An Experience Report on User-Centered Chatbot Design through Design Thinking

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Abstract. *This paper presents an experience report on the application of Design Thinking to the development of a chatbot designed to facilitate community donations and exchanges. The approach was systematically conducted through the Inspiration, Ideation, and Implementation stages, employing participatory techniques such as interviews, empathy mapping, role storming, and MoSCoW prioritization. The resulting high-fidelity prototype was evaluated by six users, achieving average scores of 5.29 for perceived usefulness and 5.71 for intention to use (TAM), as well as 6.10 for attractiveness (AttrakDiff). Findings indicate that the structured application of Design Thinking supported the creation of interaction flows and features more closely aligned with real user needs, enhancing usability, attractiveness, and empathy in chatbot design. This work offers lessons learned and practical recommendations for teams seeking to adopt user-centered methodologies in conversational interface projects, contributing to the development of more effective and socially relevant solutions.*

1. Context

The adoption of chatbots has expanded substantially over the past decade, with applications spanning domains such as commerce, education, healthcare, and public services. By leveraging natural language processing, these systems can simulate human-like interactions, offering continuous availability, scalability, and responsiveness to diverse user needs [Caldarini et al. 2022]. Despite these advantages, much of the development in this area has been predominantly driven by technical priorities—such as performance optimization, automation, and system integration—often at the expense of critical human-centered factors, including empathy, contextual awareness, and overall user experience [Chaves and Gerosa 2019]. This imbalance has contributed to the emergence of chatbot solutions that, while functionally capable, frequently fail to establish meaningful, trustworthy, and engaging interactions with their intended audiences.

In recent years, user-centered design approaches have gained prominence within software engineering, emphasizing the systematic integration of real user needs, preferences, and lived experiences into the development lifecycle [Calp and Akcayol 2019]. Among these approaches, Design Thinking has emerged as a particularly effective methodology for addressing complex design challenges. Its iterative, collaborative nature combines empathy, creativity, and experimentation, enabling multidisciplinary teams to explore innovative solutions while continuously validating them with users [Plattner et al. 2009, Brown 2009]. When applied to the Design of conversational agents, Design Thinking has the potential to produce interaction flows that are not only functional but also socially and emotionally attuned to the contexts in which they operate [Feng et al. 2024, Guha 2023].

This experience report investigates the application of Design Thinking to the development of a high-fidelity chatbot prototype aimed at facilitating community donations and exchanges. Structured around the three core stages of the methodology—Inspiration, Ideation, and Implementation—the study examines how specific techniques and tools within each phase supported the creation of more empathetic and contextually relevant conversational interactions. Beyond presenting the development process, the report reflects on the practical outcomes, lessons learned, and the implications for practitioners seeking to adopt Design Thinking in the Design of conversational agents.

2. Background

2.1. *Chatbots*

Chatbots are software systems designed to interpret natural language—whether in text or speech—and generate automated responses that simulate human conversation [Adamopoulou and Moussiades 2020]. By combining natural language processing (NLP), dialogue management, and, in some cases, machine learning, these agents can perform a wide range of tasks, from answering customer queries to supporting educational activities or facilitating transactions. Their ability to operate continuously, respond to multiple users simultaneously, and provide immediate feedback has driven widespread adoption across domains such as e-commerce, education, healthcare, and public services [Caldarini et al. 2022].

While these advantages make chatbots attractive, their Design and implementation often prioritize technical efficiency—such as response time, scalability, and integration with backend systems—over human-centered qualities, including empathy, trust, and contextual appropriateness [Chaves and Gerosa 2019]. This imbalance can result in interactions that are functional but fail to resonate with users, leading to disengagement, reduced satisfaction, and diminished trust in the system.

Recent research highlights the importance of integrating principles from Human–Computer Interaction (HCI) into chatbot design, aiming to ensure that conversational agents are not only operationally effective but also socially and emotionally attuned to their intended contexts [Calp and Akcayol 2019]. This shift towards user-centered chatbot design has been reinforced by advances in conversational UX, which emphasize personalization, adaptive dialogue flows, and multimodal interaction capabilities. In this context, methodologies such as Design Thinking provide a structured way to bridge the gap between technical robustness and meaningful user engagement, enabling the creation

of conversational experiences that balance performance with empathy and contextual relevance.

2.2. Design Thinking

Design Thinking is a human-centered design approach structured into stages that aim to understand users deeply, reframe problems from their perspective, and propose innovative and feasible solutions [Brown 2009]. Its primary objective is to address complex and ill-defined problems through collaborative and iterative processes that integrate empathy, ideation, and experimentation [Plattner et al. 2009]. Unlike traditional, linear development methods, Design Thinking blends creative and analytical thinking to explore possibilities, prototype concepts, and incorporate honest user feedback throughout the development lifecycle [Brown 2009].

When applied to the Design of conversational interfaces such as chatbots, Design Thinking has demonstrated promising results. By emphasizing the social, cognitive, and emotional dimensions of user interaction, it enables the creation of conversational flows that are not only functionally adequate but also empathetic, contextually relevant, and more likely to foster user trust and engagement [Mesquita and Ferreira 2021].

2.2.1. Inspiration

The Inspiration phase focuses on immersing the design team in the user's context to uncover needs, emotions, and behavioral patterns. This is typically achieved through qualitative research methods such as semi-structured interviews, field observations, and root-cause analysis techniques [Brown 2008]. Insights generated in this phase form the foundation for reframing the problem in a way that reflects the lived experiences of users.

2.2.2. Ideation

In the Ideation phase, the goal is to generate a broad set of creative possibilities through divergent thinking, before narrowing down and refining ideas into potential solutions aligned with user expectations [Plattner et al. 2009]. This stage often involves collaborative techniques such as brainstorming, sketching, and mapping, fostering multidisciplinary contributions that enhance the originality and feasibility of the proposed concepts.

2.2.3. Implementation

Finally, the Implementation phase transforms selected concepts into tangible prototypes and validates them through iterative testing with real users [Plattner et al. 2009]. Feedback collected during these evaluations informs refinements to interaction flows, visual Design, and functional elements, ensuring that the final solution remains aligned with user needs and contextual constraints.

3. Application of Design Thinking to the Solidarity Chatbot

3.1. Solidarity Chatbot

The scope of the chatbot emerged from the intent to create a solution that fosters stronger connections within local communities. The proposed conversational agent was designed

to mediate donations and item exchanges, promoting user collaboration. The envisioned application aimed to be accessible, empathetic, and functional, guiding users through both offering and requesting goods or services, while encouraging circular economy practices, solidarity, and resource reuse.

3.2. Inspiration

The Inspiration stage involved immersing the design team in the context of community-based donations to understand the stakeholders involved, their needs, and the challenges they face throughout the donation process. Multiple techniques were employed to capture real-world perceptions and experiences, ensuring that the resulting solution would be empathetic and aligned with the lived realities of its users.

The **Onion Model** was first applied to map the stakeholders in the donation ecosystem, structured into three levels of involvement: (i) directly affected (beneficiaries and donors), (ii) intermediaries (NGOs, volunteers, community leaders), and (iii) peripheral actors (local businesses, public authorities, and society at large). This categorization served as the foundation for identifying user profiles to be explored in subsequent research activities.

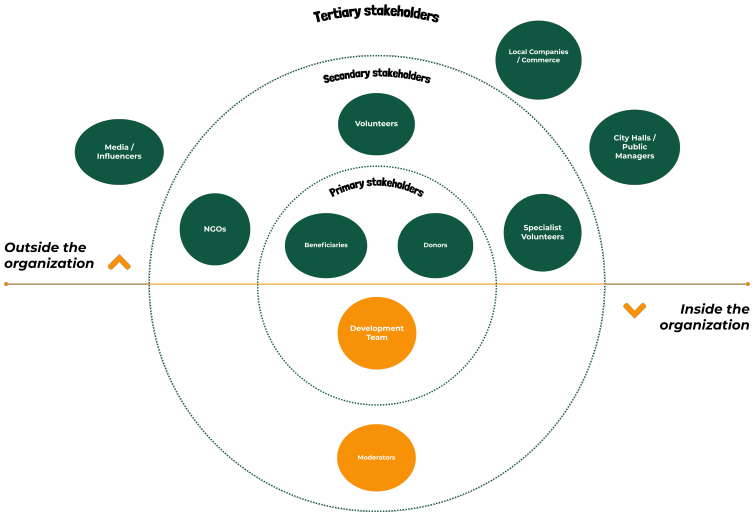

Figure 1. Onion Model

Semi-structured interviews were then conducted with two distinct profiles: an NGO coordinator and a university student who regularly donates. The NGO coordinator, with extensive experience in working with vulnerable communities, reported difficulties in beneficiary screening and in managing fragmented communication—often scattered across multiple social media channels. The student donor expressed concerns over the reliability of donation campaigns and the lack of clear, centralized information on donation drop-off points. These interviews helped refine the understanding of user needs and informed early solution hypotheses.

Next, the **Five Whys** technique was applied, starting with the central question: "Why create a chatbot for donations and exchanges?". This process uncovered both logistical and emotional motivations, such as the absence of centralized communication channels, the stigma associated with requesting assistance, and the desire to contribute meaningfully. These insights were instrumental in refining the project's goals beyond pure functionality.

Three representative **personas** were then developed: a beneficiary, a recurring donor, and a social worker. Each persona consolidated observed behavior patterns, pain points, and expectations, serving as reference profiles throughout the design process. For example, the beneficiary persona highlighted feelings of shame and fear of judgment, reinforcing the need for a safe and welcoming digital environment.

Figure 2. Personas

To further deepen the understanding of these profiles, an **Empathy Map** was constructed using the interview data and personas. This technique organized insights about what users see, think, say, and feel, revealing core issues such as insecurity when requesting help, the desire for reciprocity, and difficulty in finding clear instructions on how to make donations.

Overall, the Inspiration stage provided a comprehensive understanding of the social context surrounding donations, confirming the chatbot's objectives and validating the importance of a design approach sensitive to emotional and contextual dimensions.

3.3. Ideation

Building on the insights from the Inspiration stage, the Ideation stage aimed to generate creative solutions aligned with the needs of the identified user profiles, expanding the range of possibilities and defining core system functionalities.

The **Group Sketching** technique was the first exercise to materialize ideas. Two team members and two potential users quickly sketched desirable interaction flows for the chatbot. Initial drafts included user registration, donation listing, and donor–beneficiary communication. These sketches were then shared and refined collaboratively, allowing convergence towards cohesive design concepts.

Next, the team used **Mind Mapping** to explore and expand on system functionalities. From the central concept of a "solidarity chatbot," branches were developed for features such as registration, donation search, gamification, and moderation. This non-linear visualization facilitated the identification of emerging requirements and their logical relationships, helping structure the initial scope.

Role Storming was another key activity, in which participants simulated interactions from the perspectives of five personas: beneficiary, donor, NGO volunteer, visually impaired senior, and platform administrator. Each participant embodied one role and described how they would interact with the chatbot. This revealed the need for features such as an accessible mode with enlarged buttons, screen reader support, intuitive navigation, and simplified language.

Subsequently, the **Collage** technique was used to visually express the atmosphere and values to be embedded in the application's interface. Images, keywords, and visual

elements representing attributes such as warmth, trust, simplicity, and empathy were collected into a visual board. This served as a reference for defining the chatbot's visual identity, guiding the choice of soft color palettes, accessible icons, and a humanized tone in system messages.

The Ideation phase concluded with a systematic consolidation of requirements, prioritized using the **MoSCoW method** (Figure 3). Requirements were classified into four categories: Must have, Should have, Could have, and Won't have. This prioritization defined the solution's minimum viable scope, enabling effective allocation of development effort and the scheduling of less critical features for future iterations. Core "Must have" features included user registration, donation posting and viewing, item search, and private messaging between users.

Figure 3. MoSCoW

3.4. Implementation

The Implementation stage focused on transforming prioritized ideas and requirements into a testable solution. The team developed a **high-fidelity prototype** using Figma, enabling simulation of primary interaction flows without requiring code implementation.

The prototype (Figure 4) incorporated functionalities such as user registration, donation posting and viewing, item search, private messaging, reward redemption, and donation history tracking.

Figure 4. Protótipo de Alta Fidelidade

For evaluation, a **user testing plan** was designed involving six participants representing varied profiles, including students, frequent donors, and beneficiaries. Each par-

ticipant interacted with the prototype following a predefined task script, covering actions from account registration to simulating donations and exchanges.

During testing, team members observed participants' navigation, noting behaviors, spontaneous comments, and difficulties. Two standardized instruments were applied: the **Technology Acceptance Model** (TAM) to assess perceived usefulness, perceived ease of use, and intention to use; and the **AttrakDiff** to evaluate both hedonic and pragmatic aspects of the user experience.

4. User test results

The tests conducted with the high-fidelity prototype enabled an evaluation of the chatbot's user experience and an assessment of whether the proposed functionalities aligned with user needs. Overall, participants reported that navigation was intuitive and praised the accessible and straightforward language used in the chatbot's interactions. Features such as donation posting, donation search, and history tracking were well received, being described as both useful and intuitive. The points-based reward system was perceived as a positive incentive for participation, particularly among users who already donate frequently. On the other hand, specific improvement opportunities were identified. The registration process via the chatbot was considered lengthy or repetitive by some participants, who suggested offering a direct form-based alternative alongside the guided conversation. Additional suggestions included improving the display of search results and expanding the viewing options for available items.

The Technology Acceptance Model (TAM) evaluation indicated high levels of perceived usefulness, perceived ease of use, and intention to use the system in the future. Participants stated that Reuzy could significantly streamline the process of finding or offering donations, particularly by removing barriers such as the need for physical travel and the lack of centralized information. However, results from the AttrakDiff revealed relatively low scores in the Hedonic Identity dimension, while Attractiveness, Pragmatic Quality, and Hedonic Stimulation received favorable ratings. This pattern reinforces the potential of the solution to deliver a pleasant and functional user experience, while also highlighting areas for enhancement in building a stronger identity and personal connection with users. In summary, the results suggest that the prototype met the key requirements identified during the design cycles and that the structured application of Design Thinking contributed to the development of a socially relevant, functional, and user-sensitive solution.

4.1. Participant Feedback

Table 1 summarizes the main verbal feedback gathered during testing. Overall, comments reflected a positive reception of the system's core functionalities, while also identifying valuable suggestions for improvement—particularly regarding the registration process and item recommendation display. Positive highlights included the points system, private user-to-user messaging, and a clean, visually straightforward interface.

4.2. TAM e AttrakDiff

Table 2 shows TAM scores, which reveal high acceptance, especially in Intention to Use (5.71) and Perceived Usefulness (5.29).

Table 1. Summary of Participant Feedback

Participant	Feedback
P1	Found chatbot-based registration tedious; preferred a direct form. Liked the donation posting feature. Suggested revising the points system to prevent fraud.
P2	Considered registration boring but praised donation search. Suggested more precise item visualization. Approved of simple, functional messages.
P3	Found it easy to locate items. Rated the bot as more efficient than marketplaces. Highlighted history tracking and points system as applicable. Liked the direct chat between users.
P4	Found overall flow good but suggested recommendations show multiple options or a gallery of items.
P5	Described registration and donation processes as simple and intuitive. Liked gamification; suggested allowing ad sharing and product detail views.
P6	Praised visual Design and overall flow. Found the helpful system and stated willingness to use it. Suggested revising the AttrakDiff form, which was found confusing.

Table 2. TAM Results

Dimension	Mean (0 a 6)
Perceived Usefulness (PU)	5.29
Perceived Ease of Use (PEOU)	5.57
Intention to Use (IU)	5.71

Table 3 presents AttrakDiff results. The system achieved an excellent Attractiveness score (6.10), alongside positive ratings for Pragmatic Quality (5.12) and Hedonic Stimulation (5.81). However, Hedonic Identity scored lower (4.33), indicating opportunities for enhancing brand personality and emotional connection.

Table 3. and AttrakDiff Results

Dimension	Mean (0 a 7)
Attractiveness	6.10
Pragmatic Quality	5.12
Hedonic Stimulation	5.81
Hedonic Identity	4.33

5. Lessons Learned

The development and evaluation of the Solidarity Chatbot through a structured Design Thinking process generated several insights that may be valuable to both researchers and practitioners engaged in designing conversational agents for social impact.

Value of Early and Continuous User Engagement. Engaging with users from the earliest stages of the project proved critical for uncovering needs that extended beyond purely functional requirements. Techniques such as empathy mapping and stakeholder analysis revealed emotional and contextual factors—such as the stigma associated with requesting help—that shaped design decisions. This reinforced the importance of including diverse user perspectives not only at the outset but throughout the iterative design process.

Selecting and Adapting Design Thinking Techniques. While several techniques were highly effective (e.g., role storming, group sketching, collage), others—such as mind mapping and the Five Whys—had less direct impact in this specific context. This highlights that Design Thinking is not a rigid sequence but a flexible toolkit; techniques should be selected, adapted, or replaced based on the nature of the problem, the target audience, and the maturity of the design stage.

Balancing Functionality and Identity in Chatbot Design Evaluation results indicated strong usability, attractiveness, and hedonic stimulation, but comparatively lower scores for hedonic identity. This points to the challenge of not only meeting functional and aesthetic expectations but also establishing a distinctive personality and brand presence that fosters emotional connection. For social-purpose chatbots, building trust and identity may require deliberate narrative design and consistent tone of voice.

Importance of Flexible Interaction Paths Feedback on the registration process revealed that offering only a chatbot-guided onboarding can be cumbersome for some users. Providing alternative input paths, such as form-based registration alongside conversational onboarding, can accommodate different user preferences and increase adoption.

Educational Value for the Development Team From an educational standpoint, the project offered student participants an authentic, end-to-end experience in user-centered design. Applying Design Thinking in a real-world social context enhanced their skills in requirements elicitation, prototyping, and user testing, while reinforcing the principle that technology should adapt to users—not the other way around.

The results highlight the value of applying a structured Design Thinking process to the Design of conversational agents, particularly in contexts that demand both functional efficiency and social relevance. By grounding the chatbot's development in deep user immersion (Inspiration), the team was able to uncover not only functional requirements but also emotional and contextual drivers—such as the stigma around requesting help and the desire for reciprocity—that shaped the interaction flows. Collaborative ideation sessions generated solutions that balanced usability, attractiveness, and motivational elements, as reflected in high TAM and AttrakDiff scores for perceived ease of use, attractiveness, and hedonic stimulation. At the same time, the lower score for hedonic identity and participant feedback on onboarding and content display reveal opportunities for refining the chatbot's personality, branding, and visual presentation to strengthen user connection. These findings reinforce that Design Thinking, when applied systematically, can bridge the gap between technical robustness and human-centered experience, enabling the creation of chatbots that are not only operationally effective but also empathetic, contextually relevant, and capable of fostering sustained user engagement.

6. Conclusion

This paper shows the experience report on the application of Design Thinking to the development of a chatbot aimed at mediating community donations and exchanges. The experience demonstrated that a user-centered approach can significantly contribute to the creation of solutions that are not only functional and technically sound, but also empathetic to the social and emotional contexts in which they operate.

By systematically conducting the Inspiration, Ideation, and Implementation stages, the team was able to capture the real needs of diverse user profiles, understand the barriers and motivations shaping their interactions, and translate these insights into tangible design decisions. Participatory techniques such as interviews, empathy mapping, and co-creation dynamics played a decisive role in generating interface and functionality concepts closely aligned with user expectations. Although some techniques—such as mind mapping and the Five Whys—were perceived as less impactful in this specific context, their inclusion still contributed to maintaining a holistic exploration of the problem

space.

The high-fidelity prototype, developed in Figma, was positively evaluated by real users, with TAM and AttrakDiff results indicating high perceived usefulness, ease of use, attractiveness, and hedonic stimulation. At the same time, the relatively lower score for hedonic identity and specific feedback on onboarding and item display highlight opportunities for refinement, particularly in strengthening the chatbot's personality, branding, and visual presentation.

Some limitations were noted, including the absence of certain planned features—such as an offline map and NGO dashboard—in the prototype. Addressing these gaps, alongside the enhancements suggested by participants, would be a step toward increasing adoption and long-term engagement.

Beyond the product itself, the project provided a valuable experiential learning opportunity for the student team. Engaging directly with users and iteratively refining the solution reinforced the importance of placing the user at the center of the development process. The experience also underscored that a chatbot designed for social impact must go beyond technical adequacy to foster trust, empathy, and contextual relevance—qualities that structured Design Thinking processes are well-positioned to cultivate.

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