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The Smiling Chatbot

Investigating Emotional Contagion in Human-to-Chatbot Service Interactions

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Zusammenfassung

Bedeutende Fortschritte im Bereich der künstlichen Intelligenz haben der Verbreitung darauf basierender Technologien in den zurückliegenden Jahren starken Rückenwind verliehen. KI-Technologien beeinflussen vermehrt private Kontexte aber auch den Servicesektor. Dort etablieren sich Chatbots als ein beliebtes Instrument für das Handling von Serviceinteraktionen. In Teilen scheint die Verbreitung von Chatbots und der damit verbundene Fokus auf funktionale Vorteile jedoch Erkenntnissen der Serviceforschung zu widersprechen, dass Serviceinteraktionen auch deutlich getrieben sind von emotionalen Komponenten. Eine zentrale Rolle spielt dabei beispielsweise die sogenannte Emotional Contagion, also die unbewusste Übertragung von Emotionen von Mitarbeitern auf Kunden. Vor dem Hintergrund, dass diese Ansteckung mit in der Regel positiven Emotionen im weiteren Verlauf für eine bessere Evaluation der Servicetransaktion führen kann, war es das Ziel der vorliegenden Dissertation, die Effekte positiver dargestellter Emotionen eines Chatbots zu untersuchen. Dafür wurden sechs aufeinander aufbauende Studien durchgeführt. Die Ergebnisse zeigen deutlich, dass ein Chatbot in der Lage ist, durch die Darstellung positiver Emotionen, Serviceinteraktionen anzureichern, indem er für eine Übertragung positiver Emotionen sorgt, was im weiteren Verlauf ebenfalls zu einer besseren Serviceevaluation führt. Es zeigt sich, dass die affektiven Reaktionen jedoch von der Persönlichkeit der Kunden sowie dem Erscheinungsbild des Chatbots, ausgedrückt durch ein Avatar, beeinflusst werden. Außerdem deuten die Ergebnisse darauf hin, dass die Reaktionen auch während kritischer Service Recoveries auftreten.

Abstract

Significant advances in the field of artificial intelligence have given a strong tailwind to the spread of technologies based on it in recent years. AI technologies are increasingly influencing private contexts but also the service sector where more and more service encounters are handled by chatbots. In part, however, the spread of chatbots and the associated focus on their functional advantages seem to contradict extant research findings that service interactions are also clearly driven by emotional components. A central role is played here, for example, by so-called emotional contagion (i.e., the unconscious transfer of emotions from employees to customers). Against the background that this contagion with usually positive emotions can lead to a better evaluation of the service transaction in the further course, it was the goal of the present thesis to investigate the effects of positive displayed emotions of a chatbot. For this purpose, six consecutive studies were conducted. The results clearly show that the expression of positive emotions by a chatbot enriches the service interactions by transmitting positive emotions that, in the further course, do also lead to a better evaluation of the service experienced. Moreover, it is shown that these emotional reactions are dependent on the customer's personality and the chatbot's appearance, expressed through an avatar. Furthermore, the results suggest that the reactions occur also during critical service recovery interactions.

Contents

Abbreviations

AFC	automated facial coding
AI	artificial intelligence
al.	alii/aliae (and others)
ANOVA	analysis of variance
AVE	average variance extracted
CA	Cronbach's alpha
CASA	computers are social actors (paradigm)
CFA	confirmatory factor analysis
CI	confidence interval
CMV	common method variance
CPA	customer positive affect
CR	composite reliability
EDB	emotional decision behavior
e.g.	exempli gratia (for example)
EP	empathy
ES	encounter satisfaction
EX	extraversion
EXPCB	experience with chatbots
EXPLC	experience with live chats
FACS	facial action coding system
fMRI	functional magnetic resonance imaging
HTMT	heterotrait-monotrait (method)
i.e.	id est (that is)
JAS	Job-Affect-Scale
LSD	least significant difference
M	mean

MICOM	measurement invariance of composite models
n.d.	no date
NFI	need for interaction
OE	openness to experience
p.	page
PDE	positive displayed emotions
PLS	partial least squares
RS	recovery satisfaction
SD	standard deviation
SEM	structural equation modeling
SR	successful recovery
SST	self-service technologies
VIF	variance inflation factor
vs.	versus

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Introduction

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1.1 Relevance

In today's world, in both private and business life, technologies powered by artificial intelligence (AI) are becoming increasingly powerful. According to Bellman (1978, p. 3), AI is the ability of computers to perform "[…] activities that we associate with human thinking, activities such as decision making, problem solving, learning […]" by first empirically observing and later transferring human thinking and behavioral patterns. On the one hand, the progressive success occurs because more and more data are available and can be used to train these technologies (Huang & Rust, 2018; Koch, 2018). On the other hand, these technologies also generate more data, which has led to dynamic growth in recent years. In private settings, for example, AI finds its way into many households as personal assistants like Amazon's Alexa or Apple's Siri, interacting with humans as if they were humans themselves.

The power of existing AI technologies also offers potential for customers and companies, which results in an increasing number of service encounters being handled by AI (e.g., van Doorn et al., 2017). Therefore, AI is also gaining relevance in many service settings. There are various reasons for this. First, there have been major developments in terms of the possible use cases for AI. These developments rest mainly on the improving power of new technologies and new ways to support frontline employees or even replace them, thus improving value creation by including large amounts of data during the encounter (Koch, 2018). Second, companies expect efficiency gains when using AI technologies (Marinova, de Ruyter, Huang, Meuter, & Challagalla, 2017; Riikkinen, Saarijärvi, Sarlin, & Lähteenmäki, 2018). These expectations rest mainly on automation potential due to the use of AI. The instantaneous processing of data in market

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research may possibly be optimized by AI-based analytics (Gentsch, 2018). In addition, it is possible to take over tasks that occur with a high frequency and demand only a small degree of sophistication. The takeover of these tasks by AI allows employees to focus on other, more complex tasks (Sawhney, 2016).

Even though there are many more ways to use AI in service settings, chatbots are among the most widely spread forms that companies use. This thesis follows the suggested definition by Crutzen, Peters, Portugal, Fisser, and Grolleman (2011, p. 514), who describe a chatbot as "[…] an artificially intelligent chat agent that simulates human-like conversation, for example, by allowing users to type questions […] and, in return, generating meaningful answers to those questions." The special feature of chatbots is that they enable communication, for example, service requests, that is strongly aligned with human-to-human communication (McTear, Callejas, & Griol, 2016). Their increasing relevance for the service sector becomes clear when looking at the fact that there were 34,000 chatbots active on Facebook Messenger in 2017 (Schneider, 2017), increasing to more than 300,000 one year later in 2018 (Boiteux, 2019). The main reason for their fast growth is that chatbots enable customer service to take place around the clock (Schneider, 2017; Wünderlich & Paluch, 2017). Furthermore, intelligent agents can support or even replace human employees, thus lowering labor costs (Li et al., 2017), and also reduce a variance in performance levels by delivering a consistent level of service quality (Behera, 2016; Schanke, Burtch, & Ray, 2021).

1.2 Research Gaps

With the spread of chatbots, the way service tasks are being performed is set to change tremendously (Huang & Rust, 2018). While, on the one hand, the importance of chatbots in service is increasing, on the other hand, service encounters often include important emotional components, such as emotional contagion (Hatfield, Cacioppo, & Rapson, 1992). This automatically raises several questions that cannot currently be answered by the existing literature, and that consequently represent the research gaps of the present thesis.

Research gap 1: Can chatbots trigger emotional contagion?
First, chatbots as conversational agents without any physical representation have so far gone unnoticed regarding their ability to trigger emotional contagion. Only a few research papers have investigated emotional contagion triggered by conversational agents represented by an avatar (e.g., Tsai, Bowring, Marsella, Wood, & Tambe, 2012) or robots (e.g., Tielman, Neerincx, Meyer, & Looije, 2014). The basis of these

research approaches is the so-called computers are social actors (CASA) paradigm (Reeves & Nass, 1996). It refers to humans' unconscious interaction (Katagiri, Nass, & Takeuchi, 2001) with computers as if they were human beings and social entities. While all the named studies were able to confirm the occurrence of emotional contagion, they were all limited by the fact that they relied on either an embodied conversational agent or a robot with a physical appearance. In comparison to robots, chatbots, as so-called text-based conversational agents, are usually characterized by their missing physical representation and the fact that they do not perform physical service tasks because the core aspect of the performed service is the conversation (Jain, Kumar, Kota, & Patel, 2018). This physical appearance is typically considered a central determinant in causing social reactions toward artificial entities (Duffy, 2003). The key challenge in this regard is that emotions in text-based communication are generally considered difficult to communicate (Walther & D'Addario, 2001). In recent years, emojis (e.g., 😃 or 😊), colored pictograms (Ganster, Eimler, & Krämer, 2012), in particular, have emerged as possible substitutes, which today offer a seemingly endless list of display options. Thus, the question of whether chatbots can trigger emotional contagion, taking into account that only text-based communication is available to them, remains unanswered. This is problematic in that it means that important findings are missing, regarding what features of a chatbot are responsible for triggering social responses in customers. With the progressive spread of chatbots, the question then arises as to whether, from the customer's point of view, social interaction partners are lost in service encounters or if there is a way for chatbots to adequately substitute these emotional components as well. It is therefore important to investigate the influence of human-like behavior, in the form of displayed emotions by a chatbot, on customers.

Research gap 2: Are emotional components equally as important in chatbot-handled service encounters as they are in human-to-human interactions?
Second, many studies have highlighted the importance of emotions for marketing (e.g., Grandey, Fisk, Mattila, Jansen, & Sideman, 2005; Kenning, Plassmann, Deppe, Kugel, & Schwindt, 2005; McClure et al., 2004; Pugh, 2001). In the course of research on emotional contagion (Hatfield, Cacioppo, & Rapson, 1994), the affect-as-information theory (Clore, Gasper, & Garvin, 2001) has gained increasing attention. Several studies have shown that the transmission of positive emotions from employees to customers leads to a better evaluation of the service experienced, as their current affective state serves as heuristic information (Pugh, 2001; Tsai & Huang, 2002). In this respect, however, the influence of emotional components in human-to-chatbot service interactions has not yet been studied. Thus,

while it is well documented from human-to-human research that customers evaluate service encounters based on more than functional aspects alone, this question is unanswered in the context of chatbot-handled encounters. This is problematic because it means that there is no comprehensive knowledge of the factors on which customer satisfaction in chatbot-handled service encounters is based.

Research gap 3: Can customers feel empathy toward a chatbot without any physical or graphical representation?
Third, the feeling of empathy has been the subject of various research efforts in the context of robots (e.g., Kwak, Kim, Kim, Shin, & Cho, 2013; Riek, Rabinowitch, Chakrabarti, & Robinson, 2009b; Rosenthal-von der Pütten, Krämer, Hoffmann, Sobieraj, & Eimler, 2013; Rosenthal-von der Pütten et al., 2014). Feeling empathy toward a social entity is based on anthropomorphism (Epley, Waytz, & Cacioppo, 2007), which, in contrast to the CASA paradigm, is characterized by a conscious attribution of human features. In the context of this thesis, results of extant research are subject to two major limitations: on the one hand, the feeling of empathy toward the robot has always been considered in the context of negative emotions. This means that the robot was either tortured (Rosenthal-von der Pütten et al., 2013; Rosenthal-von der Pütten et al., 2014) or bullied (Paiva, Dias, Sobral, Woods, & Hall, 2004) before assessing subjects' empathic reactions. On the other hand, compared to chatbots, robots possess a higher ability to trigger anthropomorphic reactions by humans due to their physical appearance (Duffy, 2003). The basic distinction between robots and chatbots (i.e., their physical appearance), therefore, raises the question of whether the physical appearance of an agent is a prerequisite for anthropomorphic reactions toward artificial entities. Thus, it is also necessary to investigate the feeling of empathy and anthropomorphic reactions toward chatbots in the context of positive emotions and without a physical appearance of the agent. The importance of addressing this research gap arises particularly from its interplay with the aforementioned CASA paradigm, as people at the conscious level normally negate the application of social behaviors toward artificial entities (Reeves & Nass, 1996). In this respect, the approach can create a deeper understanding of affective and social responses of humans toward chatbots, particularly in service encounters.

Research gap 4: Does a chatbot's graphical representation through an avatar affect customers' affective responses?
Fourth, looking at the implementation of chatbots in practice, it can be found that the representation through avatars, which are defined as "[…] computer-generated representations of the actors" (Bente, Rüggenberg, Krämer, & Eschenburg, 2008,

p. 292), is a very popular approach. In particular, the multitude of different implementation strategies, from corporate logos to cartoon-like human representations, shows that the mechanisms at this point are not yet fully understood. The extant research could show that the graphical representation of a conversational agent by a human-like avatar promotes anthropomorphic reactions (Lin, Doong, & Eisingerich, 2021) because the avatar serves as a human-like cue, which is used by interacting people to guide their own behavior (Blut, Wang, Wünderlich, & Brock, 2021). However, with regard to the use of avatars, the question remains unanswered if an avatar does influence customers' responses caused by a chatbot's human-like behavior through the expression of positive emotions (Felbo, Mislove, Søgaard, Rahwan, & Lehmann, 2017). An investigation of the research gap thus offers the potential to deepen the understanding of the effects of avatars in general, but especially regarding the interplay between the graphical representation of chatbots and their human-like behavior.

Research gap 5: Is a chatbot's affective delivery also beneficial in service recovery encounters?

Fifth, while chatbots are on the advance in the service sector, the extant research could repeatedly show that some customers exhibit reservations toward chatbots (e.g., Dietvorst, Simmons, & Massey, 2015; Mozafari, Weiger, & Hammerschmidt, 2020). The context of the service encounter seems to have a decisive influence on when these reservations are expressed. For example, Mozafari et al. (2020) reported a significant drop in customers' trust if revealed that they interacted with a chatbot when a critical service encounter was handled by the chatbot. Situations that are commonly considered as critical service encounters are service recoveries undertaken by organizations after the occurrence of a service failure (Johnston & Hewa, 1997). These service recoveries serve to rectify the inconvenience caused to the customer and are decisive for the continuation of the customer relationship (McCollough & Sundar, 1992). The expressed reservations raise the question of whether the use of chatbots, and thus also the possible favorable effects through their display of positive emotions, are limited only to routine activities. In addition, the use of emojis to substitute facially expressed emotions does not seem to be unproblematic in this context. For example, Thies, Menon, Magapu, Subramony, and O'Neill (2017) reported that the use of emojis or emoticons by customers was perceived as juvenile. In formal encounters aversions, in the sense of perceiving them as strange, could also be found (Duijst, 2017). The last research gap thus concerns the generalizability regarding emotional contagion triggered by a chatbot. Specifically, an answer is attempted to be found to the question of whether customers' affective responses to a chatbot's positive displayed emotion do occur also in service recoveries and if they

are equally as beneficial as they are in routine encounters. An investigation of this research gap can provide important information on possible limitations regarding the use of affective chatbots, depending on the service context.

1.3 Objectives and Contributions

Objective 1: Emotional contagion triggered by chatbots
Six consecutive studies, which gradually strove to shed light on the outcomes of positive displayed emotions by chatbots, were conducted to close the outlined research gaps. Based on extant findings on the CASA paradigm (Reeves & Nass, 1996), *Study 1* strove to provide first ever empirical insights on how customers unconsciously react to a chatbot that displays positive emotions during the interaction and thus displays typical human behavior (Felbo et al., 2017). The expectation was that customers would unconsciously mimic the chatbot's displayed positive emotions as they would in human-to-human interactions. To test this assumption, a laboratory experiment was conducted, which relied on the Wizard of Oz method (i.e., a human operator secretly acts as chatbot). The unconscious changes in the customers' facial reactions were videotaped and then analyzed using automated facial coding software. The results of *Study 1* address the first research gap and partially close it by showing that the expression of positive emotions by a chatbot can trigger unconscious mimicry in customers. The results thus contribute to the literature on conversational agents and specifically on chatbots. They provide important evidence that the mechanisms (i.e., emotional contagion) known from human-to-human interactions can also be applied to human-to-chatbot interactions.

Objective 2: Relevance of emotional components for encounter satisfaction in chatbot-handled service encounters
The spread of chatbots in service is repeatedly motivated for by functional advantages such as permanent availability of the customer service (Schneider, 2017; Wünderlich & Paluch, 2017) or higher cost efficiency (Li et al., 2017). Because the extant research has shown that emotional components play an important role in human-to-human service encounters (e.g., Pugh, 2001), the second research gap outlined that in this respect, no knowledge exists regarding chatbot-handled service encounters. To address this research gap, *Study 2* and *Study 3* were conducted based on the affect-as-information theory (Clore et al., 2001). The studies pursued the objective to answer the question of whether a change in customers' affective state caused by the chatbot would lead customers to report higher satisfaction with

the service experienced. By confirming this expectation, the results make a significant contribution to the service literature and show that chatbot-handled service encounters are by no means to be evaluated purely in functional terms. Instead, chatbot-handled encounters follow the mechanisms known from human-to-human research, where the service evaluation is influenced by emotional components. These results help in understanding more comprehensively the occurrence of satisfaction in chatbot-handled service encounters and are thus of importance for both scientists and practitioners. With this approach, the thesis follows a call for research approaches by Mustak, Salminen, Plé, and Wirtz (2021) to deepen the understanding of the mechanisms and modes of action of AI in service encounters.

Objective 3: Empathic reactions toward chatbots in service encounters
Based on theoretical insights from research on anthropomorphism, *Study 4* proposed empathy as a second mediation path that, in contrast to emotional contagion, is characterized by its more cognitive and conscious nature (Rogers, 1959). In human-to-human research, few research studies have examined empathy from the customer's perspective toward an employee (e.g., Wieseke, Geigenmüller, & Kraus, 2012). These found that empathy is an essential variable in the development and a determinant of the strength of the customer-employee relationship. In the context of conversational agents, the feeling of empathy toward an artificial agent implies anthropomorphism (Epley et al., 2007), the attribution of human features, such as an own affective state. Since existing research had so far investigated empathy toward artificial entities only in the context of negative emotions or using robots (e.g., Kwak et al., 2013; Riek et al., 2009b; Rosenthal-von der Pütten et al., 2013; Rosenthal-von der Pütten et al., 2014), there was a critical research gap in this regard. This was because it was not clear how the issue would behave in the context of positive emotions and applying a chatbot without any physical representation. It was therefore the third objective of the thesis to close this gap. The results show that displaying typical human behaviors in the form of positive emotions (Felbo et al., 2017) leads to triggering not only unconscious processes in customers (i.e., emotional contagion) but also conscious processes (i.e., customers more strongly anthropomorphize the chatbot and feel empathy). In the course of this extended investigation of the affective responses of customers to the positive emotions of a chatbot, the influences of different personality traits of customers were examined. Of particular interest were extraversion and openness to experience, acting as moderators. With the obtained results, the thesis contributes to both the service literature and the literature on conversational agents: first, the results show that the feeling of empathy toward chatbots also acts as a vital variable in chatbot-handled service encounters. Second, displaying typical human behavior bears the potential to cause anthropomorphic reactions

toward chatbots. Neither a physical nor a graphical representation is necessary for such reactions. Third, not all customers respond in the same way to the chatbot's affective delivery. It turns out that customers with a high level of extraversion appear more receptive to the chatbot's positive emotions. This shows that there should be a much stronger focus on individual traits of customers in research on chatbots, as this can significantly influence responses toward chatbots. The same applies to the use of chatbots in practice. While this can be beneficial in some customer segments, it may not have the same effect in others, and may even have negative consequences in some segments.

Objective 4: Effects of a chatbot's graphical representation on customers' affective responses

The extant research considers the presence of graphical human-like representations in the context of conversational agents, such as an avatar, as a vital factor concerning the attribution of human-like features (e.g., Corti & Gillespie, 2016; Lee, Kiesler, & Forlizzi, 2010; von der Pütten, Krämer, Gratch, & Kang, 2010). Previous research, however, has not been able to explain the influence of an avatar on affective customer responses to positive displayed emotions by a chatbot. Therefore, the fourth objective of this thesis was to investigate this moderating influence of an avatar. The results of *Study 5* show that simple graphical representations may affect the attribution of human-like features, but more so do human-like behavioral patterns such as displaying emotions. Thus, a vital contribution is made to the literature on conversational agents: that displaying more human-like cues seems to cause a decreasing marginal effect. In contrast, the effects caused by behavioral patterns may be inhibited by graphically designing a chatbot, so it contradicts the human-like behavior. On the one hand, this shows the importance of the chatbot's behavior during a service encounter. On the other hand, it shows that an unsuitably designed avatar can undermine the effects intended to be caused by the behavior. The results are important for literature on conversational agents. They show that a consideration of purely graphical implementations of chatbots falls short. Instead, behavioral features must be considered more intensively. In addition, the finding regarding the negative effects caused by a computer-like avatar is particularly relevant for practitioners, where the large number of different avatars gives the impression that there is no knowledge of the possible negative consequences.

Objective 5: Relevance of a chatbot's affective delivery in service recoveries

The reservations presented about chatbots in critical service encounters have strongly questioned whether a chatbot's affective delivery in the form of positive emotions can be beneficial in such encounters as well. It was the objective of *Study 6*

to transfer the research context from a routine encounter to a more critical service recovery. With this, *Study 6* strove to extend the generalizability of the previous results. Furthermore, it should be explored if there are limitations regarding possible use cases for (affective) chatbots. By showing that emotional contagion between a chatbot and customers is not limited to routine encounters, the results contribute to the service literature and once more highlight the beneficial outcomes of enriching human-to-chatbot interactions by letting chatbots display positive emotions. This finding also has special relevance for practitioners. Since chatbots are not only resistant to catching the negative emotions of customers, but can also trigger a contagion of positive emotions, chatbots are ideally suited for use in service recoveries. Additionally, the results provide insights about how the successful handling of a recovery encounter affects the conscious process of empathy toward a chatbot.

1.4 Structure

The first chapter of the thesis, the "Introduction," began by highlighting the relevance of chatbots and their potential emotional performance in service encounters. Based on the progressive proliferation of chatbots in the service sector and the known relevance of emotions, the research gaps were outlined and the objectives highlighted. The central issue was that it has not yet been investigated how the display of positive emotions by a chatbot may affect chatbot-handled service encounters. An answer to this question is of paramount importance especially for the service literature because, in the context of emotional contagion, its influence on service-relevant outcomes such as encounter satisfaction is well documented. The "Introduction" concludes with an explanation of the structure of the present thesis.

For reasons of clarity, this thesis will organize the theoretical foundation into two main chapters that address the two central theoretical aspects. In these two chapters, first the foundations of AI and conversation agents are considered (Chapter 2) before addressing the investigated affective processes in the second half of the theoretical section. Since progress in AI technologies has been crucial for the progressive development of chatbots and for specific shifts regarding the research direction in recent years, the chapter begins with an introduction to AI (Section 2.1) before conversational agents are considered in detail (Section 2.2). There is a multitude of different approaches toward the topic of AI. To make it clear from which perspective this thesis approaches the topic, the different approaches are discussed before highlighting the relevant approach for the further