Design Thinking Approach in Building a Chatbot for Troubleshooting and Handling Disruption Complaints in Network Services

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A B S T R A C T

This study explores the application of the Design Thinking approach in building a chatbot for troubleshooting and handling service network disruption complaints. Specifically, the DeepDive method IDEO developed is the main framework in the chatbot creation process. DeepDive, as a methodology that focuses on a deep understanding of user needs and creative problem-solving, allows chatbot creators to design solutions that are highly suitable for unique challenges faced by users in network services. The result is a chatbot capable of effectively handling complaints and providing timely solutions. The research results show that applying IDEO's DeepDive methodology can enhance the efficiency and effectiveness of chatbots in addressing disruption complaints. This significantly contributes to improving network service quality and overall customer satisfaction. This study provides important insights for practitioners and researchers on applying Design Thinking and deep-dive methodology in creating chatbot technology.

Keywords: Design Thinking, DeepDive Methodology, Disruption Complaints, Troubleshooting.

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1.   INTRODUCTION

Network services have become the backbone for most daily activities in an increasingly digital world [1]. Almost all aspects of our lives depend on stable and reliable connectivity, from communication and entertainment to business and education [2]. However, disruptions in network services can occur at any time and hinder productivity and efficiency. One emerging technology is chatbots, a computer program designed to simulate human conversation. To address this issue, many organisations have begun using chatbots to quickly and efficiently handle network disruption complaints[3]. Chatbots can respond instantly to user questions or problems, making them valuable tools for troubleshooting and handling complaints [4], [5].

However, creating an effective chatbot is a challenging task. It requires a deep understanding of user needs and the ability to design intuitive and user-friendly solutions that meet those needs. Therefore, this chatbot creation process needs a structured and user-centred approach [6], [7].

Design Thinking is one such approach [8]. Design Thinking is a methodology that places users at the centre of the design process. Through a series of stages, Empathize, Define, Ideate, Prototype, and Test [9]. Design Thinking encourages us to understand challenges from the users' perspective, create innovative ideas to face them, prototype our solutions, and test them in real-world contexts [10]–[12].

In this research, we apply the Design Thinking approach in creating a chatbot for troubleshooting and handling service network disruption complaints. We focus on how this approach can help us create innovative solutions that meet existing user needs at Panca Budi Development University [13]–[15] while maintaining quality interaction between humans and machines.

2.   RESEARCH METHOD

IDEO's DeepDive™ methodology is a user-centred approach called "design thinking"[16]. This approach attempts to understand users, challenge assumptions, and redefine problems to identify alternative strategies and solutions. This research will utilise the design thinking approach and apply IDEO's DeepDive

methodology. IDEO is a global design firm focused on creating products, services, and experiences that positively impact humans. IDEO is known for their "design thinking" approach - a method for solving complex problems in a human-centred way. This approach involves profoundly understanding user needs and challenges, generating innovative ideas, and testing them through prototypes.[17]

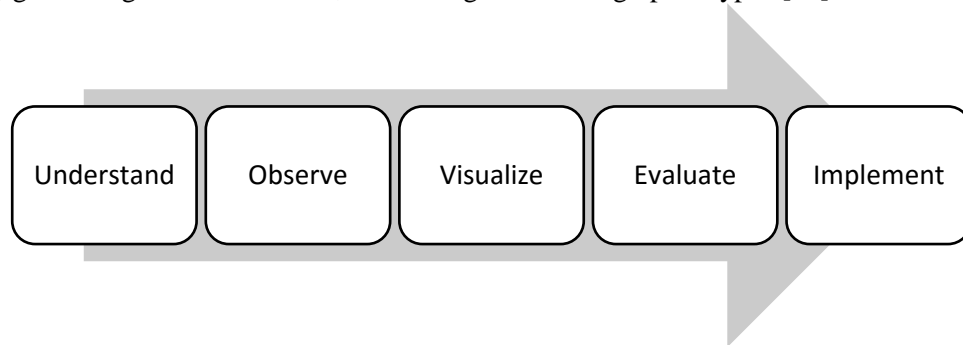| Understand | Observe | Visualize | Evaluate | Implement |

Figure 1. IDEO: DeepDive Methodology

The author uses IDEO's Deep Dive method in this research, part of the design thinking approach. This method consists of five stages: understand, observe, visualize, evaluate and implement.

1. Understand

In this stage, the researcher strives to understand users' needs, including employees and lecturers, in creating a chatbot for troubleshooting and handling complaints about network service disruptions. This involves a deep understanding of how network services are hindered, what common problems users face, and how a chatbot can help solve these issues.

2. Observe

The observation stage involves observing actual user behaviour in real situations. The observations are when users encounter problems, how they report their issues or complaints, and how the troubleshooting process is carried out. These observations provide insights into what users truly need from a chatbot.

3. Visualize

After understanding and observing, the next step is to design the chatbot concept by visualizing it. In this stage, the author designs the main functions of the chatbot based on previous observations and understanding results.

4. Evaluate and Refine

After the initial prototype is created based on that visualization, an evaluation needs to be done by testing it with users to get their feedback. This feedback is then used to refine the design and functionality of the chatbot.

5. Implement

The final stage is the implementation or launch of the chatbot after all improvements have been made based on user feedback in the previous evaluation stage

3. RESULTS AND DISCUSSION

3.1 Default Welcome Message

The welcome message in a chatbot is an important starting point in the interaction between the user and the chatbot [18]. This is the chatbot's first response when a user initiates a conversation through a chat window or a start button. This message determines whether users will continue interacting with the chatbot.
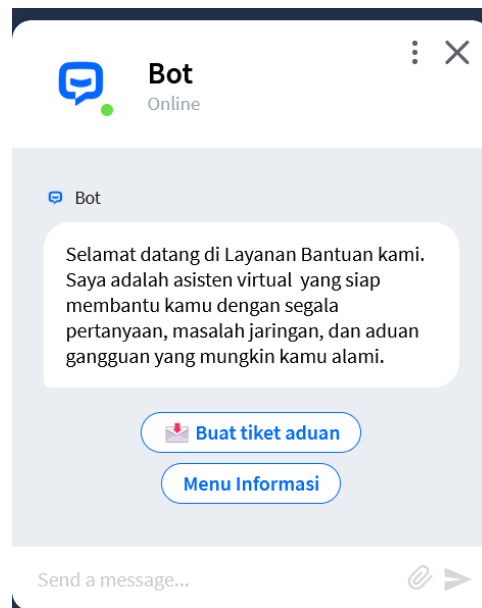
Figure 2. Welcome Message

The welcome message delivered at the beginning explains to the bot users that they must speak with a natural person. To ensure that users understand they are not talking to a natural person, the term "virtual assistant" is used. Subsequently, users can see several buttons to explore. Users do not need to type anything to get answers to their questions. This method helps prevent misunderstandings and helps keep the conversation going.

3.2 Collect User Input in ChatBot

The functionality of a chatbot depends on the process of collecting user input, which allows the chatbot to gather data and understand the desires and needs of users. The chatbot can interactively engage and provide personalised responses by collecting user input [19]. By requesting specific information or answering questions, it can tailor its responses to meet user needs, resulting in more dynamic and relevant interactions between the chatbot and users.

Figure 3. Collect User input

Users can type their responses using natural language text. The chatbot then processes this text input to understand and generate an appropriate response. The configuration of user input collection involves

defining questions or instructions to its users so they know what information is needed or expected from them.

3.3 Fallback messages in ChatBot

Fallback interactions in a chatbot play a crucial role when the bot cannot recognise a message from the user. This fallback allows customers to reformulate their questions, display available answer options, or even direct them to communicate via other methods.

This fallback feature helps the chatbot maintain the conversation despite misunderstandings or ambiguities. So, the system automatically triggers fallback interactions whenever the bot cannot identify a particular message from the user due to its low confidence score.
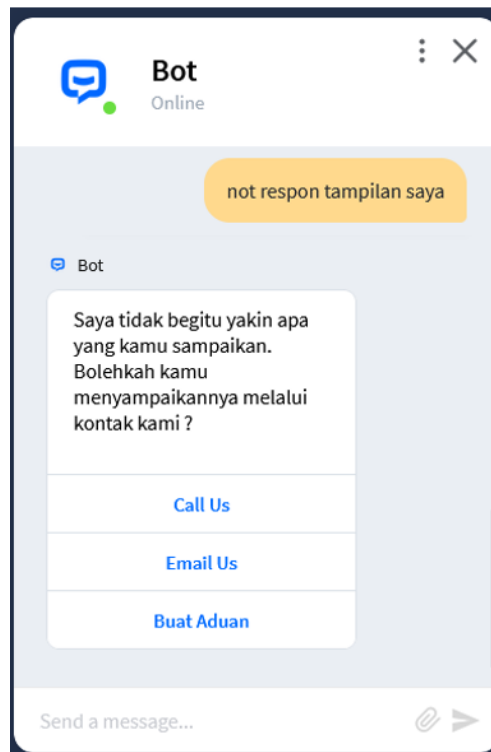

Figure 4. Fallback message

3.4 Gather user data with ChatBot

Collecting user data with a chatbot, or "Gather User Data with ChatBot", is an effective strategy for handling service disruption complaints. Using question blocks, the chatbot can collect crucial information from users such as name, email, unit, subject, and description of the disruption.

This process starts with the chatbot asking the user to enter specific information. For example, the chatbot may ask about their username and email address for identification purposes. Next, it will request further details like the unit or department where they work and the subject of the problem they are facing.

The bot will ask for the name, email, division/unit, subject and description that become service disruption complaints. The description of the disruption is also very crucial in this process. The chatbot will ask users to explain in detail about issues they are experiencing. Technical support teams or other relevant departments can then use this information to diagnose and resolve these complaints.
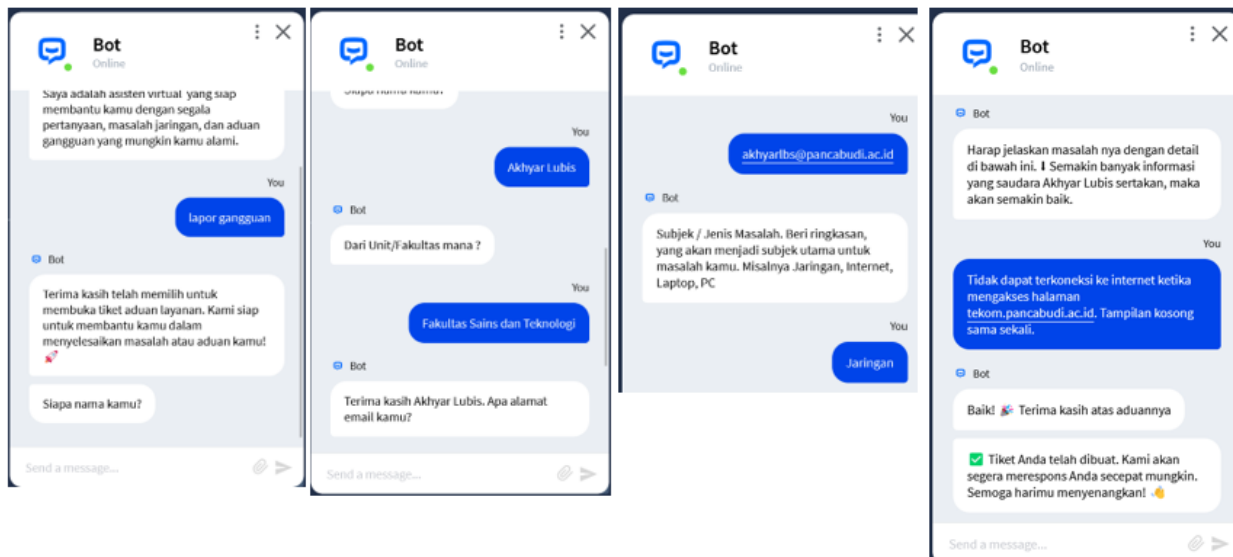
Figure 5. Gather user data

In this way, Gather User Data with ChatBot not only assists in obtaining the necessary information to handle service disruption complaints but also provides faster and more efficient service to users. This will undoubtedly enhance customer satisfaction and the company's overall operational efficiency.

4. CONCLUSION

This discussion provides an overview of some crucial aspects of the operation and utilisation of chatbots. The welcome message is an important starting point for interaction, clarifying that users interact with a virtual assistant, not a human, and offering buttons to explore the chatbot's features.

Next, collecting user input forms the main foundation of chatbot functionality. Through natural text interactions or defined instructions, chatbots can understand and respond to user needs effectively.

Fallback interactions also play a vital part in the chatbot system. When the bot cannot recognise a user message or misunderstandings occur, fallback mechanisms will be triggered to help maintain conversation and guide users.

Finally, the Gather User Data with ChatBot strategy collects essential user data such as name, email, work unit, complaint subject, and disruption description. This information is then used to resolve complaints more quickly and efficiently.

Overall, the combination of effective welcome messages, good ability to collect user input, and reliable fallback mechanisms ultimately help improve service quality by better handling service disruption complaints using chatbots.

REFERENCES

[1]   A. Lubis, R. Septian, F. Sain, U. Pembangunan, and P. Budi, "Pengembangan Aplikasi Troubleshooting Jaringan Melalui Sistem Notifikasi dengan Integrasi Cacti dan Telegram," vol. 4, no. 1, pp. 104–109, 2022.

[2]   R. Pratama, A. Lubis, and S. Wahyuni, "RANCANG BANGUN SISTEM LOAD BALANCER DENGAN LAYANAN CLOUD AMAZONE WEB SERVICES," *Journal of Information Technology and Computer Science (INTECOMS)*, vol. 5, no. 2, 2022.

[3]   J. Penerapan Kecerdasan Buatan, A. Lubis, R. Septian, and F. Sain dan Teknologi, "Pengembangan Aplikasi Troubleshooting Jaringan Melalui Sistem Notifikasi dengan Integrasi Cacti dan Telegram," 2022.

[4]   A. Almustaqim and A. N. Toscany, "Perancangan Sistem Chatbot Sebagai Virtual Assistant Pada PT. Everbright Jambi," 2022.

[5]   A. Lubis and I. Sumartono, "Implementasi Layanan Akademik Berbasis Chatbot untuk Meningkatkan Interaksi Mahasiswa," *RESOLUSI : Rekayasa Teknik Informatika dan Informasi*, vol. 3, no. 5, pp. 397–403, 2023, [Online]. Available: https://djournals.com/resolusi

[6]   A. Almustaqim and A. N. Toscany, "Perancangan Sistem Chatbot Sebagai Virtual Assistant Pada PT. Everbright Jambi," 2022.

[7]   A. S. S. K. Sreeharsha, S. M. Kesapragada, and S. P. Chalamalasetty, "Building Chatbot Using Amazon Lex and Integrating with A Chat Application," *Interantional Journal of Scientific Research in Engineering and Management*, vol. 06, no. 04, pp. 1–6, 2022, doi: 10.55041/ijsrem12145.

[8]   N. Cross, *Design thinking: Understanding how designers think and work*. Bloomsbury Publishing, 2023.

[9]   R. A. Hasani, M. R. A. Yudianto, P. Sukmasetya, and Y. Febriyanto, "Uji Prototype Metode Design Thinking pada penyebaran Informasi COVID-19," *Jurnal Kajian Ilmiah*, vol. 22, no. 2, pp. 163–172, 2022.

[10]   R. S. Hardinata, R. F. Wijaya, A. Putra, and L. Nastari, "APLIKASI RECORDING TERNAK DOMBA BERBASIS WEB MENGGUNAKAN METODE DESIGN THINKING," *Penerbit Tahta Media*, 2023.

[11]   R. S. Hardinata, I. Sulistianingsih, R. F. Wijaya, and A. M. Rahma, "Perancangan Sistem Informasi Pelayanan Rekam Medis Menggunakan Metode Design Thinking (Studi Kasus: Puskesmas Simeulue Tengah)," *INTECOMS: Journal of Information Technology and Computer Science*, vol. 5, no. 2, pp. 112–118, 2022.

[12]   R. S. Hardinata, R. F. Wijaya, A. Putra, and L. Nastari, "Analisa Metode Design Thinking Dalam Merancang Aplikasi Recording Ternak (Studi Kasus: Kelompok Tani Karya Bersama," *INTECOMS: Journal of Information Technology and Computer Science*, vol. 6, no. 1, pp. 283–289, 2023.

[13]   I. MALIKHAH, "PENGARUH MUTU PELAYANAN, PEMAHAMAN SISTEM OPERASIONAL PROSEDUR DAN SARANA PENDUKUNG TERHADAP KEPUASAN MAHASISWA UNIVERSITAS PEMBANGUNAN PANCA BUDI," *Jurnal Manajemen Tools*, vol. 11, pp. 67–79, 2019.

[14]   A. Lubis, E. Hariyanto, M. I. Harahap, U. Pembangunan, and P. Budi, "Wireless controller menggunakan capsman di jaringan laboratorium komputer perguruan panca budi medan wireless controller using capsman in computer laboratory network of panca budi education medan," *Journal of Information Technology and Computer Science (INTECOMS)*, vol. 5, pp. 97–103, 2022.

[15]   S. Wahyuni, K. S. Saragih, and M. I. Perangin-Angin, "IMPLEMENTASI METODE DECISION TREE C4. 5 UNTUK MENGANALISA MAHASISWA DROPOUT," *Ethos (Jurnal Penelitian dan Pengabdian Masyarakat)*, vol. 42, p. 51, 2018.

[16]   R. Friis and Yu Siang Teo, "10 Insightful Design Thinking Frameworks: A Quick Overview ." Accessed: Sep. 30, 2023. [Online]. Available: https://www.interaction-

design.org/literature/article/design-thinking-a-quick-overview#4._deepdive%E2%84%A2_methodology%E2%80%94ideo-4

[17]   interaction-design, "What is Design Thinking?" Accessed: Sep. 30, 2023. [Online]. Available: https://www.interaction-design.org/literature/topics/design-thinking

[18]   R. Usmany, "PENGEMBANGAN CHATBOT PENGADUAN DAN TROUBLESHOOTING TEKNOLOGI INFORMASI DENGAN PENDEKATAN NLP (STUDI KASUS: POLITEKNIK NEGERI AMBON)," *JURNAL SIMETRIK*, vol. 12, pp. 575–583, 2022.

[19]   C.-C. Lin, A. Y. Q. Huang, and S. J. H. Yang, "A review of ai-driven conversational chatbots implementation methodologies and challenges (1999–2022)," *Sustainability*, vol. 15, no. 5, p. 4012, 2023.