An Analysis of Federal and Municipal Chatbots in Germany*

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Abstract. Chatbots are often encountered in e-commerce and specifically customer service. In the last years, governmental institutions are also using them more often as a communication channel for citizens. In this paper we report our findings on the landscape of publicly available chatbots in federal states and large city municipalities in Germany. We collected a dataset of 25 chatbots and analysed them with a codebook of 12 feature characteristics and 12 chatbot interaction patterns. These patterns describe how interactive elements are used in a chatbot conversation to guide the user. Our results show the presented features of the assessed municipal chatbots in terms of avatars, names, and layout. We also discuss our findings concerning the use of existing chatbot interaction patterns, and introduce four new patterns based on this real-world analysis. Our analysis also focuses on the differences between governmental and e-commerce chatbots in terms of their implementation of features and interaction patterns.

Keywords: Chatbots · Municipal Chatbots · Chatbot Interaction Patterns · Conversational User Interfaces · Human-centric AI.

1 Introduction

Chatbots are used both in commercial and public sectors as new communication channels to free time from employees [8]. Often chatbots take on easy, repetitive tasks like answering frequent questions, providing documents or links, and

* This paper is supported by the European Union's HORIZON Research and Innovation Programme under grant agreement No 101120657, project ENFIELD (European Lighthouse to Manifest Trustworthy and Green AI)

are especially available round the clock [12]. While chatbots are prevalent for customer service, they are also common in the public sector, for example for governmental tasks [1]. Research has been conducted on the use of chatbots in different countries [2,3], on which government levels and for which tasks they are used [3,8,12], and on the interaction between citizens and chatbots [2,5,6]. While chatbots on a national level provide a broad range of services, they offer more resident-oriented services in lower government levels, especially local municipalities [12].

In this study we set the scope to federal and municipal chatbots in Germany, contributing to the growing set of similar investigations in other countries [2,3]. The successful implementation of such chatbots depends on several elements, one of which is the user interface. For a better orientation and understanding of both the content and possible interactions, repeating patterns in the interface can guide the users in this process. We are analysing German federal and municipal chatbots on their feature characteristics and their use of chatbot interaction patterns [15]. With these results we can compare which and how these patterns, derived mostly from e-commerce chatbots, are used in governmental chatbots. Our contributions in this paper are the following:

1. Analysis of chatbot features on the federal and municipal level in Germany
2. A dataset of German federal and municipal Chatbots
3. Insights and a validation of existing chatbot interaction patterns, a presentation of new patterns, and a discussion of non-regularly used patterns

Following the state of the art in the next section, we present our methodology in section 3. The websites of currently 83 large cities[5] and 16 federal states were visually inspected for their use of chatbots. We collected 25 chatbots that are deployed from 20 large cities and 2 federal states. These implementations were then analysed with a codebook regarding their feature characteristics like their topics, presentation, integration, and use of avatar, name and gender as well as their use of chatbot interaction patterns. Our results of the feature analysis, the used chatbot interaction patterns and newly defined patterns are presented and discussed in sections 4 and 5. There, we present insights both general and specific on the use of chatbot interaction patterns and how their implementation can change in different domains. Even when our dataset is restricted to Germany, we believe this study helps to understand the differences between e-commerce and government chatbots beyond the German context. Additionally, our work sets the basis for other research for a broader and diversified dataset of government chatbots and its analysis in the future.

2 Related Work

With more technological advancements, digital governments introduced new channels for their citizens, like chatbots [10]. This section includes three literature groups: research generally on governmental chatbots, on the interaction

[5] with more more than 100.000 residents

between users and governmental chatbots, and chatbot interaction patterns for analysing graphical interaction elements in the chatbot interface.

2.1 Use of Chatbots by Governments

This section concentrates on how governments are using chatbots on national, regional and municipal levels. We focused on papers which either conducted analyses on the literature [12,3] or existing government chatbots [8,3] to systematically create frameworks and typologies. Most of the research we found shows chatbots are mainly used in governmental organizations to free employees from repetitive tasks, which can as-well be taken over by an automated customer support channel. The literature shows that all different government levels provide services and information for citizens [3,8,12]. A focus on the local level offers additional tasks which chatbots take over, like providing a channel for transactions and collecting complaints [12]. The work of Cortés-Cediel et al. includes access to open government data, public services, improving citizen participation and facilitating communication between stakeholders [3]. This work provides a framework for analysing chatbots which the authors implement both on a literature research and on a set of Spanish government chatbots. This is the only publication in this subsection which directly regards the chatbot interface in one of the variables in its framework. A typology of chatbots published in 2021 likewise mentions customized health services and help in submitting government documents [8]. This typology also defines low and high levels for the complexity in the sophistication levels, as well as specific characteristics like suitable dialog management, suitable databases for the technological properties, and initial service queries and responses as for their capabilities. In a review by Senadheera et al., the authors find that while national governments provide broader services, often on legal documents and regulations, chatbots on the level of local governments provide access to more resident-oriented services [12]. In this review, several trends in the research are identified, one of which are studies on user-chatbot interactions, which are the topic in the next section.

2.2 Interactions with (Municipal) Chatbots

Results from a 2019 study of chatbots in Latvia, Vienna and Bonn [10] suggest that chatbots are used to switch traditional services from physical to digital channels, but that a successful adoption is dependent on other variables. One of these variables, i.e. public trust, was identified and studied by Aoki et al. In a survey with 8.000 Japanese citizens, most of whom were inexperienced with chatbots, they find that the trust in chatbots depends on the topic and communicated purpose [2]. Citizens are less trusting in complex cases where empathy was expected, than for general information like trash disposal. Participants also show higher trust levels if a reason for the use of a chatbot is given, like providing citizens with a 24/7 communication channel. Abbas et al. likewise find that citizens might benefit from chatbots if they include additional benefits to established channels [1]. Besides trust, other aspects like usefulness and effort

are also key to their willingness to use municipal chatbots. Some authors of this work also conducted other studies on the communication forms between citizens and chatbots and find that citizens recognize chatbots as a technology with certain capabilities and limitations, rarely humanize them, and communicate in a mostly utilitarian style [6]. These results were further explored, where the authors also factor where the chatbot access is located on the website [5]. Finally, in a 2024 interview on a particular municipal chatbot (mostly used in Norway), they find that citizens touted other aspects like efficiency and information availability [7]. Most of these studies report on qualitative analyses, usually relying on surveys, while in our work we aim at providing a structured analysis based on fixed criteria.

Table 1. Chatbot interaction patterns, their description and relation to other patterns.

Nr. Pattern name	**Description. (Relation to other patterns)**
1. Chat Messages	Displaying outputs from chatbot and user, most often as speech bubbles.
2. Cards	Presenting similar information, often with text, images, and actions. (1., 3.)
3. Carousel	A set of similar items in a horizontal list. (2.)
4. Quick Replies	A set of actions or functionalities under a chat message in the form of buttons. (1.)
5. Typing Indicators	A visual representation of the waiting time for the reply of the chatbot. (1.)
6. Persistent Menu	A constant menu in the chat window for important information or settings.
7. Call-on Menu	A dynamic representation of consistent information which was requested by the user. (1., 4., 6.)
8. Webview	A preview on web content from other providers or the chatbot homepage itself. (1.)
9. Message Reactions	Emojis beside or under a chat message to provide feedback on the answer of the chatbot. (1.)
10. Help Systems	Offering assistance for users, either on request or proactively by the chatbot. (4., 6., 7., 11.)
11. Functionality Introduction	Introducing the main functionalities or providing a tutorial in the first chat messages. (1.)
12. Conversation Recovery	Avoiding conversation breakdowns by providing possible actions or commands. (4., 7.)

2.3 Chatbot Interaction Patterns

The chatbot interaction patterns [15] describe how and in which situations individual or combined interaction elements are used in the implementation of

chatbots. Table 1 shows the list of already defined chatbot interaction patterns. Since chatbots are a form of Conversational User Interface (CUI) with a visual-centric style, natural language processing is combined with graphical elements [9]. Research on the use of these graphical elements in chatbots is scarce. Recently, we published a list of chatbot interaction patterns based on previous works [13,16] which include individual interaction elements [15], while Valério et al. also discuss help strategies offered by the chatbots for users [16]. These publications were mapped to interaction patterns from graphical user interfaces by Tidwell et al. [14] to create chatbot specific patterns.

3 Methodology

In this section we present how the dataset was collected and analysed with a codebook. For the dataset collection we first offer inclusion and exclusion criteria before we detail the process of the collection of chatbot instances and then present both the development of the codebook and the subsequent coding process.

3.1 Dataset collection

The scope for the dataset was set with the following inclusion and exclusion criteria: The chatbots should be publicly accessible and implemented from a federal state or large city (German: "Großstadt", with more than 100.000 residents). We also exclude any chatbots which are not providing support for languages that include German, as it is the official administrative language.

The chatbots were collected by going through lists of large cities[6] and federal states[7] in Germany. Germany has a federal system, which means that the country is divided into 16 semi-autonomous federal states. Three of these states have a special status of a federal city-state. The landing pages of the federal states, their ministries, the large cities and, if available, their service portals were scanned by the coders for any chatbots through visual inspection, i.e., scrolling through the web pages, menus and their content, and looking out for any links, menupoints or icons of chatbots. With this search, a total of 25 chatbots were found, where 6 were found from two federal states for specific portals or institutional services; one city deploys two chatbots, one on the landing page and one on the city portal[8].

3.2 Coding process

The chatbots were analysed with a codebook of 24 categories which are split in two different areas: a feature analysis with 12 categories and 12 chatbot interaction patterns [15]. Each of the categories contain at least one code, all of which

[6] https://de.wikipedia.org/wiki/Liste_der_Großstädte_in_Deutschland
[7] https://de.wikipedia.org/wiki/Land_(Deutschland)
[8] The second one was found due to interacting with the chatbot on the landing page.

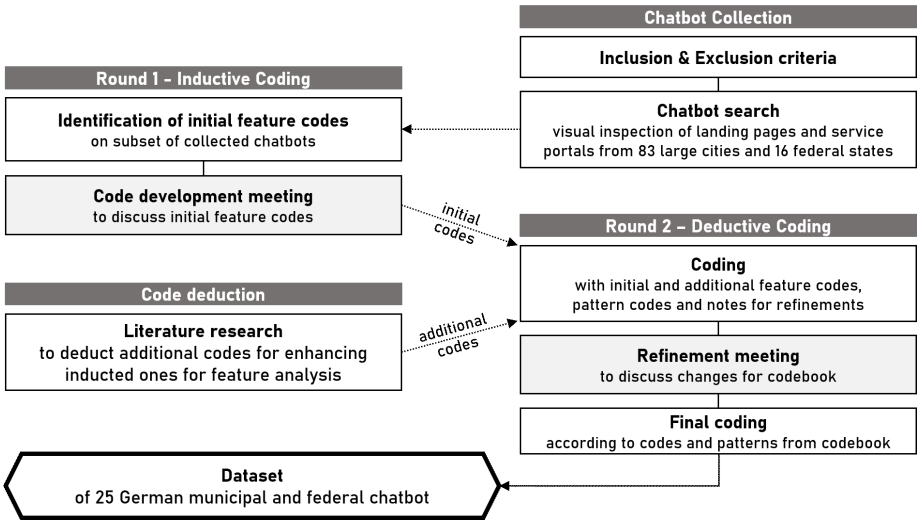

Fig. 1. Process of chatbot collection and the development of the codebook through inductive and deductive coding.

are described in the digital appendix. Three authors were involved in the coding process: one coding author for the inductive coding, one coding author for the deductive coding, and one author who was part in the refinement meeting for the final codebook. In this section we describe the development of this codebook.

The codes for the feature analysis were developed iteratively in an abridged version of the codebook development as described by Rogers et al. with both inductive and deductive coding [11], as can be seen in Fig. 1. After the chatbots were collected, a subset of them was used for inductive coding by the first coding author to find applicable categories and codes regarding the features and to verify the pattern codes in this dataset. The inductive coding showed that the chatbot interaction patterns are present in principle, and some potential new patterns are emerging. In a code development meeting between the two coding authors, the initial categories and codes for the feature analysis were discussed and possible weaknesses were deducted in the granularity of the codes, mostly regarding the presentation and access of the chatbot.

The initial codes were then expanded upon by the second coding author based by deducting codes from literature regarding several features: The use of avatars, names, and assigned gender [4], as well as the topics the chatbots are trained on [3,8,12], and the implementation of the chatbot on the page itself [5]. In the second round of coding, the initial codes and the ones deducted from literature sources were then enhanced upon by further deductive coding, which means that similar to grounded theory[9], possible codes for the categories were noted by the second coding author for further consideration.

[9] cf. https://www.sciencedirect.com/topics/social-sciences/grounded-theory

For the coding in the second round, a semi-structured series of typical tasks concerning municipal services was conducted. The goal of this process was to let the chatbot provide a range of interaction patterns. The tasks included the following goals: registering for a new flat, extending the passport, searching for document downloads regarding these requests, and asking for information on trash services. In the conversation the chatbot was also prompted with messages like "*This doesn't help me.*", "*Help*" or "*What can the chatbot do?*", so that possible interaction patterns related to help the user can be discovered. Each conversation started with the prompt "*I want to register.*" As each chatbot reacts differently to the input, the order of the subsequent prompts after the initial one were dynamically adapted depending on the unfolding conversation flow. As the chatbots on the federal level provide different information, the approach was adapted to their specific profile, with the consistent procedure to prompt the chatbot for providing help as detailed above. For each chatbot, screenshots and a recording of the final conversation were saved for further discussions. After the second round of coding, a refinement meeting took place between the second coding author and a third author who was not involved in the coding process. In this meeting, possible changes in the codebook and edge cases in the coding were discussed and based on the result, a final coding was conducted.

The 12 final categories for the feature analysis and their codes are explained next. The metadata includes the four categories for the *location* of the municipality or federal state, the *chatbot URL* to its interface, the *last accessed date*, and the *chatbot name*, each with one individual code. The *governmental level* is split into the codes city, federal state and federal city-state, while the category *topics* the chatbot is trained on includes administration services, institutional information, and other. "Administration services" means here that among others, information is provided on openings hours, addresses, available services, how these services can be used and where to find necessary documents. The next categories include the *interface*, which can be a pop-up, full screen or a modal and the *access* which can be either at the bottom (including left or right), in the middle of the page, a combination of both, or as a part of the menu. The *page level* on the other hand describes if the chatbot can be accessed on the landing page or a sub-page. The presentation of the chatbot is regarded in the categories *avatar* (Yes or No), and *reference* of its name like a locality, an acronym, the chatbot platform, a human name, if it is neutral or does not have a name. Additionally we code which *gender* would be assigned to the chatbot name. The category *languages* is coded either as German or multilingual, where at least one additional language is available. The 12 chatbot interaction patterns and their description are listed in Table 1 in section 2.3 and are coded with Yes or No. The finalized dataset and descriptions of the categories and codes can be accessed in the digital appendix here[10]. In Fig. 2 we show three different examples of the collected governmental chatbots.

[10] https://sync.academiccloud.de/index.php/s/zhONwlIn3gmlJvO

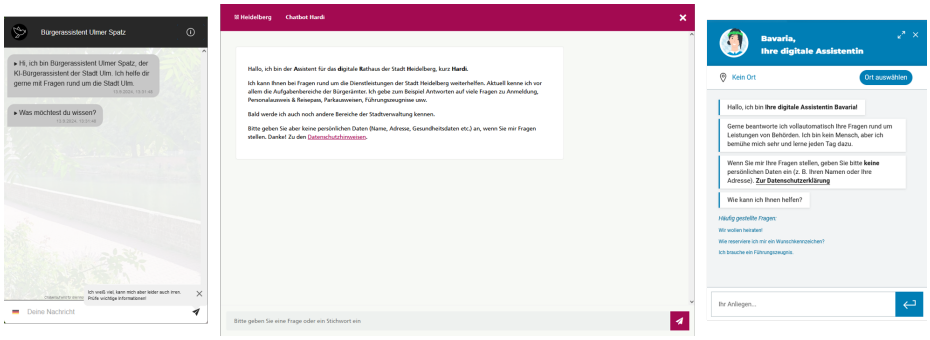

Fig. 2. Sample of three interfaces with welcome messages, illustrating the variety of interfaces of governmental chatbots. From left to right: a popup with logo as an avatar and a name, a modal without avatar, and a popup with an avatar, name and a selection of faq questions for starting the conversation.

4 Results

This section presents the results of our analysis and is split in two subsections: the feature analysis and chatbot interaction patterns.

4.1 Feature analysis

In this subsection we present the results of our analysis of 12 features regarding the metadata, presentation and integration of the chatbots on the website. Figure 3 shows the results for the analysis of the governmental levels and the topics of the chatbots.

Governmental level

Germany has a federal system, which means that the country is divided into 16 semi-autonomous federal states. Three of these states have a special status of a federal city-state: Berlin, Bremen with Bremerhaven, and Hamburg; all of these cities are also large cities. The distribution of the chatbots is as follows: 6 were found from 2 federal states (with one of these also deploying 4 for specific

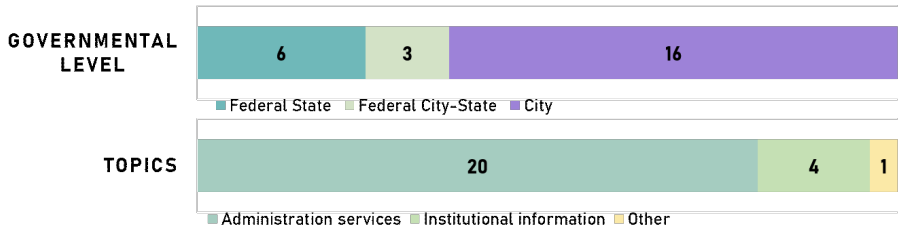

Fig. 3. The distribution on chatbots concerning their governmental levels and the topics they are deployed for.

institutions of its state parliament), 16 are from large cities and 3 from federal city-states. As these chatbots offer services similar to other large cities, we will further consider them under the same level.

Topics

From 19 large city chatbots, 18 provide information on administration services, which also includes information on the municipal service portal or are linked specifically to the "Behördennumer 115"[11]. The other chatbot provides information on the portal of classified ads, it is deployed on. Two federal state chatbots provide general administrative information on their federal state level and its municipalities, while the other 4 are linked to information about specific institutions. This includes information on integration, taxes, the state library, and the department of human resources.

Avatars and names

The distributions of chatbots concerning their codes for avatars and names can be seen in Fig. 4. We found that 7 chatbots do not have an avatar, from the 18 chatbots including avatars some use their city crest or logo, others a logo provided by the platform or a specifically created one. Only one chatbot is presented without name and avatar, all others have names. The names of the chatbots can be references to different sources (corresponding chatbots in brackets):

- the *platform* the chatbot was provided from (115-Chatbot [city name] (three times), Govii (twice), Lumi[nous])
- *acronyms* (CiSA, CREDO, Frida, Hardi, Ina, Kora)
- relations to the *locality* like the city / institution name or landmarks (Bavaria, Chatbot Erlangen, DLZP-Chatbot, Frag-den-Michel, Hein Mück, Karlsbot, Nordi, Sparrenbert, Steuer-Chatbot SH, Ulmer Spatz, Wuebot)
- real *names* without any direct reference (Bobbi, Thekla, Toni)

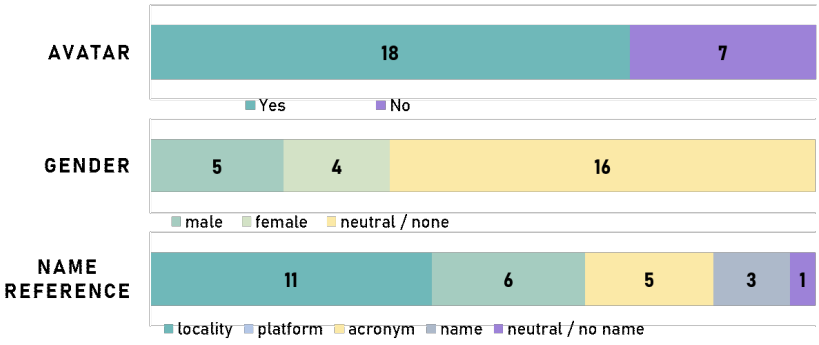

Fig. 4. The distribution of chatbots concerning their use of an avatar, the gender related to the used name and to which source the name can be referenced.

[11] English: "Administration phone number 115", a phone number which provides administrative information for a network of participating municipalities and states

Chatbot interface types, page level, and access
The access to the chatbot was mostly provided as an icon on the bottom right of the landing page (17 chatbots), with one additional chatbot icon situated on the bottom left corner. Of the remaining chatbots, 5 had to be accessed as an element on the middle of the page, one could be accessed both on the middle and as an icon on the bottom, and one could only be accessed via the menu of the service portal.

For the chatbot interface types, we used three different codes: full screen, pop-up, and modal. We found 4 chatbots which open on a full screen page, 18 are implemented as a popup, and 3 as a modal on the middle of the screen with a darkened background. Of the popup chatbots, most are anchored to the bottom right corner or span the complete height of the right side of the website. Two implementations are a bit different, one opens as a popup on the middle of the screen and the other one is anchored to the left side of the interface. Two chatbots which were implemented by the same platform opened as a popup but could be enhanced via the persistent menu to a full screen. As the popup is the default version, we coded it as such. In Fig. 5 we present the relation between the page level, where the chatbot access is situated and on which interface type is provided.

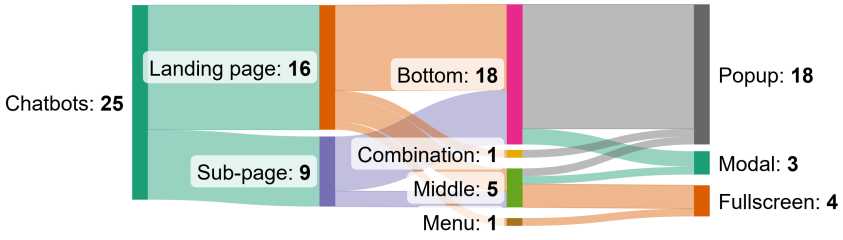

Fig. 5. A diagram presenting the relation between the interfaces type, the chatbot access, and the access level.

4.2 Chatbot interaction patterns

From 12 coded chatbot interactions, all except for "Webview" were found in the analysis. Their distribution is presented in Fig. 6.

In the analysis we found some possible new chatbot interaction patterns, which we want to shortly present here. Examples of the new patterns can be seen in Fig. 7. The new patterns are named as follows with the number of found instances added in brackets: System information (9), Information stamps (9), Dialogue Reload (5), Accordion (9). For these new patterns we provide a short description, with the updated catalogue in the corresponding appendix. These patterns will have to be verified and further elaborated on in future research.

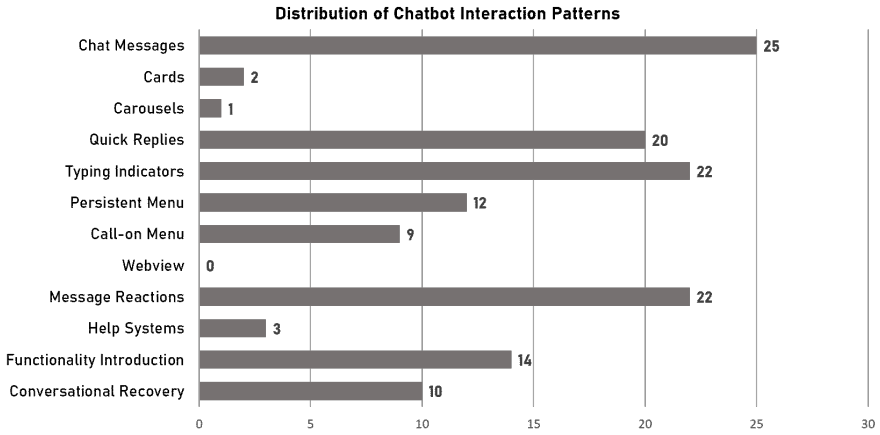

Fig. 6. A bar chart presenting the distribution of found chatbot interaction patterns.

System information. This pattern presents itself by offering information on the chatbot system outside of the conversation with the entity chatbot itself. It is provided as banners or like "news tickers" above or underneath the respective footer or header of the chatbot, but can also be presented as a small pop-up or even span the complete area of the chatbot interface before access is given. As such, it mostly provides information on data protection, although the pattern can also inform on technical limitations of the chatbot. For this pattern we do not include any information provided via the persistent menu.

Information Stamps. Some chatbots include information on the time, user and context of the conversation. Most often this is done by including the time at which a chat message was sent either above or beneath that message (8 times). This is sometimes accompanied by the date or name of the sender, so either the chatbot name, 'guest' or a given name for the user (3 times). Some chatbots only provided the current date on top of the chat (4 times), while one also provides information on the current topic of the conversation.

Dialogue Reload. Of the analysed chatbots, 5 offer the option to reload the dialogue and start the conversation again. As such, it can help to solve situations in which the chatbot does not understand the user which might lead to frustrations. This can be seen as a specific sub-pattern of *Conversation Recovery*. The difference to that pattern is that *Conversation Recovery* is provided by the chatbot at best without a specific prompt from the user. The *Dialogue Reload* on the other hand is an action consciously taken by the user if they recognize that the chatbot either does not function as intended or cannot provide a satisfactory answer.

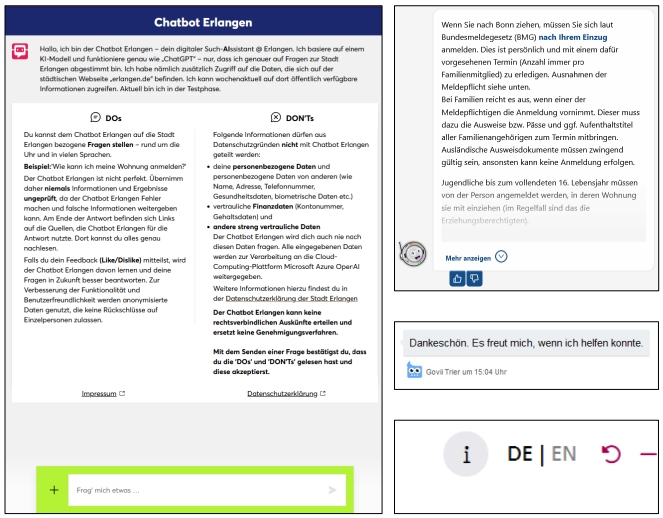

Fig. 7. Examples of new chatbot interaction patterns. Left: *System Information*; right, top to bottom: *Accordion*, *Information Stamps*, and *Chatbot Reload*

Accordion. The *Accordion* is a well known pattern from graphical user interfaces and is used to hide information to save space. In the analysed chatbots, *Accordions* are used either to shorten a very long chat message or to provide a short insight into several available search results. Some chatbots also include a similar option to show more *Quick Replies* for the users.

5 Discussion

This section presents findings of our analysis based on the previously presented results.

General Insights. While most chatbots offer a unique implementation, some are relying on the same platforms. We found that 2 chatbots use Viind[12], 2 are implemented by govii[13] although it has to be noted that their interfaces and implementations of patterns are different from each other, and 3 of them are a "115-Chatbot", which is related to services of the "Behördennummer 115" (English: Administration phone number 115). This "Behördennummer" started an initiative in late 2023 to beta test a chatbot trained on the available data from the network[14]. It can be expected that this initiative will have an influence on the landscape of municipal chatbots in the future.

[12] `https://www.viind.com/`
[13] `https://govii.de/`
[14] `https://www.115.de/news/detail/behoerdennummer-115-startet-testphase-fuer-service-chatbot`

One insight we gained in the dataset collection is that some cities apparently deployed a chatbot for some time or a specific occasion (like Covid-19 or elections), but do not have an active instance running anymore. This is documented by news articles on the implementation of such chatbots - we did not conduct an in-depth research into this direction, but some anecdotal links we found during our research are presented in the digital appendix[15].

Another insight is the use of gender for the personification of the chatbots. Different to previous research [4], we did not find a gender bias in our dataset. While we still found names which can be related to a gender, the numbers were nearly identical for both female (4) and male (5) connoted chatbots. Way more often we found more neutral names or ones which do not have any specific relation to a gender. It's possible that this is mostly caused by the use of acronyms, the inclusion of the chatbot platform or by referring to localities. Even though some of these names were combined with real names which are clearly gendered, most do not. The focus on rather including locally known names or simply providing the function of the chatbot seems to avoid the gender biases which can be observed in e-commerce chatbots.

Insights into existing patterns. In some chatbots, particular implementations were found for individual patterns. One of three chatbots offered as a *Help System* not only the contact to real people but also an option to forward the conversation to provide some context for these employees. The *Typing Indicator* is symbolized in one chatbot by an animated glowing infinity symbol, in another as a progress bar with short messages and emoticons, while the ministry chatbots included this pattern in a way which is rather hard to recognize by showing the texts like "*[chatbot name] types ...*" (translated) under the text input field. While *Message Reactions* usually are shown as thumbs up or down, one chatbot used a 5-star rating system. All chatbots which provide *Message Reactions* also include some kind of feedback form. Either as an input field directly under the corresponding message, by opening a pop-up or even a dedicated feedback-page for this. The feedback is then either sent to the municipality or the responsible development team.

Insights into patterns which were not commonly found. Another noteworthy insight is that some patterns are used sparingly or not at all in one case. *Cards* were only found in two chatbots, in one it was combined with *Carousels* which were not seen in any other chatbots. In the literature these patterns are based on Shevat and Valério et al., where the existence and use of these patterns is well documented [13,16]. One possible explanation is that the chatbots in the literature are mostly based in the e-commerce sector. This might offer more situations where *Cards* and subsequently *Carousels* make sense, as both usually rely on the inclusion of pictures. Administrative chatbots might not use this option, as most provided information could be better or at least as-well presented in a textual way.

[15] `https://figshare.com/s/80fa41a1d5f237fdb3ec`

The pattern of *Webviews* was not found in any of the analysed chatbots. This pattern describes the preview of information from another page. In e-commerce this can be seen for example for switching colours of products or providing map information [13]. We noticed in our analysis that chatbots often link to sub-pages or other websites with further information. For citizens who search for example for the location of a specific municipal office, including this pattern instead of only linking to it could help to present the information in a more user friendly way, especially as it is then presented in the same user interface.

We found 8 instances in our analysis of *Conversation Recovery*, a pattern which means that the chatbot 'proactively' provides the user with help on how to go on in the conversation, if the chatbot itself does not understand the request. This means that the chatbot has to offer possible options for the user, present them with help on how to formulate their requests or provide another option to resume the conversation. A simple message that the chatbot does not understand the user is not fulfilling this pattern. It might be possible that we did not find all possible instances of *Conversation Recovery*, as it is hard to artificially create situations in which the user is not understood by the chatbot.

6 Limitations and Threats to Validity

This section presents three limitations to the validity of our research and our mitigation strategies. The first limitation is internal and concerns our data collection. To avoid biases, we used available lists of large cities and federal states, and searched for chatbots on their websites with a visual inspection. As another mitigation strategy we used an iterative process in which our codebook was developed through iterative inductive and deductive approaches. In the deductive approach we based codes not only on already existing literature and available meta-data, but also iteratively, where codes were used on the dataset based on the occurrences in the chatbot interactions. The codes for the chatbot interaction patterns were based on already existing definitions and guidelines for the use of these patterns. Any edge cases were discussed in a refinement meeting with an author not involved in the coding process to reach a consensus.

An external limitation is that we only include German governmental chatbots on the federal and municipal level. To avoid any potential regional biases, we are not making any claims outside of this domain and are conscious that our results cannot be generalized to other nations or any domains outside of the governmental use. The scope on chatbots in Germany is based on similar publications from other countries. One goal is to provide an analysis and a dataset which can be merged and systematically analysed in later research to mitigate regional biases which might appear in singular studies.

The construct limitation concerns the methodology we chose to analyse our dataset. Due to the systematic approach, it is possible that we did not find all possible patterns specifically concerning the ones which have a more conversational nature, like *Conversation Recovery*. We tried to avoid biases by artificially prompting the chatbot directly or indirectly to provide help for the user.

7 Conclusion and Future Work

In this paper we analysed 25 chatbots from federal and municipal government levels in Germany on their features and their use of chatbot interaction patterns. We presented our results of the collected metadata, the presentation and integration of the chatbots, and how they use the presented patterns. The results show that the recently introduced chatbot interaction patterns can be validated in an analysis with in-use implementations. The analysis also shows that there are apparent differences in the use of patterns across different domains like e-commerce and governmental chatbots. On the other hand, even in one domain there are many different ways in how the patterns are implemented. We also find that the chatbots in our dataset do not have a gender bias in their use of names, different than previously found in e-commerce chatbots. In the discussion we also compared the use of existing patterns with a special regard of patterns which were not commonly used, even though they are present and described in e-commerce chatbots.

The presented analysis contributes threefold: For one, it provides a view on the landscape of German government chatbots on the federal and municipal level, shows the topics for which chatbots are used and how they are presented both in their implementation on the websites and regarding avatars and names. Additionally it provides the corresponding dataset of 25 federal and municipal chatbots. Lastly, we verify chatbot interaction patterns on a set of real-world chatbots and enhance the pattern catalogue with four new patterns presented in this paper. We also show which patterns are favored by governmental chatbots and discuss where they differ to e-commerce chatbots.

As this publication presents a baseline of the use of chatbot interaction patterns in governmental chatbots and a feature analysis of German federal and municipal chatbots, future research possibilities are manifold. The results from the presented analysis can be either compared with other domains like e-commerce or health, or within the same domain in another context. This can be done by analysing and comparing chatbots from different countries, but also to enhance the current dataset of federal institutions and large cities by collecting and analysing chatbots from smaller cities and townships in Germany. While we consider avatars, names and their genders, this can be enhanced by a wider and more systematic look at the use of these elements in the personification of the chatbots in different domains and contexts.

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