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Different Chatbots for Different Purposes: Towards a Typology of Chatbots to Understand Interaction Design

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Abstract. Chatbots are emerging as interactive systems. However, we lack knowledge on how to classify chatbots and how such classification can be brought to bear in analysis of chatbot interaction design. In this workshop paper, we propose a typology of chatbots to support such classification and analysis. The typology dimensions address key characteristics that differentiate current chatbots: the duration of the user's relation with the chatbot (short-term and long-term), and the locus of control for user's interaction with the chatbot (user-driven and chatbot-driven). To explore the usefulness of the typology, we present four example chatbot purposes for which the typology may support analysis of high-level chatbot interaction design. Furthermore, we analyse a sample of 57 chatbots according to the typology dimensions. The relevance and application of the typology for developers and service providers are discussed.

Keywords: Chatbots, typology, interaction design

1 Introduction

There is great variation in how chatbots are implemented. From a user-centred design perspective, the variation in high-level approaches to interaction design is particularly interesting. One source of variation concerns the level of control bestowed on the chatbot. While some chatbots are designed to resemble Victorian servants, only aiming to satisfy their masters' requests, others are designed to persuade its users and lead them towards a particular goal. Another source of variation concerns the duration of the relation with the chatbot. While some chatbots target brief one-off encounters, others aim for establishing and maintaining long-term relations with their users.

Choice of high-level approach to chatbot interaction design is important, as it needs to fit the users' needs and desires in a given use-case and also reflect the strengths and limitations of the underlying technology on which the chatbot depends.

As an illustration of the importance of these choices, consider two well-known chatbots: Woebot (https://woebot.io), a self-help chatbot where users learn to cope with mental health issues, and Google Assistant (https://assistant.google.com), a personal assistant helping users with tasks such as planning, search, and controlling smart home devices. Whereas Woebot takes the user through a long-term program

consisting of brief daily interactions where much of the user input is predefined, Google Assistant awaits the user's requests and seeks to serve these with minimal requirements on the user as to how or what the input should be.

While different chatbot purposes clearly require different overall approaches to interaction design, there is little guidance to be found in the literature on how to classify chatbots and how to analyse interaction design with regard to different chatbot types.

The contribution of this paper is to propose a typology of chatbots, intended as a first step towards a framework that enables chatbot classification and provides better understanding of chatbot interaction design. To exemplify one possible use of the typology to support interaction design, we demonstrate how the proposed typology may be used to guide analysis of high-level interaction design in four common chatbot purposes: customer service, personal assistants, content curation, and coaching. We also apply the typology to classify a set of chatbots of some current prominence.

The paper is structured as follows. First we present a brief overview of relevant background on chatbots, chatbot interaction design, and typologies. We then propose a typology of chatbots, show example uses of the typology to support analysis of high-level interaction design, and present a study where the typology is applied for classifying current chatbots. Finally, we discuss the typology and propose future work.

2 Background

2.1 Chatbots and chatbot interaction design

Chatbots are conversational agents that provide users' with access to data and services through natural language dialogue [7]. While the term *chatbots* typically is applied for text-based interaction, it may also encompass voice-based conversational agents such as Apple's Siri and Amazon's Alexa. Chatbots are used for a range of application areas such as customer support [12], health [6], and education [8], in addition to marketing, entertainment, and general assistance with simple tasks.

While conversational user interfaces have been an object of research and development since the sixties [11], the literature comprehensively treating how to design for chatbots is somewhat limited. However, major tech companies have provided guidelines on conversational interaction design, such as Google's guide to conversation design (https://developers.google.com/actions/design/), IBM's resources on conversational UX design (http://conversational-ux.mybluemix.net/design/conversational-ux/), and Amazon's design guide for Alexa (https://developer.amazon.com/designing-for-voice/). Material on conversational design is also found in developer and designer blogs, and in some practitioner-oriented textbooks on conversational design [e.g. 9].

2.2 Typologies

Typologies are much used for classification purposes, in particular within the social sciences [1]. Typologies can support analysis and design of information systems as is facilitates learning across instances, for example as transfer of knowledge between instances of the same type [5].

Collier et al. [4] provided a three-step template for typology development. First, the general concept is outlined. Second, key dimensions capturing salient variation in the concept are identified. Third, the dimensions are cross tabulated, and each type within the cross tabulation is described.

Within a typology, the classes of a dimension should be collectively exhaustive and mutually exclusive. That is, the typology should include all possible cases and each case should fit exclusively within only one type.

The current literature provides little support for designers and developers in distinguishing between different chatbots types, and even less on different approaches to analyse chatbot interaction design in correspondence to such types. IBM's research group on conversational UX design suggest to differentiate between four interactional styles in conversational systems: system-centric, content-centric, visual-centric and conversation-centric (https://researcher.watson.ibm.com/researcher/view_group.php?id=8426). Chen et al. [4] distinguished between task-oriented and non-task oriented dialogue systems, but did not detail how this brings to bear on the interaction design of such systems.

3 Research objective

In response to the lack in support for classifying chatbots, in particular for the purpose of supporting interaction design, three objectives were explicated for the presented work. First, to propose a chatbot typology in compliance with established criteria for typology development [1]. Second, to explore how this typology could be helpful in analyzing different high-level approaches to interaction design. Third, to review a sample of notable chatbots to investigate the potential usefulness of the typology for analysis and classification.

By meeting the research objectives, the presented work should be useful as a starting point for future research on differentiating chatbots and approaches to chatbot interaction design.

4 Research method

The research method consisted of a four-step process.

Step 1: First, a set of chatbots of some prominence was gathered. We took as starting point the listings of recommendable chatbots from four relevant blogs and news websites (*Chatbot Magazine*, *Wired*, *Forbes*, and the Norwegian *Din Side*), as well as the *Chatbottle Award 2017*. Also, we included chatbots mentioned by two or more participants in a survey on chatbot users [2]. In total, 57 chatbots were included in the set.

Step 2: On the basis of reviewing this initial set of chatbots, dimensions differentiating these were suggested in an explorative manner. Possible dimensions included, for example, application domain (e.g. consumer goods, finance, games and entertainment, health and fitness, media and publishers), purposes (e.g. marketing and ecommerce, news and factual media content, social chatter and connections, customer support, personal assistant), platform (e.g. Facebook Messenger, Slack, Skype, Kik), or user group (e.g. children, youth, professional workers, elderly). However, the dimen-

sions seemingly most promising were more generic, characterizing the intended duration of the relation and the locus of control for the dialogue. The typology was then detailed, following the recommendations of Collier et al. [4].

Step 3: High-level interaction designs for four chatbot purposes were analysed with a starting point in the proposed typology. These purposes were intended to reflect key areas of interest: customer service, personal assistants, content curation, and coaching.

Step 4: The initial set of chatbots were coded in accordance with the typology. The typology was critically discussed based on the four steps of the research method.

5 Chatbot typology

The initial set of chatbots identified as basis for establishing the typology, belonged to domains such as consumer goods, health, finance, media, food and beverage, travel, social, general utilities. The chatbots served purposes such as social connections and chatter, customer support, marketing and ecommerce, entertainment, news and factual content, and personal assistant.

Within this broad variation, we noted that the chatbot interaction designs could be structured according to two high-level dimensions. We refer to these as: *Locus of Control* and *Duration of Interaction*. These dimensions comply with key requirements for typology classification [4], where the types should be mutually exclusive while covering the area of interest in a comprehensive manner. In the following we briefly describe these two dimensions, before we detail the resulting four chatbot types.

5.1 Dimension 1: Locus of Control

Dialogue between humans typically is characterized by reciprocity, where the dialogue partners are expected to drive the dialogue in relatively equal measures. This in contrast to chatbot dialogue, where different chatbots display markedly different approaches to which of the dialogue partners that are given the role as leaders of the dialogue. In particular, we distinguish between *chatbot-driven dialogue* and *user-driven dialogue*.

Chatbot-driven dialogue. Some chatbots provide a highly predefined interaction design; that is, the interaction is to a high degree driven or controlled by the chatbot. This is typically seen in scripted chatbots where the scripts include only limited options for branching or alternative paths. Or chatbots providing their users a small number of choices for standardized content, for examples through the use of menus, tiles, or carousels. Examples of such chatbots include content curating chatbots such as the chatbot of the Wall Street Journal, chatbots serving as coaches or guides, such as Woebot, and chatbots for marketing, such as the chatbot for Kia Motors America.

User-driven. Some chatbots are set up to enable more flexibility in the possible input users may make, and to be more responsive to variations in user input. This arguably is more challenging, both technologically and in terms of the needed breadth and volume of content. The chatbot will need to identify the users' intent, both on the level of the individual messages and overall for the interaction or parts of the interac-

tion, and also to be able to respond adequately on this intent. In consequence, for some user-driven chatbots, interaction sequences are typically relatively brief. This is for example often the case in customer support chatbots, such as Alibaba's chatbots for first tier response, or personal assistants, such as Google Assistant.

However, chatbots that has social small-talk as their main objective, so called chatterbots, are examples of chatbots that are user-driven and that also may enable longer conversational sequences. Much because social chatter may have an associative character where answers are not easily classified as correct or not, chatbots for small-talk may be set up with the sole purpose of keeping the conversation going. Well-known examples of chatterbots include Mitsuku and Cleverbot.

5.2 Dimension 2: Duration of Relation

Human-chatbot relations may, from the service provider point of view, be intended as either short-term or long-term relations. A short-term relation is characterized by a user engaging with the chatbot once, without user profile information being gathered or stored. A long-term relation is characterized by the chatbot drawing on user profile information for strengthening user experience across visits.

Short-term relation. Chatbots for short-term engagement are typically set up to provide users with one-off interactions, without an aim for a sustained relation. Chatbots for short-term interaction may possibly be characteristic of this period in chatbot development still being in early phase. Many companies are still at a level of chatbot maturity at which they are just trying out chatbots without seeing this as a prioritized platform. Hence, the need to generate sustained relations is limited. This does not mean that chatbots for short-term relations are only used once by the same users; users may visit the chatbot several times. However, they are then treated as a newcomer on each visit. Examples of short-term chatbots include content curating chatbots such as those run by CNN and Washington Post and marketing chatbots such as those of Burberry and Kayak.

Long-term relation. Chatbots for long-term engagement to a greater degree exploit the potential in user profile information to provide a personalized interaction. Examples of long-term engagements include content curation chatbots that offer recurring updates, chatbots for small-talk that remember what you chatted about in previous interaction sessions, and fitness chatbots that provide your fitness or workout history and schedule. Chatbots situated in messaging platforms such as Facebook Messenger and Kik has a good starting point for establishing long-term relations. The messaging platform provide the chatbot service provider with access to user profile information as well as facilities for easy reengagement.

Some long-term chatbots exploit the duration of the relation to gradually present a rich set of content, such as a complex story or a game, or to gradually build skills and capabilities in the user, such as in educational, fitness or therapy chatbots. Examples of long-term chatbots include content providers with subscription functionality, such as Poncho the weather cat and TechCrunch, educational and coaching chatbots such as Atlas Fitness, Woebot, and St. Panda, and social chatbots such as Replika.

5.3 A two-dimensional typology

With basis in the two typology dimensions, a two-dimensional typology may be established. The typology provides four mutually exclusive categories of chatbots, which arguably overlap well with some of the main chatbot purposes.

Four main chatbot purposes, and their main location in the chatbot typology, is illustrated in **Fig. 1**. It should however be noted that our placing of the example chatbot purposes in the typology is not definite. That is, customer support chatbots may also be rigged for long-term duration; however, due to current limitations in such chatbots and lack of integration with customer relationship management (CRM) systems such chatbots, as of now, typically are in the upper left-hand corner. Likewise, while content curation chatbots often reside in the upper right-hand corner, some aim at long-term relations with their users, for example in the form of daily updates.

The chatbot typology may be used for the analyses and presentation of chatbot interaction design, as is seen for the examples chatbot purposes below.

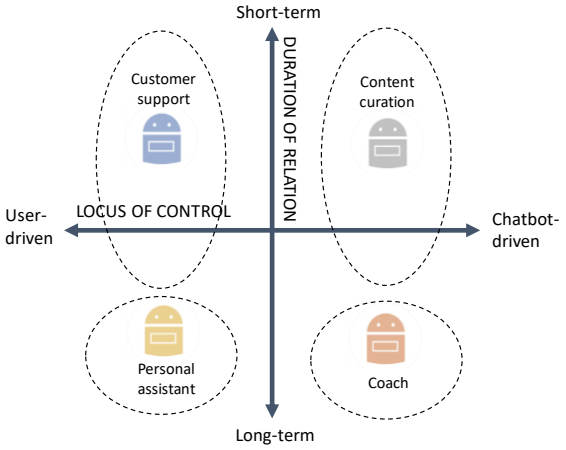

Fig. 1. A typology of chatbots with four example chatbot purposes located within the typology dimensions

6 Analysing interaction design on the basis of the typology

The proposed typology was used as basis for identifying high-level approaches to interaction design for chatbots reflecting the four chatbot types. We briefly present these for four example chatbot purposes.

6.1 Chatbots for customer support

By customer support we mean the provision of help or advice to customers or clients, provided by a company, government body, or non-profit organization. Customer support is typically user-driven, that is, the user engages with customer support with a particular question or concern in mind. The role of the service provider is to identify the customers root problem and provide possible solutions.

Depending on user and service context, interactions may be one-off engagement (e.g. in the case of general enquiries from a prospective customer) or part of a long-term engagement with an existing customer. Hence, chatbots for customer support typically may be classified as having a user-driven Locus of Control. Current chatbots

for customer support typically have a short-term Duration of Relation. However, as CRM integrations improve, such chatbots may increasingly be used for building long-term engagement.

The user-driven character of customer support chatbots, typically lead designers to make it easy and efficient for customers to enter their questions or concerns. Often in the form of free-text, which the chatbot uses as basis for identifying topic and intent. The customer then may confirm or critique the response.

For example, in Alibaba's customer support chatbot (Anna), the first customer action is to enter the query. However, the chatbot also provides a short menu of frequently asked question categories.

The main drivers of the dialogue are the user questions, efficient chatbot responses, and an opportunity for the user to provide feedback to query for additional information or provide response of relevance to the quality of the answer.

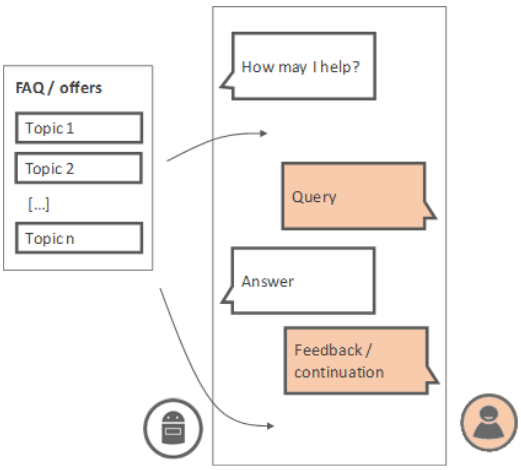

Fig. 2. High-level approach for interaction design in customer service chatbots (user-driven, short-term)

6.2 Personal assistant chatbots

Personal assistant chatbots are chatbots designed to serve a user continuously, on the fly, in the users daily tasks. Such as help to look up information, find and present content (typically music or movies), or control the environment through internet of things applications (e.g. turn on/off lights).

Personal assistant chatbots are highly user-driven, that is, the chatbot may respond to a wide range of requests made by the user. The role of the personal assistant is to efficiently and effectively interpret and deliver. The personal assistant is further intended for long-term relations, with high levels of personalization. Personal assistance chatbots may therefore be classified as having a user-driven Locus of Control and long-term Duration of Relation.

In response to the personal assistants' user-driven, interaction design typically aim to make it easy and efficient for cus-

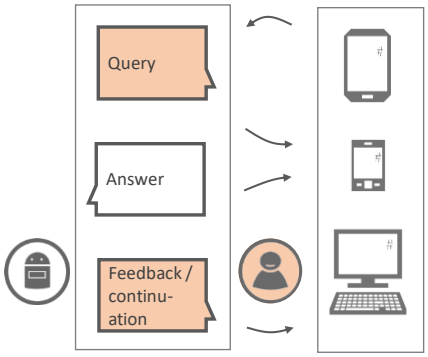

Fig. 3. High-level approach for interaction design in personal assistant chatbots (user-driven, long-term)

tomers to enter their questions or concerns. Often in the form of free-text, which the chatbot uses as basis for identifying topic and intent. The customer may then confirm or critique the response. This is much similar to current customer support chatbots as discussed above.

However, in contrast to typical customer support chatbots, the personal assistant is highly integrated in the personal digital universe of the user, often cross-platform. Hence, the personal assistant may be called from a wide range of contexts within the user's digital universe. When called, the aim of the chatbot is to efficiently lead the user to the desired goal, a goal which is often reached outside the chatbot dialogue.

Hence, the chatbot may help the user achieve the goal even without other feedback than the goal being achieved (e.g. turning off the light, or starting to play a desired song.). In cases of choice alternatives or uncertainty, the dialogue may be extended. However, the goal typically is to leave the chat dialogue as soon as the goal is achieved, or the path towards the goal is laid out.

6.3 Content curation chatbots

A wide range of content curation chatbots exist in the market, for access to news, entertainment, and useful information such as weather forecasts or flight information.

Content curation chatbots are designed to serve as a point of access to a set of content, either owned by the service provider (e.g. CNN news content) or accessed by the service provider (e.g. weather forecasts). The chatbot hence needs to be set up so as to display and suggest available content to the user. In consequence, content curation chatbots typically have a chatbot-driven Locus of Control where the user initiative is limited to accepting or rejecting content offers, or requesting specific content types, serving to filter the presented content selection.

Current content curation chatbots often address a one-off use-case, where a user without a previous history engages with the chatbot. However, increasingly content curation chatbots invite users to form long-term relations with the chatbot as a regular-basis content provider. Hence, current content curation chatbots often have a short-term Duration of Relation, though this seems to change towards long-term relation as chatbots mature.

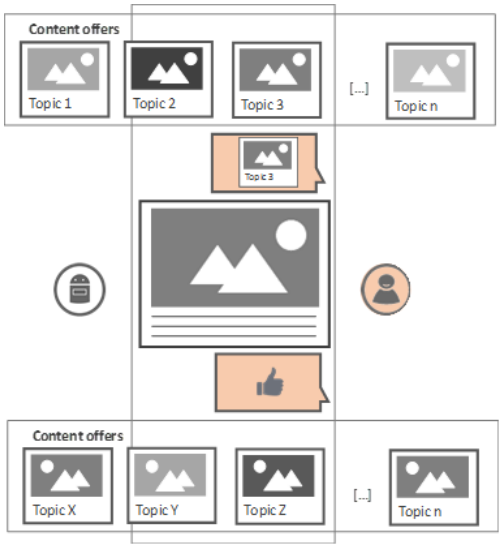

Fig. 4. High-level approach for interaction design in content curation chatbots (chatbot-driven, short-term)

Opposed to the user-driven chatbots seen for customer support and personal assistant chatbots, content curation chatbots actively guides users to recommended content rather than aiming for the user to freely chose and select. This is, in part, due to limitations in the dialogue interface, where browsing and search are less well supported that in regular web-pages or apps. Hence, promoting and recommending relevant and interesting content is critical.

Content typically is promoted through menus or present options, often including visuals to strengthen user experience and engagement.

6.4 Chatbots for coaching

An increasing number of chatbots appear that aim to serve as coaches or guides for users, to help out with a specific challenge or task over time. For example education, therapy, or exercise.

Such coaching chatbots are designed to establish and maintain a long-term relation with the user. A relation which provides value to the user through, for example, learning new skills or mastering existing challenges. Examples of coaching chatbots are therapy chatbots such as Woebot, or guiding chatbots providing reminders and support to prospective students on their way towards college enrollment [10]. The aim of the chatbot needs to a able to take the user stepwise through a therapeutic or educational program, where the user increasingly gains the means necessary to learn the desired skill or master a specific challenge. Hence, coaching chatbots often have a chatbot-centred Locus of Control and a long-term Duration of Relation.

Coaching chatbots are characterized by taking the user through a predefined program through brief sessions on a recurrent basis, typically involving a few minutes of interaction every day. Each session typically builds on the next, with the aim of gradually increasing the users knowledge or skill. The interactions within each of the sessions are scripted, where the users may choose between a small number of paths, depending on individual skill level or preference. Likewise, the order of the sessions may to some degree be reorganized to reflect the preferences or needs of the user. Also, some session elements may be recurring. For example, a therapy chatbot may have session elements that may be triggered at different reported states in the user. For example, a user reporting to feel down or depressed may trigger a specific session element addressing this reported state.

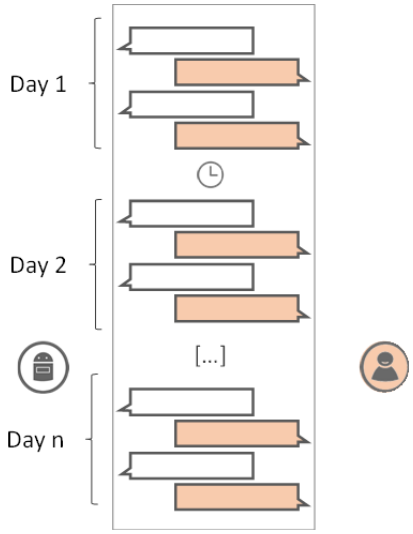

Fig. 5. High-level approach for interaction design in coaching chatbots (chatbot-driven, long-term)

7 Classifying a larger set of chatbots

To explore the usefulness of the proposed typology for analysis and classification purposes, it was applied in an analysis of the 57 chatbots identified in the first step of the presented study.

The basic functionality of each chatbots was explored through interaction by the first author. The chatbots were tried on the platforms of their location, including Facebook Messenger (44), dedicated webpage (7), device (4), Slack (1), and a smartphone app (1). The chatbot was then categorized in terms of Locus of Control (user-driven or chatbot-driven) and Duration of Relation (short-term or long-term).

The chatbots' distribution in terms of the typology is presented in **Table 1**.

Table 1. Distribution of the 57 chatbots included in the analysis, across the dimensions Duration of Relation (short-term or long-term) and Locus of Control (chatbot-driven or user-driven)

	User-driven interaction	**Chatbot-driven interaction**	**Sum**
Short-term relation	8 chatbots Examples: DNB (customer support), Zo (chatter)	24 chatbots Examples: Whole Foods (marketing), CNN (news)	32
Long-term relation	5 chatbots Examples: Google Assistant (assistant), Mitsuku (chatter)	20 chatbots Examples: BBC Politics (news), Atlas Fitness (health)	25
Sum	13	44	57

Note that the sample of chatbots in no way purports to be a representative sample across all available chatbots. The sample is only intended as a set of chatbots that have received some note. The analysis nevertheless provide some interesting insights.

First, chatbot-driven chatbots are prominent among the chatbots that have received some note. This may be seen as a reflection of the relative immaturity in underlying technologies and content, making it challenging for chatbot providers to allow the user to take more control of the interaction.

Second, short-term relations are common. And for quite a few of the long-term relation chatbots (10 of 16), the chatbots merely provided subscriptions to notifications rather than building and extending the relationship with the user. This hints at the opportunities for relationship building through chatbots are not yet fully exploited.

Third, providers within the same market may make different choices in terms of duration of the relation users are expected to have with the chatbot. For example, within news and content provision providers such as CNN and BBC make different choices with regard to whether they want users make a long-term relation with the chatbot, e.g. in terms of subscriptions to daily briefs. This difference may likely be attributed to chatbots for content curation being a relatively new and immature market where different actors use different strategies to try our engagement with chatbots.

8 Discussion

We have in this paper proposed a typology for chatbots, exemplified how the typology can be used as basis for guidance on high-level analysis and guidance on interaction design for chatbot purposes such as content curation, customer support, coaching, and personal assistance.

The chatbot typology has been shown exhaustive (that is, the typology dimensions could be used to categorize all analysed chatbots) and with exclusive types (that is, all analysed chatbots fitted only one type). The dimensions for classification furthermore were found to be sufficiently general and relevant so as to identify meaningful differences between chatbots as seen in the analysis of high-level interaction design for the example chatbot purposes.

The typology dimensions further seems to provide a novel take on chatbot classification as compared to earlier attempts, such as the distinction of four kinds of interactional styles in conversational systems discussed by the IBM's research group on conversational UX design, and the proposed dichotomy of Chen et al. [3] between task oriented and non-task oriented conversational systems. Regarding the former classification, the interaction styles presented may to some degree be seen as a consequence of chatbot type. For example the visual-centric interaction style is frequently seen in chatbots classified as chatbot-driven. Regarding the latter dichotomy, it may be noted that the line between task-oriented and non-task oriented chatbots may be blurry as seen from the availability of chatbots that supports both task support and non-task oriented features, such as marketing chatbots that are intended to engage experientially while at the same time aiming to promote a product or service, or news and factual chatbots supporting both pleasant exploration and task-oriented fact-finding and updates.

The presented work clearly illustrates that chatbots still is an emerging technology which service providers have mainly taken up for exploratory use. This is for example seen in the way different service providers in the same market set up their chatbots differently in terms of Duration of Relation. As chatbot technology, chatbot content, and market uptake of chatbots mature, it may be expected that the distribution of chatbots across the typology dimensions will change. Possibly, towards longer durations of the user relation and more user-driven chatbots. As such, the proposed typology may serve to help service providers set goals for their chatbot developments, for example where service providers could set up goals for more long-term user engagement through chatbots and exploit the assumed potential of chatbots as a relationship-building technology. Such goal-setting will have implications for chatbot interaction design, as well as for requirements regarding the underlying technology and content available through the chatbot.

Chatbots are only emerging as an interactive technology, and their potential uses and purposes are only beginning to be seen. We hope the presented work may serve as a step towards strengthening the usefulness and user experience of chatbots.

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References

1. Bailey, K. D.: Typologies and taxonomies: an introduction to classification techniques (Vol. 102). Sage, Thousand Oaks, CA (1994).
2. Brandtzaeg, P. B., Følstad, A.: Why people use chatbots. In Proceedings of the International Conference on Internet Science. LNCS, vol. 10673, pp. 377-392. Springer, Cham, Switzerland (2017). doi: 10.1007/978-3-319-70284-1_30
3. Chen, H., Liu, X., Yin, D., Tang, J.: A survey on dialogue systems: Recent advances and new frontiers. ACM SIGKDD Explorations Newsletter **19**(2), 25-35 (2017). doi: 10.1145/3166054.3166058
4. Collier, D., LaPorte, J., Seawright, J.: Putting typologies to work: Concept formation, measurement, and analytic rigor. Political Research Quarterly **65**(1), 217-232 (2012). doi: 10.1177/1065912912437162
5. Eide, A. W., Pickering, J. B., Yasseri, T., Bravos, G., Følstad, A., Engen, V., Tsvetkova, M., Meyer, E. T., Walland, P., Lüders, M.: Human-machine networks: Towards a typology and profiling framework. In Proceedings of International Conference on Human-Computer Interaction, pp. 11-22. Springer, Cham, Switzerland (2016). doi: 10.1007/978-3-319-39510-4_2
6. Fitzpatrick, K. K., Darcy, A., Vierhile, M.: Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): a randomized controlled trial. JMIR Mental Health **4**(2) (2017). doi: 10.2196/mental.7785
7. Følstad, A., Brandtzæg, P. B.: Chatbots and the new world of HCI. Interactions **24**(4), 38-42 (2017). doi: 10.1145/3085558
8. Fryer, L. K., Ainley, M., Thompson, A., Gibson, A., Sherlock, Z. (2017). Stimulating and sustaining interest in a language course: An experimental comparison of Chatbot and Human task partners. Computers in Human Behavior **75**, 461-468 (2017). doi: 10.1016/j.chb.2017.05.045
9. Hall, E.: Conversational design. A Book Apart, New York, NY (2018).
10. Page, L, Gehlbach, H.: How an artificially intelligent virtual assistant helps students navigate the road to college. AERA Open **3**(4). doi: 10.1177/2332858417749220.
11. Weizenbaum, J.: ELIZA—a computer program for the study of natural language communication between man and machine. Communications of the ACM, **9**(1), 36-45 (1966). doi: 10.1145/365153.365168
12. Xu, A., Liu, Z., Guo, Y., Sinha, V., Akkiraju, R.: A new chatbot for customer service on social media. In Proceedings of CHI' 17, pp. 3506-3510. ACM, New York, NY (2017). doi: 10.1145/3025453.3025496