

Co-Design for Indigeneity and Sovereignty

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In this conceptual paper, we present our collaborative efforts in co-designing an AI-driven disaster management chatbot with two Indigenous communities in Nebraska: the Sac and Fox Nation of Missouri in Kansas and Nebraska, and the Omaha Tribe of Nebraska. The paper is organized into three sections. Firstly, we provide an overview of the interviews and design workshop with stakeholders and the resulting AI-driven chatbot artifact. Secondly, we highlight the key findings derived from the participatory co-design workshop. Thirdly, we discuss our future plans for integrating a large language model to enhance the chatbot's functionality and facilitate disaster damage mitigation. We also delve into potential issues related to data collection for AI model training and emphasize the imperative need to introduce a collaborative governance framework in this context. We consider co-design as a means to uphold indigeneity and sovereignty. Our exploration may illuminate important issues within Indigenous communities in the AI era, as acknowledged by the HCI/CSCW communities.

CCS Concepts: • **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

Additional Key Words and Phrases: datasets, neural networks, gaze detection, text tagging

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1 INTRODUCTION

This paper offers a comprehensive review of our collaborative endeavors with two indigenous communities in Nebraska: the Sac and Fox Nation of Missouri and the Omaha Tribe of Nebraska [6]. We delve into the intricate intersection of disaster management, artificial intelligence (AI) technology, and the unique requirements and experiences of indigenous communities. Our discussion encompasses our findings and insights concerning co-designing AI chatbots to address the distinct challenges encountered by tribal people during natural disasters. Furthermore, we explore the potential benefits of harnessing large language models to enhance chatbot design, dataset creation, and the associated challenges. Our objective is to initiate a discourse on how co-designing an AI system with indigenous communities can serve as a vital perspective for comprehending the influence of power, values, and cultural factors in the realm of technology.

Co-designing disaster management systems for indigenous communities entails a collaborative and participatory approach to address the unique disaster management requirements, challenges, and cultural nuances of these populations. This methodology revolves around involving indigenous community members, including tribal leaders, emergency managers, and residents, in the

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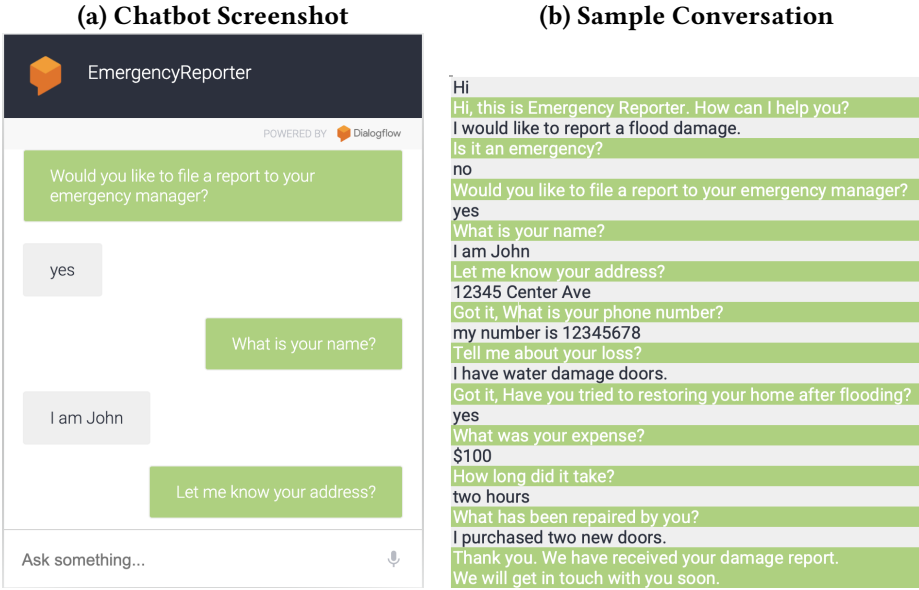


Fig. 1. (a) Screenshot of *Emergency Reporter* chatbot and (b) a sample conversation showing how tribal members could file a flood damage report to their emergency managers. The user inputs were labeled in grey and the agent responses were highlighted in green [6].

creation and tailoring of technology that supports real-time communication, damage assessment, documentation, and information dissemination during and after natural disasters. The co-design process is designed to empower indigenous communities, bolster their disaster resilience, and advocate for disaster management approaches that respect their cultural sensitivities and sovereignty. This collaborative endeavor promotes active engagement between developers, researchers, and community members, enabling indigenous communities to actively influence technology design to align with their specific needs [4].

We have selected chatbots as a design artifact with transformative potential, particularly within the context of disaster management for Indigenous communities. Chatbots offer an innovative solution, as demonstrated in recent studies [2], that can effectively bridge critical communication gaps, streamline data collection processes, and efficiently disseminate crucial information. This is especially valuable in remote or underserved areas where access to resources and information may be limited. Chatbots could play a pivotal role in simplifying disaster declaration procedures, thereby empowering indigenous communities by enhancing their capacity to request assistance promptly. The incorporation of co-design principles is of paramount importance to ensure that these technological solutions are culturally sensitive and respectful of tribal sovereignty. By integrating AI chatbots into emergency management practices within indigenous communities, we take a significant step forward in improving disaster preparedness and response capabilities. We believe this approach aligns technology development with Indigenous values and practices, as corroborated by previous research [3, 5].

In our study, a participatory design approach was employed to co-design an AI-based chatbot with local indigenous communities for disaster reporting to Federal Emergency Management Agency (FEMA). The research process comprised two stages: First, interviews with 4 tribal emergency managers, and second, a design workshop with tribal community members (N=28). Qualitative

This is Tribal Emergency Reporting Dashboard, we have 29 reports now.

ID	Name	Phone	▲ Address	Situation	Labor	Cost	Repair	Score	Int.	Time	Form
webdemo-d9d48b7c-715a-33a4-585c-76a9735f80df	my name is Jack	402123456	my address is 123 centre ave	the front door was broken	2 hours	100 dollar	thank you	0.10	14	2022-11-15 13:26:57	PDF
webdemo-2c2c312c-6368-88c9-e4d8-5ba09747e39f	Jack	402123456	412233 centree ave	my front door was broken also the windows	2 hours	100 dollar	thank you	0.12	13	2022-11-15 13:35:33	PDF
webdemo-7cd96ef8-2feb-cf2b-64b3-337a05f084b9	my name is john	523524542	omaha	water all over my house				-0.03	9	2022-11-15 17:07:41	PDF
webdemo-db13c118-23f5-7ab7-604d-02f1d43a6db4	john	124134425	377 centre ave	my house was water all over the place....	2 hours	\$500	I tried remove the water myself...	0.03	20	2022-11-15 17:14:10	PDF

Fig. 2. The figure illustrates how the submitted flood reports were stored and presented in a dashboard [6].

thematic analysis was used to identify emergent themes related to chatbot design, emergency management, and user experience. Privacy and ethical considerations, particularly concerning vulnerable populations, were of paramount importance and were addressed in the research process, ensuring participant privacy and protection. Our chatbot artifact is depicted in Figures 1 and 2.

2 KEY FINDINGS

2.1 Improving Emergency Communication and Damage Reporting

Chatbots play a pivotal role in improving emergency communication and damage reporting within indigenous communities. The findings from our study highlight their significance in facilitating real-time communication between tribal members and emergency managers. Before a disaster strikes, chatbots enable emergency managers to disseminate crucial information such as weather alerts, preparedness measures, and contact details, ensuring that tribal members stay informed and prepared. During and after a disaster, chatbots offer a streamlined and efficient channel for tribal members to report damage, request resources, and seek assistance. They could alleviate the burden on emergency managers, who might otherwise be inundated with numerous phone calls, by allowing individuals to report their status and needs directly through text or images via the chatbot. This not only reduces communication costs but also ensures that timely and accurate information reaches emergency management authorities. Moreover, chatbots can facilitate community support by inquiring about the well-being of neighbors, promoting a sense of collective responsibility during emergencies. They expand the reach of assistance beyond individual households, allowing emergency managers to gain a comprehensive view of the community's situation. Incorporating chatbots into emergency management practices enhances communication efficiency, reduces response times, and contributes to better disaster preparedness and response within indigenous communities.

2.2 Streamlining Documentation and Cost-Sharing

Chatbots serve as valuable tools for streamlining documentation processes within indigenous communities, particularly concerning damage reporting and resource utilization. One key aspect is the ability of chatbots to facilitate real-time documentation during and after disasters. Participants highlighted the significance of documenting damage through images and descriptions, which aids in compiling comprehensive damage reports. This documentation is instrumental when tribal communities file claims with organizations like FEMA or state emergency bodies, ensuring that they meet necessary thresholds for funding requests. Furthermore, chatbots simplify the recording

of time, expenses, and resources expended during emergency response efforts. This documentation is crucial for cost-sharing purposes, as it helps tribal communities track their contributions and provide in-kind support. In scenarios where only a portion of the total loss is covered by external funds, meticulous documentation becomes essential to protect tribal sovereignty and governance. The automatic documentation feature, proposed by participants, enhances efficiency, allowing individuals to record information without the need for manual data entry. This capability can speed up collecting data for final cost-sharing documentation and reporting, which is crucial for obtaining FEMA's 25% cost share during emergency declarations. By simplifying document retrieval and supporting collaborative damage reporting, chatbots can expedite the declaration process, aiding tribal members. Additionally, these AI chatbots can offer real-time communication during chaotic disaster scenarios, improving overall responsiveness.

2.3 Enhancing User Experience and Empowerment

Enhancing user experience and empowerment through chatbots within indigenous communities emerges as a promising prospect. Our study revealed that tribal members and emergency managers held generally optimistic views regarding chatbot adoption in disaster reporting and management. They expressed a desire for chatbots to encompass a wider range of use cases, including scenarios like blizzards, ice storms, fires, and windstorms. This broader functionality would empower tribal members with more options for addressing diverse emergency situations effectively. Furthermore, participants stressed the importance of user-friendly chatbot interfaces. For instance, older tribal members found voice options preferable, facilitating communication with emergency managers without the need for extensive text input. This consideration reflects a commitment to inclusivity, ensuring that all community members, regardless of their techsavviness, can utilize the chatbot effectively. Moreover, the chatbot's ability to prioritize emergency responses based on the immediacy of danger, as suggested by one participant, holds promise for efficient resource allocation. By discerning between urgent and non-urgent situations, chatbots can help emergency managers better understand the ground-level conditions of those affected by disasters, ensuring that assistance reaches where it is needed most.

3 DISCUSSIONS

Effective co-design integrates principles of equitable partnership, cultural responsiveness, and community empowerment to develop technology that respects tribal sovereignty. Thoughtful co-design provides a framework for ensuring technical solutions align with cultural values rather than undermine them. For instance, Abdilla and Fitch demonstrate how co-design can uplift tribal sovereignty and values in technical education. Their principles of equitable partnership, cultural grounding, and community capacity building resulted in technological solutions that respect, rather than threaten, tribal culture. This provides a model for co-designing solutions that empower rather than impair indigenous communities.

In the context of disaster management, we are aware that the critical issue is cross-sovereignty. We contend that the development and implementation of the planned AI chatbot, through co-design, require a governance framework that adeptly addresses various levels, interactions, and evaluations. For instance, the initial phase of this governance framework ensures a collaborative development and implementation process involving the US government, tribal nations, and stakeholders. This design artifact will adhere to governance rules that empower Indigenous people to make final decisions regarding its functions and purposes. Subsequent phases will illuminate how accountability outcomes inform the further development of collaborative governance structures and processes to ensure accountability. Finally, during the chatbot's development and implementation, input will be

collected across all phases to validate and adjust the governance framework for broader application among tribal nations.

Our future work aims to customize chatbot interfaces to be culturally and linguistically sensitive, taking into account diverse approaches to disaster response across indigenous communities. We also plan to address the challenges of scalability and accessibility by investigating offline tools and alternative communication channels to reach remote areas with poor internet connectivity. Furthermore, we intend to expand the chatbot's functionalities to not only respond to emergencies but also assist communities in proactive disaster preparedness and smart mitigation strategies. We will explore the integration of chatbots with existing emergency management systems to create a seamless and more effective disaster response infrastructure. Additionally, we aim to launch educational campaigns to raise awareness among indigenous communities about how this technology can be beneficial to them.

Furthermore, we plan to leverage large language models, such as Meta's LLAMA 2 and ChatGPT, to enhance the chatbot's capabilities for context-based interactions and to provide general disaster prevention information and resources. Initially, we developed a chatbot using Google Dialogflow, a service that facilitates voice or text-based business-customer conversations. In future works, we plan to fine-tune a customized language model using the FEMA Q&A dataset¹. The chatbot's primary function is to gather specific information from users, including demographic details and property loss information, and provide documentation, informational, and mitigation responses. However, we are aware that this approach may raise concerns regarding the respectful treatment of indigenous knowledge and practices, particularly concerning the data used to train the model and the language used to respond to stakeholders. To address these concerns, ongoing collaboration with tribal nations is essential to protect stakeholders' values and interests and to ensure clarity and transparency regarding expectations for those who choose to participate in our study. It is worth noting that this aspect remains relatively understudied in the field of HCI and social computing, specifically in the context of the relationship between AI and Indigeneity, which we aim to stimulate discussion on within this research community.

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¹<https://www.fema.gov/about/organization/tribes>