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AI/Human Augmentation:
a study on Chatbot – Human Agent Handovers

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Abstract. The combination of chatbots with live chats supported by human agents creates a new type of man-machine coordination problem. Prior research on chatbot interactions has focused mostly on the interaction between end users and chatbots and there is limited research on the interaction between human chat agents and chatbots. This study aims to fill this gap contributing to the body of research on coordinating humans and artificial conversational agents by addressing the Research Question: How can the handover between chatbots and chat employees be handled to ensure good user experience? The study aims to contribute to the emerging discipline of Human-Centered AI providing insights on how to create AI-enabled systems that amplify and augment human abilities while preserving human control by identifying key aspects that need to be considered when integrating chatbots in live chat workflows.

Keywords: chatbots, live chats, workflow optimization, human-AI coordination, automation, augmentation, digital public services

1 Introduction

Chatbots are increasingly being used for the delivery of public services, with a focus on citizen inquiries and information [1]. Chatbots are digital conversational agents that can interact with different user groups using natural language, at any time of the day, every day. They enable 'rich' and expressive digital interactions convincingly simulating how a human would behave in a conversation [2]. They can automate communication tasks that used to be performed by human agents. Yet, a chatbot can't replace a real human for all inquiries. It is common practice to have chatbots lead to live chat agents for a human to human chat when the dialogue

cannot be completed due to complex inquiries or other difficulties in communication. A chatbot with a live chat takeover is a combined solution for handling customer inquiries efficiently: a chatbot undertakes the most straightforward part of the conversation and a human agent is taking over if it is not possible for a bot to complete it. This can happen when the conversation requires understanding nuanced messages or addressing complex issues.

In service design it is important to consider the totality of interactions focusing at whole relationships and going beyond digital automation [3]. The combination of chatbots with live chats (i.e. chatting with human agents) provides such a holistic approach but remains under-researched. Prior research on chatbot interactions focused mostly on the interaction between end users and chatbots. For instance, it is known that when users are stressed, human agents are better in expressing the necessary empathy to help deal with the situation [4]. Recent research points to the required characteristics and to the pitfalls that must be avoided to ensure good interaction with end users [5, 6]. Nevertheless, there is limited research on the interaction between human chat agents and chatbots. Chatbots are gradually becoming "co-workers" within customer service units, they handle simple inquiries allowing human chat agents to focus on complex cases. This study aims to fill this gap contributing to the body of research on coordinating humans and digital conversational agents by taking a "co-worker" perspective. To this end, we propose the following Research Question (RQ):

RQ: How can handovers between chatbots and chat employees be streamlined?

To address the RQ we aim to examine what happens when citizens first interact with a chatbot and then are transferred to a human agent. While chatbots can free humans for other activities, the partnership of humans with chatbots will require refactoring communications to use the relative strengths and address the weaknesses of both machines and humans [7, 8]. Creating Artificial Intelligence (AI) that allows both a high level of automation and a high level of human control is a key aim of human-centered AI [9]. Human-centered AI is the emerging discipline for AI-enabled systems that amplify and augment human abilities while preserving human control and ensuring ethically aligned design.

In this paper we present the research design and early conceptualizations for an inquiry on chatbot - human agent coordination within public service delivery in Norway. The Norwegian government promotes the responsible use of Artificial Intelligence (AI) in public administration aiming to lead the way in developing human-friendly and trustworthy solution [10]. Chatbots are key citizen-facing AI applications. The management of handovers between chatbots and humans is important for ensuring the quality of service for citizens and the quality of work experience for workers handling the live chats.

The remainder of the paper is structured as follows. First, the conceptual background is laid out; then, an overview of the method is provided. Next, initial findings are presented. The paper is concluded by pointing to aimed contributions and directions for the continuation of research.

2 Conceptual Background

A chatbot is a virtual cooperation arrangement, where at least two sides communicate based on an initial inquiry from a user. The end user receiving answers to inquiries through a chatbot is a human end in the communication but also, human agents that are handed over conversations from chatbots are part of the "human end". To understand the unfolding of chatbot-human chat agent coordination, we need to examine actual practices in place and the sociotechnical arrangements established.

Overall, chatbots have a number of significant strengths for service organizations but at the same time have significant limitations. This is why there is a growing interest for combined solutions of chatbot service delivery with a live chat takeover for handling customer inquiries efficiently. The table that follows (Table 1) provides an overview of strengths and weaknesses of chatbots and live chats.

Table 1. Chats performed by chatbots *vs* human chat agents: strengths and weaknesses

Channel	Strengths	Weaknesses
Chat with chatbot	Real-time responses 24/7. Easily scaled-up for demand surges. Answers common/standard questions. Can point to information available on web pages. Can accommodate the needs of special user groups (e.g., with hearing problems).	Lacks empathy - can lead to frustration. Cannot handle complex or unusual inquiries.
Chat with human agent	Enables a wide scope of problem-solving. Empathy. Supports relationship-building, flexible human customer service.	Subject to office hours. Cannot be scaled-up easily to handle demand surges. Cognitive limitations especially under time pressure.

The advantages show that chatbots can be good as the first line of customer support. They can instantly answer simple queries that have predefined or

predictive patterns. But they might lack the ability to think and adapt complex questions where the customers might need answers they can rely on. Furthermore, empathy and relationship building are best with human agents. Computer systems can respond to users' emotions (e.g., frustration) [11], however human agents are better in expressing empathy to help deal with emotionally loaded situations [4]. It is possible to balance using both chatbots and human agents, first to handle simple queries with bots and then transfer more complex queries to human agents. The key question that remains is what is the best time to handover the interaction with the citizen from the chatbot to the human agent and what information needs to be shared to facilitate this handover. The chatbot needs to be able to handover the interaction at the right moment, while including all the relevant information that will help the human agent process the chat.

3 Method

To address our RQ, this study proposes performing both qualitative and quantitative data collection across three different public organisations that use chatbots for service delivery. Traditional user-oriented research methods will be employed including interviews, participatory evaluation sessions and also, digital ethnographies. Chat interactions can be captured via timestamps (beginning-end), count of conversation turns, missed messages (the ones that the chatbot was unable to process), chat outcome (e.g., turned to human agent, clicked link to web content etc.), type of device and browser used.

We propose this research design because it can help us identify broad, statistically derived patterns and also develop rich accounts of the underlying mechanisms driving such patterns. The design involves a multistep process through which we will collect multiple types of data (digital traces of conversations, interview data, process mapping) and carry out multiple analyses (qualitative coding, computational operationalization of variables, statistical modeling, and visualizations). We aim to inductively identify constructs and relationships between constructs using iterative interactions with the data corpus and emergent theory informed by relevant literature.

4 Triggering chatbot – human chat agent handovers

The first step in our research is to identify the triggers for handovers to human chat agents. These triggers belong to two main areas: a) *sensemaking* issues (i.e., situations where the chatbot cannot understand the citizen requests or the citizen cannot understand the chatbot responses) and b) *AI service limitations* (due to

atypical (new) requests, complex requests or requests that are beyond the service area designated for the bot). Figure 1 provides a conceptual overview of these two main areas.
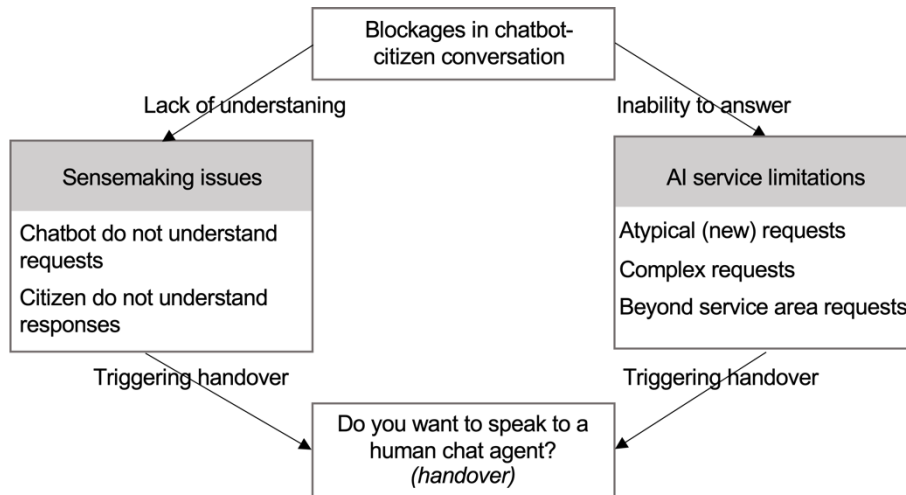
Fig. 1. A conceptual overview of handover triggers.

To enrich our understanding, a qualitative inquiry on identified triggers will be performed developing insights related to the timing of handovers and the information to be shared.

5 Conclusion and Future Research

Chatbots are an exemplary consumer-oriented artificial intelligence application. There are significant opportunities for enhancing their interplay with human chat agents and for streamlining chatbot-human chat agent handovers to achieve human augmentation and not mere automation in service delivery. This study aims to contribute to the design of citizen service chatbots. In prior research handovers from autonomous systems to human agents have been mainly studied in the field of autonomous vehicles [12]. This study can generate knowledge both related to citizens' and to workers' perspectives identifying key aspects that need to be considered when integrating chatbots in live chat workflows. However, it should be noted that as the study will be performed in the context of public organizations one of the limitations is that it will be specific to such organizations and the particularities of service delivery by private organizations will not be covered. The suggested work can contribute to research on AI and autonomous agents as part of big data analytics ecosystems for successful digital transformation [13]. Improving

the handover between chatbots and human agents, can increase the range of use cases for chatbots, enhance empathy when needed and support the development of stronger relations, thus offering a significantly improved overall experience to citizens.

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