COMPARISON OF COMMERCIAL CHATBOT SOLUTIONS FOR SUPPORTING CUSTOMER INTERACTION

Research paper

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Abstract

Considering the advancing digitalization and the rise of new technologies, the way people interact with one another but also approach companies has fundamentally changed. In this respect, chatbots have experienced a "comeback" recently and many large companies but also small and medium-sized enterprises (SMEs) in the B2C sector search for ways to support the conversation with customers via chatbots. Nevertheless, chatbots must fulfil particular functionalities (e.g., in terms of language processing or quality of communication) to be purposefully applied in an entrepreneurial setting, and particularly, at SMEs. The investigation at hand analyses the solutions of 14 technology providers for realizing a chatbot in terms of (1) quality of the communication, (2) reaction to inappropriate input, (3) personalization, (4) language processing, (5) security, (6) interfaces & mobile device support, (7) training, (8) implementation and (9) costs. Thereby, the peculiarities of human-machine communications and requirements of firms are taken into account. The results were derived on base of an online survey among the solution providers. It turned out that a high percentage of the functionalities, which are decisive for a valuable entrepreneurial chatbot application, are covered by the providers, however, with nuanced differences being observed regarding particular features.

Keywords: chatbot, human-machine interaction, small and medium-sized enterprise

1 Motivation

Digitalization is one of the major topics CEOs of modern enterprises currently have to deal with (CapGemini, 2016; Matt et al., 2015). The term "digitalization" addresses the spread of digital technologies within society and the changing communication behaviour of individuals and the way people connect with one another (Gimpel and Röglinger, 2015). In this context, the rise of new digital technologies (e.g., social networks, cloud computing, etc.) (Patil et al., 2017) has led to an increase of market transparency while the information asymmetry between sellers and buyers is constantly getting smaller (Laudon and Laudon, 2014). Consequently, the establishment of long-term customer loyalty is of high importance for companies (Lovelock et al., 2015; Mukerjee, 2013) and customer relationship management (CRM) activities have experienced a "second spring" within many firms recently (Orenga-Roglá and Chalmeta, 2016; Faed et al., 2014; Greenberg, 2010). In this regard, the rise of new technologies also affected the way private persons communicate with companies and more and more consumers preferably approach firms via digital channels (e.g., online forms, social media) to utter service requests or to settle transactions amongst others (Berthon et al., 2012; Hanna et al., 2011; Dale, 2016).

Considering this, the use of chatbots to support the external communication with customers (e.g., Gallaugher and Ransbotham, 2010) in business-to-consumer (B2C) settings is ever more paid attention to by companies (Kuligowska, 2015; Xu et al., 2017). Thereby, a chatbot is a *"computer program"* that has *"the ability to hold a conversation"* with human beings *"using Natural Language Speech"* (Abdul-

Kader and Woods, 2015, p. 72). Building on chatbots to interact with consumers brings about several value-propositions (cf. Lanning and Phillips, 1991) for companies. Toshiba for instance could reduce the number of support calls by 30-50% decreasing service employees' workload (cf. Living Actor, 2017). At the same time, customer service via the chatbot is available 24hrs a day and, hence, customers can post their service request independent from usual business hours, which increases consumer satisfaction (cf. Gorelov, 2016). More, chatbots may also contribute to users' "customer experience" during online shopping (Horzyk et al., 2009). The Bank of Amerika for instance uses a chatbot that analyses customers' behaviour to provide individual and tailored product offerings (Kusber, 2017). Generally, chatbots are applied in various branches (e.g., financial services, production industries) (e.g., Deshpande et al., 2015) and the technology has been constantly further developed in recent years, e.g., by an integration with messengers of social media platforms or speech recognition (Dale, 2016; Yan et al., 2016).

Against this background, the use of chatbots to support CRM activities in B2C markets is not only a topic for large firms but is increasingly becoming interesting for small and medium-sized enterprises (SMEs) as well. Generally, SMEs play a decisive role considering the economy of most countries (Newby et al., 2014). However, SMEs have limited budgets (Javaid et al., 2017), buy and sell in small quantities and multiple tasks are done by the same departments or employees, respectively, due to limited personal resources (Bharati and Chaudhury, 2009). At the same time, fostering close relationships with the customer base is decisive for SMEs to maintain a competitive edge (Newby et al., 2014). Considering this, SMEs have recognized the value of IT to effectively and efficiently strengthen the customer relationships (Newby et al., 2014; Bull, 2003). Nevertheless, SMEs still lack behind in terms of digitalization (McKinsey, 2014; Javaid et al., 2017). This is because decision makers are unsure whether potential benefits of IT usage will outweigh the necessary IT investments (Barba-Sánchez et al., 2007).

Incidentally, chatbots are a promising technology to automatize the customer interaction to a large degree, strengthen customer relationships by offering a 24hrs customer service and, consequently, to set free personal resources for the core business activities. However, firms will only invest into the introduction of chatbots in case the aspired value-propositions prevail the costs of investment (e.g., Barba-Sánchez et al., 2007). Against this background, the following question arises: *What are the functionalities current chatbot solutions should meet to be purposefully applied in a B2C setting and do current solution providers on the market cover these appropriately?*

To answer this question an online survey among commercial providers of chatbot solutions was performed. Whereas qualitative evaluations of concrete chatbot implementations (e.g., the chatbot "Ania" realized via the "Artifical Solution" chatbot solution) exist in literature (cf. Kuligowska, 2015), the study at hand abstracts from concrete realizations and analyses the general functionalities of chatbot solutions corresponding technology providers offer for establishing a chatbot. The paper unfolds as follows: in the subsequent section, a short introduction to chatbots is given and requirements on software solutions to realize chatbots are shown. In section 3, the procedure of the investigation is explicated and the functionalities of chatbot solutions – mandatory for their entrepreneurial use at SMEs – are derived. The results of the survey are described and discussed in section 4. The paper is rounded off with benefits of the study as well as limitations and an outlook (section 5).

2 Foundations

2.1 Background on chatbots

The initial purpose of chatbots was to mimic human conversations for user amusement (Shawar and Atwell, 2007). In this context, ELIZA, which was created by Joseph Weizenbaum in the 60's (cf. Weizenbaum, 1966), was the first attempt of building a chatbot and – although its language processing abilities were rather limited – inspired the development of many modern chatbots (Shawar and Atwell, 2007; Dale, 2016). Recently, a new hype arose regarding the chatbot technology triggered by the spread of mobile applications and social media, which fundamentally changed the way people connect and communicate with each other (Dale, 2016; Kuligowska, 2015). Thereby, a chatbot comprises the components "user interface", "responder", "classifier" and "graphmaster" according to Stoner et al. (2003).

The "user interface" presents the interface between the human and the computer and the "responder" controls the input provided by the human and processes it to the "classifier" (Abdul-Kader and Woods, 2015; Stoner et al., 2003). The input is then split into singular units by the "classifier" (e.g., extraction of keywords by eliminating unwanted words) and the syntax of the markup language used (usually the Artificial Markup Language) is checked (Abdul-Kader and Woods, 2015). The "graphmaster" then performs pattern matching, i.e., data is identified on base of the underlying structure (Stoner et al., 2003; Abdul-Kader and Woods, 2015). Then, an answer to be handed back is created on base of the content stored in the "graphmaster", which is then transferred to the user via the "classifier" over the "responder" and the corresponding "user interface" (Stoner et al., 2003). Today's application fields for chatbots comprise "e-government" (e.g., Sandoval-Almazán and GutiérrezAlonso, 2009), "education" (e.g., Kerry et al., 2009; Goda et al., 2014), "healthcare" (e.g., Comendador et al., 2015), "e-commerce" (e.g., Horzyk et al., 2009) or "law & finance" (e.g., Dole et al., 2015; Gorelov, 2016; Gibbs, 2016) amongst others. In "e-government" for instance, Sandoval-Almazán and GutiérrezAlonso (2009) describe a chatbot, which was run by the Public Information Access Unit (IAU) of the Guanajuato State in Mexico to facilitate the interaction with users in terms of administration-related issues. Regarding "education", Goda et al. (2014) analyse to what extent chatbots can be purposefully used for teaching foreign languages. "Pharmabot" is an example for a chatbot in the healthcare industries and serves as a "virtual pharmacist" to consult patients during the shopping of medicaments (Comendador et al., 2015). Bickmore et al. (2010) developed a computer-animated conversational agent for hospital patients providing them with discharge information. More, an automated health counsellor agent for promoting physical activity and fruit/vegetable consumption was created, which was proven to be effective for changing peoples' health behaviour (Bickmore et al., 2013). Dole et al. (2015) give an example for a chatbot in the banking sector with the purpose to answer customer questions about the bank's offerings. In the study of Kuligowska (2015), six Polish-speaking commercial chatbots, applied in B2C commerce (e.g., Ania – "IKEA", Zosia – "Villa Tan Tadeusz", Karen – "WSHiFM", etc.), are evaluated in terms of their visual look, presentation of knowledge as well as conversation abilities amongst others.

2.2 Requirements for chatbot usage

To be purposefully used for entrepreneurial purposes, chatbots have to meet specific requirements. On the one hand, these are general requirements that can be defined considering the specifics of the communication between humans and chatbots. On the other hand, certain requirements arise regarding the chatbot use at SMEs as set forth in the following.

General requirements emerge by the peculiarities considering the communication between humans with chatbots as they were identified by Hill et al. (2015) for instance, but also by the implications for human-computer interaction (HCI) that are caused by the increasing dissemination of natural language interfaces (cf. Følstad and Brandtzæg, 2017). In enterprise settings, it needs to be considered that chatbots play an increasing role in the knowledge creation process of individuals as stipulated by the theory of social constructionism (cf. Andrews, 2012; Schwandt, 2000) because they gradually replace humans in service encounters and become partners for interacting with customers, e.g., in the context of handling service requests. Thereby, the conversation with chatbots should not only help to solve a customer problem but a chatbot's language may also carry emotions and feelings (cf. Andrews, 2012; Burr, 2006). In this respect, messages sent to chatbots are rather short (text economy) which leads to the fact that people tend to send more than twice as many messages to chatbots in comparison to a conversation with other humans (Hill et al., 2015). In this respect, people often feel they have to alter their communication to match the one of chatbots similar to people changing their language when talking to children (Hill et al., 2015). Whereas this circumstance may be acceptable when communicating with chatbots for amusement purposes, a professional business appearance requires enterprises to explain facts (e.g., contractual terms, service responses) using consumers' language. Accordingly, a chatbot must be adjustable to the language of a specific target-audience and ensure a high quality of the communication in addition ***(requirement 1 – Rq 1)***. That way, it can be assured that language and conversation become the objects of design (Følstad and Brandtzæg, 2017) during chatbot implementation.

Furthermore, the communication with chatbots is imprinted by a huge share of profanity but also swear, negative or sexual words respectively (Hill et al., 2015). Accordingly, a chatbot must allow to realize chatbots that are able to react to such inappropriate input in a quick-witted and polite way ***(Rq 2)***. In case chatbots have a human-like appearance it turned out that people do not necessarily feel more uncomfortable when interacting with a chatbot instead of a human even if they are aware that the interaction is performed with a machine (Hill et al., 2015). This circumstance is also in accordance with media equation (cf. Reeves and Nass, 1996) stating that people tend to treat technology and instances of media as people (Heller et al., 2005). Hence, means to strengthen the perception on the users' side to actually communicate with a human need to be offered by a chatbot ***(Rq 3)***. This can be done by the help of individually configurable avatars for instance (cf. Braun, 2003; Berry et al., 2004; Gennermann and Hack, 2011) or by the ability to conduct "small talk".

Further general requirements on chatbot solutions can be derived by considering the specifics of text messages on the internet. Thus, abovementioned text economy (cf. Hill et al., 2015) increases when interacting with machines, i.e., whitespaces are spared and numbers with similar pronunciation are used instead of words (Laboreiro et al., 2010; Petz et al., 2013). Generally, language on the internet is imprinted by the use of internet slang (e.g., the expression "HB2U"), multiple languages within one text message, or spelling errors (e.g., "Hellllllooooo") (Laboreiro et al., 2010; Petz et al., 2013; Schwaiger et al., 2016) that need to be taken into account considering the communication with chatbots. More, as people use a highly emotional language when interacting with chatbots (cf. Hill et al., 2015) capitalization is often used to express emotions or to express irony or sarcasm (Petz et al., 2013). Consequently, means to deal with slang expressions ***(Rq 4)***, multiple languages ***(Rq 5)***, spelling errors and case sensitivity ***(Rq 6)*** as well as irony or sarcasm ***(Rq 7)*** need to be implemented by a chatbot. More, recent trends such as the use of chatbots in branches processing sensible data (e.g., banking) (cf. Kusber, 2017) as well as the rise of mobile technologies and social networks (cf. Statista, 2017) pose further requirements on the entrepreneurial chatbot use. Thus, the handling of sensitive data requires means to enable encoded data transmission and storage ***(Rq 8)***. Furthermore, as social media are increasingly used to get in contact with firms (cf. Hanna et al., 2011), which also holds true for SMEs in special (cf. Schwaiger et al., 2017), the integration of chatbots with new communication channels (e.g., social network messengers) needs to be considered to purposefully handle consumer requests uttered via these (cf. Dale, 2016; Chaykowski, 2016) ***(Rq 9)***. Additionally, an integration with other IT-systems (e.g. to trigger workflows) as well as the ability to be run on mobile devices is required these days (cf. Dale, 2016) ***(Rq10)***.

Besides, specific peculiarities must be considered for an entrepreneurial use of chatbots at SMEs. Hence, SMEs usually have a limited regional presence (Durkin et al., 2013), their customers come from few different communities in the same region (Bharati and Chaudhury, 2009) and, thus, conversations may refer to specific products or local events hosted by the corresponding firms accordingly (Schwaiger et al., 2016). Addressing this peculiarity falls under abovementioned ability to adjust the chatbot to the language of a target-audience (see Rq1). However, due to firms' interaction within a limited geographical area (Bharati and Chaudhury, 2009) the language of customers of SMEs is imprinted by regional dialect and colloquial language (Schwaiger et al., 2016). Therefore, chatbots must be able to recognize these language styles and still reply appropriately ***(Rq11)***. More, SMEs often have limited IT skills (cf. Bull, 2003; Newby et al., 2014; Bharati and Chaudhury, 2009). Accordingly, the training of the chatbot must be possible without technical skills being required ***(Rq12)***. In this respect, the chatbot should ideally learn from interactions with different users, which presents a major topic for HCI regarding natural language interfaces (cf. Følstad and Brandtzæg, 2017). The initial installation of a chatbot by a firm should not expect sophisticated technical skills either ***(Rq13)***. More, due to limited buying powers of SMEs (Bharati and Chaudhury, 2009) and their restraint of investing into IT (cf. Newby et al., 2014), affordable prizing models are required when it comes to chatbot introduction ***(Rq14)***.

3 Survey on current providers of chatbot solutions

The procedure of our research was as follows: in a first step, providers of chatbot solutions were identified and asked for their willingness to participate in this study. Then, functionalities of chatbot solutions

to enable their purposeful application in B2C settings considering abovementioned requirements were derived from literature. Based on that, a questionnaire was designed to assess as to which degree current solutions cover these functionalities. The data was collected via a corresponding online survey.

3.1 Selection of chatbot solution providers for the study

To find participants for the study, commercial providers of chatbot solutions applicable for B2C settings were searched for in a first step. For that purpose the "Google" search engine, the website "chatbots.org", studies about the evaluation of commercial chatbots in literature (cf. Kuligowska, 2015) as well as the expertise of two practitioners working at an internationally operating consultancy firm and dealing with entrepreneurial chatbot application amongst others, were drawn upon. Particular attention was paid to the applicability of the solutions in B2C settings but also to the fact that the companies are still active in further distributing and developing their solutions. In total, 48 technology providers for commercial chatbots were identified that way and asked for their willingness to take part in our investigation. The providers mainly came from North America, South America and Europe but also from Australia, Africa and Asia. Finally, 14 commercial providers of chatbot solutions decided to participate in the study seeing the investigation as promising for gaining a detailed market overview.

Among these participants were "Creative Virtual", "Do You Dream Up", "Synthetix", "Artificial Solutions" and "Virtual Spirits" for instance. However, the majority of participants wanted to stay anonymous in this report due to reasons of confidentiality. An online survey was seen as appropriate for collecting the data since providers' knowledge is decisive to identify the functionalities that are actually offered by the corresponding solutions. In contrast, users of these solutions realizing a chatbot might not be aware of all functionalities that are provided. Their focus will most likely be on those features they particularly require for implementing a chatbot meeting their demands. More, testing chatbots from a customer perspective may give an incomplete picture of their functionalities as well since the capabilities of the underlying solution may not have been fully utilized for implementing the chatbot.

3.2 Functionalities investigated

To effectively support the communication with customers in B2C settings, diverse functionalities of chatbot solutions are decisive. In the following, we present the functionalities of chatbot solutions that were investigated in this study more closely. To support the general validity of our investigation the functionalities were derived from literature (e.g., Klopfenstein et al., 2017; Gennermann and Hack, 2011; Braun, 2003; Kuligowska, 2015) and assigned to corresponding requirements as presented *(section 2.2)*. We clustered the functionalities according to the superordinate categories (1) quality of communication, (2) reaction to inappropriate input (3) personalization, (4) language processing, (5) security, (6) interfaces & mobile device support, (7) training, (8) implementation and (9) costs.

The **categories 1** and **2** focus on the conversation skills, the adaption to the language of a target-audience as well as the reaction to inappropriate user input such as profanity, swear, negative or sexual words (cf. Hill et al., 2015). They thus consider functionalities required for fulfilling the first and second requirement of section 2.2 *(Rq1 and Rq2)*. At the same time, the consideration of regional dialect, slang and colloquial language is a matter concerning the "quality of communication" and, hence, *Rq 4* and *Rq 11* are covered by **category 1** as well (see Table 1). The **categories 3** and **4** deal with functionalities concerned with the personalization of a chatbot and its language processing abilities. Accordingly, the requirements *Rq3, Rq5, Rq6* and *Rq7* are addressed. Security-related functionalities are subject of **category 5** covering *Rq 8* consequently. Interfaces and mobile device support (*Rq9* and *Rq10*) are considered by **category 6**. The SME-specific requirements dealing with training *(Rq12)*, implementation efforts *(Rq13)* and cost-related issues *(Rq14)* are focused by the **categories 7** to **9** (see Table 1). Table 1 shows the aforementioned categories, the functionalities these comprise as well as their assignment to the requirements. Details on each functionality are outlined in the following.

No.	Category	Detailing of functionalities		Rq (section 2.2)		
1	*Quality of the communication*	1.1	The option to adjust the chatbot to the language of a specific target-audience.	**Rq1**		
		1.2	The functionality to individually configure the response time of the chatbot from the user input to the response given by the chatbot.			
		1.3	The provision of a memory function to refer to previous statements of a conversation during interaction.			
		1.4	The ability to insert internet-links to an answer provided.			
		1.5	The functionality to obtain customer feedback considering the advisory skills of the chatbot.			
		1.6	The option of an automated handover to a human agent.			
		1.7	The provision of a "history" function (conversation logs).			
		1.8	The option to identify synonyms within a conversation.			
		1.9	The provision of means to ensure freedom of barriers.			
		1.10	The functionality to provide voice input and output.			
		1.11	The consideration of language packages supporting lexical variation, slang or dialect.	**Rq 1**	**Rq 4**	**Rq 11**
2	*Reaction to inappropriate input*	2.1	The functionality to react to inappropriate user input (e.g., insults).	**Rq2**		
		2.2	The functionality to protect the chatbot from manipulating user input.			
		2.3	The functionality to react to unspecific user input.			
3	*Personalization*	3.1	The option to generate an avatar.	**Rq3**		
		3.2	The capability to individualize the avatar.			
		3.3	The functionality to perform "small talk".			
		3.4	The functionality to support diversified conversations.			
4	*Language processing*	4.1	The support of different languages.	**Rq5**		
		4.2	The offering of a spell-checking functionality.	**Rq6**		
		4.3	The functionality of considering case sensitivity.			
		4.4	The functionality to detect irony and sarcasm.	**Rq7**		
5	*Security*	5.1	The functionality of encoded data storage.	**Rq8**		
		5.2	The functionality of encoded data transmission.			
		5.3	The functionality of authentication towards the chatbot.			
		5.4	The option to implement a role model for administration purposes of the chatbot.			
		5.5	The functionality to provide a data backup.			
		5.6	The support of PCI standards.			
6	*Interfaces & mobile device support*	6.1	The functionality of integrating the chatbot with a website.	**Rq9**		
		6.2	The functionality of integrating the chatbot with messengers.			
		6.3	The provision of interfaces to other IT-systems.	**Rq10**		
		6.4	The functionality to be run on mobile devices.			
7	*Training*	7.1	The use of self-learning algorithms.	**Rq12**		
		7.2	The provision of a graphical user interface (GUI) for a manual training of the chatbot.			
		7.3	The functionality to train the chatbot without technical skills.			
8	*Implementation*	8.1	The provision of initial and prepared language packages to enable a direct implementation.	**Rq13**		
		8.2	The option to initially host the chatbot without requiring any programming skills.			
		8.3	The availability of supportive (discussion) forums for the software product.			
9	*Costs*	9.1	The availability of attractive license/billing models.	**Rq14**		
		9.2	The option to run the chatbot in form of a "software as a service" (SaaS).			
Key: Rq1 – Rq10: general requirements; Rq11 – Rq14: SME-specific requirements						

Table 1. Functionalities investigated

(1) Quality of communication: As mentioned in section 2.2, the success of a chatbot largely depends on whether its language can be adapted to the one of the target-audience or not (Gennermann and Hack, 2011) *(functionality 1.1; see Table 1)*. Hence, in a business setting, customers need to have the feeling of meeting the conversation partner on equal terms, which requires the chatbot to attune to consumers' language. Hence, this represents a key functionality technological solutions for realizing a chatbot must enable. A further success factor for the acceptance of chatbots by customers is the provision of an immediate answer to user input (Gennermann and Hack, 2011). Receiving an answer to a specific question immediately (approx. within 0,1 seconds) gives users the "illusion" to communicate with a real person and, hence, largely contributes to the quality of the communication (Miller, 1968; Gennermann and Hack, 2011). Nevertheless, this illusion is reinforced if the response times slightly vary to simulate the cognitive thought processes of humans before giving an answer. Because of that, the option to configure the response times of chatbots represents an important functionality to evaluate chatbot solutions *(functionality 1.2)*. More, a memory function is required for chatbots to imitate a human being convincingly (Vetter, 2003). That way, information – such as the "name" of the user – can be stored and referenced

later on throughout the conversation (Vetter, 2003) *(functionality 1.3)*. More, certain information customers search for may be found on particular webpages, and, hence, the insertion of corresponding internet links to a chatbot's response is a valuable functionality contributing to the perceived quality of a communication (cf. Kuligowska, 2015; Shawar and Atwell, 2007) *(functionality 1.4)*. For the purpose of assessing users' satisfaction with the chatbot, obtaining feedback about the chatbot's advisory skills is helpful (Klostermann, 2006; Klostermann, 2007; Gennermann and Hack, 2011). Ideally, giving customers the opportunity to submit feedback in the follow-up of a conversation represents a functionality of the chatbot solution itself (Kuligowska, 2015; Callejas et al., 2011) *(functionality 1.5)*. Sometimes, customer concerns and requests may be too complex and individual and, thus, require the intermediation of an employee. In such cases, the customer inquiries should be handed over to the corresponding employee by the chatbot directly (Gennermann and Hack, 2011) *(functionality 1.6)*. This functionality also facilitates the implementation of chatbots as customer touchpoints in the light of holistic service processes (cf. Følstad and Brandtzæg, 2017). Hence, chatbots can be installed by a company to acquire the relevant information that is further processed by employees in the back-office, e.g., in the course of complaint management. In this respect, the chatbot should also provide its users with a protocol of the conversation upon request *(functionality 1.7)* (Gennermann and Hack, 2011). More, the detection of synonyms within a conversation is desirable for being able to adequately respond to users (Bradeško and Mladenić, 2012) *(functionality 1.8)*. Also the technical and language barriers of a chatbot must be kept low to enable people with language problems or disabilities the use of the chatbot (Gennermann and Hack, 2011; Klostermann, 2007) *(functionality 1.9)*. In this context, voice input and output becomes increasingly important as well (Dale, 2016; Kuligowska, 2015) *(functionality 1.10)*. The wish for voice support of chatbots is largely boosted by the upcoming of virtual assistants such as Apple's Siri, Microsoft's Cortana, Google's Assistant and Amazon's Alexa for instance (Armstrong, 2017). Finally, language packages provided for a particular chatbot solution should consider slang, dialect or lexical variations (e.g., Gray and Hansen, 2005; Petz et al., 2013) that may be used by a certain target-audience to assure a high quality of the conversation *(functionality 1.11)*. As mentioned, the language of customers of SMEs is usually characterized by colloquial language or regional dialects (Schwaiger et al., 2016).

(2) Reaction to inappropriate input: A chatbot must react to unspecific user input (e.g., by asking the customer again) or to inappropriate input (e.g., swear, negative or sexual words) in a polite but quick-witted way to maintain users' respect *(functionalities 2.1 and 2.3)* (Pilato et al., 2011; Vetter, 2003; Kuligowska, 2015). In this regard, a chatbot should not be passive but try to bring close those contents it is supposed to provide (Vetter, 2003). Additionally, there is also the danger that users willingly manipulate chatbots as was the case with Microsoft's bot "Tay" (Steiner, 2016; Wakefield, 2016). Hence, means to mitigate a corresponding "re-education" of a chatbot solution is required *(functionality 2.2)*.

(3) Personalization: Avatars are used in human-machine interaction to further strengthen users' impression to actually communicate with human beings (cf. Angga et al., 2015; Lindner, 2003; Sheth, 2003). Therefore, they are a popular means for simulating human communication behaviour *(functionality 3.1)*. Chatbots providing an avatar are less seen as a computer program but much more as a real communication partner (cf. Braun, 2003; Berry et al., 2004). However, the chatbot and the avatar, respectively, should be individually adapted to the domain they are applied for *(functionality 3.2)* (Gennermann and Hack, 2011). Otherwise, there is the danger of distracting users from the communication as was the case with Microsoft's "Clippit" in the past for instance (Sheth, 2003). Furthermore, chatbots with "small talk" abilities are felt to be more trustful and entertaining (Kopp et al., 2005; Klüwer, 2011; Spierling et al., 2006). Hence, the functionality to perform small talk is desirable for chatbot solutions to optimize the personal "customer experience" (cf. Schmitt, 2009) when interacting with the chatbot (Kuligowska, 2015) *(functionality 3.3)*. More, to shape the conversation in a lively way, a chatbot should provide different but correct answers to identical user input (e.g., introductory information) (Geeb, 2007; Gennermann and Hack, 2011) *(functionality 3.4)*.

(4) Language processing: In terms of language processing, different languages should be supported by a chatbot because firms may operate on an international level or customers might switch languages within text messages (Schwaiger et al., 2016) *(functionality 4.1)*. More, a spell-checking functionality should be provided (Polatidis, 2014; Kuligowska, 2015). That way, chatbots are more fault tolerant

considering user input which might not be grammatically correct in each case (Gennermann and Hack, 2011; Schwaiger et al., 2016) *(functionality 4.2)*. Indeed, spelling errors (e.g., "Hellllllooooo") are observed above-average considering human-machine interaction on the internet (Laboreiro et al., 2010; Petz et al., 2013; Schwaiger et al., 2016). More, while texts are often written in lowercase, capitalization is used to express emotions in some cases, and, hence, dealing with case sensitivity is a valuable feature (Gennermann and Hack, 2011) *(functionality 4.3)*. More, the detection of irony and sarcasm within a conversation is desirable for being able to adequately respond to users (González-Ibánez et al., 2011; Davidov et al., 2010) *(functionality 4.4)*. Although the automatic detection of irony and sarcasm is highly challenging, González-Ibánez et al. (2011) show that it can be nearly as good as by human assessment in case appropriate mechanisms are applied. Those applied by the participants will be shown hereafter.

(5) Security: In terms of security, the encoded data storage and data transmission are highly relevant for branches transferring sensitive data, e.g., in the financial service industries (e.g., Armstrong, 2017) and should thus be supported by chatbot solutions *(functionalities 5.1 and 5.2)* (Klopfenstein et al., 2017). In this context, also the authentication of the communication partner towards the chatbot (or a registration) may be desired to enable the use of the chatbot for a specific target-audience only *(functionality 5.3)* (Klopfenstein et al., 2017). To prevent unrestricted modifications to the chatbot, a role concept (cf. Bachman and Daya, 1977) for administration and configuration purposes is reasonable *(functionality 5.4)*. Hence, the opportunity to establish a corresponding role concept is a looked-for functionality by firms. More, data backups and the support of the PCI security standards *(https://www.pcisecuritystandards.org/) (functionalities 5.5 and 5.6)* are functionalities that are highly relevant for firms processing sensitive data, e.g., account data.

(6) Interfaces & mobile device support: Chatbots must be easily integrated into websites to be directly found and used by visitors (Kuligowska, 2015; Gennermann and Hack, 2011) *(functionality 6.1)*. However, recently, the integration of chatbots with messengers has become the centre of attention (Dale, 2016; Chaykowski, 2016). Accordingly, firms see massive opportunities in providing an automatized customer service via messengers in social media platforms such as Facebook for instance (Iftene and Vanderdonckt, 2016). Therefore, the ability to be integrated with messengers is more and more becoming a central requirement on chatbot solutions *(functionality 6.2)*. Furthermore, user input may be directly transferred into other IT-systems, e.g., CRM-systems, for the purpose of further processing, which, though, requires chatbot solutions to offer corresponding interfaces *(functionality 6.3)* (e.g., Klopfenstein et al., 2017). Additionally, with the spread of mobile devices within the population, chatbots must be runnable on corresponding devices just as they are executable on work stations *(functionality 6.4)* (Dale, 2016; Price and Lewis, 2017).

(7) Training: Especially SMEs with limited personal capacities neither have the resources to devote themselves to a laborious training of the chatbot nor do they have profound IT skills (cf. Bull, 2003; Newby et al., 2014). So, to constantly improve the conversation skills of a chatbot, it should build on self-learning algorithms (Guo et al., 2014). That way, chatbots may revert to customer data or input to automatically enhance the response spectrum for consumers (Kühl, 2016) *(functionality 7.1)*. However, also a manual training of chatbots may be strived for. For that purpose, corresponding GUIs are necessary *(functionality 7.2)*. What is decisive for the rapid introduction of chatbots at firms is the ability to train them without specific technical skills being required *(functionality 7.3)*.

(8) Implementation: To enable a quick implementation of the chatbot, an initial language package (e.g., Baccianella et al., 2010) should be delivered by chatbot providers straight away *(functionality 8.1)*. Furthermore, due to the lack of IT skills at SMEs (cf. Bull, 2003; Newby et al., 2014), an initial hosting or implementation of the chatbot, respectively, without programming skills being required should be possible *(functionality 8.2)*. Additionally, open accessible discussion forums on the internet, to immediately get help in terms of running the chatbot, would be helpful for SMEs in addition *(functionality 8.3)*.

(9) Costs: As previously mentioned, license/billing conditions should consider the limited buying powers of SMEs (Bharati and Chaudhury, 2009) *(functionality 9.1)*. Further, the running of the chatbot as a "software as a service (SaaS)" solution would be attractive for SMEs, considering scarce financial budgets but also the lack of IT know-how within firms (cf. Bharati and Chaudhury, 2009) *(functionality 9.2)*.

3.3 Questionnaire and collection of data

The above-described functionalities were then transferred to a corresponding questionnaire. The nine categories as shown presented corresponding sections of the questionnaire and we captured each functionality in form of a question. We then asked whether a chatbot provider offered the corresponding functionality or not. Wherever possible, the answers were specified as a 3-point Likert scale (degree of fulfilment – "0" not offered; "1" partly offered; "2" offered). In other cases the items ask for a "yes/no" answer. To achieve additional information, we attached free text fields to each item, asking participants to specify the assessment made in more detail (e.g., the languages supported by the chatbot solution). As an additional help, we explained all terminology and gave short explanations for each item to reduce subjective interpretations of a question. Four researchers designed the questionnaire and validated it in a workshop with two practitioners of a large consulting company who had long years' experience in conducting surveys in practice. The questionnaire was designed as an interactive Excel file and sent to the 14 participants of our study via email in the period from November 2016 to January 2017.

Each participant was given a timeframe of two weeks to complete and return the questionnaire. During this period, the researchers could be asked for assistance in case ambiguities occurred. We then screened the responses for completeness as well as consistency. In case of incomplete information (regarding specific items) the free text fields were drawn upon to see whether conclusions on the associated Likert scales could be made or not. In cases of ambiguity or lack of information the affected items were excluded from the calculation regarding the corresponding chatbot provider. Consistency checks referred to the relation between the Likert scale assessment of an item and the additional information provided via the free text fields. Inconsistencies would be given in case a provider claimed to support different languages but only mentioned one language in the free text field for instance. In such cases, we could either resolve the ambiguities based on the information provided (which was done by three researchers to avoid subjectivity) or the corresponding data was not considered for the calculation.

4 Results and Discussion

4.1 Results

Table 2 summarizes the results of the investigation and presents as to what degree the commercial chatbot providers cover the functionalities as posed in Table 1. However, Table 2 does not show the results for the category *(9) costs*, because a universally valid assessment of the suitability of the licence/billing models for all kinds of firms is not possible. Though, we shortly summarize the results for costs in the following. Generally, the providers saw their chatbot solutions as means to support (online) customer care, the sales conversation, the internal helpdesk, the customer engagement in marketing or even as a tool to serve as a virtual tour guide of smart city concepts. In this respect, the functionalities – as specified in section 3.2 – were largely covered by the chatbot solutions investigated.

Considering the **(1) quality of the communication**, a high coverage of the corresponding functionalities was observed in general (total average coverage of 89%). Thereby, five solutions support all the functionalities as mentioned whereas others have drawbacks (see Table 2). In this respect, all providers submitting answers for this category fully covered *functionalities 1.4, 1.5, 1.7* as well as *1.8*. Accordingly, the providers enabled chatbots to insert internet links to a response given and ask for users' satisfaction with the advisory skills. Further, they also provide a "history" function (conversation logs) and offer the capability to identify synonyms within a conversation. Nearly all providers met the *functionalities 1.1, 1.3, 1.9* and *1.10* with singular solutions representing statistical outliers in terms of particular items. For instance, only one provider (**P2**) claimed to not offer a "memory function" whereas another one (**P5**) did not support the adaption of a chatbot's language to the target-audience. In our study the lowest importance was ascribed to the ability to individually configure a chatbot's response times *(functionality 1.2)*, which was not supported by three providers providing answers for this category (**P1, P2, P5**). Additionally, dealing with slang, lexical variations or dialect seems to pose major problems because

only six providers (**P3, P4, P5, P6, P8, P9**) stated to fully consider these issues via corresponding language packages *(functionality 1.11)*. In summary, providers undertake enormous efforts for establishing a high quality of the communication, but especially in terms of lexical variations, slang or dialect potentials for future refinements of the solutions exist.

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	Total avg.
(1) Quality of the communication	82%	64%	100%	100%	82%	91%	82%	100%	100%	91%	-	82%	*100%	82%	*******89%
(2) Reaction to inappropriate input	100%	**100%	100%	100%	100%	100%	100%	100%	100%	67%	-	100%	100%	100%	*******97%
(3) Personalization	100%	75%	100%	100%	100%	50%	100%	100%	100%	100%	-	100%	100%	100%	*******94%
(4) Language processing	75%	100%	100%	75%	50%	75%	75%	100%	100%	50%	-	50%	100%	75%	*******79%
(5) Security	83%	83%	100%	***100%	83%	67%	83%	100%	100%	83%	50%	83%	***80%	100%	85%
(6) Interfaces & mobile device support	100%	****100%	100%	****100%	****100%	100%	100%	100%	100%	100%	75%	100%	****100%	100%	98%
(7) Training	100%	33%	100%	100%	67%	100%	33%	100%	100%	67%	-	100%	100%	67%	*******82%
(8) Implementation	67%	33%	67%	67%	67%	100%	67%	67%	100%	33%	*****100%	0%	100%	67%	67%
Total avg. for categories 1-8	88%	74%	96%	93%	81%	85%	80%	96%	100%	74%	******-	77%	98%	86%	

Key:
*: No answer to functionality 1.11 given by the provider; percentage refers to the coverage of the other functionalities
**: No answer to functionality 2.2 given by the provider; percentage refers to the coverage of the other functionalities
***: No answer to functionality 5.6 given by the providers; percentage refers to the coverage of the other functionalities
****: No answer to functionality 6.3 given by the providers; percentage refers to the coverage of the other functionalities
*****: No answer to functionality 8.1 given by the provider; percentage refers to the coverage of the other functionalities
******: No average value calculated due to lack of data regarding categories 1 to 4 and 7
*******: Total average value only considers providers for which percentage values could be calculated

100% fulfillment
<=50% fulfillment

Table 2. Results overview (percentage of functionalities met per chatbot provider)

The functionalities *2.1, 2.2,* and *2.3* related to the **(2) reaction to inappropriate input** were largely covered by the solutions investigated (average coverage of 97%). Only, the ability to reply to inappropriate user input (e.g., swear, negative or sexual words) *(functionality 2.1)* was reported not to be supported by one provider (**P10**). So, means to react to unspecific or inappropriate input as well as to protect the chatbot from being manipulated can be seen as standard functionalities offered by the providers.

The providers make various propositions in terms of **(3) personalization** and, accordingly, we observed a total average coverage of the associated functionalities of 94%. Holding "lively" conversations via "small talk" and communicating in a diversified way was claimed to be supported by all chatbot providers who gave information on that item in the questionnaire *(functionalities 3.3 and 3.4)*. Contrary, one provider did not support the generation and individualization of an avatar for instance, while one provider did not give any information on that category at all *(functionalities 3.1 and 3.2)*. Asked for reasons to not support an avatar, "**P6**" stated that the *"use of avatars was discontinued"* because this feature was believed to be *"counterproductive"* for chatbot use in a business setting. However, from a general perspective, the personalization of chatbots is a feature current providers largely support.

Generally, diversified observations were made regarding the **(4) language processing** abilities of the solutions (total average coverage of 79%) and five providers fully supported the corresponding functionalities. Thereby, all chatbot providers considered multiple languages, whereas one solution even supported 35 languages (**P9**) *(functionality 4.1)*. Two providers (**P10 and P12**) stated not to support spell-checking while this number increases to six providers (**P1, P5, P6, P7, P12, P14**) regarding the consideration of case sensitivity *(functionalities 4.2 and 4.3)*. Three providers claimed their solution not to support sarcasm and irony detection (**P4, P5 and P10**) *(functionality 4.4)*. To identify irony and sarcasm, the other providers either equipped their chatbots' dictionaries with "keywords" or "phrases" that indicate ironic or sarcastic expressions or offered a sophisticated natural language processing (NLP) engine (e.g., **P3**). To sum up, differences in the capabilities of the solutions regarding language processing abilities were given and the detection of sarcasm and irony seems to be challenging and a topic future initiatives to develop the technologies further may focus on.

There were also differences concerning **(5) security** aspects, which is relevant for the processing of sensitive data (total average coverage of 85%). At first, none of the solution providers fully covered all functionalities. However, encoded data storage and transmission, the option to implement a role model for administration purposes as well as the provision of data backups were those functionalities covered to the highest degree (13 providers each) *(functionalities 5.1, 5.2, 5.4 and 5.5)*. A more nuanced differ-

entiation was given regarding the support of PCI regulations *(functionality 5.6)*. Only five solution providers (**P3, P8, P9, P11, P12 and P14**) explicitly claimed to support corresponding standards (e.g., ISO 27001). In summary, considering chatbot usage for application fields processing sensitive data, companies must carefully look at the single providers and choose one meeting their particular needs. This is because only five providers showed a coverage of 100% regarding security-related functionalities.

Considering the proper integration of chatbots with a company's business processes and the wide spread of mobile devices the functionalities related to **(6) interfaces & mobile device support** are gaining importance (total average coverage of 98%). Not much difference was observed for the providers in this regard. For instance, all providers stated to support the integration of their solutions with messengers and their execution on mobile devices *(functionalities 6.2 and 6.4)*. All providers except for one supported the integration into websites **(P11)** *(functionality 6.1)*. Further, ten providers (**P1, P3, P6-P12 and P14**) claimed to facilitate the processing of input data by other IT-systems via the offering of corresponding interfaces (e.g., XML, JSON, etc.) *(functionality 6.3)*.The remaining four providers made no indications in this respect. It can be acknowledged that providers undertake considerable efforts for assuring chatbots to be integrated into a firm's IT landscape and to be executed on mobile devices.

Differences were given in terms of the **(7) training** functionalities (as posed in Table 1) (total average coverage of 82%). Whereas one provider gave no indication on the learning ability of his solution (**P11**), the majority of providers (twelve) indicated that no technical skills are required for training the chatbot (**P1-P9 and P12-P14**) *(functionality 7.3)*. However, only nine providers stated that their products build on self-learning algorithms to improve the conversation skills (**P1, P3, P4, P6, P8, P9, P10, P12 and P13**) *(functionality 7.1)*, whereas eleven providers (**P1, P3-P6, P8-P10 and P12-P14**) enhanced their solutions with GUIs to facilitate a manual training of the chatbot *(functionality 7.2)*. As becomes obvious from these results particular solutions perform significantly better in terms of training than others (see Table 2), a fact firms may consider when selecting a provider. Especially for SMEs with limited IT skills, a high coverage of the training functionalities is of central importance.

Considering the functionalities supporting an easy **(8) implementation** of a chatbot differences between the solution providers got evident (total average coverage of 67%). Whereas only four providers claimed to support all functionalities **(P6, P9, P11 and P13)**, most providers lack a supportive discussion forum *(functionality 8.3)* assisting during the implementation. Contrary, twelve providers stated that no programming skills are required for implementing a chatbot *(functionality 8.2)* and twelve offer prepared language packages for a direct start of the chatbot *(functionality 8.1)*. Hence, single providers stood out in terms of an easy implementation **(P6, P9, P11 and P13)**, which is especially relevant for chatbot applications at SMEs being characterized by limited IT skills. Accordingly, the implementation functionalities can clearly be seen as a major differentiator between the solutions.

Finally, in terms of **(9) costs**, almost all providers (**P1-P9 and P11-P14**) said that they enable to run a chatbot (realized via their software) as a SaaS solution *(functionality 9.2)*. Licence models *(functionality 9.1)* range from country-specific pricing models (e.g., **P12**), session licences (e.g., **P1**), annual licences (e.g., **P3**), licences depending on the number of user requests (e.g., **P14**) to individual pricing models considering the use case for which chatbots are to be realized (e.g., **P6, P9**). Accordingly, the providers offer license models for different companies of various sizes and branches.

In summary, the solutions for realizing chatbots all have particular strengths and, hence, a general suggestion on which tool to use cannot be given. Much more firms have to prioritize the categories or functionalities, respectively, for being able to select a solution meeting their demands.

4.2 Discussion and reflection against the requirements

By reflecting the results against the requirements (see section 2) several conclusions can be drawn. At first, the solutions investigated undertake enormous efforts to assure a high quality of the communication ***(see Rq1)***. In this respect, some solutions (**P3, P4, P8 and P9**) fulfil all the functionalities as described in Table 1. Nevertheless, dealing with lexical variations, slang or dialect seems to pose challenges because only six providers claimed to be fully able to cope with these language peculiarities (see section 4.1). Though, this aspect is particularly relevant for the chatbot application at SMEs or (large) firms

acting within a limited regional region ***(see Rq1, Rq4, Rq11)***. As mentioned, in such settings the language of customers is imprinted by regional dialect, slang expressions and colloquial language (cf. Schwaiger et al., 2016). Considering this, potentials for a further development of software solutions can be acknowledged. Second, the market of software solutions for chatbot realization seems to have a high degree of maturity when it comes to coping with inappropriate user input ***(see Rq2)***. The functionalities used to operationalize this requirement (see Table 1) where largely covered by the providers investigated. This concerns the reaction to inappropriate or unspecific user input as well as the provision of mechanisms to avoid user manipulations (see Table 2). Third, the generation of the illusion to actually communicate with a real person ***(see Rq3)*** is a topic most providers intensively deal with. Only one provider does not offer the opportunity to generate and individualize avatars, though the said provider has particular reasons for not doing so as described in section 4.1 (**P6**). At the same time, holding small talk and diversified conversations are issues the software solutions largely cover. Fourth, while the support of multiple languages is guaranteed by all providers investigated ***(see Rq5)***, spell-checking (supported by eleven providers) and case sensitivity (supported by seven providers) ***(see Rq6)*** are not considered without exceptions. Differences between the providers also get evident when it comes to irony and sarcasm detection ***(see Rq7)***. Thereby, only ten providers claimed to fully consider irony and sarcasm detection.

Fifth, security-related issues play an increasingly important role for the solution providers analysed ***(see Rq8)***, making them applicable for branches processing sensitive data. Only in singular cases, providers said not to support particular functionalities such as encoded data storage and transmission or authentication towards the chatbot amongst others (see section 4.1). Nevertheless, in terms of supporting PCI regulations there seem to be drawbacks with only six providers explicitly stating to fully consider these in their solutions. Sixth, the use of messengers and mobile devices has risen tremendously in recent years (Patil et al., 2017; Statista, 2016). This trend is considered by all of our study participants because the integration and compatibility with messengers ***(see Rq9)*** and mobile devices is explicitly supported ***(see Rq10)***. More, ten providers said to offer interfaces to other IT-systems ***(see Rq10***) allowing an easy further processing of data. Hence, the ground is prepared for an integration of chatbots with a firm's IT-landscape. Seventh, regarding an easy training of the chatbot ***(see Rq12)*** it turned out that self-learning algorithms are applied by many providers, however, with the general danger of users trying to manipulate a chatbot (e.g., Microsoft's "Tray") (e.g., Steiner, 2016; Wakefield, 2016). Nonetheless, all providers offering self-learning algorithms (nine providers) stated to have implemented techniques to prevent user manipulations. The manual training of the chatbot without technical skills being required was explicitly confirmed by twelve providers. Hence, current solutions on the market are suitable to be applied at SMEs or firms lacking IT skills at large. Eighth, the implementation of chatbots ***(see Rq13)*** via the software solutions investigated may be facilitated in future versions. As mentioned, particularly SMEs have limited IT expertise and, hence, in-depth programming knowledge is not available within the workforce. Twelve providers explicitly claimed not to require programming skills to run the chatbot and eleven offer prepared language packages to guarantee a quick installation. However, more supportive discussion forums could be helpful to foster the spreading of chatbots (see section 4.1). Ninth, flexible pricing models make the realization of chatbots affordable, even for SMEs with limited IT budgets ***(see Rq14)***. In this respect, 13 providers stated to support the realization of chatbots as "SaaS".

Summing up, the rise of chatbots and natural language interfaces brings about three major implications for HCI according to Følstad and Brandtzæg (2017). (I) It is no longer the visual layout of the user interface but the conversation itself that becomes the object of design (Følstad and Brandtzæg, 2017). Considering this, functionalities associated with the "quality of the communication" as well as the "reaction to inappropriate user input" that enable to design the conversation with respect to a target-audience were largely covered by all providers of our investigation (see Table 2). Some challenges existed in terms of language processing abilities (e.g., recognition of slang, etc.). However, this offers opportunities for further research and the development of means to cope with language peculiarities to adjust conversations to particular users even more. (II) Additionally, companies need to move from interface design to service design (Følstad and Brandtzæg, 2017). This development is paid attention to by the

providers allowing companies to implement the chatbot as a customer touchpoint and enabling employees to actively intervene in chatbot interactions or use the acquired information to offer services accordingly. (III) Finally, chatbots need to be designed for interaction in networks of human and intelligent machine actors (Følstad and Brandtzæg, 2017). In this respect, particularly self-learning abilities are of utmost importance (Følstad and Brandtzæg, 2017). It became evident that some providers refrain from using self-learning algorithms to prevent user manipulations as have been performed on Microsoft's chatbot Tay for instance (cf. Steiner, 2016; Wakefield, 2016). Hence, the further development of mechanisms supporting the systematic and automatized learning in networks of humans and machines seems to be a promising field for chatbot providers but also for research efforts.

5 Conclusion and Contribution

In the research at hand, the abilities of chatbot providers to cover functionalities relevant for an entrepreneurial use of chatbots at SMEs (in particular) were investigated. Hence, our research differentiates from current evaluations of concrete chatbots in literature (e.g., Kuligowska, 2015) because we focus on the abilities of existing solutions to realize a chatbot.

The research brings beneficial insights for practice and research alike. Practitioners receive a profound overview of the current capabilities of chatbot solutions offered. In this respect, it turned out that a general suggestion on which tool is superior to the others cannot be made. Much more, the providers emphasize different functionalities of their solutions, which are characterized by particular strengths correspondingly. Hence, companies seeking to implement a chatbot must carefully prioritize their requirements for being able to choose the solution that meets their expectations best. Our findings support this selection process since the coverage of certain functionalities – that are relevant for firms – by single providers is explicated in detail. More, providers of chatbot solutions receive valuable indications on which functionalities may help to differentiate from other products. Especially the handling of dialect and colloquial language, the consideration of security standards as well as the support during training and implementation seem to be promising in this respect.

Picking up that point, research may focus on the development of dictionaries considering dialect and colloquial language that are adapted for particular geographical regions or niches, respectively. That way, the perceived quality of the communication can be increased on the customer side and a handover of easy-to-solve requests to human agents reduced. Additionally, creating mechanisms to support an automatized learning in networks of humans and machines (cf. Følstad and Brandtzæg, 2017) is a promising field for research. More, research may focus on the question of how PCI regulations can be better integrated with chatbot solutions and how efficient training opportunities and implementation support (e.g., via web-based-trainings) for chatbots may look like. Finally, the research brought beneficial insights on how requirements on chatbot usage in firms can be operationalized in form of particular functionalities to be met by solutions designed for realizing chatbots.

However, there are limitations: at first, the results build on the answers as they were given by the providers of chatbot solutions. Hence, an embellishment of the answers cannot be fully excluded. However, as mentioned, providers' knowledge is decisive for identifying all functionalities of a solution, and hence, we collected the data via a corresponding online survey. Furthermore, the number of participants is restricted to 14. In total, this makes a participation rate of 29% (14 out of 48 providers contacted) which is still considerable. Another restriction is that the survey was conducted online and not in a personal face-to-face meeting, which would have allowed to ask questions for further clarification. Though, the design of the study as an online survey enabled firms to participate independently of time and location, contributing to the willingness to participate in the investigation. Finally, the results represent a snapshot of the corresponding survey period. The solutions are continuously further developed by the providers and new functionalities may have been added since the initial data collection.

In future work, we will complement the insights gained from this study with findings from an extensive test of chatbots that have been realized with the aforementioned solutions. That way, the results will be validated and an additional perspective on the usability of implemented chatbots taken.

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