are paramount, such as in balancing the needs of conflicting more-than-human actors within an ecosystem.

These differences suggest that a hybrid approach might be most effective when developing conversational agents for more-than-human representation. For instance, an agent designed to advocate for more-than-human actors in community engagement settings could combine the human-like interaction styles of Google Duplex and Eike with the impartial, data-driven advice provided by Mediktor. Such an agent would be capable of not only eliciting empathy and emotional responses from human decision-makers but also ensuring that decisions are informed by accurate, unbiased information that takes into account the complex interdependencies of ecosystems.

The contextual review collectively highlights the versatility of conversational agents and their potential to serve as mediators in representing more-than-human actors. By combining the strengths of natural language processing, anthropomorphism, and data-driven impartiality, these agents could offer a balanced and effective means of giving voice to more-than-human actors in decision-making processes. This could lead to more equitable and sustainable outcomes, as decision-makers would be better equipped to understand and consider the needs of all actors, human and more-than-human that share our environment.

4 Discussion

Rapid advancements in conversational agent technology offer future opportunities for expanding community engagement and decision-making to include more-than-human actors. As these technologies become more advanced, their ability to simulate natural language and engage in complex, nuanced interactions could be pivotal in giving voice to actors that are typically voiceless within our ecosystems.

4.1 Technology Advancement with Ecological Needs

Conversational agents can simulate the "voice" of more-than-human actors, articulating their needs and concerns in ways that resonate with human decision-makers. By employing advanced natural language processing and anthropomorphism, conversational agents can evoke empathy and foster a deeper understanding of the ecological roles and rights of more-than-human actors. This approach is particularly valuable in contexts where emotional engagement is crucial for influencing behaviour, such as environmental conservation efforts.

As conversational agents continue to evolve, it is crucial to integrate these technological advances with the ecological needs of more-than-human actors. This involves not only leveraging the latest in natural language processing and AI but also grounding these technologies in a deep understanding of ecological systems. By doing so, we can create conversational agents that are not just tools for human convenience but also advocates for the natural systems. These agents can help to shift the focus of community engagement and decision-making from a solely human-centred perspective to one that includes the voices of all participants in our shared environment.

4.2 Ethical Considerations

A critical aspect of representing more-than-human actors through conversational agents is ensuring that these representations are impartial and ethically sound. Ecosystems are composed of diverse and often conflicting needs, making it imperative that conversational agents provide balanced and unbiased advice. This can be achieved by grounding the design of these agents in interdisciplinary data, ensuring that their interactions reflect the complex interdependencies of the natural systems. Moreover, ethical considerations should guide the development of these agents, ensuring that they do not inadvertently privilege certain more-than-human actors over others.

It is also important to consider the implications of voice, tone, and character attributes to avoid reinforcing harmful stereotypes or biases. A large number of conversational agents currently integrated into society, present themselves as female through their name, avatar and pronouns [52], as the pervasive use of female voices in subservient roles may reinforce harmful stereotypes [6]. The agent should be designed to embody a neutral, balanced persona that does not unintentionally echo hierarchical human roles or characteristics, ensuring that the representation is respectful and impartial. Additionally, the conversational agent should maintain a neutral tone in its delivery of prompts and dialogue, carefully avoiding any language or behaviour that could cause users to feel blamed or offended. Instead of attributing errors to the user, the conversational agent should be designed to take responsibility for mistakes, ensuring that interactions remain respectful and focused on constructive engagement [12].

4.3 Biases

A range of biases must be carefully considered when developing and programming conversational agents. This begins with the training data, which refers to the information fed to the AI system to train algorithms and shape their behavioural outputs. Specifically, biases influencing the training of large language models include demographic, cultural, linguistic, and temporal biases [16]. Individuals and developers who feed this information to these systems are also influenced by their upbringing, cultural background and personal experience [57]. We propose that these data biases can be mitigated by conducting audits and ensuring that this data is regularly curated by accurately representing a balanced, broad range of perspectives. Additionally, the involvement of human experts from a diverse range of backgrounds is crucial for regulating training data and AI development, as they provide contextual understanding and ethical judgment. This human oversight helps address potential biases, errors, and unintended consequences within these systems.

Furthermore, it is important to acknowledge that there are competing interests among more-than-human actors such as animals, native flora and fauna, and natural systems. These actors engage in complex plant-animal interactions, including predation, frugivory, herbivory, parasitism, and mutualism, which are vital for maintaining ecological balance [4]. Representing these competing interests within conversational agents requires careful consideration to capture their complexity accurately. Each interaction reflects unique dependencies and priorities, meaning that a one-size-fits-all approach risks misrepresenting the true complexity of ecosystems. It is important to consider the specific roles and relationships of more-than-human actors for creating authentic and contextually relevant conversational agents.

Language also plays a critical role in how conversational agents are designed, as it shapes the technology and defines meaning, which is inherently non-neutral. The words and phrases selected for interactions can influence user perceptions and carry implicit biases. Thoughtful language choice helps prevent reinforcing existing biases and avoids presenting generalised or oversimplified views of more-than-human actors, fostering more authentic and inclusive engagement.

4.4 Foster Collaboration

In community engagement, where diverse perspectives must be considered, conversational agents can introduce more-than-human perspectives into the conversation and serve as moderators that stimulate dialogue, prompt new ideas, and encourage inclusive and collaborative participation. These agents can also challenge participants to think beyond conventional human-centred approaches, leading to more innovative and ecologically responsible solutions. Their ability to provide real-time feedback, suggest alternatives, and synthesise diverse viewpoints can help groups navigate complex discussions more effectively, ensuring that the needs of all human and more-than-human actors are considered.

4.5 Policy and Regulation

To effectively integrate conversational agents into community engagement practices, it is crucial to establish supportive policy and regulatory frameworks that acknowledge the rights and needs of more-than-human actors. Existing policies are predominantly human-centred and often overlook the ecological impacts of decision-making processes. Reforming these frameworks to incorporate the perspectives of animals, native flora and fauna, and natural systems is essential for enabling conversational agents to act as effective advocates for more-than-human actors. Collaborative efforts with environmental advocates, First Nations communities, and other key groups can help develop policies that ensure the ethical and sustainable use of conversational agents in amplifying more-than-human perspectives.

5 Conclusion

The integration of conversational agents into decision-making processes presents opportunities to address the representation gaps faced by more-than-human actors. By drawing on the capabilities demonstrated by the contextual review, conversational agents can amplify the voices of more-than-human actors, address power imbalances, ensure impartiality, and create emotional connections that influence more compassionate and informed decision-making. Given the pressing need for a shift from an anthropocentric perspective that views nature as a separate domain to one that recognises more-than-human actors and ecosystems as co-creators of shared lifeworlds, it is crucial to adapt conversational agents to serve not only human interests but also the broader ecological and more-than-human environment.

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