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# Left, Right, Down, or Round – Exploring the Design of Patterns in Chatbot Interfaces and how Users like them*

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**Abstract.** With the increased use of chatbots, a multitude of graphical interfaces are created to support the conversational interaction between user and chatbot. For graphical user interfaces, guidelines and best practices were developed and adapted over decades, but this is not yet the case for chatbots. In this paper we present the results of an explorative user study with 40 participants regarding the preferences of users for variations of established design patterns in chatbot interfaces. The study includes five chatbot prototypes with different combinations of pattern variations which are based on an analysis of 30 chatbots in the web. The results of the explorative study show significant differences for all pattern variations and indicate that users have some expectations regarding chatbot interfaces. With insights into the coding of the dataset, the statistical evaluation, and similarities to other interfaces, we highlight the necessity and some implications for the future creation of chatbot interface guidelines.

**Keywords:** Chatbots · Chatbot Patterns · Customer Service Chatbots · Human-centric AI.

## 1 Introduction

The use of chatbots skyrocketed in the last decade [2], among others also in the domain of customer service [5], for which companies often add a chatbot to their website. Moore and Arar [12] describe chatbots as visual-centric conversational user interfaces, mostly based on textual conversations, while Jain et al. extend this description that such text-based interfaces should be combined with buttons and media [8]. Most research currently focuses on creating the best user experience for the conversational interactions [17], a similar depth in the research

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for the user interface is not yet present. Existing chatbot interfaces incorporate various visual components which are used in similar ways and provide the users with recognizable interactions, so called patterns for the chatbot interface [19]. By combining patterns, complex interfaces can be built which are being recognized by the users [18]. Describing patterns in detail is thus an essential step to establish a common ground for designers in parallel to guidelines, best practices, and standards. As an opposite to GUIs where several heuristics and guidelines [13,16] were already established over the years, the progress of defining similar best practices for chatbots is still ongoing. Not only is the use of patterns in chatbots depending on the domain of its use [20], but each pattern can be implemented with different shapes, positions, animations, or functionalities. This paper presents another step in the specification of guidelines and best practices for the design of chatbot user interfaces. Our contributions in this paper are threefold:

1. An explorative study (n=40) on the user preference of pattern variations
2. An analysis of 30 real-world chatbots regarding their pattern variations
3. The collected dataset of chatbots in the domain of customer support

In this paper, we present the results of an analysis of pattern variations and test if differences in the preference of pattern variations are visible in an explorative study. Following the related work in the next section, we present our analysis in section 3. A dataset of 30 chatbots was collected from publicly available websites in the domain of customer service from different sectors. This dataset was first analyzed on the use of patterns, before different variations were described for a subset of patterns depending on their number of occurrence and their relevance for the graphical interface. The results of this analysis were used to create five stereotypical chatbot prototypes which were tested by 40 participants in an explorative user study in section 4. We report our results in section 5 and present insights based on the statistical evaluation, qualitative information, and some connections we can draw to already existing best practices.

## 2 Related Work

In this section, we present related work regarding the graphical chatbot user interface. We first regard some existing guiding principles for graphical user interfaces (GUIs), before we present established patterns for chatbot interfaces and discuss how other literature on chatbots describes these graphical elements.

### 2.1 Guiding Principles for Graphical User Interfaces

Chatbots are known for many decades, although their use skyrocketed since 2016 [2] even before Large Language Models made their implementation easier. The design of chatbots is still volatile and does not follow common conventions, other than GUIs, which were established way earlier and have well-known guidelines and best-practices [13,16]. Many of these best-practices regard aspects like the

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organization of elements, avoiding error sources, or how specific design decisions impact the user experience like the meaning of arrows changing depending on where they are applied [6]. For describing these common implementations and combinations of interaction elements and functionalities, patterns can be used. Interaction design patterns were among others presented by Tidwell et al. [18] and serve as a solution for recurring interactions, ensuring consistency and efficiency for users. Rogers et al.[15] for example describe the pattern "menu" which contains more actions, is commonly found in smartphone apps on the top right, and contains three visual elements. These elements can be dots or stripes in varying lengths aligned vertically, horizontally, or in a grid.

### 2.2 Chatbot Interaction Patterns

A list of patterns for chatbot interfaces was presented by Traubinger and Gaedke [19] and enhanced later to 16 patterns [20], which are included with a short description in the appendix. These patterns provide a systematic look at the user interface of chatbots and rely on interactive GUI elements or ways in which they are used in the conversational interaction.

### 2.3 Chatbot Interface Elements

While there is some research regarding the difference of using graphical interfaces or chatbots for some tasks [4,11], the graphical elements of the chatbot interface were mostly indirectly part of research. In our later chapters, we will put a focus on seven specific interface patterns, for which we provide some context. These patterns are: *Chat Messages*, *Quick Replies*, *Information Stamps*, *Typing Indicators*, *Persistent Menu*, *Session Minimization*, and *Conversation Closure*. The existing literature mostly regards these different interface elements or describes them generally, but to our knowledge, they have not yet looked into their variations. As terms differ throughout the presented literature, we use the defined names of the patterns and only relate to specific names if necessary. Similarly, we concentrate on literature describing these graphical characteristics and do not include publications which only make passing remarks.

While *Chat Messages* are the most ubiquitous pattern, there is not much literature specifically regarding them. This is probably due to the nature of chatbots where *Chat Messages* are the most basic interface element depicting the conversational interaction. In some literature, *Chat Messages* are presented as a visual container for other media like pictures, stickers, or audio [9,14], while others only use them to describe *Quick Replies* [1]. Only Jain et al. [8] mention *Chat Messages* specifically in their research and even differentiate between "Bot Text" and "User Text" depending on the sender.

For the pattern of *Quick Replies*, many different terms are used. Most publications center around the term "buttons", while Pirrone et al. also include radio buttons and drop-down menus [14] which are in recent years not typically seen in web chatbots. Some literature differentiates between functions of *Quick Replies*. Jain et al. for example depict them as either staying fixed underneath a

*Chat Message*, or disappearing after clicking on them [8] - similar observations were made by Valério et al. [21]. Klopfenstein et al. [9] distinguish even more variations of buttons, which can either be used for one interaction, replace the keyboards or are part of the chat message. The shared interaction in all of these is the presentation of predefined answers which can be chosen by the users.

*Typing Indicators* are a specific focus in two publications. Artificial delays and indicators like "is typing" are mentioned by Klopfenstein et al. [9] who are criticizing human-like features in chatbots. Focused research was conducted by Gnewuch et al. who regarded the influence of different styles, in this case "three animated dots" or the message "[Person X] is typing", on users [7].

The *Persistent Menu* is also included in two publications, once as a menu button [8] and once as a "custom defined menu" [9]. The closest mention of a *Conversation Closure* is by Feine et al., who describe "self-focused questions" which prompt the user to provide feedback on the conversation [3]. *Information Stamps* and *Session Minimization* on the other hand are not regarded in any publications to the best of our knowledge.

## 3 Chatbot Analysis

Based on the existing patterns for chatbot interfaces, an analysis of 30 chatbots is conducted in two phases. In this section, we present the creation of the dataset, the corresponding coding processes and their results. The codebook is added in the paper appendix, while more detailed information like the coding results are presented in the digital appendix[1].

### 3.1 Dataset

The dataset for this analysis consists of customer service chatbots in three sectors: e-commerce, hotels, and airlines. For all three, the following inclusion criteria are formulated:

1. the chatbots have to be publicly available via the web
2. the chatbots have to be in German or English
3. the chatbots should follow our definition in section 1 of including interactive graphical elements in their conversations

Overall, the dataset consists of 30 chatbots with 6 chatbots from hotels, 9 from airlines, and 15 from the e-commerce sector. The chatbots from the e-commerce sector include branches of clothing (6), shoes/sportswear (3), jewelry (3), market places (1), toys (1), and flowers (1).

The chatbots were searched with search engines by combining known company names with the terms "chat support", "chat assistant", or "virtual assistant". For each result, the official website was visited to manually verify that a

[1] https://sync.academiccloud.de/index.php/s/10eCAAYxj0eJzUy

chatbot is implemented and the URL was added to the dataset for further inspection. The analysis of the collected dataset was conducted in two consecutive phases: Coding them deductively based on already established patterns before inductively describing their variations. Both phases rely on the same dataset, but only a subset of the patterns was chosen for the second phase.

**Coding Process.** For the analysis, two coders interacted independently with the chatbots, which meant that they were able to detect different patterns in the conversational turns. Each coder made screenshots of their conversations for later discussions. For the first round of coding, the chatbots were coded during and after each conversation. After deciding on the subset of patterns for the second round of coding, the coders again independently coded the pattern variations based on their screenshots or, if necessary for animations for example, went back to the chatbot. While consolidating each round, both screenshots and the live chatbot were consulted to decide on the final labels.

### 3.2 Phase 1 - Distribution of Patterns

The basis for the first deductive phase of coding were 16 chatbot interaction patterns, as they are defined in [20], with the additional option to code any observations regarding potentially new patterns. The result of this coding of the dataset can be seen in Figure 1. The mean inter-rater reliability agreement was substantial (Cohen's $\kappa = 0.78$) [10]. For detailed measurements, please refer to the digital appendix linked in section 3. Additionally to the 16 already established patterns, two new ones are introduced: *Session Minimization* and *Conversation Closure*. With a *Session Minimization*, the chatbot interface provides an option to collapse the chatbot interface. The icon is commonly positioned in the top-right of the header and presented with a chevron facing downwards or a minus sign. The icon for the *Conversation Closure* signifies to users that they can end the chatbot conversation. Similar to the *Session Minimization*, it is commonly visualized by an "X" icon in the top-right corner of the chat interface or included as an option within the *Persistent Menu*.

**Analysis Results.** The distribution shows that all chatbots use *Chat Messages* while *Quick Replies*, *Session Minimization*, and *Conversation Closure* are used by 87% each. *Help Systems* as a pattern which represents the occurrence of other patterns is at 80%. *Typing Indicators* and *Information Stamps* are both used by 70 %, *Functionality Introductions* by 67%, the *Persistent Menu* by 60%, and *Call-on Menus* by 53%. Under half of the chatbots use the following patterns: *System Information* (47%), *Message Reactions* (47%), *Conversation Recovery* (43%), *Cards* (30%), *Carousels* (23%), and *Conversational Reload* (23%). *Webviews* and *Accordions* were not found at all in this dataset.

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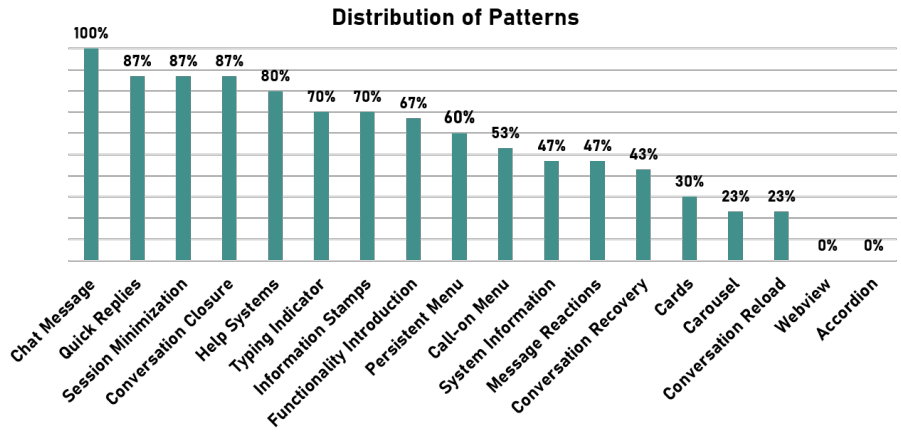


**Fig. 1.** Distribution of Chatbot Interaction Patterns across the collected dataset.

### 3.3 Phase 2 - Describing Pattern Variations

The second phase of the coding describes a set of variations for a subset of patterns which are based on characteristics like shape, position, or action. Choosing the subset is based on two considerations:

1. How often do they occur in the dataset?
2. How relevant are they for the graphical user interface?

We decided to not regard any patterns which occur in less than half of the analyzed chatbots which excludes patterns like *Message Reactions*, *Cards* or *Carousels*. For the second consideration, we consider if the patterns are describing graphical elements or rather how these graphical elements are used in specific situations of the conversation. While the *Functionality Introduction* for example is present in 67% of chatbots, it describes that the pattern of a *Chat Message* is used to introduce main functionalities to the user at the very beginning of the conversation. Similarly, the pattern of *Help Systems* with a distribution of 80% aggregates other patterns like the *Functionality Introduction* or *Call-on Menu* which are describing how the chatbot offers assistance to the user via *Chat Messages*, *Quick Replies* or other patterns. An overview of the variation distribution per pattern can be seen in Figure 2. The mean inter-rater reliability agreement was almost perfect (Cohen's $\kappa = 0.95$) [10]. For detailed measurements, please refer to the digital appendix linked in section 3.

**Analysis Results.** For *Chat Messages*, 5 variations were found, for *Quick Replies* 4, and for *Typing Indicators* and the *Persistent Menu* 3 variations were found for each. *Information Stamps* can be found in 4 variations, *Session Minimization* in 2, and the *Conversation Closure* includes 5 variations. The detailed coding can be found in the digital appendix. Due to the variability in the pattern

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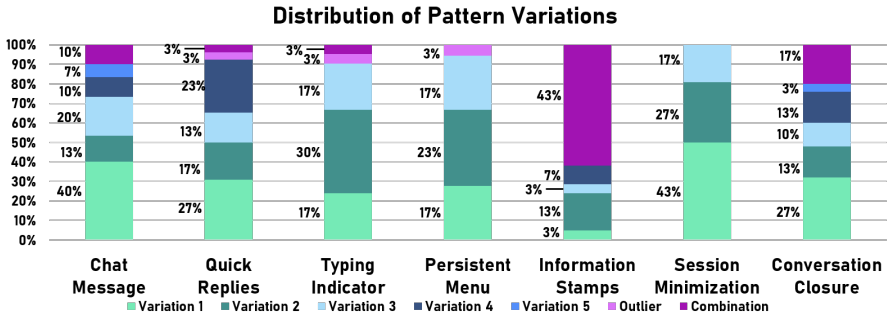


**Fig. 2.** Distribution of the pattern variations

designs, some defined variations combine different sub-variations, where either shape or position are the common factor, but another characteristic can change. This is for example the case for one variation of *Quick Replies*, where they are included in the *Chat Message* itself and not under it, as in most other cases. The different shapes of the *Quick Replies* are not regarded for this variation as this would have meant many different variations with small numbers of occurrences. Combinations of variations are present in nearly all patterns, the most often in *Information Stamps*. To provide a compact presentation in Figure 2, we provide the variations for all found occurrences and numerate them with 1-5, dependent on the number of variations. As this only shows a simplification of the multitude of variations, we do not claim any semantic relationships between variations with the same numbers across all patterns.

**Implementation Variations for Chat Messages.** For brevity, we provide the example of the five variations for the *Chat Messages* pattern. They are shown in Figure 3 with screenshots where the respective shape is highlighted in Red. We also introduce short descriptions in brackets, which will be used in a later overview for the user study in section 4. Variations 1 and 2 are rather similar as


**Fig. 3.** Screenshots of the five *Chat Message* variations (top left to bottom right) with the shapes highlighted in Red.

both describe *Chat Messages* with three round corners and one angular corner pointing to the designated side of the sender (left for the chatbot, right for the user). The difference is that variation 1 (*angular-bottom*) includes the angular corner on the bottom side facing the respective sender while variation 2 (*angular-top*) situates the angular corner at the top. Variation 3 (*all-round*) presents *Chat Messages* with four round corners. Variation 4 (*bubble*) is in the shape of a speech bubble and variation 5 (*all-angular*) has four angular corners.

## 4 Explorative User Study

Based on the analysis results, five stereotypical chatbot prototypes were created and tested by 40 participants who rated the pattern variations in each prototype. In this section we first describe the methodology, before presenting the results and discussing them in the next sections.

### 4.1 Methodology

For the user study, participants had to conduct the same short task with all 5 chatbots in a random order, before rating the corresponding pattern variations. The task consisted of checking up on the status of an order. Each chatbot was deployed with the same mock-up website in the background as the use case for the experiment. Access to the chatbot was available either via the "Help" menu or an icon on the bottom right of the screen. Participants were guided through the experiment with an online-survey. In the beginning of the survey, the terms for the different patterns were explained before participants had to provide demographic data and were instructed to create a unique identifier[2] before receiving the links to the chatbots. The identifier was used throughout the experiment, so that the participants can be tracked in all chatbot prototypes. After receiving the link to the chatbot prototype, completing the task and closing the chatbot, the participants were asked to rate the included pattern variations on a Likert scale from 1–5 ("Didn't like it at all"–"Liked it very much") and to optionally provide a reasoning for this. To access the next chatbot prototype, the participants had to go back to the survey. This repeated for all five prototypes and at the end of the survey, the participants were asked to choose the chatbot they liked the most and to provide an optional reasoning for their choice.

### 4.2 Chatbot Prototypes

In this section, we elaborate our rationale for the prototype design based on our findings from the chatbot analysis.

[2] created from the first two letters of their first name and the last two digits of their birth year.

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**Rationale.** The five different prototypes are created by combining different pattern variations. We initially planned to re-create chatbots with the most used variation combinations, but we had to change this approach after evaluating the results from the chatbot analysis. Over all chatbots, three pairs and one triple had an overlap in two pattern variations and four pairs an overlap in three pattern variations. The only complete overlaps were caused by the use of the same CSS framework or third party vendor for the chatbot creation. This lead us to the conclusion that existing chatbot interfaces are way too diverse to be used as the basis for our explorative study. Thus we tried to create interfaces with pattern variations presenting some stereotypical characteristics as we could not reuse existing combinations.

**Prototype Description.** In this section, we briefly present all variation combinations. They are named consecutively with *CB-[1–5]* and are described with some characteristics of their pattern variations. An abstract representation of the different prototype interfaces is presented in Figure 4. An overview of all variation combinations can be seen in Table 1 with keywords shortly describing each variation. More information on the variation types can be found in the digital appendix.

The first prototype, *CB-1*, is the un-informative one. It does not have a *Persistent Menu*, the *Information Stamps* only present the date as "Today" at the beginning of the conversation, and when the user clicks the close-button, it closes without any other interaction. The next one, *CB-2*, is the opposite and represents the informative prototype. This prototype has a *Persistent Menu*, presents a confirmation dialog before closing the interface, and uses two different variations of information stamps: The current date and time at the start of the conversation and the sender underneath the chat messages. *CB-3*, is the minimalistic prototype. It neither includes a *Persistent Menu*, nor a *Session Minimization*, although upon closing the chat, the users are prompted to rate the conversation. The chat messages have a time stamp underneath them, but no *Information Stamps* at the beginning of the conversation, and the *Typing Indicator* is a simple "Bot is typing...". The protoype *CB-4* again includes more patterns and is designed to be the feedback-oriented prototype. The interface

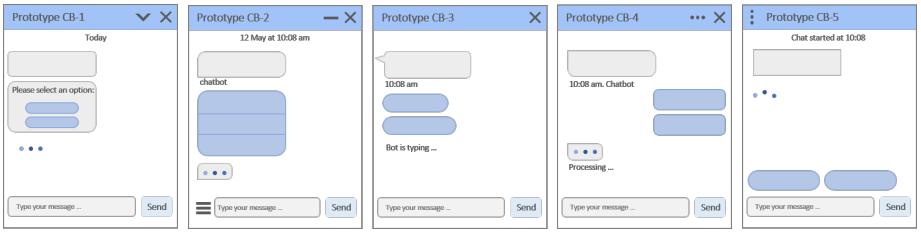


**Fig. 4.** Abstract representations of the variation combinations in the five chatbot prototypes (for brevity without resulting actions from Conversation Closure).

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does not include a *Session Minimization*, but upon closing the interface, both a confirmation screen and a feedback request for the conversation appears. The *Quick Replies* are chip-shaped and aligned on the user side of the interface. Lastly, *CB-5* is the closed-session prototype. Upon clicking the close icon, the interface stays open, but an information is presented under the last messages which informs the user of the end of the conversation session. A new session can be started by sending a new message to the chatbot. It also provides the starting time of the conversation in the beginning, but does not include any *Information Stamps* underneath the *Chat Messages*.

## 5 Results

In this section, we discuss the results from the user survey regarding the preferences of pattern variations and their preferred prototype. The survey was taken by 52 participants recruited by Convenience Sampling, out of which 12 had to be excluded because their answers were incomplete. In the end, a total number of 40 answers could be evaluated.

Figure 5 presents an overview of the participants regarding to their demographic data. Most participants are either students (50.0%) or develop software (30.0%) additionally to 7.5% working professionals and 12.5% in another occupation. From the participants, 15.0% are between 20-25 years old, 7.5% between 25-30 years, 5.0% between 30-35 years, and 2.5% 40 or above with no participants between 35-40 years old. With 62.5% most participants are female, and 37.5% male.

### 5.1 Statistical Evaluation of Variation Preferences

In this section we present our statistical evaluation of the variation preferences. Table 1 presents the means of the rating for each pattern variation.

For the pattern *Session Minimization*, the difference in the variation rating was tested with Mann Whitney U, which was significant at $p < 0.001$. Friedman tests across variations within a pattern showed significant differences in variation ratings: *Chat Message* ($\chi^2(4) = 49.26, p < 0.001$), *Quick Replies* ($\chi^2(4) =$

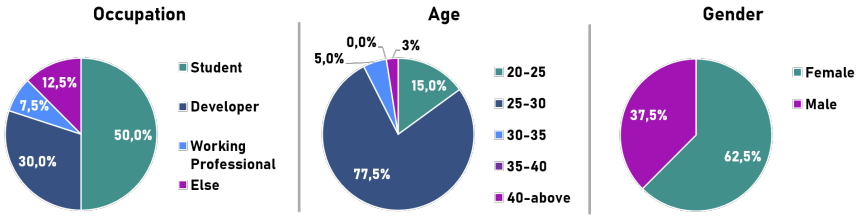


**Fig. 5.** Overview of demographics data (left to right) for Occupation, Age, and Gender.

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$29.16, p < 0.001$), *Typing Indicator* ($\chi^2(4) = 57.82, p < 0.001$), *Persistent Menu* ($\chi^2(2) = 17.73, p < 0.001$), *Information Stamps* ($\chi^2(4) = 40.38, p < 0.001$), and *Conversation Closure* ($\chi^2(4) = 56.30, p < 0.001$).

The observed difference between variation ratings represents a medium effect ($Z = 0.39$) for *Session Minimization*. The differences between variations within patterns are corresponding to low to medium effect sizes (from lowest to highest): *Quick Replies* (Kendall's $W = 0.18$), *Persistent Menu* ($W = 0.22$), *Information Stamps* ($W = 0.25$), *Conversation Closure* ($W = 0.25$), *Chat Messages* ($W = 0.30$), and *Typing Indicator* ($W = 0.36$).

**Table 1.** This table shows the combination of pattern variations (named with short description) for the chatbot prototypes CB-[1–5] with the mean values of their rating from the participants in brackets underneath. "CM" stands for *Chatbot Message*, "QR" for *Quick Replies*, "TI" for *Typing Indicator*, "PM" for *Persistent Menu*, "SM" for *Session Minimization*, and "CC" for *Conversation Closure*.

| **Pattern** | **CB-1** | **CB-2** | **CB-3** | **CB-4** | **CB-5** |
|---|---|---|---|---|---|
| **CM** | all-round | angular-bottom | bubble | angular-top | all-angular |
| | (*3.58*) | (*4.65*) | (*4.08*) | (*4.43*) | (*4.05*) |
| **QR** | message | list | chips | angular | chips |
| | (*3.63*) | (*4.53*) | (*4.13*) | (*4.18*) | (*3.9*) |
| **TI** | horizontal | horizontal | text | horizontal + text | vertical |
| | (*3.85*) | (*4.7*) | (*3.7*) | (*4.73*) | (*4.25*) |
| **PM** | - | burger | - | meatballs | kebab |
| | - | (*4.7*) | - | (*4.2*) | (*3.95*) |
| **IS** | start | start, sender | time | sender + time | start |
| | (*3.73*) | (*4.73*) | (*4.4*) | (*4.6*) | (*4.35*) |
| **SM** | chevron | minus | - | - | - |
| | (*3.67*) | (*4.48*) | - | - | - |
| **CC** | closing | confirmation | feedback | confirmation + feedback | notification |
| | (*2.78*) | (*4.45*) | (*4.4*) | (*4.33*) | (*4.05*) |

### 5.2 Qualitative Data

Additionally to the above presented preferences for variations in each chatbot prototype, the participants were asked at the end of the survey to choose their preferred prototype with the option to provide their reasoning. Regarding the preference for one of the chatbots, the distribution is similar to the previously presented results: *CB-4* was preferred by 14 participants and *CB-2* by 13, while *CB-5* was chosen by 7 participants, and both *CB-1* and *CB-3* were chosen by 3 participants. This is mirroring the mean values from the pattern variations, as *CB-2* and *CB-4* also include the patterns which were rated the highest. Most

feedback concerns the interface as a whole, but one participant made a comment on choosing *CB-4* because of its "use of buttons and typing [indicator]" (TR97).

The qualitative feedback for the prototypes provides more insights - the identifier is provided in brackets after the respective citation. For *CB-1*, participants said that "[it] would be good to have confirmation before closing the chat" (SH97), the "buttons were hard to identify as they were inside message"(TR97), and there was some "[confusion] between minimise button and menu" (UJ98). *CB-2* generally received good feedback but no comments on its pattern variations. In *CB-3*, an "animation would look better instead of [only the text "bot is typing..."]" (PR20) for the *Typing Indicator*. This pattern was liked better in *CB-4* where three animated dots are shown inside a chat message shape with "Processing..." displayed underneath it. Negative feedback for this prototype includes that *Quick Replies* were not "on the left side below chat message" (PR20), confusion because the "menu icon [looks] like minimize button" (UJ98), and that the "[close] chat process is very long" (TI95). One participant mentions for *CB-5* that the "close button [could not be found] easily" (PO98).

## 6 Discussion

In this section, we interpret the presented results from section 5 and discuss some insights regarding the effect of different pattern variations. Afterwards, we provide limitations to the validity of this paper and how we mitigated them.

### 6.1 Insights

In this section, we present insights regarding the coding of the dataset, the statistical evaluation of the user study, and observed similarities to other interfaces.

**Insight 1: Similarities, Divergences, and Outliers.** In the analysis of the collected chatbots, the patterns *Chat Messages*, *Typing Indicators*, and *Session Minimization* each have one variation which is found in over 1/3 of the chatbots. This shows that there is already some common ground for specific design decisions. Similarly for *Information Stamps*, combinations of variations are found in 43% of the dataset. Combinations are found in all patterns except for *Persistent Menu* and *Session Minimization*, which only include one icon per interface and do not offer much space for variation. Depending on the variation, its graphical elements can also be situated on the upper, lower, left or right of the chatbot interface or diverge regarding a round or angular shape or its functionality. For example, *Information Stamps* in connection with a *Chat Message* can be arranged above, underneath, or on the bottom of the message itself. *Typing Indicator* animations often have different shapes like boxes, chips or message symbols around the animated dots. Looking at these divergences, it is also visible that there are different frequencies depending on the variation. While vertical dots in *Persistent Menu* are either on the left (4 times) or right (3 times) side of the header, horizontal dots are only found on the right side

but 4 times in the header and twice underneath the text input field, while the burger menu is always on the left of the text input field. Outliers are found in *Quick Replies* (a *Chat Message* with the information that options for actions or 'instant answers' are available and, on clicking, a pop-up appears which lists the options with descriptions), a *Typing Indicator* (as a small black message shape but in another variation than the *Chat Messages* themselves), and a *Persistent Menu* (a popup with a selection of icons which then function like starting a new conversation via *Quick Replies*).

**Insight 2: Preferences for Variations.** Our statistical analysis shows significant differences in the rating of pattern variations with low to middle effect sizes. We highlight here some insights which we could see in these results regarding single variations. In the case of *Chat Messages*, it seems that participants prefer shapes which indicate the sender of the message. For *Information Stamps*, where many different combinations are possible, participants seem to like some explicit information on the context of date, time, and name, with combinations of these different types being slightly more preferred. For *Typing Indicators*, the combination of animation and text received the highest mean rating, while static text is preferred least. This pattern also has the highest effect size. The lowest rating was given to the variation of the *Conversation Closure* where a click on the icon closes the chatbot interface without any follow-up action. As we did not use a complete factorial design, we can not find any interaction effects based on the combination of variations. At the same time, this does not mean that there might not be any effects by combining pattern variations. Prototypes *CB-2* and *CB-4* were named in sum by more than half of the participants as preferred chatbots, which could show a potential indication of preferred combinations.

**Insight 3: Influences from other Interfaces and Best Practices.** Some ratings of the pattern variations seem to be influenced by familiarity and expectations based on experiences with other interfaces. *Session Minimization* makes use of two different variations one of which, the minus sign, is the typical representation of the same action in Windows systems which could be a cause for its higher mean rating. As mentioned in [6], arrows often signal that more options are available, which might explain the confusion between *Session Minimization* and the *Persistent Menu* in *CB-1*. Similarly, the position of the *Persistent Menu* on the top right beside the *Conversation Closure* in *CB-4* caused confusion, possibly because this position is often reserved in GUIs for minimizing a window. In mobile apps on the other hand, the menu is often situated on the top right [15], while similar interaction elements to the *Persistent Menu* (attachments, emojis, or photos) can be found in messenger apps commonly near the text input field, so there might also be other influences present regarding the preferences. Horizontal or vertical animations with three points for *Typing Indicators* are well known from messengers, which could explain their preference in contrast to static text. In the case of closing the chatbot interface, closing the window without any confirmation goes directly against Nielsen's heuristic of "Error Pre-

vention" [13]. This might be the reason for the low rating, as users would not expect to loose their conversation without warning. On the other hand, a longer closing process with both a confirmation and a feedback request was criticized by one participant.

### 6.2 Limitations

This section presents threats to validity of our research, our mitigation strategies, and other limitations. Due to the external observational research design without access to source code, it is possible that not all conversation turns and correspondingly, all patterns were found in our chatbot analysis. To mitigate this, two coders interacted with the chatbots independently for more variety in the interactions. Most patterns are of a graphical nature, and as such should not depend on specific conversation turns. While we do not claim to have found all available patterns, we expect that the found selection represents the general characteristics of the chatbots. The second internal threat lies in the choice of methodology. By combining variations of different patterns in each chatbot prototype, there might be biases due to the combinations, as the pattern variations are not regarded in isolation. As there is no previous research specifically on chatbot interface design elements, our goal is to explore if different pattern variations can cause any effect as a groundwork for more in-depth research later on. As such, we do not claim to present results regarding the use of specific variations, nor to present the most ideal combinations of patterns or their variations. Our exploration is designed to include as many variations as possible to represent the breadth of the current chatbot interfaces for first insights into their effects.

## 7 Conclusion and Future Work

In this work, we present contributions to the development of guiding principles for the design of graphical interfaces in chatbots. First, we present the analysis of a dataset with which we show both the distribution of patterns in chatbot interfaces, and describe different variations for a subset of seven patterns. Based on this, we conduct an explorative study in which we can observe significant differences in the preference of pattern variations with low to medium effect sizes. In section 6, we present three insights regarding the coding of the dataset, the statistical evaluation, and similarities to other interfaces.

The analysis of the dataset shows that in some cases there is a tendency towards one variety. But even though either shapes, positions, animations, or functionalities might be used similarly, their other characteristics are often different or sometimes outliers break completely with more common variations. As the only similar chatbot interfaces were caused by the same technological basis, the multitude of variations and their combinations suggests that users might benefit from more similarities based on guidelines. The statistical analysis shows that there seem to be preferences from the user side. In future work, specific effects of patterns and their variations should be explored with A/B tests in

larger scale studies. Other research can be conducted on the effects of pattern variations on usability and user experience. This would especially be interesting in regards to task outcomes or user preferences across different domains and task types. The last implication we can draw from our study is that there seem to be some influences on user preferences by other interfaces. This leads us to the conclusion that chatbot interfaces will benefit from the creation of guidelines or best practices which not only regard their conversational nature, but also their graphical interface.

## References

1. Abbas, N., Følstad, A., Bjørkli, C.A.: Chatbots as Part of Digital Government Service Provision – A User Perspective, vol. 13815, p. 66–82. Springer International Publishing, Cham (2023), https://link.springer.com/10.1007/978-3-031-25581-6_5, series Title: Lecture Notes in Computer Science
2. Adamopoulou, E., Moussiades, L.: Chatbots: History, technology, and applications. Machine Learning with Applications **2**, 100006 (2020), https://doi.org/10.1016/j.mlwa.2020.100006
3. Feine, J., Adam, M., Benke, I., Maedche, A., Benlian, A.: Exploring Design Principles for Enterprise Chatbots: An Analytic Hierarchy Process Study. In: Hofmann, S., Müller, O., Rossi, M. (eds.) Designing for Digital Transformation. Co-Creating Services with Citizens and Industry. p. 126–141. Springer International Publishing, Cham (2020), https://doi.org/10.1007/978-3-030-64823-7_13
4. Flohr, L.A., Kalinke, S., Krüger, A., Wallach, D.P.: Chat or Tap? – Comparing Chatbots with 'Classic' Graphical User Interfaces for Mobile Interaction with Autonomous Mobility-on-Demand Systems. In: Proceedings of the 23rd International Conference on Mobile Human-Computer Interaction. p. 1–13. ACM, Toulouse & Virtual France (Sep 2021), https://dl.acm.org/doi/10.1145/3447526.3472036
5. Følstad, A., Nordheim, C.B., Bjørkli, C.A.: What Makes Users Trust a Chatbot for Customer Service? An Exploratory Interview Study. In: Bodrunova, S.S. (ed.) Internet Science. pp. 194–208. Springer International Publishing, Cham (2018)
6. Galitz, W.O.: The essential guide to user interface design: an introduction to GUI design principles and techniques. Wiley Pub, Indianapolis, IN, 3rd ed edn. (2007)
7. Gnewuch, U., Morana, S., Adam, M., Maedche, A.: "The Chatbot is typing ..." – The Role of Typing Indicators in Human-Chatbot Interaction. SIGHCI 2018 Proceedings (dec 2018), https://aisel.aisnet.org/sighci2018/14
8. Jain, M., Kumar, P., Kota, R., Patel, S.N.: Evaluating and Informing the Design of Chatbots. In: Proceedings of the 2018 Designing Interactive Systems Conference. p. 895–906. DIS '18, Association for Computing Machinery, New York, NY, USA (2018), https://doi.org/10.1145/3196709.3196735
9. Klopfenstein, L.C., Delpriori, S., Malatini, S., Bogliolo, A.: The Rise of Bots: A Survey of Conversational Interfaces, Patterns, and Paradigms. In: Proceedings of the 2017 Conference on Designing Interactive Systems. p. 555–565. DIS '17, Association for Computing Machinery, New York, NY, USA (2017), https://doi.org/10.1145/3064663.3064672
10. Landis, J.R., Koch, G.G.: The measurement of observer agreement for categorical data. Biometrics **33**(1), 159–174 (1977), http://www.jstor.org/stable/2529310

11. Liu, X., Rietz, T., Maedche, A.: Conversational versus graphical user interfaces: the influence of rational decision style when individuals perform decision-making tasks repeatedly. Univers. Access Inf. Soc. **24**(2), 1157–1172 (Jun 2024). https://doi.org/10.1007/s10209-024-01122-1, https://doi.org/10.1007/s10209-024-01122-1
12. Moore, R.J., Arar, R.: Conversational UX design: A Practitioner's Guide to the Natural Conversation Framework. ACM Books, ACM Books, New York, first edition edn. (2019), https://doi.org/10.1145/3304087
13. Nielsen, J.: Enhancing the Explanatory Power of Usability Heuristics. In: Proceedings of the SIGCHI conference on Human Factors in Computing Systems. pp. 152–158 (1994)
14. Pirrone, R., Cannella, V., Russo, G.: GAIML: A New Language for Verbal and Graphical Interaction in Chatbots. p. 715–720 (Mar 2008), https://ieeexplore.ieee.org/document/4606758
15. Rogers, Y., Sharp, H., Preece, J.: Interaction Design: beyond human-computer interaction. John Wiley and Sons, Indianapolis (2023)
16. Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N., Diakopoulos, N.: Designing the User Interface: Strategies for Effective Human-Computer Interaction. Pearson (2016)
17. Silva, G.R.S., Canedo, E.D.: Towards user-centric guidelines for chatbot conversational design. International Journal of Human–Computer Interaction **40**(2), 98–120 (2024), https://doi.org/10.1080/10447318.2022.2118244
18. Tidwell, J., Brewer, C., Valencia, A.: Designing Interfaces: Patterns for Effective Interaction Design. O'Reilly, Beijing [China]; North Sebastopol, CA, third edition edn. (2020)
19. Traubinger, V., Gaedke, M.: Interaction Design Patterns of Web Chatbots. In: Stefanidis, K., Systä, K., Matera, M., Heil, S., Kondylakis, H., Quintarelli, E. (eds.) Web Engineering. pp. 309–317. Springer Nature Switzerland, Cham (2024), https://doi.org/10.1007/978-3-031-62362-2_22
20. Traubinger, V., Heil, S., Grigera, J., Garrido, A., Abhyankar, S., Gaedke, M.: An analysis of federal and municipal chatbots in germany. In: Følstad, A., Papadopoulos, S., Araujo, T., Law, E.L.C., Luger, E., Hobert, S., Brandtzaeg, P.B. (eds.) Chatbots and Human-Centered AI. pp. 200–216. Springer Nature Switzerland, Cham (2025), https://doi.org/10.1007/978-3-031-88045-2_13
21. Valério, F.A.M., Guimarães, T.G., Prates, R.O., Candello, H.: Chatbots Explain Themselves: Designers' Strategies for Conveying Chatbot Features to Users. Journal on Interactive Systems **9**(3) (Dec 2018), https://doi.org/10.5753/jis.2018.710

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# Appendix

### Chatbot Screenshot Selection

In this appendix, we present six examples of chatbot screenshots which were used for the analysis. The full dataset will be published on Zenodo.

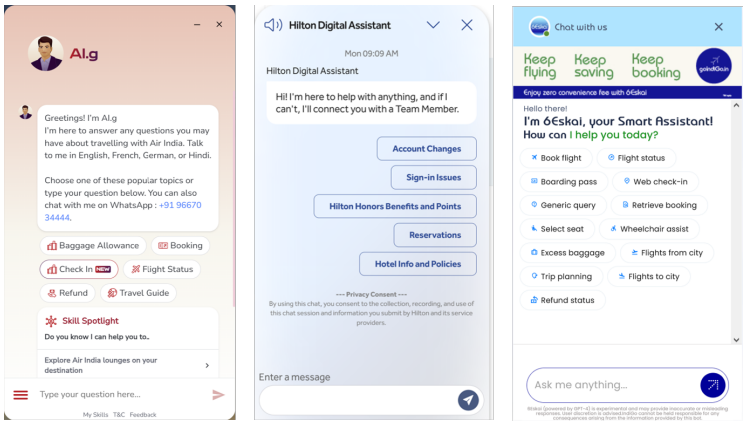


**Fig. 6.** Chatbot Screenshots from Air India, Hilton Hotels, and IndiGo (left to right).

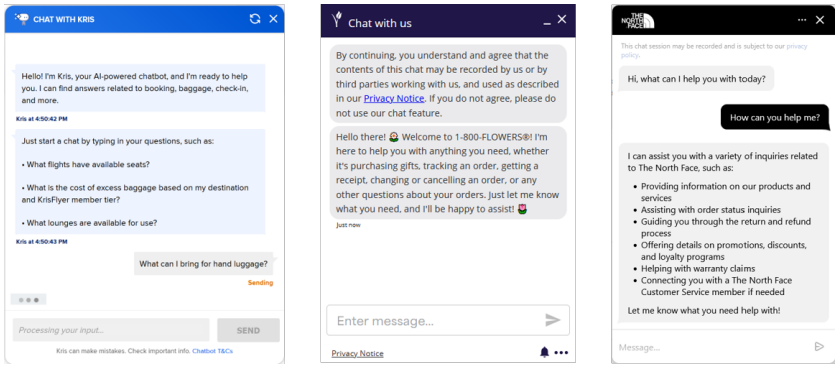


**Fig. 7.** Chatbot Screenshots from Singapore Airlines, 1-800 Flowers, and NorthFace (left to right).

**Chatbot Patterns**

This appendix includes a table with all pattern descriptions which were used for the first round of coding.

**Table 2.** Chatbot interaction patterns from Traubinger et al.[20] and their description.

| **Pattern name** | **Description of pattern** |
|---|---|
| Chat Messages | Displaying outputs from chatbot and user, most often as speech bubbles. |
| Cards | Presenting similar information, often with text, images, and actions. |
| Carousel | A set of similar items in a horizontal list. |
| Quick Replies | A set of actions or functionalities under a chat message in the form of buttons. |
| Typing Indicators | A visual representation of the waiting time for the reply of the chatbot. |
| Persistent Menu | A constant menu in the chat window for important information or settings. |
| Call-on Menu | A dynamic representation of consistent information which was requested by the user. |
| Webview | A preview on web content from other providers or the chatbot homepage itself. |
| Message Reactions | Emojis beside or under a chat message to provide feedback on the answer of the chatbot. |
| Help Systems | Offering assistance for users, either on request or proactively by the chatbot. |
| Functionality Introduction | Introducing the main functionalities or providing a tutorial in the first chat messages. |
| Conversation Recovery | Avoiding conversation breakdowns by providing possible actions or commands. |
| System Information | Providing the users with information outside of the direct communication with the chatbot. |
| Information Stamps | Information on metadata regarding the conversation or *Chat Messages*. |
| Dialogue Reload | Presenting an option to re-load the complete dialogue. |
| Accordion | Hiding additional information on a topic or search result under a cut. |

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**Codebook**

The Codebook includes the Patterns, and descriptions of all their variations. The column "Short Description" refers to Table 1, where short descriptions had to be used for brevity. The complete coding can be seen in the digital appendix.

| **Pattern** | **Variation Number** | **Short Description** | **Description** |
|---|---|---|---|
| Chat Message | Variation 1 | angular-bottom | bottom-left corner non-rounded |
| | Variation 2 | angular-top | top-left corner non-rounded |
| | Variation 3 | all-round | all corners rounded |
| | Variation 4 | bubble | speech bubbles |
| | Variation 5 | all-angular | all non-rounded corners |
| Quick Replies | Variation 1 | list | vertical list |
| | Variation 2 | angular | box-shaped horizontal list of buttons |
| | Variation 3 | chips | pill or chip shaped horizontal list of buttons |
| | Variation 4 | message | combination of vertical list and buttons embeded in Chat Message |
| Typing Indicator | Variation 1 | text | static text |
| | Variation 2 | horizontal | horizontal animation |
| | Variation 3 | vertical | vertical animation |
| Persistent Menu | Variation 1 | burger | burger icon (3 horizontal lines) |
| | Variation 2 | kebab | kebab icon (three vertical dots) |
| | Variation 3 | meatballs | meatballs icon (three horizontal dots) |
| Information Stamps | Variation 1 | start | time/day stamp in beginning of chat |
| | Variation 2 | time | timestamp below chat message |
| | Variation 3 | sender + time | user context and timestamp below chat message |
| | Variation 4 | sender | user context below chat message |
| Session Minimization | Variation 1 | minus | "-" icon |
| | Variation 2 | chevron | "V" icon |
| Conversation Closure | Variation 1 | confirmation | confirmation dialog |
| | Variation 2 | notification | text notification |
| | Variation 3 | feedback | feedback dialog |
| | Variation 4 | - | minimize window |
| | Variation 5 | closing | close chat window completely |