Towards Human-Centered Design of AI Service Chatbots: Defining the Building Blocks

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Abstract. Chatbots have been spread widely to online customer service due to recent technological advancements. For chatbots' successful utilisation as customer servants, it is essential that they are developed for human users in a way that meets their needs. Human-centred design (HCD) puts humans in the centre of the development. However, research-based information of HCD for service chatbots is still scarce. Hence, we reviewed recent literature to explore and map the relevant themes that are recurrent in chatbot research to determine the building blocks of HCD for service chatbots. Our study reveals three main themes: (i) AI service chatbots' purpose is to serve humans, (ii) trust is crucial for service chatbot uptake, and (iii) AI chatbot design combines user interface design, dialogue design, and bot persona design to create positive UX. The findings of our study serve as a basis to the understanding of human-centered chatbot design, and can help practitioners develop service chatbots that are successful in supporting users accomplish their tasks.

Keywords: Chatbots, human-chatbot interaction, human-AI interaction, human-centred design (HCD), literature review

1 Introduction

Chatbots are conversational and interactive software technology that are rapidly gaining their popularity because of their availability and interaction using natural dialogue [7]. One domain where chatbots are gaining popularity is customer service as chatbots are seen as holding great potential in terms of service efficiency, cost savings, and customer experience [29]. Customer service chatbots (referred hereafter as "service chatbot") can repeatedly answer questions, give information, and help people to accomplish their tasks without getting tired or bored. The use of chatbots as customer servants benefits both customers and companies, for flexibility, accessibility, and low-cost operations in comparison with human assistants [10, 31]. Recent developments in AI techniques have made chatbots easier to implement, more flexible in terms of application and maintainability, and increasingly capable to offer natural conversation and intuitive interaction [1]. Hence, AI improves the interaction between human and chatbot and increases chatbots' affordances.

However, conversing with artificial agent can raise concerns. First, the use and the use domains of service chatbots might influence their users and other people's lives. Chatbots influence the behaviour of the user by asking questions and responding to the user's questions [11]. Second, automated software might be unable to answer various queries or not work properly for their purpose, as currently develop chatbots are typically set up following a one-size-fits-all approach [9]. Moreover, often customers, the users of the service chatbots, are unwilling to share their personal information with chatbots citing privacy concerns [3]. In addition, the utilisation of AI brings AI-related factors to take account to, like explainability or fairness [13]. Hence, it is not surprise that in current situation companies prefer using chatbots, but their customers are hesitant and the uptake of service chatbots lag behind [1, 29].

To improve chatbots as customer servants, we have to understand the users and other humans affected by the chatbots decisions and recommendations and their needs, and approach these with an appropriate human-centered design (HCD) approach developed to service chatbots. With appropriate HCD approach we can develop chatbots that are efficient and useful for their purpose, as well as safe and trustworthy. However, for that it becomes paramount to have a clear overview of what should be considered in HCD for service chatbots. There is a lot of research on the chatbot domain, however there is a lack of knowledge of what makes service chatbot human-centered or design instruction for them. Hence, we set out to understand what are the building blocks of HCD of service chatbots are. The research question of this study is:

RQ: What are the building blocks of HCD for AI service chatbots?

The present study identifies, analyses, and integrates scientific research on AI and service chatbots across different fields in order to understand and define the building blocks of HCD for service chatbots. We analyse the data derived from 34 chatbot papers with a human-centered lens. Our study offers two main contributions: (i) theoretical: a novel perspective on the topic and a base for the future research, (ii) practical: themes that enable practitioners consider essential building blocks for designing chatbots for successful online customer service.

2 Background

2.1 Chatbots

Chatbots could be classified into various categories based on several criteria. One way to classify chatbots is based on the domain [14]. Closed domain chatbot means that the chatbot works in some closed domain, e.g., for a certain company. This is in contrast to so-called open-domain or general chatbots [29]. Chatbots can be classified by the length of the that can be short-term, where the interaction ends when the user has accomplished the task, or long-term interaction with the user, that evolves during time [2, 9]. In addition, chatbot can be task- or goal-oriented meaning that these chatbots have some predetermined task or purpose that they serve. Unlike task-oriented chatbots, non-task

oriented chatbots can simulate a conversation with a person and seem to perform chitchat for entertainment or social purpose in open domains [29]. These chatbots can be called social chatbots, too, whose purpose is social, mainly to serve users' needs for communication, affection, and social belonging [2, 25]. In addition, chatbot can be classified by the technology the use. Chatbots can be rule-based, or they can utilise AI [29]. Rule-based chatbots use a series of pre-determined defined rules, whereas AI models are based on Machine Learning (ML) algorithms that allow them to learn from an existing database of human conversations. This allows chatbots to be more flexible and no longer dependent on domain specific knowledge [1, 28]. With the help of Natural Language Processing (NLP) and Voice Recognition (VR), chatbots can provide more possibilities for the user to interact with the chatbot in the way that is preferable for the user [1, 28]. In addition, AI chatbots can learn from the use and its behaviour can evolve based on the use data to better respond to a variety of user needs [1, 28].

In this study, our focus is on chatbots that utilise AI and they are used in customer service. Service chatbots are usually task-oriented and they work in specific closed domain, like for certain company. Usually, the interaction between the service chatbot and the human is short-term – it ends when the user has accomplished the task.

2.2 Chatbots in customer service

In the past five years, chatbots have become more widely available and more popular as a customer service solution [9, 10]. Currently chatbots can facilitate various business processes, particularly those related to customer service and personalization because of their accessibility, fairly low cost, and ease of use for the end consumers [1, 7, 10, 28]. Studies show that efficient and accessible support is the main motivation to use this technology [14]. Service chatbots provide users with action possibilities related to distilling information, hence, they facilitate users´ understanding of large information amounts. In addition, service chatbots can enrich the information provided. AI-enabled information enrichment makes chatbots more helpful as assistants in everyday tasks. Chatbots can provide context to what users are talking about or looking for. Hence, they can identify relevant information, provide feedback as reaction and orient ongoing conversations. In addition, with AI's help, service chatbots contribute to the provision of personalised experiences.[1, 10, 29] They are able to adapt interactions to their users providing tailored responses, adjusting their tone and style. As chatbots learn from interactions further they continually improve personalisation [7]. Although cost- and time-saving opportunities triggered a widespread implementation of AI-based chatbots, they still frequently fail to meet users expectations potentially resulting in users being less inclined to comply with requests made by the chatbot [9].

While an increasing number of service providers are offering customer service through chatbots, the acceptance of service chatbots is growing more slowly than expected []. In order to accept a technology, or to keep its usage over time, individuals need to be motivated [24]. Service chatbots are typically designed for efficient and effective interactions, accentuating pragmatic quality, and there is a need to understand how to make these more pleasant and engaging, strengthening hedonic quality [12]. Studies show that perceived value plays a major role in affecting behavioural intention

to accept chatbots for customer care [6, 24]. Understanding and improving user experience is key to strengthening uptake and realizing the potential of chatbots for customer service [12, 16]. UX with service chatbots concerns whether the user is provided relevant answers to their queries and the chatbot interaction brings them closer to resolving their problem [9, 10]. This implies that user experience varies substantially depending on the problems that motivate users to interact with the chatbot. [16] Chatbot use is beneficial for companies when associated with positive customer experience [19].

2.3 Human-centered design

The development of human-centered chatbots is based on the idea of human-centered technology and human-centered design (HCD). HCD refers to development of useful technology that offers positive UX [8]. Focus is on humans and how they behave and interact with the technology, as it aims fundamentally understand and improve the relation between computational technology and human, as well as enhance human performance [15]. Human-centered approach can help designers adapt to the affordances of emerging technologies, making sure that essential and important factors are being considered in the development. This approach contributes to a broad consideration to human characteristics as well as contextual understanding very early in the product design in order to design an interactive system that fulfils various stakeholders' needs.[8, 15]

3 STUDY DESIGN

To identify relevant themes related human-centered service chatbots in current research we conducted a study using the integrative literature review method [27]. We use integrative literature review method, as that is suitable especially for emerging topics. An integrative review method should result in the advancement of knowledge and theoretical frameworks, rather than in a simply overview or description of a research area. We follow literature review process proposed by Snyder et al. (2019) that consists of four phases: (i) designing the review, (ii) conducting the review, (iii) analysis, and (iv) writing up the review [27]. The resulting literature corpus is described in Appendix.

3.1 Phase 1 – designing the review

The goal of this study was to understand and define the building blocks of human-centered service chatbots. As the topic is widely studied and it would not have been possible to systematically review all the material, we decided to approach the problem with an integrative literature review. An integrative literature review has an aim to assess, critique, and synthesize the literature on a research topic in a way that enables new theoretical frameworks and perspectives to emerge. This method has the purpose is usually not to cover all articles ever published on the topic but rather to combine perspectives and insights from different fields or research traditions. The general aim of a data analysis in an integrative review is to critically analyse and examine the

literature and the main ideas and relationships of an issue. An integrative review method should result in the advancement of knowledge and theoretical frameworks, rather than in a simply overview or description of a research area [27]. We continued identifying databases for the literature search. Our primary database concluded to be Google Scholar, as we wanted to find studies from a variety of domains, and it covers all the relevant databases. Additionally, we used Semantic Scholar and the Tampere University's database.
After this, we determined the inclusion / exclusion criteria, based on this study's scope and aim.

The inclusion criteria in this review are the studies that:

- refer to AI chatbots, their design, or UX
- refer to chatbots in customer service
- are published as peer-review academic articles
- are written in English
- are published between 2016-2022, as the use of chatbots in customer service has increase dramatically during last five years

We excluded papers concentrating on:

- rule-based chatbots, as their basic functioning is different. However, some papers did not specify if they were talking about rule-based or AI chatbots
- social chatbots papers, as we believe that these two types of chatbots should be studied differently regarding the profound differences in their affordances / purposes
- papers specific to certain use (e.g., 'Covid-19 chatbot'), use domain (e.g., education or banking), or geographical area (e.g., "Chatbot acceptance in India"), as our aim was to study the phenomena in general
- papers of technological development (e.g., chatbot development techniques or programming), as our aim is in the design
- personal assistants, since this term consistently refers to voice-based assistants such as Google Assistant or Amazon's Alexa
- publications others than academic papers, e.g., books or technical reports, as we wanted to base the knowledge in peer-review scientific knowledge

3.2 Phase 2 – conducting the review

We had a four-step approach to conduct the integrative literature review.

STEP 1 – initial search: we conducted the literature search in May 2022. We initially started querying the selected databases using a seed search term "chatbot" and "chatbots" which broadly described the subject matter and we wanted to collect information broadly from different perspectives (Noteworthy is that a search with a search word "human-centered + chatbot" came back with cero hits). For the same reason we chose to not limit the field of the study. Boolean words "AND", "OR", and "NOT" in the searching strategies were applied. Our first search 'chatbot OR chatbots'

resulted in tens of thousands of results, so we added some restrictions from our exclusion criteria to the search in order to reduce the number of results. Thus, we applied a first filtering operation by selecting articles based on their title. The objective was to focus only on relevant articles for our study. For this step the exclusion criteria were used. We excluded papers that mentioned teaching, education, social, or health in the title, as these papers were not in the scope of our research. This resulted to 520 results.

Step 2 – screening: we screened these papers by the title, keywords, and abstract based on the predetermined inclusion / exclusion criteria to check their relevance to the research question. For this step the exclusion criteria were used. To maintain the original focus of our study, we discarded articles that focused on rule-based or social chatbots. We also discarded articles that consider chatbots for specific use or use domain. We selected only the relevant articles that provided concrete information related to service chatbots or AI chatbots. At the end of this step, 135 papers were shortlisted for review**.**

Step 3 - full text assessment: the full text of the shortlisted papers was assessed for relevance. We again used the inclusion / exclusion criteria, and also excluded some of the papers if they had no relevant information to offer related to our research question of human-centeredness of the service chatbots. Overall, 102 papers were excluded, leaving total of 33 papers included to our study corpus (list of papers is listed in Appendix). We conducted the same search in Semantic Scholar and Tampere University's database, but we did not find any new relevant articles with these searches.

Step 4 - snowballing: finally, we studied the bibliographies of the chosen articles to identify more articles that seemed pertinent. We used Google scholar to retrieve the full text of potential articles that appeared in the bibliography of 34 articles. This process allowed us to obtain a further two relevant articles for our study.

3.3 Phase 3 – analysis

We used the content of the selected and reviewed articles as data to be analysed for developing themes describing the phenomena. We combined deductive and inductive coding [25]. We had nine pre-determined codes related to the basic concepts of HCD: *user*, *user interface (UI)*, *usability*, *user experience (UX)*, *interaction*, *purpose*, *acceptance*, *adoption*, and *design*. We used these codes as keywords to find relevant information related to our research question. In addition, we used inductive coding, in order to find elements related to chatbots in customer service or to the use of AI in chatbots. The codes that emerged from the literature are: *antromorphism*, t*rust*, *transparency*, *explainability*, *privacy and data use*, and *fairness*. All the different chatbot elements related to HCD identified in the papers were coded. The first author reviewed and coded all the data. We used data analysis -tool Atlas.ti for the coding. Data analysis was supported by memo writing [4]. After coding all the corpus, these codes and related memos were analysed and challenged by another researcher, and we

refined and modified the codes based on these conversations. After refining the codes, the first author conducted a second round of coding and then as a team we discussed and refined each code. The data that we withdraw from the chosen articles was then analysed using Thematic Content Analysis (TCA). In thematic analysis, key elements and frequently occurring features are highlighted from the material in terms of the research problem [25, 30]. Our aim was in defining the building blocks that should be considered in HCD of service chatbots. Hence, we were not aiming to summarise and synthetise the content of the chosen articles, but derive the relevant information related to our RQ and the aim of the study. We reviewed the chosen articles with HTI and HCD lens, filtering the text based on the main concepts of these fields. We recognised three overarching themes defining the building blocks of HCD for service chatbots. Codes and themes are presented in table 1. The outcome of this analysis is presented in the next section.

Table 1. Codes and themes.

Codes	Main theme	Subtheme
User (45), purpose (9), acceptance (23), adoption (14), domain (14), context (25)	Service chatbots purpose is to serve user and their needs	Users and their needs AI and chatbot to be used when the best tool Chatbot acceptance
Explainability (17), transparency (21), trust (94), fairness (13), privacy and data use (22)	Trust is essential for service chatbot uptake	Perceived expertise and responsiveness Explainability and transparency Privacy and data-use Fairness
Interaction (23), UI (21), UX (94), design (97), attributes and characteristics (28)	Service chatbot design should combine *UI*, *dialogue*, and *bot personality* design to create positive UX	UI design Dialogue design Bot personality

4 RESULTS

This chapter presents three themes describing the building blocks of HCD of service chatbots derived from the data. In the theme descriptions, we refer to the articles in the corpus with codes A1…A34. In the beginning/end of each theme, we summarise the key points of the theme.

THEME 1: USER – SERVICE CHATBOT'S PURPOSE IS TO SERVE USER AND THEIR NEEDS

Included codes: user, purpose, acceptance, domain, context

User and their needs

Being compatible with the user should be the main goal for a chatbot. This depends on the way the bot carries out the conversation depending on its ability and qualities. The design and development of a chatbot should be based on the requirement from the customer base and should solve a specific purpose with the well-defined objective to be achieved. It is essential to clearly determine the user's problem and the necessity and the purpose of the bot. Requirements and development decisions rise from these. Context needs to be considered in understanding the conversation or the type and purpose of the conversation for which chatbot needs to be designed. The domain where a chatbot will be deployed has to be fully understood in order to develop chatbot accordingly. Designers have to fully understand the context, its requirements, and then tailor the content to fit to it. It is crucial to specify the tasks of the bot - it should be clear what bot should do and how well. Tasks are aimed for the efficiency and usefulness of the service – being compatible with the user should be chatbots main goal.

AI and chatbot to be used when the best tool

Appropriate AI technique and interaction design approach for the chatbot are chosen according to the purpose and the use domain. Chatbot and AI should be used when the best solution to the user problem, or they have something unique to offer. The hype around chatbots, as well as the need to save in costs, has motivated companies to deploy chatbots to support their customer service. However, there are factors related to the utilisation of AI as well as to technology as a customer servant. Hence, companies have to make sure they first understand the needs of their customers, their users, and based on those needs they try to find the best solution to solve that need. If that is AI-powered chatbot, companies should make sure that they have resources to build well-functioning chatbot that really solves the user needs. Deploying a chatbot that does not work well or help the user to solve their problems, might affect negatively to the whole organisation or brand image.[A9, A17, A22, A24]

Chatbot acceptance

Correctness of the chatbot produced suggestions as well as its effectiveness are the keys to service chatbot acceptance. As service chatbots work as customer servants, the expectations that the users have for those are similar to the regular customer service – they have a problem or a query that they want help or guidance from the customer servant. A key success factor for service chatbots using natural language user interfaces is how well they can support user needs in the conversational process seamlessly and efficiently - if the user is able to solve their problem or their query, they are happy and content, and this affects positively to the acceptance of the chatbots in customer service. In order to develop correct and efficient service chatbot solutions, the developer have

to understand the user need and define that chatbot tasks, so that they can base the development for these. [A1, A2, A6, A14, A17, A18]

THEME 2: TRUST IS ESSENTIAL FOR THE SERVICE CHATBOT UPTAKE

Included codes: explainability, transparency, trust, ethics, fairness, privacy and data use

Trust seems to be an important factor in human-chatbot interaction as well, especially in those contexts where the conversational agent's actions may have heavy consequences for the user. In related literature we found trust in customer service chatbots to be related to two factors: (i) chatbot-related factors, and (ii) context-related factors [A6, A18].

Perceived expertise and responsiveness

Results show that the chatbots' expertise and responsiveness impact trust. This means that the chatbot's ability to correctly interpret the users' requests, provide helpful responses, and relevance of the answers are key factors that positively impact on trust. The quality of the chatbot responses reflecting its ability to understand, and that builds trust. In addition, user's perception of the consistency with which the chatbot behaves, affects trust. In addition, getting fast response from the chatbot impact positively on trust, as such responsiveness makes the service chatbot an efficient means of support.[A6, A9, A18]

Explainability and transparency

Explainability of information processing performed by AI is essential when building trust. It is important to clearly explain how chatbot thinks and works, define the outcomes and how the chatbot will contribute to it. Helping people to understand chatbots workings can make them use them better. The explanations given by the chatbot should be appropriate for to user and to the user context, so that they would be understandable. Human and chatbot need to communicate in a way that is intuitive for both of them. This requires the development of appropriate human-agent interfaces and agent protocols to provide information and visualise explanations. Transparency of the chatbots could be translated as 'truthfulness'. It is important that the bot is being truthful with the user throughout the interaction, starting with stating that it is a bot. It is beneficial to set the right expectations by declaring what the bot can do and how well, its skills and limitations. In addition, chatbot should always answer in reasonable manner, grounded on the understanding of the user and the domain. It is important, that with requests that the chatbot do not understand, it is honest and clear about the situation and the problematic part of the question, stating if they cannot answer, instead of silly answers. When chatbot's skills match the expectations of the user, the UX will be better and trust is built.[A1, A6, A9, A15, A22, A24, A32]

Privacy and data-use

One of the main aspects in trust in service chatbots is privacy and data use. Users have to feel comfortable to share even personal data, if it is necessary for the chatbot to serve to user effectively. Companies should be aware of the responsibilities and precautions related to the privacy, data collection, data use, and storage. The use of data should be designed to align with appropriate guidelines for the purpose and use domain. Chatbot must always be developed to protect user data, also in the cases where the data is directed to a third party. User should always be able to know the data collected and how this data will be used and stored. User has to be able to abort the task before giving any personal data if they choose so.[A1, A6, A8, A9, A14, A15, A25, A30,]

Fairness

It is essential that chatbots are appropriately designed in order to mitigate risks. This way safe and fair chatbot solutions and service can be created. Service chatbots often deal with user data, and this might bring challenges and requirements. It is essential that the chatbot is fair, hence they have to be designed to minimize bias and promote inclusive presentation, as AI has an impact on people's lives. Chatbots can affect the life of not only the user, but others too, so the fairness of their workings and outcomes is essential. In addition, chatbot should be designed to aligned with the norms and values of the user. This is why knowing the user and the domain is so important in chatbot development. In addition, for fair chatbots in customer service, organisations have to be aware of the potential negative effects of AI and how to overcome them.[A9, A15, A30]

THEME 3: CHATBOT DESIGN COMBINES DIALOGUE DESIGN, UI DESIGN, AND BOT PERSONALITY TO CREATE POSITIVE UX

Included codes: interaction, UI, UX, design, attributes and characteristics

UI design

UI design is essential in order to create chatbots that users can accomplish their tasks in effective and comfortable manner, as productivity is one of the main motives for accepting AI-chatbot to use. However, visual UI design for chatbots is more about visual design and the designer repertoire of graphical and interaction mechanisms will is reduced [A14]. The design objectives and the interaction design should be determined based on different influencing factors, that are: the type of user and their needs, use context, and bot's purpose and tasks. It is important for the UI to suit the users in the target domain [A14]. Adding AI to chatbots add to its possibilities to interact with the user, and this kind of personalisation and accessibility is one of the biggest benefits for the chatbot users. It is essential, that the UI adapts to the needs of different user groups and that the user can choose the way to interact with the chatbot. Chatbot UI should support flexible interactions depending on the use context by providing users with the appropriate or preferred input and output modality and hardware. In addition, it is important that chatbot system always keep users informed

about what is going on without overwhelming the user. The system should guide the user throughout the dialogue by clarifying system capabilities. Help features should be visible when needed, they should be easy to retrieve and search, focused on the user's task, list concrete steps to be carried out. The user may require information on how to interact with the conversational agent, they should not be overwhelmed with too much information.[A10, A14, A21]

Dialogue design

Language and conversation play a vital role in human-chatbot interaction. Appropriate, natural conversation offers smooth interaction, so that the user can accomplish their goals efficiently. This helps in building trust between the chatbot and the user, that can lead to a positive UX. Natural conversation, as a sense of understanding and communication is developed between human and chatbot making the chatbot easy for the user to use. Language and tone must be adjustable to the language of the target audience. To ensure the quality of communication the language must be set to a specific target audience – these decisions are made depending on the type of user and the use context. Past research has identified simple and uncomplicated responses as the key to significant AI interactions. Responsiveness of the chatbot is important - chatbots should understand user's input and queries and respond accordingly. Managing the conversation context is probably one of the most challenging aspects of designing a chatbot. The mismatch between the chatbots context in the conversation and the users perception of the chatbots understanding leads to confusion and consequent dialogue breaks. The openness of conversational interfaces and variations in the user input are the main challenges in chatbot design. There are no error-free chatbots, however, it is important to design for these situations - any chatbot design has to properly address conversations breakdowns. When chatbot does not understand user query, it should state this clearly and ask for clarification, or offer the user guidance how to continue in the situation. Since chatbots by definition inhere a key characteristic of interpersonal communication (i.e., use of natural language), they always elicit some social behaviour. As a consequence, even task-oriented service chatbots should not only be designed to be functional, but also to act social [A1, A3, A5, A6, A12, A13, A14, A18, A20, A21, A22, A24].

Bot personality

Designing a chatbot that meats users expectations is crucial in order it to succeed. Chatbot should be human-like but not too much - these decisions are made depending on the type of user and the use context. Anthropomorphism (i.e., attribution of human-like characteristics) is an important topic in service chatbots. The level of it has to be fully considered in relation to the user and the use context. Some level of human-likeness might make to chatbot more acceptable for the user, as the chatbot matches users "mental model" as customer servant. However, too much human-likeness might result in over-expectations from users side, and this can lead to a disappointment in the interaction and to bad UX and abandonment of the chatbot. Chatbot should have an

avatar - digital representation of real people - rather than virtual agent, and this chatbot embodiment should meet users expectations. This means, that for example a chatbot that is answering to health-related questions should have an embodiment of a nurse instead of talking watermelon. In addition, animated facial representations make the avatar and chatbot appear more human-like and increases the naturalness of the communication. Users find it easier to communicate with a chatbot that has certain level of human-like naturalness, and if the personality of the bot matches with the ones of the user, this can lead to better UX. Social cues, like humour, chitchat, and empathy, are another important part of bot personality -design. However, choosing an appropriate social cue design for a service chatbot is a difficult and complex challenge, because social cues of chatbots can lead to either positive or negative UX. For example, research has shown that users perceive small talk of a chatbot differently according to their cultural background, prefer visual appearances of chatbots that correspond to task related gender stereotypes. Therefore, it is highly important to consider several influences in the design of a chatbot to create positive UX and to avoid possible negative effects.[A2, A5, A6, A17, A19, A21, A22, A23, A24, A27]

5 DISCUSSION

This study was set to understand what are building blocks of HCD for service chatbots. We recognised three overarching themes describing the building blocks.

Theme 1 - Service chatbots purpose is to serve users and their needs: *AI service chatbots are here to serve the user. Hence, the development of the chatbot should be based on real user needs and benefits, not on company savings. The user, use context, purpose, and domain should be in the centre of the development.*

Our results show that there are some similarities to the know concepts and factors related to HCD, like the importance of understanding the user and their needs in order to make the chatbot useful. In addition, understanding the use context is essential so that the develop chatbots solution fits to the use context. We found similarities to know basics of human-centered design – user and their needs should lead the way. Design should include only features that are needed to accomplish the user task. However, since chatbots are becoming increasingly prevalent across all industries, chatbots success increasingly depends on their ability to adapt chatbots design to the conditions it is developed for, which includes, in particular, the users and their needs, and the chatbot's purpose. Nevertheless, it is not a simple task, as chatbots are meant to serve different user groups with various skills and understandings. However, the adaptability of AI, used correctly, helps in order to serve users with different needs. The tasks of service chatbots can usually be defined quite well, as their purpose has to be well considered, and for this their design might be easier.

Theme 2 - Trust is essential for service chatbot uptake: *Trust is focal point of successful human-chatbot interaction, and it is essential for successful interaction and*

their uptake. It is important that the user can trust the bot, especially when the user is asked to share personal information. Building trust between human and service chatbot is related to factors specific to (i) the chatbot: expertise, responsiveness, explainability, transparency, and (ii) the context: privacy and data-use, fairness.

Trust is a known essential factor in technology acceptance. Our result show, that this is true in service chatbot context, too. Trust in technology has previously been seen in the light of the technology's functionality, ability to provide help and operational reliability. Our results partly support this. However, the factors contributing to the trust between the service chatbot and the user, are related not only to the technology, but several other factors, like to the appriate use of AI and data, and the responsiveness of the chatbot. User trust in service chatbots is not important only for their acceptance and uptake. It is required for the appropriate functioning of the service chatbot in the purpose it is designed to, meaning that the service chatbot should make the user to feel comfortable to share required information to solve the user problem. In addition, trust is essential form the users perspective, too, as chatbot technology is gradually becoming part of people's everyday life – trusting chatbots offers humans a possibility for a new, enhanced user experience and customer service form. Explainability of AI's decicions and transparency of AI's funtioning and data use are important elements to acknowledge in service chatbot design as they help to build trust. Communication and understanding between user and chatbot are essential which results in better understanding of the issue encountered by the user. However, it has to be fully considered, which aspects of artificial behaviour are explain-worthy and how to provide this information to the user, as explainability might challenge the effectiveness of the chatbot. It is clear, that the developers have to know the user and the use context well in order to make their chatbot work and meet the users expectations. If the expectations are not met, that might lead to no adopt the chatbot in use. Efficiency is the main motive to use chatbots, so the design should be concentrating on that by building on the understanding of the user and their needs and the context, and as AI allows personalisation, more varied user groups can be served. However, it has to be acknowledged, that there are always problems in the communication, as there is no error free chatbots. The use of AI and NPL offer more natural intercation, but this means that the interaction is harder to control. The way the chatbots messages are understand depends on the understanding of the user. However, it is important how the chatbots handles these error-situations by informing the user of the communication gap, and by directing them to a human customer servant.

Theme 3 - Service chatbot design combines UI design, dialogue design, and bot personality design in order to create positive UX: *Designing the chatbot combines three equally important parts: dialogue design, UI design, and bot personality -design. The design functionalities have a significant impact on the way a user interacts with the chatbot, hence they affect to the UX.*

In order to be effective and efficient for the user, chatbots have to be usable. Usually, good usability is assured with appropriate UI design. However, for the use of AI and

the natural converstation provided by it, usability design of service chatbots, there is a clear shift from UI design to dialogue design, as the user is mostly interacting through the dialogue. Hence, chatbot UI design is less demanding, as the command are done by conversing – however, this demands proper dialogue design in order to user queries clear and understandable. Hence, the usability of chatbot is not depending only on the usability of the visual UI, that much than to the level of the conversation, meaning how well the chatbot understand user queries. With service chatbots good UX is a result of good, effective conversation that enables the users to solve their problem. Hence, important is how well user can accomplish the task, and usually with chatbot this, either is related to the UI, but to the chatbots understanding of users queries. Problems with the communication can lead to negative UX and abandonment. UI design might be less demanding in service chatbot context. However, the main motivation for the chatbot use is efficiency, hence clear chatbot UI is required, however simple it is. In addition, usability of service chatbots means that the chatbot states what they can do and then do it. Like with any other human-technology interaction, it is important to provide user guidance throughout interaction, like always, but with chatbots this should be done with the conversation, too, rather than with visual clues in UI. This makes the UI simpler, and its design easier, but it might increase the user's congnitive load, if the guidance is given in the dialogue. With AI the user can interact with the service both in a way that is preferable for them, usually by text or voice, and this has to be acknowledged in the development.

5.1 Future work

The HCD building blocks defined in this study work as an initial structure for AI chatbot design guidelines. It is built on the findings from the literature analysed by only a few researchers, but it is expected to evolve as future works build on the understanding on the topic. We aim for our initial model to serve as a basis for future research on human-centered chatbot development and that it hence will benefit the community of chatbot and HCI researchers in guiding needed work in this area. We will continue the research in the future by developing HCD approach for service chatbot design. We will use these themes as a base for the approach. We will adopt an iterative way of working, and evaluate the suggested HCD approach with chatbot design professionals.

5.2 Limitations

There are some limitations related to this study. As the review was not systematic but followed integrative review method, there is a possibility of leaving out some relevant related research. However, the purpose of this study was to form understanding on this novel topic, as well as provide a basis to build on, so the limitation of this study can be adjusted in the future research.

6 CONCLUSION

This study provides a basis for future chatbot design by presenting themes summarising the builduing blocks of the human-centered design for AI service chatbots. Three main themes emerged from the integrative literature review: 1) Theme 1 - Service chatbots purpose is to serve users and their needs, 2) Theme 2 - Trust is essential for service chatbot uptake:, and 3) service chatbot design combines UI design, dialogue design, and bot personality design in order to create positive UX. These themes and their subthemes can be used for a basis for the research in this emerging topic. In addition, the themes can be used to support and guide service chatbot design in deploying companies to develop AI chatbots that improve users' and company's current processes, saving time, using fewer resources, and improving quality of the service.

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Appendix: Literature review corpus

	Authors	Title	**Publication**	**Vol**	**Nr**	**Pages**	**Year**	**Publisher**
A1	Brandtzaeg, Petter Bae; Følstad, Asbjørn;	Chatbots: changing user needs and motivations	interactions	25	5	38-43	2018	ACM New York, NY, USA
A2	Chaves, Ana Paula; Gerosa, Marco Aurelio;	How should my chatbot interact? A survey on social characteristics in human–chatbot interaction design	International Journal of Human–Computer Interaction	37	8	729-758	2021	Taylor & Francis
A3	Piccolo, Lara SG; Mensio, Martino; Alani, Harith;	Chasing the chatbots: Directions for interaction and design research	Internet Science: INSCI 2018 International Workshops, St. Petersburg, Russia, October 24–26, 2018,			157-169	2019	Springer International Publishing Cham
A4	Følstad, Asbjørn; Brandtzaeg, Petter Bae;	Users' experiences with chatbots: findings from a questionnaire study	Quality and User Experience	5	1	3	2020	Springer International Publishing Cham
A5	Ciechanowski, Leon; Przegalinska, Aleksandra; Magnuski, Mikolaj; Gloor, Peter;	In the shades of the uncanny valley: An experimental study of human–chatbot interaction	Future Generation Computer Systems	92		539-548	2019	Elsevier
A6	Rapp, Amon; Curti, Lorenzo; Boldi, Arianna;	The human side of human-chatbot interaction: A systematic literature review of ten years of research on text-based chatbots	International Journal of Human-Computer Studies	151		102630	2021	Academic Press
A7	Mygland, Morten Johan; Schibbye, Morten; Pappas, Ilias O; Vassilakopoulou, Polyxeni;	Affordances in human-chatbot interaction: a review of the literature	Responsible AI and Analytics for an Ethical and Inclusive Digitized Society: 20th IFIP WG 6.11 Conference on e-Business, e-Services and e-Society, I3E 2021, Galway, Ireland, September			3-17	2021	Springer International Publishing

			1–3, 2021, Proceedings 20					
A8	Ischen, Carolin; Araujo, Theo; Voorveld, Hilde; van Noort, Guda; Smit, Edith;	Privacy concerns in chatbot interactions	Chatbot Research and Design: Third International Workshop, CONVERSATIONS 2019, Amsterdam, The Netherlands, November 19–20, 2019,			34-48	2020	Springer International Publishing
A9	Przegalinska, Aleksandra; Ciechanowski, Leon; Stroz, Anna; Gloor, Peter; Mazurek, Grzegorz;	In bot we trust: A new methodology of chatbot performance measures	Business Horizons	62	6	785-797	2019	Elsevier
A10	Sugisaki, Kyoko; Bleiker, Andreas;	Usability guidelines and evaluation criteria for conversational user interfaces: a heuristic and linguistic approach	Proceedings of Mensch und Computer 2020			309-319	2020	
A11	Borsci, Simone; Malizia, Alessio; Schmettow, Martin; Van Der Velde, Frank; Tariverdiyeva, Gunay; Balaji, Divyaa; Chamberlain, Alan;	The Chatbot Usability Scale: the design and pilot of a usability scale for interaction with AI-based conversational agents	Personal and Ubiquitous Computing	26		95-119	2022	Springer London
A12	Abdul-Kader, Sameera A; Woods, John C;	Survey on chatbot design techniques in speech conversation systems	International Journal of Advanced Computer Science and Applications	6	7		2015	The Science and Information (SAI) Organization
A13	Sheehan, Ben; Jin, Hyun Seung; Gottlieb, Udo;	Customer service chatbots: Anthropomorphism and adoption	Journal of Business Research	115		14-24	2020	Elsevier
A14	Følstad, Asbjørn; Brandtzæg, Petter Bae;	Chatbots and the new world of HCI	interactions	24	4	38-42	2017	ACM New York, NY, USA
A15	Murtarelli, Grazia; Gregory, Anne; Romenti, Stefania;	A conversation-based perspective for shaping ethical human–machine interactions: The particular challenge of chatbots	Journal of Business Research	129		927-935	2021	Elsevier

A16	Maroengsit, Wari; Piyakulpinyo, Thanarath; Phonyiam, Korawat; Pongnumkul, Suporn; Chaovalit, Pimwadee; Theeramunkong, Thanaruk;	A survey on evaluation methods for chatbots	Proceedings of the 2019 7th International conference on information and education technology			111-119	2019	
A17	Adam, Martin; Wessel, Michael; Benlian, Alexander;	AI-based chatbots in customer service and their effects on user compliance	Electronic Markets	31	2	427-445	2021	Springer
A18	Nordheim, Cecilie Bertinussen; Følstad, Asbjørn; Bjørkli, Cato Alexander;	An initial model of trust in chatbots for customer service—findings from a questionnaire study	Interacting with Computers	31	3	317-335	2019	Oxford University Press
A19	Crolic, Cammy; Thomaz, Felipe; Hadi, Rhonda; Stephen, Andrew T;	Blame the bot: anthropomorphism and anger in customer–chatbot interactions	Journal of Marketing	86	1	132-148	2022	SAGE Publications Sage CA: Los Angeles, CA
A20	Smestad, Tuva Lunde; Volden, Frode;	Chatbot personalities matters: improving the user experience of chatbot interfaces	Internet Science: INSCI 2018 International Workshops, St. Petersburg, Russia, October 24–26, 2018			170-181	2019	Springer
A21	Di Prospero, Adam; Norouzi, Nojan; Fokaefs, Marios; Litoiu, Marin;	Chatbots as assistants: an architectural framework	Proceedings of the 27th Annual International Conference on Computer Science and Software Engineering			76-86	2017	
A22	Schuetzler, Ryan M; Grimes, G Mark; Giboney, Justin Scott; Rosser, Holly K;	Deciding Whether and How to Deploy Chatbots.	MIS Quarterly Executive	20	1		2021	
A23	Roy, Rajat; Naidoo, Vik;	Enhancing chatbot effectiveness: The role of anthropomorphic conversational styles and time orientation	Journal of Business Research	126		23-34	2021	Elsevier
A24	Skjuve, Marita; Haugstveit, Ida Maria; Følstad, Asbjørn; Brandtzaeg, Petter;	Help! Is my chatbot falling into the uncanny valley? An empirical study of user experience in human–chatbot interaction	Human Technology	15	1	30	2019	Centre of Sociological Research (NGO)

A25	Cheng, Yang; Jiang, Hua;	How do AI-driven chatbots impact user experience? Examining gratifications, perceived privacy risk, satisfaction, loyalty, and continued use	Journal of Broadcasting & Electronic Media	64	4	592-614	2020	Taylor & Francis
A26	Cheng, Xusen; Zhang, Xiaoping; Cohen, Jason; Mou, Jian;	Human vs. AI: Understanding the impact of anthropomorphism on consumer response to chatbots from the perspective of trust and relationship norms	Information Processing & Management	59	3	102940	2022	Elsevier
A27	Go, Eun; Sundar, S Shyam;	Humanizing chatbots: The effects of visual, identity and conversational cues on humanness perceptions	Computers in Human Behavior	97		304-316	2019	Elsevier
A28	Ashfaq, Muhammad; Yun, Jiang; Yu, Shubin; Loureiro, Sandra Maria Correia;	I, Chatbot: Modeling the determinants of users' satisfaction and continuance intention of AI-powered service agents	Telematics and Informatics	54		101473	2020	Elsevier
A29	Følstad, Asbjørn; Taylor, Cameron;	Investigating the user experience of customer service chatbot interaction: a framework for qualitative analysis of chatbot dialogues	Quality and User Experience	6	1	6	2021	Springer
A30	Srivastava, Biplav; Rossi, Francesca; Usmani, Sheema; Bernagozzi, Mariana;	Personalized chatbot trustworthiness ratings	IEEE Transactions on Technology and Society	1	4	184-192	2020	IEEE
A31	Ciechanowski, Leon; Przegalinska, Aleksandra; Wegner, Krzysztof;	The necessity of new paradigms in measuring human-chatbot interaction	Advances in Cross-Cultural Decision Making: Proceedings of the AHFE 2017 International Conference on Cross-Cultural Decision Making, July 17-21, 2017			205-214	2018	Springer
A32	Yen, Chiahui; Chiang, Ming-Chang;	Trust me, if you can: a study on the factors that influence consumers' purchase intention triggered by chatbots based on brain image evidence	Behaviour & Information Technology	40	11	1177-1194	2021	Taylor & Francis

		and self-reported assessments						
A33	Kvale, Knut; Freddi, Eleonora; Hodnebrog, Stig; Sell, Olav Alexander; Følstad, Asbjørn;	Understanding the user experience of customer service chatbots: what can we learn from customer satisfaction surveys?	Chatbot Research and Design: 4th International Workshop, CONVERSATIONS 2020, Virtual Event, November 23–24, 2020.			205-218	2021	Springer
A34	Janssen, Antje; Grützner, Lukas; Breitner, Michael H;	Why do chatbots fail? A critical success factors analysis	International Conference on Information Systems (ICIS)				2021	