# Towards Designing Cooperative and Social Conversational Agents for Customer Service

*Short Paper*

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## Abstract

*The idea of interacting with computers through natural language dates back to the 1960s, but recent technological advances have led to a renewed interest in conversational agents such as chatbots or digital assistants. In the customer service context, conversational agents promise to create a fast, convenient, and cost-effective channel for communicating with customers. Although numerous agents have been implemented in the past, most of them could not meet the expectations and disappeared. In this paper, we present our design science research project on how to design cooperative and social conversational agents to increase service quality in customer service. We discuss several issues that hinder the success of current conversational agents in customer service. Drawing on the cooperative principle of conversation and social response theory, we propose preliminary meta-requirements and design principles for cooperative and social conversational agents. Next, we will develop a prototype based on these design principles.*

**Keywords:** Conversational agents, design science, cooperative principle, social response theory, customer service

## Introduction

The idea of interacting with computers through natural language has been around since the 1960s. Recent years, however, have seen a renewed interest in conversational agents (CAs), such as chatbots or virtual personal assistants, due to advancements in artificial intelligence (Knijnenburg and Willemsen 2016; Luger and Sellen 2016). Many organizations already have or are planning to implement a CA (Oracle 2016). The interest in CAs is particularly strong in the domain of customer service where companies are starting to invest heavily into this technology (Hopkins and Silverman 2016; Oracle 2016). As today's customers expect fast, convenient, and personal customer service, organizations are faced with an increasing pressure to innovate (Gartner 2017a). Disappointing customer service threatens customer loyalty and revenue growth (Ovum 2016). Consequently, many organizations are planning to use CAs as a channel that offers rich 24/7 customer service and, at the same time, save money by reducing the number of required service employees (e.g., for traditional phone support) (Oracle 2016). Despite the interest in CAs as a potential cost-effective solution for customer service (Chakrabarti and Luger 2015; Lester et al. 2004), many CAs implemented on commercial websites were unable to live up to their promises and have disappeared (Ben Mimoun et al. 2012). The excitement has given way to the realization that many challenges remain in the understanding of what users are looking for when interacting with CAs and how to design them accordingly (McTear et al. 2016; Moore

2013; Shechtman and Horowitz 2003). Both research and industry reports suggest that current CAs fail to provide convincing and engaging interactions (Jenkins et al. 2007; Ben Mimoun et al. 2012; Schuetzler et al. 2014; Wannemacher 2016). Many CAs fail to “hold a longer conversation, understand the conversation, gauge whether the conversation is going in the desired direction, and act on it” (Chakrabarti and Luger 2015). Consequently, service quality leaves much to be desired (Lester et al. 2004; Wannemacher 2016). Furthermore, attempts to provide overly humanized CA representations (e.g., avatars) and/or to perfectly imitate human conversation (Von Der Pütten et al. 2010; Shawar and Atwell 2007) led to unrealistic user expectations that often turned into frustration (Berg 2013; Knijnenburg and Willemsen 2016). In sum, several design issues need to be resolved before CAs can be used effectively in customer service.

Extensive research on the design of CAs has been conducted in information systems (IS), computer science (CS), human-computer interaction (HCI), and related fields. Across all these disciplines, researchers have suggested that CAs need to adopt the characteristics of human communication in order to be more natural and engaging (Berg 2013; Derrick et al. 2011; Dybkjær et al. 2004; Elkins et al. 2012). CS research has focused on improving the technical capabilities of CAs by developing better algorithms (e.g., Griol et al. 2008) or new architectures (Sarikaya 2017). However, designing CAs is not only a technical challenge, but also involves an HCI element (Jenkins et al. 2007). Consequently, researchers in HCI have studied how users react to human-like characteristics of CAs (e.g., Ochs et al. 2017) and how these characteristics affect their behavior (e.g., Lee and Choi 2017). In contrast, IS research has primarily focused on identifying factors that influence user perceptions and adoption decisions of CAs (Qiu and Benbasat 2009; Schuetzler et al. 2014). In addition to studies on the design of CAs, IS researchers have also investigated the design of the interface between a service provider and its clients (Barrett et al. 2015; Den Hertog 2000). While these client interfaces have been extensively studied in the context of customer self-service (e.g., Meuter et al. 2005; Scherer et al. 2015), researchers recently called for more research on how different types of artificial intelligence may be implemented into existing service systems (Beverungen et al. 2016). Despite the significant amount of research, it has not been clarified how to design CAs to provide customer service on a level similar to that of more traditional channels (e.g., web, mail, or phone). Apart from a few exceptions (e.g., Derrick et al. 2011; Nunamaker et al. 2011), there is a lack of design knowledge for CAs in IS research, particularly in the customer service context. Given the issues of current CAs for customer service, more research is necessary to guide their design as the customer-provider interaction is not only crucial for value co-creation in service systems (Grönroos and Voima 2013), but also significantly influences how customers perceive service quality (e.g., of customer service provided by CAs) (Gronroos 1988). Hence, we pose the following research question:

> *How to design cooperative and social conversational agents to increase service quality in customer service?*

To address this research question, we conduct a research project following the design science research (DSR) approach (Hevner et al. 2004). As stated above, there is a lack of design knowledge for CAs and the DSR approach is particularly suited to address this research gap. We pursue to iteratively design and evaluate a CA artifact on the baseline of existing theory (e.g., Grice’s (1975) cooperative principle of conversation) informing the artifact design (Hevner et al. 2004). Although several studies have applied the Gricean maxims (e.g., Chakrabarti and Luger 2015; Saygin and Cicekli 2002) to evaluate conversations between humans and CAs, to the best of our knowledge, there is no study that rigorously derives design knowledge for CAs based on this theory. The remainder of this paper is organized as follows. Section two introduces related work on CAs, their role in service systems, as well as on customer service in general. In section three, we illustrate the theoretical foundations of our DSR project. Section four presents our research methodology in more detail. Subsequently, we report on first results of our research by elaborating on the issues of current CAs, deriving meta-requirements and proposing design principles for CAs. Finally, we conclude with a brief summary, current limitations, and intended contributions.

## Related Work

### *Conversational Agents*

CAs build on the idea that people interact with intelligent systems using natural language, just like engaging in a conversation with another human being (McTear et al. 2016). Such agents have been around since the 1960s when Joseph Weizenbaum developed ELIZA to simulate natural human interactions between a user and a computer (Weizenbaum 1966). In the early days, CAs could only make simple responses based on matching a user's input against a set of stored patterns and were primarily developed to pass the Turing test and to win the Loebner prize (McTear et al. 2016; Shah et al. 2016; Shawar and Atwell 2007). However, their capabilities have improved enormously in recent years due to advances in artificial intelligence, specifically in natural language processing and machine learning (Berg 2015; Knijnenburg and Willemsen 2016). When referring to CAs, researchers as well as practitioners have proposed several different definitions and conceptualizations (Luger and Sellen 2016; Von Der Pütten et al. 2010; Shawar and Atwell 2007). To provide a brief overview and to clarify the focus of our research, we classify different types of CAs along the two dimensions: (1) primary mode of communication and (2) context. To account for the fact that natural language includes *written* and *spoken* language (Lee et al. 2009), the first dimension indicates how users primarily communicate with the CA (i.e., via text or speech input). As current CAs have been developed for specific contexts or for general purposes (Nunamaker et al. 2011), the second dimension specifies whether the CA is limited to a specific domain or is able to converse about any topic the user can think of. As shown in Table 1, we also provide examples from research and practice for each category.

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Context</th></tr>
<tr><th>General-Purpose</th><th>Domain-Specific</th></tr>
<tr><td rowspan="2">Primary Mode of Communication</td><td>Text-based*1</td><td>ELIZA (Weizenbaum 1966)<br>Cleverbot, ...</td><td>Enterprise-class CAs (Lester et al. 2004; McTear et al. 2016; Shawar and Atwell 2007),<br>IKEA's Anna, ...</td></tr>
<tr><td>Speech-based*2</td><td>Apple's Siri, Amazon's Alexa, Google Now, Samsung's Bixby, ...</td><td>SPECIES (Derrick et al. 2011; Nunamaker et al. 2011)<br>In-car assistants (Reisinger et al. 2005);<br>Mercedes-Benz Linguatronic, ...</td></tr>
<tr><td colspan="4">*1 Text-based: chatbot, chatterbot, dialogue system, etc.<br>*2 Speech-based: (virtual) personal assistant, digital companion, intelligent/smart agent, etc.</td></tr>
</table>

**Table 1. Types of Conversational Agents**

Text-based CAs are often referred to as chatbots (e.g., Hill et al. 2015; Shawar and Atwell 2007) or natural dialogue systems (e.g., Shah et al. 2016; Zadrozny et al. 2000), which can be interacted with using text messages. General-purpose text-based CAs can basically converse about any topic (e.g., Cleverbot), while domain-specific text-based CAs are limited to specific domains, users, or tasks. Examples can be found in museums (Kopp et al. 2005; Vassos et al. 2016), in healthcare (Miner et al. 2016), or in e-commerce (Ben Mimoun et al. 2016). In contrast, speech-based CAs are often called virtual or digital assistants (e.g., McTear et al. 2016; Sarikaya 2017), which primarily rely on spoken input. General-purpose speech-based CAs, such as Apple's Siri, aim to support users in finding information or accomplishing basic tasks (e.g., entering appointments in the calendar) and are not limited to a specific domain. They can be found on many mobile devices and are typically used in the private-life context (Maedche et al. 2016). Domain-specific speech-based CAs, however, are deployed to assist in a specific situation. Examples can be found in modern cars (i.e., in-car assistants) or in border screening processes (Derrick et al. 2011; Nunamaker et al. 2011). It should be noted that the boundaries are not always clear cut since, technically speaking, any text-based CA could include speech input using a device's built-in speech-to-text features. Moreover, some general-purpose CAs, such as Amazon's Alexa, already allow developers to create custom skills for specific tasks. One aspect that has received considerable attention in research are embodied or animated CAs (Ben Mimoun et al. 2016). These CAs have an embodied form (Cassell et al. 2000), such as virtual 3D avatars (e.g., Nunamaker et al. 2011) or simpler representations like static pictures (e.g., Vassos et al. 2016). Despite the promising results reported in literature, the practical relevance of embodied CAs remains unclear since many of them disappeared after a few year of operation (Ben Mimoun et al. 2012). Furthermore, Ben Mimoun et al. (2016) showed in an eye-tracking experiment that a CA's physical appearance does not significantly attract users' attention.

In summary, extensive research on the design of CAs has been conducted in the IS, HCI, and CS domain. Most studies focus on a single aspect of CAs, such as their technical capabilities or how users react to their human-like characteristics. Therefore, we argue that there is a need to apply a more holistic approach to their design involving key findings from all relevant disciplines.

## *The Role of Conversational Agents in Service Systems*

The digital transformation is driving massive changes throughout the business world (Barrett et al. 2015). The trend towards more service-oriented business models has led to the creation of complex service systems that are understood as "configurations of people, technologies, organizations, and information that create and deliver value to all stakeholders in the system" (Maglio et al. 2009; Peters et al. 2016). Although CAs primarily represent a technology (i.e., a resource) that can be implemented in service systems, they can also take an active part in the service encounter and thus, become actors involved in the value creation process (Larivière et al. 2017; Verhagen et al. 2014). CAs increasingly fulfill the role of service employees and substitute tasks historically performed by human service personnel (Larivière et al. 2017; Marinova et al. 2017; Verhagen et al. 2014). For example, instead of calling a company and complaining to a human service employee, customers can file their complaint by interacting with a CA. In this service encounter, the CA plays an active role that has been traditionally performed by a human. In contrast to most other technologies used in service systems, CAs can also incorporate human characteristics (e.g., friendliness, smiling) that are important for delivering successful service encounters (van Doorn et al. 2017; Verhagen et al. 2014). Therefore, CAs have the potential to address the common lack of interpersonal interaction in online service encounters by eliciting feelings of social presence and senses of personalization (Verhagen et al. 2014). Moreover, they promise to increase service encounter quality and efficiency as well as enhance customer experiences (Larivière et al. 2017).

In conclusion, it can be argued that CAs play a dual role in service systems. They not only represent a technology that can be leveraged to enhance or create new service systems, but they can also take an active part in interactions with customers. Therefore, their design needs to account for their active role as well as their ability to display human characteristics.

## *Customer Service*

Increasing digitalization has paved the way for digital or ICT-enabled services and ICTs have been recognized as playing an important role in service innovation (Barrett et al. 2015). In the context of customer service, the introduction of technology-based self-service channels (e.g., web portals) has brought significant changes to the interaction between customers and service providers (Meuter et al. 2000). Researchers and practitioners highlight the potential benefits of customer self-service, such as increased efficiency, cost reduction, and improved customer experience (Bitner et al. 2000; Meuter et al. 2005; Scherer et al. 2015). *Service quality* has established itself as an important concept to assess the performance of the customer-provider interaction (Gronroos 1988; Johnston 1995). It is defined as the outcome of a comparison between expectations of a service and what is perceived to be received (Parasuraman et al. 1985). The most widely applied measurement instrument SERVQUAL (Parasuraman et al. 1988) has been adapted to other disciplines such as IS (Pitt et al. 1995). It represents the customer's perceptions about a provider's service reliability, assurance, empathy, and responsiveness, as well as the tangible aspects of the provider's infrastructure and/or appearance (Parasuraman et al. 1988). More recently, it has been applied to assess the quality of services delivered by intelligent systems (e.g., Claessen et al. 2017; Etemad-Sajadi and Ghachem 2015). A major challenge for customer service is to improve efficiency and reduce costs without compromising the quality of service (Frei 2006). While customers appreciate the accessibility and flexibility of self-service channels, they also enjoy the personalized attention in personal service channels (Scherer et al. 2015). As CAs have the potential to combine the best of both worlds, they are generating widespread attention and many service providers are planning to implement them for this purpose (Oracle 2016). However, research on how CAs can be used in customer service is still scarce and focuses mainly on behavioral outcomes (e.g., Ben Mimoun et al. 2016), thus, more research on this topic is required (Beverungen et al. 2016).

To sum up, in our research, we focus on the design of text-based CAs for a specific domain (i.e., customer service) due to the following reasons. First, we argue that in the customer service context, service providers are primarily interested in CAs that focus on a specific domain (i.e., their service offerings). Second, while speech-based CAs are certainly of interest for service providers, the current proliferation of messaging apps on smartphones provides the opportunity to reach many customers via text-based CAs (Ask et al. 2016; Gartner 2017b). Finally, we selected the customer service context as it allows us to study the design of CAs in a context in which they currently attract much attention, even though they have been applied for this purpose without much success in the past (Ben Mimoun et al. 2012). Additionally, this context provides the opportunity to examine how CAs affect existing service systems by substituting human service employees (Larivière et al. 2017).

# Theoretical Foundations

An important principle of DSR is that existing theories should be leveraged within the design process (Gregor and Jones 2007; Hevner et al. 2004). We argue that it is reasonable to consider human-human communication as the theoretical foundation to enhance the design of CAs that involve communication between a user and a CA. Therefore, we draw on Grice's (1975) cooperative principle to understand and design the actual conversation. We selected this theory because it has been frequently applied to evaluate the communication between humans and CAs (e.g., Chakrabarti and Luger 2015; Saygin and Cicekli 2002). However, until now the theory has not been used to derive design principles for CAs. Additionally, we draw on social response theory (Nass and Moon 2000) that has been commonly used to design and evaluate IT artifacts with human-like characteristics (Qiu and Benbasat 2009). In the following, we briefly introduce both theories.

## *The Cooperative Principle of Conversation*

One of the most uniquely human qualities is the ability to communicate through the use of language (Holtgraves et al. 2007). Consequently, a considerable amount of research has been conducted to study processes of human communication and to develop models explaining these processes (Littlejohn and Foss 2010). One area of communication research is concerned with the conversation. A conversation is defined as an ongoing sequence of communicative acts exchanged between two (or more) agents relating to some topic of discourse (FIPA 1998). The work of philosopher H. Paul Grice is often used to understand the basic mechanics of a conversation (Neale, 1992). According to his theory, every participant of a conversation will be expected to observe a *cooperative principle*: "Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged" (Grice 1975, p. 47). Grice (1975) further proposes four maxims that guide a meaningful conversation:

| Maxim | Description | Violation Examples |
|---|---|---|
| Quantity | Make your contribution as informative as is required. | Responding to a simple question with a long monologue |
| Quality | Try to make your contribution one that is true. | Lying |
| Relation | Be relevant. | Responding to small talk with stating one's political opinion |
| Manner | Be perspicuous. | Person A: *Did you like the party?*<br>Person B: *Well, I liked the food.* |

**Table 2. Gricean Maxims (adapted from Grice 1975)**

## *Social Response Theory*

The language of conversation includes behavioral cues and social signals that convey additional information and strongly influence conversational interaction (McTear et al. 2016). HCI studies have demonstrated that well-known psychological principles also come into play when people interact with computers (Moon 2000, 2003; Nass and Moon 2000; Reeves and Nass 1996). According to social response theory, humans tend to respond socially to anything that displays human-like characteristics such as animals or technologies (Moon 2000). This evolutionary behavior occurs mindlessly (i.e., without extensive thought or deliberation) (Nass and Moon 2000). When people are confronted with human-like characteristics, such as speech, interactivity, or filling of social roles from a computer, they automatically apply social rules to their interaction with it (Nass and Moon 2000), even though they report that such attributions are inappropriate (Nass et al. 1994). The underlying cause of this behavior is that social cues from computers trigger mindless responses from humans, no matter how rudimentary those cues are (Nass et al. 1994). Fogg (2002) classifies these social cues into five categories: physical, psychological, language, social dynamics, and social roles. Following the "computer are social actors" paradigm, many studies have examined different social cues, such as language style (Nass et al. 1994), smiling (Ochs et al. 2017), or posture shifts (Von Der Pütten et al. 2010), and how they impact HCI. Research has emphasized the importance of understanding these cues as they are able to facilitate (e.g., Nunamaker et al. 2011), but also to constrain the interaction with a computer when they create exaggerated expectations (e.g., Ben Mimoun et al. 2012).

# Research Methodology

Our DSR project addresses the proposed research question of how to design cooperative and social conversational agents to increase service quality in customer service. We argue that the DSR approach is particularly suited to answer our research question because it allows to iteratively design and evaluate our CA artifact in a rigorous fashion (Hevner et al. 2004). Overall, our research aims to contribute with a nascent design theory that gives explicit prescriptions for designing this class of artifacts (Gregor 2006; Gregor and Hevner 2013). As illustrated in Figure 1, our research project is based on the DSR framework proposed by Kuechler and Vaishnavi (2008) and it is divided into two consecutive design cycles.

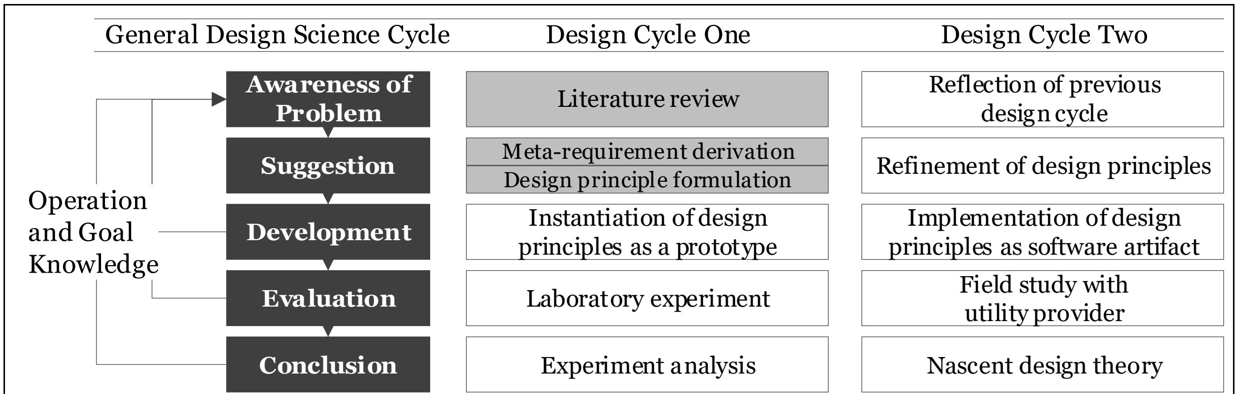


**Figure 1. Research Methodology (based on Kuechler and Vaishnavi 2008)**

In this research-in-progress paper, we report on the preliminary findings of the first two activities of the first design cycle (see grey boxes). We started by reviewing extant literature (e.g., in IS, HCI, and CS) and practical studies to identify issues of current CAs. Subsequently, we derived a set of meta-requirements (MRs) (Hevner et al. 2004) based on two theoretical foundations: (1) the cooperative principle and (2) social response theory. Finally, we formulated preliminary design principles (DPs) addressing these MRs using the structure suggested by Chandra et al. (2015). In our future research, these DPs will be instantiated in the form of a prototype. We are currently developing our prototype based on Microsoft's Bot Framework (Microsoft 2017). Venable et al. (2016) define four evaluation strategies, from which we selected the human risk and effectiveness strategy as our research focuses on a user-oriented artifact that needs to prove its utility and benefit in a real context (i.e., in customer service). Thus, we will first evaluate our prototype in a formative and artificial setting (i.e., lab experiment). In the experiment, participants will have a conversation with the prototype to address a customer service issue. Subsequently, they will fill out a questionnaire to provide their perceptions of service quality (Doucet 2004; Parasuraman et al. 1988) as well as of the prototype itself, such as social presence (Qiu and Benbasat 2009). This will allow us to identify difficulties and improve our prototype before conducting a more costly evaluation in a summative and natural setting as part of the second design cycle (Venable et al. 2016). This second evaluation will be in the form of a field study with a German utility provider that plans to implement a CA for its customer service. The findings from both evaluation episodes will be summarized as a nascent design theory (Gregor and Hevner 2013) for cooperative and social CAs for customer service.

# Designing Conversational Agents for Customer Service

## *Problem Awareness*

Driven by technological advances in artificial intelligence, combined with the proliferation of messaging apps, CAs have received increased interest as a potential cost-effective solution for customer service (Chakrabarti and Luger 2015; Lester et al. 2004). However, many CAs designed for this purpose (e.g., IKEA's Anna) were unable to fulfill their promises and their use was discontinued not long after their introduction (Ben Mimoun et al. 2012). Based on our review of current literature, we have identified several issues that may have contributed to their disappearance. In line with previous studies (e.g., Ben Mimoun et al. 2012; Möller et al. 2009), we observe that these issues correspond to the quality of customer service provided by CAs. Thus, we base our discussion on the five service quality dimensions (i.e., reliability, assurance, empathy, responsiveness, and tangibility) as developed by Parasuraman et al. (1985, 1988).

Several studies have shown that the success of CAs significantly depends on their ability to effectively communicate with a human (Lee and Choi 2017; Schuetzler et al. 2014). Although most current CAs are able to satisfactorily answer simple questions, they perform poorly in longer conversations or when more complex questions are asked because of their limited natural language understanding capabilities (**I1**) (Chakrabarti and Luger 2015). Thus, their **reliability** in customer service can be considered rather low since interactions between customers and service employees can be quite complex. Accordingly, CAs in customer service are often limited to basic tasks, such as providing product information (Shawar and Atwell 2007). Therefore, their current range of application is limited as they cannot take appropriate action (**I2**) (e.g., place an order or open a new support ticket) based on a user's input (Chakrabarti and Luger 2015; Lester et al. 2004). As a result, CAs are unable to provide **assurance** that more complex problems can be handled and thus, customers still have to rely on other service channels. Moreover, current CAs often fail to provide convincing human-like interactions (Ben Mimoun et al. 2012; Schuetzler et al. 2014). As they provide too much generic information (**I3**) that make users feel like they are "talking to a robot" (Jenkins et al. 2007, p. 81), they are unable to show **empathy** towards customers. Furthermore, current CAs often fail to hold a longer conversation towards a specific goal (**I4**) and to evaluate whether it is going in the desired direction (**I5**) (Chakrabarti and Luger 2015). Thus, interaction processes are often mechanical or even intrusive (**I6**) (Ben Mimoun et al. 2012). This inability to listen to customers often leads to "clunky and awkward exchanges" (Wannemacher 2016, p. 3) and therefore, results in a perceived lack of **responsiveness**. Often, these exchanges are lacking elements of traditional face-to-face interaction with service employees (**I7**), such as friendliness or helpfulness, that are crucial for successful service encounters (Verhagen et al. 2014). Another issue of CAs used for customer service relates to the **tangibles** dimension and has been termed "appearance inadequacy" by Ben Mimoun et al. (2012). In many cases, CAs were designed as an overly humanized agent (**I8**) (i.e., in appearance or conversation) by providing richer representations of the CA, such as interactive avatars (Von Der Pütten et al. 2010), or by attempting to perfectly imitate human conversation (Shawar and Atwell 2007). As a result, their appearance overplayed their actual capabilities which created high expectations among users that usually could not be met (Berg 2013; Jenkins et al. 2007; Knijnenburg and Willemsen 2016).

In conclusion, we argue that all identified issues of CAs have contributed to the fact that their current service quality leaves much to be desired (Ben Mimoun et al. 2012; Wannemacher 2016). As a result, customers have stopped using CAs after an initial stage of experimentation (McTear et al. 2016) and have not considered them as a viable alternative to more traditional customer service channels (e.g., web, mail, or phone) (Oracle 2016). Due to the identified lack of design knowledge for CAs in customer service, we argue that it is suitable to apply the DSR approach to address this challenge. Next, we propose MRs and DPs for these CAs.

## *Suggestion*

Several researchers have suggested that CAs need to adopt the characteristics of human communication (Berg 2013; Derrick et al. 2011; Dybkjær et al. 2004; Elkins et al. 2012). Therefore, our first step is to analyze how the cooperative principle (Grice 1975) can be incorporated into the design of CAs. Although several studies have applied the Gricean maxims to evaluate conversations with CAs (e.g., Chakrabarti and Luger 2015; Saygin and Cicekli 2002), to the best of our knowledge, this is the first study to rigorously derive MRs and DPs from them. Subsequently, we use the social response theory (Nass and Moon 2000) as a baseline to formulate additional MRs and DPs. Finally, we map the proposed MRs and DPs to the identified issues of current CAs.

Although the Gricean maxims are presented as being of equal importance, Grice (1975) states that other maxims "come into the operation only on the assumption that [the] maxim of quality is satisfied" (p. 46). Thus, it is not surprising that much research has focused on improving the natural language processing and dialogue capabilities of CAs to provide more accurate responses (e.g., Griol et al. 2008, 2014). Only if CAs are able to understand a user's message and extract her/his intent, no matter how the message is phrased **(MR1)**, they can gain sufficient evidence to generate a response that makes a high-quality contribution to the ongoing conversation (Allen et al. 2001; Zadrozny et al. 2000). Many current CAs that use rather simple pattern-matching techniques or hard-coded question/response pairs struggle with the peculiarities of natural language (Lin et al. 2016; McTear et al. 2016). However, several platforms such as Wit.ai, Api.ai, Microsoft LUIS, or IBM Watson provide online services based on machine learning algorithms that allow developers to integrate advanced natural language processing capabilities into their CA without the need of extensive development skills (McTear et al. 2016). Since CAs should be able to converse comfortably on any topic related to their service offerings **(MR2)**, they should leverage these capabilities to provide effective customer service. Additionally, CAs need to be able to take action by invoking relevant business logic (Chakrabarti and Luger 2015; Lester et al. 2004). Therefore, CAs must be able to integrate with existing applications such as product or customer databases **(MR3)**. Thus, we propose:

> **DP1:** *Provide the CA with advanced natural language processing capabilities and business integration in order for users to communicate their service request in a natural way and receive a high-quality response.*

Grice (1975) states that a person should make her/his contribution neither less nor more informative than required. This has interesting implications for CAs since the identical content may be transmitted in a short/long message or even segmented into multiple, consecutive messages instead of a single, aggregated one. Research has found that, when CAs provide too much information, users are easily disengaged (Jenkins et al. 2007). In customer service, simple questions should not be answered in too much detail, whereas the confirmation of important transactions might require more detailed responses. Therefore, CAs should be able to reply with a message which length corresponds to its informativeness and segment messages, if necessary, to facilitate the understanding **(MR4)**. This aspect is also relevant for a CA's opening message. In contrast to graphical user interfaces in which a user sees some familiar elements (e.g., a menu or buttons), the first encounter with a CA is less intuitive as users are not able to fully understand what the CA can and cannot do (Dybkjær and Bernsen 2001). Thus, it is imperative to start with an opening message that provides insight into the CA's capabilities while not flooding the user with unnecessary information **(MR5)**. Thus, we propose:

> **DP2:** *Provide the CA with conversational abilities to deliver messages characterized by situation-dependent length and segmentation in order for users to receive the right amount of information.*

In customer service, interactions with a CA may involve rather complex conversations consisting of several messages or "one-shot" conversations in which the user asks one question and the CA responds (McTear et al. 2016). Therefore, CAs should be able to not only answer single questions, but also to hold longer conversations that are going in the desired direction **(MR6)** (Chakrabarti and Luger 2015). This corresponds to the cooperative principle stating that all conversations have a specific goal that is central to the communication (Grice 1975). As participants should only say things relevant to this goal (Grice 1975), the overall conversation flow should be goal-oriented and unambiguous **(MR7)** so that users feel in control during the interaction (Dybkjær et al. 2004). However, conversations might be non-linear and current algorithms may still struggle with the peculiarities of natural language (Holtgraves and Han 2007; McTear et al. 2016). Thus, a CA needs to have efficient clarification and confirmation strategies in place to deal with customer requests that could not be understood **(MR8)** (Berg et al. 2011; Dybkjær and Bernsen 2001). Furthermore, a CA should be able to detect and recover from misunderstandings (e.g., when a CA starts to execute a wrong transaction) **(MR9)** in order to avoid trapping customers in a wrong conversation path (Lester et al. 2004). Thus, we propose:

> **DP3:** *Provide the CA with perspicuous and flexible conversation flows towards a specific goal combined with effective clarification, confirmation, and error-handling strategies in order for users to efficiently achieve their goals despite potential misunderstandings.*

So far, we derived our MRs and DPs from Grice's (1975) cooperative principle that generally describe the characteristics of effective communication as well as from related research. However, communication is further affected by the user's automatic responses to social cues from technologies with human-like characteristics (Moon 2000, 2003; Nass and Moon 2000). In line with other researchers (e.g., Fogg 2002; Knijnenburg and Willemsen 2016), we argue that this aspect has major implications for the design of CAs, particularly in the domain of customer service, because these CAs are expected to fulfill the role of human service employees and take an active part in the service encounter (Larivière et al. 2017; Marinova et al. 2017; Verhagen et al. 2014). Therefore, CAs should display key service agent characteristics (e.g., friendliness, expertise) in their interaction with customers **(MR10)** (Verhagen et al. 2014). Consequently, CAs should produce social cues (e.g., appearance or language) that correspond to these service agent characteristics as well as fit to the context in which they are implemented **(MR11)**. For example, customer service for a bank may require a more formal language than for a fashion retailer that mainly serves teenage customers. If a CA's social cues and context do not fit together, the possibility of creating unsatisfied expectations is high (Ben Mimoun et al. 2012). This fit is particularly important for CAs that provide customer service in different cultures (c.f., Donthu and Yoo 1998; Ben Mimoun et al. 2012). Additionally, CAs should seek a balance between the capabilities conveyed by their social cues and their actual capabilities **(MR12)**. If a CA overplays its capabilities, users believe it to be more intelligent and act in a more human-like way towards it (Knijnenburg and Willemsen 2016). However, if the CA then fails to fulfill the high expectations, users will be frustrated (Berg 2013; Knijnenburg and Willemsen 2016). Thus, we propose:

> **DP4:** *Provide the CA with social cues that correspond to key service agent characteristics, fit its context, and neither over- nor underplay its capabilities in order for users to better understand what they can expect from it.*

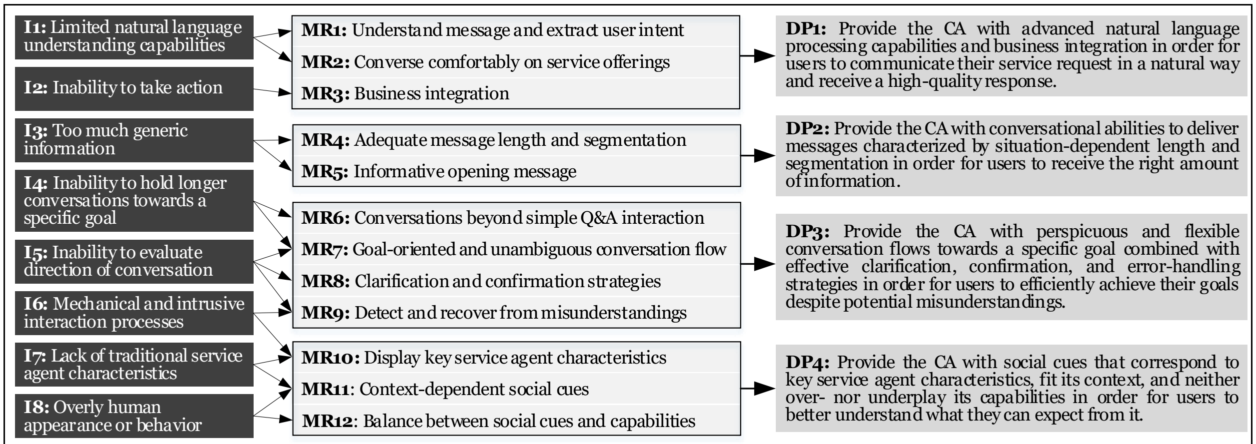


**Figure 2. Issues, MRs, and DPs for Conversational Agents in Customer Service**

As illustrated in Figure 2, we have derived twelve preliminary MRs and four preliminary DPs for CAs addressing the eight identified issues of CAs in customer service. MR1-9 are based on Grice's cooperative principle, while MR10-12 are based on social response theory. We argue that a CA that instantiates our DPs should increase service quality in customer service because these DPs were formulated based on the analysis of current issues related to the service quality dimensions proposed by Parasuraman et al. (1985, 1988). For example, a CA that can handle more complex conversations and displays key service agent characteristics should increase the customers' feelings of responsiveness and empathy.

## Conclusion and Expected Contributions

This paper presents first insights from our ongoing DSR project on how to design cooperative and social CAs to increase service quality in customer service. We discuss several issues of current CAs as well as propose preliminary MRs and DPs that address them. Next, we will develop a CA prototype that will be evaluated in a formative and artificial setting (Venable et al. 2016). Ultimately, we expect our research to contribute with a nascent design theory (Gregor and Hevner 2013) for a class of artifacts, that is, CAs in customer service. Our research can be classified as an improvement according to the DSR contribution framework by Gregor and Hevner (2013) as we address a known problem with a new solution. Although we focus on customer service, we assume that our proposed design could also be valuable for other contexts in which CAs are implemented.

Although our research follows established guidelines for conducting DSR (Kuechler and Vaishnavi 2008), there are some limitations that need to be discussed. The outlined DSR project is still in an early stage and we only propose preliminary MRs and DPs to illustrate our intended design of CAs. Moreover, our design is based on two specific theories (i.e., cooperative principle and social response theory). We acknowledge that a different theoretical foundation could have been selected to guide the design that might have resulted in different DPs. However, both theories have been applied to evaluate CAs. Thus, we regard them as a valid starting point for our design. Future research can extend our proposed design with additional MRs and DPs based on the deeper issues addressed by Grice or by incorporating other theories. Furthermore, we identified issues of current CAs from an initial review of literature in several disciplines. However, a systematic literature review might provide additional insights and is planned for future research.

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