Semiotica e intelligenza artificiale
ISBN 979-12-218-0429-4
DOI 10.53136/97912218042949
pp. 149-169 (gennaio 2023)

HOW TO BUILD A CHATBOT. A SEMIOTIC AND LINGUISTIC APPROACH

Anna Dall'Acqua, Federico Bellentani*

Titolo in italiano: *Come creare un chatbot: Un approccio semiotico e linguistico*

Abstract: chatbots are Artificial Intelligences able to simulate a written or vocal conversation in natural languages through software, applications or websites. Their aim is to provide users with the information they need through a faster and simpler user experience. Many businesses and organisations use chatbots as tools to improve user experience, provide 24/7 customer service, simplify online shopping and payments, manage reservations and so on.
Semiotic research has recently analysed chatbots. Its aim has mainly been to advance the understanding of how to make the conversation of chatbots "more human" as possible in order to avoid disruption and frustration in users. Semiotic analysis is accurately used to respond to this challenge, focusing on how humans make meanings and interpret them, against a machine–centred approach. However, it makes theoretical generalisation from analysis of existing chatbots in specific domains, e.g. healthcare. The domain in which a chatbot operates is important, so is the cultural context, that is notably absent in previous semiotic analysis of chatbots.
This paper presents a semiotic and linguistic approach to chatbot design that focuses on three dimensions: a) the user/chatbot goal; b) the target user, her context and interpretations; c) the chatbot personas. This approach can prove useful to identify how users make and interpret meanings during conversations with chatbots in a given social and cultural context.

Key–words: Chatbot, Conversational AI, Human–Computer Interaction, Semiotics, Linguistics

* Future Education Modena; Università degli Studi di Torino e Injenia.

1. Introduction[1]

Chatbots are artificial intelligences able to simulate a written or vocal conversation in natural languages through software, applications or websites. Their aim is to provide users with the information they need through a fast and simple user experience, without the need to use the device's memory to download or update them. Many businesses and organisations have started to consider chatbots as tools to improve the customer experience: by 2025, the chatbot market size is projected to grow to $10.4 billion (*Market Data Forecast* 2020).

There is a terminological confusion in conversational AI applications in the academic, public and business discourse: "chatbot", "virtual assistant" and "conversational agent" are often used as synonyms (Dale 2016). This paper uses the terms "chatbot" or "conversational agent" to generally refer to conversational AIs that interact with users through natural language in a conversational manner (McTear 2020). Specifically, "chatbot" is the oldest term referring to a conversational system designed for specific purposes such as improving the user experience of company websites or e–commerce platforms, providing 24/7 customer service, simplifying online shopping and payments, managing reservations, generating and qualifying marketing leads. Gnewuch *et al.* (2017) group chatbots in the industrial sector into five categories: generic customer–service, help–desk, website navigation support, shop assistant and technical support. According to them, customer service is the most common application of chatbots in business. They are employed also in healthcare (Jovanovic *et al.* 2020) and education (Winkler & Söllner 2018), especially in languages teaching (Fryer *et al.* 2020).

Some semiotic research has recently analysed chatbots. Valtolina, Barricelli & Di Gaetano (2020) studied the communicability of chatbot in comparison to traditional graphical user interfaces. They demonstrated that chatbots can help users with poor technological attitudes to solve simple tasks by analysing cases in healthcare and smart home domains. Valério *et al.* (2017: 28) used a semiotic inspection method

(1) This paper has been written in equal parts by the two authors. For formal attribution, the parts 2 and 3.1 can be attributed to Anna Dall'Acqua and the parts 1, 3.2 and 4 to Federico Bellentani.

to analyse the communicative strategies of chatbots, i.e. "a qualitative evaluation method based on Semiotic Engineering that assesses systems' communicability". The authors identified strategies for chatbots to present their features to users and thus being more effective. Klimczak, Wirsching & Graben (2020) claimed that current speech assistive devices can be frustrating because they still lack semantic analysis capabilities. To overcome this shortcoming, they demonstrated that machines only need to learn human meanings by a trial–and–error process, without understanding the meanings of single words or implicit context knowledge. The aim of the semiotic analysis of chatbots is to understand how to make the conversation of chatbots "more human" as possible in order to avoid disruption and frustration in users. Semiotic analysis is accurately used to respond to this challenge, focusing on how humans make meanings and interpret them, against a machine–centred approach. However, semiotic research on chatbots makes theoretical generalisation from analysis of existing chatbots in specific domains, e.g. healthcare. The domain in which a chatbot operates is important, so is the cultural context, that is notably absent in previous semiotic analysis of chatbots.

This paper proposes a semiotic and linguistic approach to the phase of chatbot design that takes place before the actual implementation of the solution, whose aim is to identify the project's requirements and design the most appropriate human–computer interaction. To do so, section 2 first sets the context by providing an historical and cultural overview of chatbot and conversational AI. Section 3 introduces the framework focusing on the three dimensions of chatbots: a) the user/chatbot goal; b) the target user, context and interpretations; c) the chatbot personas.

2. Historical and cultural overview of chatbot and Conversational AI

2.1. *Key terms in Conversational AI*

The term "chatbot" comes from "chatterbot", coined by the computer scientist Michael Mauldin (1994) to describe conversational softwares.

He named "chatterbot" his game character for a multiuser game whose main function was to chat. The term "chatterbot" is still used in the literature (Luger & Sellen 2016), together with its variants "chatbot" (Panesar 2019), "chat bot" (Wuenderlich & Paluch 2017), "chat-bot" (Bala *et al.* 2017), "chatter bot" (Chakrabarti & Luger 2015). All these terms refer to "computer programs that interact with users using natural languages" (Shawar & Atwell 2007: 29) or to systems designed for extended unstructured conversations mainly for entertainment purposes (Jurafsky & Martin 2019). The website *chatbots.org/synonyms/* shows the proliferation of terms used to name these technologies: beside multiple spelling variants of chatbots, there are several terms related to the domain of dialogue and assistance.

The primary modality of interaction used by these technologies is traditionally text-based, but chatbots used though vocal commands are becoming increasingly more common: in this case, the term "voicebot" is used to highlight this feature and they are often associated with avatars or talking heads (Ciechanowski *et al.* 2019). Moreover, studies such as Dasgupta (2018) and Pearl (2016) support the opportunity of a multimodal modality of interaction that involves multiple channels. Radzwill & Benton (2017) identify chatbots as conversational agents that mimic human interactions without any humanoid robots, which are typical elements of the embodied conversational agents.

Chatbots belong to the wider category of dialogue system, a generic term referring to software that communicates with users in natural language in the form of text, speech or both. Jurafsky & Martin (2019) consider dialogue systems and conversational agents as synonyms and categorise them according to their functions of completing tasks. There are several classifications of dialogue systems based on their functions and goals in the literature (Hussain *et al.* 2019). The task-oriented conversational systems include virtual assistants whose interactions are usually short, including commands and notification tasks across a broad range of contents (Jacques *et al.* 2019). No-task-oriented conversational agents are designed for extended and unstructured conversations without any specific task to achieve (Cercas Curry *et al.* 2017). Mathur & Sing (2018) distinguish chatbot in two groups: "goal-driven" and "non-goal-driven", associable to "task-oriented"

and "no task–oriented" respectively. Task–oriented chatbots have become more popular thanks to social media platforms such as Facebook, which started to use them to help users to achieve specific tasks, such as scheduling a meeting or booking a hotel (Hussain *et al.* 2019).

Personal assistants such as *Google Assistant*, *Amazon Alexa*, *Apple Siri* and *Microsoft Cortana* are often compared with chatbots (Chaves & Gerosa 2019). They are voice–activated assistants that can respond to a much larger number of commands than the task–oriented chatbots. They are always connected to the Internet and each interaction is analysed by a central computer system that matches the voice's user commands with the assistants' response (Hoy 2018). McTear *et al.* (2016) provide a list of terms used to mean these objects, which includes "personal assistant", "virtual personal assistant", "intelligent personal assistant", "digital personal assistant", "mobile assistant" and "voice assistant".

In the taxonomy proposed by Følstad *et al.* (2019), the term "chatbot" refers to both text–based and voice–based conversational agents and encompasses personal assistants such as the Google Assistant as well. The classification is based on two high–level dimensions: locus of control and duration of interaction. The first dimension classifies agents according to their role in leading the conversation (chatbot–driven dialogue and user–driven dialogue); the second one according to the duration of relation (short–term relation and long–term relation). The locus of control comes from the taxonomy proposed by Zue & Glass (2000) in "user–initiative", "system–initiative" and "mixed–initiative" interfaces. Hussain *et al.* (2019) summarises the broad classification following four criteria: interaction mode, goal, implementation technique and domain.

The fact that there is not a single definition for chatbot and Conversational AI technologies is meaningful in itself: this lack demonstrates inconsistencies in the evaluation (Braun & Matthes 2019) and in the studies on the interaction design techniques for their implementation. Since there are terminological inconsistencies and overlappings, it is difficult to identify a coherent design methodology suitable for the various modalities of interaction that chatbot and Conversational AI offer (Fadhil & Schiavo 2019).

2.2. *An historical overview of chatbots*

The first chatbots were based on pattern matching and simple template–based mechanisms with rudimental conversational abilities (Weizenbaum 1966; Colby *et al.* 1971; Wallace 2003). Traditional building processes were rule–based, with the system's behaviour determined by a predefined set of handcrafted rules and therefore predictable. They used rule–based grammars for the Natural Language Understanding (NLU) component to interpret utterances produced by users.

The 1950 article *Computing Machinery and Intelligence* by Alan Turing can be considered as the origin of the study of Human–Computer Interaction. Here Turing was asking the question "Can the machine think?" and proposed to evaluate machine thinking by examining their capacity of producing and understanding natural language. Even though the creation of a machine able to talk was not a priority, Turing laid the foundations for the first ancestors of chatbots.

The first actual chatbot traces back to 1966, when the computer scientist Joseph Weizenbaum implemented ELIZA, known also with the name of DOCTOR. The conversation of this chatbot mainly consisted of questions, whatever was the users' inputs. The idea was to impersonate a Rogerian therapist. The psychological attitude characterised also the chatbot PARRY (Colby *et al.* 1971), that simulates the behaviour of a paranoid schizophrenic patient whose responses were usually based on conceptualizations and misunderstandings. Both these chatbots were realised through a simple pattern matching technique and a rule–based approach (Jurafsky & Martin 2019). An analogous rule–based approach was the one underlying A.L.I.C.E. (*Artificial Linguistic Internet Computer Entity*), a pattern–matching chatbot labelled through the markup language AIML derived from the metalanguage XML (Wallace 2003).

Despite these predecessors, only recently chatbots and conversational agents have become popular: Dale (2016: 811) identifies chatbots as "one of the most breakthrough technologies of 2016", while Tsvetkova *et al.* (2017: 1) speaks about an "ecosystem of bots". Technologies such as *Google Home* or *Alexa* are taking over households, making

conversational technology become a part of everyday life. However, despite the important achievement in Natural Language Processing and the potential of conversational technologies, we are still far from creating a machine capable of truly understanding natural language and holding a real human–like conversation (Wu *et al.* 2019).

Today most conversational agents base their NLU component on machine learning algorithms. Machine learning led to the spread of conversational technologies and platforms (Dale 2016). Today, the largest tech industries have their own platforms, like *Dialogflow*, *IBM Watson* or *RASA*, but the data for the initial training[2] are still private (Braun *et al.* 2017). The architecture of these systems is like the modular rule–based models, but the core modules are modelled probabilistically and learned from data (McTear 2020). The most recent research in conversational agents architecture focuses on end–to–end neural dialog systems, where an input utterance is mapped to an output response and therefore without requiring any processing by the modules of the traditional architecture (McTear 2020).

The commercial tools for building conversational agents share a statistically data–driven NLU core model, based on the Intent–Entity–Context–Response (IECR) paradigm (Moore & Arar 2019). This can extract useful information from naturally unstructured natural language inputs and to structure them into *intents* and *entities*. An "intent" is "a mapping between what the user says and what action should be taken by the chatbot" (Adamopoulou & Moussiades 2020: 377); "entities" are tools that do not deal with the entire utterance but with the extraction of details or parameter values inside the sentence itself. The "context" is a feature that helps to structure the conversation and the interplay between different dialogue states that need more than one single conversational turn to be developed. "Response" is the response that appears during the conversation. The response generation in the mentioned platforms is *retrieval–based* (Wu *et al.* 2017), i.e. that the system retrieves some response candidates from an index and analyses available information using APIs, before matching the input with

(2) These platforms adopt a supervised machine learning model and are trained on both private data provided by the proprietary industries and on input data specific for the single project selected, uploaded and annotated by the developer working on that specific project (Braun *et al.* 2017).

the corresponding output. Current research is focusing on Natural Language Generation algorithms using advanced deep learning algorithms, i.e. the generation of answers based on previous users' inputs; however, there are still difficulties in building and training them (Adamopoulou & Moussiades 2020).

3. A semiotic and linguistic approach to build chatbots

3.1. *Conceptual frameworks to investigate conversations*

A conversation is an exchange of ideas by spoken words. It is the tangible expression of our mutual understanding and values, which is expressed through language. Language, in turn, is shaped and defined by conversations. Conversations between humans are often seen as social and transactional talks (Clark *et al.* 2019). Social talks are made to develop, build and maintain relationships. Transactional interactions are aimed to achieve a specific goal. Typically, their primary goal is the effective transferring of information from one speaker to another (Brown & Yule 1983). Social and transactional talks are two categories that often overlap, depending on the context and the participants (Cheepen 1988). Schlegoff (1999) identifies the ordinary conversation as the most general type of dialogic interaction, from which other types of conversations are derived and adapted for specific purposes. Moore & Arar (2019) define the ordinary conversation as the most flexible type, covering a vast number of intentions. In ordinary conversation, there is a balance between the speakers, while in other types of conversation there can be asymmetry or subordination (Linell & Luckmann 1991).

Linguistics has traditionally explored conversational and dialogical exchanges. Functional linguistics has focused on the interactional and contextual dimension of language. Dialogical interactions are also at the core of pragmatics, which is known to be the field of linguistics involved in the study of language in use and their users in interaction (Bublitz & Norrick 2011). One of the most relevant frameworks of analysis in pragmatics concerning the structure of conversation is Conversation Analysis (Levinson 1983). The origins of this approach

can be traced back in the late 1960s, when the sociologists Harvey Sacks, Gail Jefferson and Emanuel Schegloff observed that conversations were not as chaotic as they could seem, rather they were based on regular internal structures. They performed an inductive data–driven analysis through collected video– or audio–recorded conversations to find recurring patterns of interaction. This analysis showed that each type of conversation depends on the same "conversational machinery" (Sacks 1984: 26), but the activities and settings in which they occur contain distinctive patterns and slight adaptations (Sacks *et al.* 1974; Schegloff 2007).

Conversation Analysis can be useful to identify structural elements of conversations in spontaneous human interaction that can be applied also to Human–Computer Interactions. These categories are: turn–taking (Sacks *et al.* 1974) sequential organisation in expandable adjacency paris sequences (Schegloff 2007; Schegloff 1968; Schegloff & Sacks 1973), storytelling sequences (Jefferson 1978), repair practices (Schegloff *et al.* 1977), recipient design (Sacks & Schegloff 2007; Sacks *et al.* 1974) and minimization (Sacks & Schegloff 2007). The variety of approaches to verbal interactions analysis increased as Conversation Analysis crossed the borders of the USA and became progressively implanted in other countries, such as in France, where the methods of the conversation analysis were adopted mainly by linguists with a strong cultural background in discourse analysis (Kerbrat–Orecchioni 1997).

If Conversation Analysis positions itself on a structural and empirical point of view, dialogic interactions can be treated on the level of meaning and abstract principles (Grice 1975; Searle 1969). One of the key attributes of conversation between humans is indeed establishing common ground and mutual understanding between the speakers (Clark 1996), i.e. having the knowledge of what the other person is like in terms of personality, in order to contextualise his/her utterances. This attitude comes spontaneously: according to the Cooperative Principle (Grice 1975), humans naturally expect cooperation between the participants in a conversation. This is relevant in relation to conversational agents because humans tend to cooperate in the conversation with the chatbot as they would to another person (Reeves & Nass 1996), even though empirical studies demonstrate that final users do

not leave unnoticed they are actually conversing with chatbots (Hill *et al.* 2015).

These traditional linguistics approaches to conversations lay the foundation of multiple methodological texts (for example, Cohen *et al.* 2004; Pearl 2016) and of singular experimental studies (for example, Jacquet *et al.* 2018). However, the cultural and semiotic dimensions are neglected areas in this field. The next section makes up for this lack by providing a semiotic approach for chatbot design.

3.2. *Semiotic elements for chatbot design*

The linguistic research methodologies and perspectives presented in the previous section are useful to identify structural elements of human conversations and thus are applicable to human–computer ones. Here we present an alternative approach based on semiotics to implement culture and semiotic aspects into the chatbot design. Specifically, this approach focuses on the three dimensions that are to be considered before the actual conversation design and implementation of the chatbot: a) the user/chatbot goal; b) the target user, her context and interpretations; c) the chatbot personas.

a. Defining the user/chatbot goal: the actantial model by Greimas (1966: 174–185 and 192–212) can be useful to theoretically analyse potential user goals. In this model, goals are broken down into six components named actants: subject, object, helper, opponent, sender and receiver. The subject–object relationship establishes the axis of desire: the subject is directed toward a desired object that, in the case of chatbot, is the goal the user strives to achieve. The relationship between subject and object defines a junction, which becomes a conjunction when the subject connects with the object, i.e. when users get the information they need. Helpers may assist the subject in reaching the goal, while opponents hinder the same. The sender requests the junction between subject and object, while the receiver is the element for which the action occurs. All actants are analytical components, not ontological entities. Different actors can thus assume different actantial roles: for example, small talk or irony in chatbot can assume the role of helper for the user that is predisposed to them, while they can be opponents for the user that is eager to get information as fast as possible.

Actantial analysis can be a tool used to analyse the action that takes place in the conversation between users and chatbot and the functional relations between users and the information they need. As such, it can better explain the reasons behind the subject's informative needs and identify the elements that help or hinder the goal. The actantial model and narrative analysis may help to define helpers that engage with the users, suggest interests and provide content to let the users better recognise their needs.

Once the users' goals are clear, the first practical step is to align them with the scope of the chatbot. A successful chatbot design exhaustively covers the main users' needs, but only according to a series of defined paths. Chatbots can thus take care of simple tasks, but their conversation has to be articulated to effectively interact with users. The first questions to answer before the implementation are: what is the scope of the chatbot? What it can and cannot do? Answering those questions is crucial before starting the chatbot project to understand if the chatbot goal is feasible.

Narrative semiotics of Greimas (1970, 1983) can improve the understandings of the following dimensions of the users engaged in the conversation with the chatbot:

– the cognitive dimension refers to the knowledge users have, that affects how users engage with the chatbot, talk with it, evaluate new information;
– the axiological dimension considers users' personal opinions and evaluations. The question is whether users have positive or negative attitudes towards the conversation and the new knowledge gathered from it;
– the emotional dimension identifies which kinds of emotions and feelings users have and develop during the conversation;
– the pragmatic dimension concerns how users interact within the chatbot and how they act according to the knowledge gathered through the conversation.

b. Defining the target users, her context and interpretations: the model of textual interpretation by Umberto Eco (1990) — the "Model Reader" — analyses the complex interaction between authors, readers

and texts. He suggested that textual interpretation lies in an intermediate point between the authors' and the readers' intentions. Eco (1990: 50–51) dubbed this intermediate point "intention of the text" or *intentio operis*, that interacts with the *intentio auctoris* and the *intentio lectoris* — that are the intention of the author and the intention of the reader respectively. Envisioning the intention of the text has overcome the idea that appropriate interpretations occur only when readers follow the intentions of authors. In the wake of these proposals, semiotic analysis has begun to include interpretations deviating from the intentions of the authors. However, texts necessarily impose certain constraints on interpretation and make certain reading more desirable than others: textual strategies are available to authors to entice readers along a specific interpretation. Eco grouped these textual strategies under the terms "Model Reader" (Eco 1979: 7–11). According to this model, empirical authors write texts making assumptions about the readership's social background, education, cultural traits, tastes and needs. Hence, empirical authors foresee and simultaneously construct their readership, emphasising certain interpretations while concealing others (Eco 1979: 7–11). Although authors seek to control interpretations, texts do not function as mere "communicative apparatuses" to directly imprint meanings to readers (Eco 1984: 25). Yet, texts are aesthetic productions that inevitably leave something unexplained. As such, texts became the place where authors and readers continuously negotiate their interpretations: while authors empirically seek to control readers' interpretations, readers interpret texts in line with their knowledge, experience and needs. Hence, a complex interaction between authors, readers and texts themselves underpin textual interpretation.

This model can be applied to conversation design: chatbot designers strive to entice users along interpretations that conform to their intentions, anticipating a set of interpretations and discomforting others. "Model Users" are those individuals that conform to the designers' intentions and that develop interpretations and behaviour that are consistent with the envisioned function of chatbots. However, users can have different or even contrary interpretations to the designers' intentions, thus finding the chatbot useless as unable to provide appropriate information they need to achieve their goals.

A cultural semiotic analysis can provide a better understanding of the real-life context of users, providing a photograph of the local cultural context in which chatbots operate, including contingent needs, local dialects and colloquialisms. The notion of Encyclopaedia by Eco is also useful to analyse the cultural context of users. It indicates the stock of shared signs that interpreters use during their interpretative processes. At the global level, the Encyclopaedia contained all the potential interpretations circulating in culture. At local levels, there was the routinised set of instructions to interpret specific portions of the socio-cultural space (Eco 1984: 68). He called this set of instructions "encyclopaedic competence" (Eco 1984: 2–3). Local cultures could select relevant portions of knowledge to delimit their own areas of consensus and thus to differentiate themselves from other cultures (Hajer & Wagenaar 2003: 27). Analysing the culture of users could mean to have insight into "a number of incorporated and (implicit) routinised 'recurrent regularities' about how to behave and act in specific situations", including chatbot conversation (Othengrafen & Reimer 2013: 1273).

Drawing on this framework, an ethnographic approach based on semi-structured interviews or surveys to future users will be useful to analyse what people look for and how they ask for it during the conversation. Answering the following questions helps the building of the chatbot: 1) who are the target users of the chatbot? 2) What do they ask and what do they need? 3) How do they ask questions? Regarding the latter, a request can be expressed in almost unlimited ways and it is impossible to map every single utterance users may use. Still, specific groups of users share recurrent syntactic or morphological structures and sociolinguistic characteristics that have to be taken into account while implementing the linguistic features of the chatbot. Conversational AI platforms belong to the dominant IECR paradigm (section 2.2) and are therefore supported by NLU algorithms. This means that all the possible linguistic formulations of a request are not needed, because they can generalise and extract the underlying intent trained on a limited set of examples.

c. Create the chatbot's personas: chatbot personas refer to the identity, tone and language style of chatbot. It aims to build stronger personal connections with the users, adding fun, clarity and smoothness to the conversation. As the identity of social groups is built on differences

and similarities, also the personas of chatbots is relational: it is built in relation to personality types circulating in the cultural context and opposed to competitors. Chatbot personas are not built once and for all: designers should continuously optimise conversational flows, as users' needs and their way to solve them constantly change. Semiotics, jointly with ethnosemiotic methods (Marsciani 2007), allows designers to better understand personas in relation to the cultural context, while focusing on meaning, narrative and the ways to engage with the audience culturally. Three aspects are important in tailoring chatbot personas:

– *Personality:* chatbot personas can be formal or informal, serious or fun, enthusiastic or dispassionate. Defining in advance chatbot personas helps to decide how the chatbot talks and acts in conversation. It influences its identity, tone of voice and the conversational flow. Chatbot should speak the same language of the target users. In relation to this, Bennett (2018) suggests to expressively manipulate orthography to define the degree of considerateness or enthusiasm the chatbot is supposed to express. During the conversation, humour could be used as a tool to improve the user experience (Jain *et al.* 2018). It allows users to establish an emotional connection with the conversational experience. Humoristic responses should be calibrated in relation to the goals of the chatbots. Since efficiency and productivity are what users expect from a chatbot itself (Brandtzaeg & Følstad 2018), humoristic responses can be counterproductive. Surprising effects could instead be used in purely small–talk conversations, in which the chatbots does not have to pursue the goal it has been mainly developed for, but entertain the users and build truthfulness. Another important issue is the attribution of a gender to a chatbot: when the chatbot is anthropomorphised, the question is whether it should reproduce the traditional conceptions of gender, including gender biases and issues, or it could be seen as an opportunity to deconstruct prejudices and deformed expectations. The UNESCO for the EQUALS Skills Coalition 2019 pictures a prevalent tendency to give female voices to voice assistants, thus reproducing subordinations and servant dynamics as well as the tolerance towards sexist verbal harassment (West *et al.* 2019).

– *Job description:* setting a job description for the chatbot may improve the building phase. Does the chatbot have a technical background or is a member of the customer support team? Is it an expert in marketing or in sales? Trying to write down the competences that are required for the chatbot's imaginary job position and the task it has to execute is a good way to stay consistent and identify jargon and technical language it has to manage (Moore & Arar 2019).
– *Self–awareness:* even though a chatbot of course has no real self–perception in a philosophical sense, it is still able to speak in some way. This is the reason why it should be able to formulate sentences about itself, managing topics like what a chatbot is and what are its main competencies, and it does not have. This awareness may help the user to navigate the conversational space created by the chatbot and give them the possibility to formulate questions and requests (Følstad & Brandtzaeg 2020).

4. Conclusions

This paper proposed a semiotic and linguistic approach to contribute to chatbot design. This approach can prove useful to focus on the three dimensions of chatbots: a) the user/chatbot goal; b) the target user, her context and interpretations; c) the chatbot personas. Specifically, a semiotic perspective can identify not only which information chatbots provide to users and how, but also how users make and interpret meanings in conversation, considering the particular cultural context in which they occur. In this paper, the scope was limited to present the theoretical and methodological foundation of the semiotic and linguistic approach to building chatbot. Future research will operationalise the framework, testing its components on real–life cases.

References

Adamopoulou E., Moussiades L. (2020), An Overview of Chatbot Technologies. *Artificial Intelligence Applications and Innovations,* 584: 373–83.

Bala K., Kumar M., Hulawale S., Pandita S. (2017), Chat–Bot for College Management System Using A.I. *International Research Journal of Engineering and Technology,* 4 (11): 26–30.

Bennett G.A. (2018), Conversational style: Beyond the nuts and bolts of conversation. In R.J. Moore R., Arar H., Szymanski M., & G. Ren G. Ren, eds, *Studies in Conversational UX Design*, 161–180. Springer, International Publishing.

Brandtzæg P.B., Følstad A. (2018), Chatbots: Changing User Needs and Motivations. *Interactions* 25 (5): 38–43.

Braun D., Mendez A.H., Matthes F., Langen M. (2017), Evaluating natural language understanding services for conversational question answering systems. In *Proceedings of the 18th Annual SIGdial Meeting on Discourse and Dialogue* (pp. 174–185).

Braun D., Matthes F. (2019), Towards a Framework for Classifying Chatbots. In *Proceedings of the 21st International Conference on Enterprise Information Systems*, 1, 484–489.

Brown G., Yule G. (1983), *Discourse Analysis.* Cambridge: Cambridge University Press.

Bublitz W., Norrick N.R. (2011), Introduction: The Burgeoning Field of Pragmatics. In W. Bublitz & N.R. Norrick, eds, *Foundations of Pragmatics*, 1–20. Berlin: Mouton de Gruyter.

Cercas Curry A., Hastie H., Rieser V. (2017), A Review of Evaluation Techniques for Social Dialogue Systems. In *Proceedings of 1st ACM SIGCHI International Workshop on Investigating Social Interactions with Artificial Agents,* 25–26.

Chakrabarti C., Luger G.F. (2015), Artificial Conversations for Customer Service Chatter Bots: Architecture, Algorithms, and Evaluation Metrics. *Expert Systems with Applications*, 42 (20), 6878–6897.

Chaves A.P. Gerosa M. (2019), How Should My Chabot Interact? A Survey on Human–Chatbot Interaction Design. *arXiv:1904.02743v1 [cs.HC].*

Chaves A.P., Doerry E., Egbert J., Gerosa M. (2019), It's How You Say It: Identifying Appropriate Register for Chatbot Language Design. In *Proceedings of the 7th International Conference on Human–Agent Interaction*, 102–9.

Cheepen C. (1988), *The Predictability of Informal Conversation.* London: Pinter.

Ciechanowski L., Przegalinska A., Magnuski M., Gloor P. (2019), In the Shades of the Uncanny Valley: An Experimental Study of

Human–Chatbot Interaction. *Future Generation Computer Systems*, 92, 539–548.

Clark H.H. (1996), *Using language*. Cambridge University Press.

Clark L., Pantidi N., Cooney O., Doyle P., Garaialde D., Edwards J., Spillane B., Gilmartin E., Murad C., Munteanu C., Wade V., Cowan B.R. (2019), What Makes a Good Conversation? Challenges in Designing Truly Conversational Agents. *arXiv:1901.06525v1 [cs.HC].*

Cohen M.H., Cohen M.H., Giangola J.P., Balogh J. (2004), *Voice user interface design*. Addison–Wesley Professional.

Colby K.M., Weber S., Dennis F.H. (1971), Artificial Paranoia. *Artificial Intelligence* 2 (1): 1–25.

Dale R. (2016), Industry Watch. The Return of theChatbots. *Natural Language Engineering*, 22 (5), 811–817.

Dasgupta R. (2018), *Voice User Interface Design. Moving from Gui to Mixed Modal Interaction*. New York: Apress.

Eco U. (1979), *The Role of the Reader*. Bloomington: Indiana University Press.

——— (1984), *Semiotics and the Philosophy of Language*. Bloomington: Indiana University Press.

——— (1990), *The Limits of Interpretation*. Bloomington: Indiana University Press.

Fadhil A., Schiavo G. (2019), Designing for Health Chatbots. *arXiv preprint arXiv:1902.09022*.

Fryer K.L., Coniam D., Carpenter R., Lăpușneanu D. (2020), Bots for Language Learning Now: Current and Future Directions. *Language Learning & Technology,* 24(2), 8–22.

Følstad A., Skjuve M., Brandtzaeg P.B. (2019), Different Chatbots for Different Purposes: Towards a Typology of Chatbots to Understand Interaction Design. In S. Bodrunova O., Koltsova A., Følstad H., Halpin P., Kolozaridi L., Yuldashev A., Smoliarova, & H. Niedermayer, eds., *Internet Science. INSCI 2018. Lecture Notes in Computer Science*, vol 11551, 145–156. Springer, Cham.

Følstad A., Brandtzaeg P.B. (2020), Users' experiences with chatbots: findings from a questionnaire study. *Quality and User Experience*, 5(1), 1–14.

Gnewuch U., Maedche A., Morana S. (2017), Towards Designing Cooperative and Social Conversational Agents. In *Proceedings of the 38th International Conference on Information Systems*, 1–13.

Greimas A.J. (1966), *Sémantique Structurale*. Paris: Larousse.
——— (1970), *Du Sens*. Paris: Seuil.
——— (1983), *Du Sens II*. Paris: Seuil.
Grice H.P. (1975), Logic and Conversation. In P. Cole & J.L. Morgan, eds., *Syntax and Semantics*, Vol. 3, Speech Acts, 41–58. New York: Academic Press.
Hajer M., Wagenaar H. (2003), *Deliberative Policy Analysis: Understanding Governance in the Network Society*. Cambridge: Cambridge University Press.
Hill J., Ford W.R., Farreras I.G. (2015), Real Conversations with Artificial Intelligence: A Comparison between Human–Human Online Conversations and Human–Chatbot Conversations. *Computers in human behavior* 49, 245–250.
Hoy M.B. (2018), Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants. *Medical Reference Services Quarterly* 37 (1), 81–88.
Hussain S., Ameri Sianaki O., Ababneh N. (2019) A Survey on Conversational Agents/Chatbots Classification and Design Techniques. In: L. Barolli M., Takizawa F., Xhafa & T. Enokido, eds., *Web, Artificial Intelligence and Network Applications*. WAINA 2019. *Advances in Intelligent Systems and Computing*, vol. 927. Berlin: Springer.
Jacques R., Følstad A., Gerber E., Grudin J., Luger E., Monroy–Hernández A., Wang D. (2019), Conversational Agents: Acting on the Wave of Research and Development. *CHI Conference on Human Factors in Computing Systems Extended Abstracts*.
Jacquet B., Baratgin J., Jamet. F. (2018), The Gricean Maxims of Quantity and of Relation in the Turing Test. In *Proceedings of the 11th International Conference on Human System Interaction — HSI 2018*, 332–338.
Jain M., Kumar P., Kota R., Patel S.N. (2018), Evaluating and Informing the Design of Chatbots. In *Proceedings of the 2018 Designing Interactive Systems Conference*, 895–906.
Jefferson G. (1978) Sequential Aspects of Storytelling in Conversation. In J. Schenkein, ed., *Studies in the organization of conversational interaction*, 219–248. New York: Academic Press.
Jovanovic M., Baez M., Casati F. (2020), Chatbots as Conversational Healthcare Services, *arXiv:2011.03969*.
Jurafsky D., Martin H.J. (in press) (2021), *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition* (3rd ed. draft).

Kerbrat–Orecchioni C. (1997), A Multilevel Approach in the Study of Talk–in–Interaction. *Pragmatics*, 7 (1), 1–20.

Klimczak P., Wirsching G., Graben P. (2020), Machine Semiotics. *ArXiv abs/2008.10522*.

Klimczak P., Wirsching G. (2020), Machine Semiotics. *arXiv preprint arXiv:2008.10522.*

Levinson S.C. (1983), *Pragmatics*. Cambridge: Cambridge University Press.

Linell P., Luckmann T. (1991), Asymmetries in Dialogue: Some Conceptual Preliminaries. In I. Markova & K. Foppa, *Asymmetries in dialogue*, 1–20. New York: Harvester Wheatsheaf.

Luger E., Sellen A. (2016), "Like having a really bad PA": The Gulf between User Expectation and Experience of Conversational Agents. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 5286–5297.

Market Data Forecast. (2020), Chatbot Market. August 2020. Available at: https://www.marketdataforecast.com/market–reports/chatbot–market, accessed 16.5.2021.

Marsciani F. (2007), *Tracciati di Etnosemiotica*. Milan: Franco Angeli.

Mathur V., Sing A. (2018), The Rapidly Changing Landscape of Conversational Agents. *arXiv:1803.08419v2 [cs.AI]*.

Mauldin M. (1994), ChatterBots, TinyMuds, and the Turing Test: Entering the Loebner Prize Competition. In *Proceedings of the Eleventh National Conference on Artificial Intelligence*, AAAI Press, 16–21.

McTear M., Callejas Z., Griol D. (2016), *The Conversational Interface. Talking to Smart Devices.* Berlin: Springer.

McTear M. (2020), *Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots*, Williston: Morgan & Claypool.

Moore R.J., Arar R. (2019), *Conversational Ux Design. A Practitioner's Guide to the Natural Conversation Framework.* Association for Computing Machinery.

Othengrafen F., Reimer M. (2013), The Embeddedness of Planning in Cultural Contexts Theoretical Foundations for the Analysis of Dynamic Planning Cultures. *Environment and Planning* A45. 1269–1284.

Panesar K. (2019), Conversational Artificial Intelligence (AI) — Demystifying Statistical vs Linguistic NLP Solutions. *Journal of Computer–Assisted Linguistic* 4, 47–79.

Pearl C. (2016), *Designing Voice User Interfaces. Principles of Conversational Experiences.* Sebastopol: O'Reilly.

Radziwill N.M., Benton M.C. (2017), Evaluating Quality of Chatbots and Intelligent Conversational Agents. *arXiv 1704.04579.*

Reeves B., Nass C. (1996), *The Media Equation: How People Treat Computers, Television, and New Media Like Real People.* Cambridge University Press.

Sacks H. (1984), Notes on Methodology. In J.M. Atkinson and J.C. Heritage, eds., *Structures of Social Action*: *Studies in Conversation Analysis*, 21–27. Cambridge: Cambridge University Press.

Sacks H., Schegloff E.A., Jefferson G. (1974), A Simplest Systematics for Organization of Turn–Taking for Conversation. *Language* 50: 696–735.

Sacks H., Schegloff E.A. (2007), Two Preferences in the Organization of Reference to Persons in Conversation and their Interaction. In N.J. Enfield & T. Stivers, eds., *Person Reference in Interaction: Linguistic, Cultural and Social Perspectives, Language Culture and Cognition,* 23–28. Cambridge University Press.

Shawar B.A., Atwell E. (2007), Chatbots: Are they Really Useful?. *LDV–Forum* 22(1), 29–49.

Schegloff E.A. (1968), Sequencing in Conversational Openings. *American Anthropologist* 70, 1075–1095.

——— (1999), Discourse, Pragmatics, Conversation, Analysis. *Discourse Studies* 1, 405–35.

——— (2007), *Sequence Organization in Interaction: A Primer in Conversation Analysis*. Vol. I. Cambridge: Cambridge University Press.

Schegloff E.A., Sacks H. (1973), Opening up Closings. *Semiotica* 8: 289–327.

Schegloff E.A., Jefferson G., Sacks H. (1977), The Preference for Self–Correction in the Organization of Repair in Conversation. *Language* 53 (2), 361–382.

Searle J.R. (1969), *Speech Acts: An Essay in the Philosophy of Language*. Cambridge: Cambridge University Press.

Tsvetkova M., García–Gavilanes R., Floridi L., Yasseri T. (2017), Even Good Bots Fight: The case of Wikipedia. *PloS one*, *12*(2).

Turing A. (1950), Computing Machinery and Intelligence. *Mind*, *LIX*: 433–460.

Valério F.A., Guimarães T.G., Prates R.O., Candello H. (2017), Here's What I Can Do: Chatbots' Strategies to Convey their Features to Users. In *Proceedings of the XVI Brazilian Symposium on Human Factors in Computing Systems*, 28.

Valtolina S., Barricelli B.R., Di Gaetano S. (2020), Communicability of Traditional Interfaces Vs Chatbots in Healthcare and Smart Home Domains. *Behaviour & Information Technology* 39 (1), 108–132.

Wallace R.S. (2003), *The Elements of Aiml Style. A.L.I.C.E.* Artificial Intelligence Foundation Inc.

West M., Kraut R., Ei Chew H. (2019), *I'd blush if I could: closing gender divides in digital skills through education.*

Winkler R., Soellner M. (2018), Unleashing the Potential of Chatbots in Education: A State–Of–The–Art Analysis. In *Academy of Management Proceedings*, 1.

Wu W., Guo Z., Xiangyang Z., Hua H., Xiyuan. Z., Rongzhong L., Haifeng W. (2019), Proactive Human–Machine Conversation with Explicit Conversation Goals. *arXiv:1906.05572v2 [cs.CL].*

Wu, Y., Wu W., Xing C., Zhou M., Li Z. (2017), Sequential Matching Network: A New Architecture for Multi–turn Response Selection in Retrieval–Based Chatbots. In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics* (Volume 1: Long Papers), 496–505, Vancouver, Canada. Association for Computational Linguistics.

Wuenderlich N.V., Paluch S. (2017), A Nice and Friendly Chat with a Bot: User Perceptions of AI–Based Service Agents. *ICIS 2017 Proceedings*, 1–12.

Weizenbaum J. (1966), ELIZA — A Computer Program for the Study of Natural Language Communication between Man and Machine. *Communications of the ACM*, *9*(1), 36–45.

Zue V.W., Glass J.R. (2000), Conversational Interfaces: Advances and Challenges. In *Proceedings of the IEEE*, 88 (8), 1166–1180.