Trust in chatbots for customer service

findings from a questionnaire study

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Abstract

Recently, there has been an increased interest in chatbots. Chatbots are software systems which interact with humans through natural language. This technology is utilised and implemented in a variety of sectors, in particular for customer support purposes. Though chatbots' capabilities for efficient interaction has increased, user uptake has been lower than anticipated. A critical success factor for such uptake is user trust. However, there is a knowledge gap concerning the factors that affect trust in chatbots. This thesis aims to cover this gap by presenting a questionnaire study, including the response of 154 users of customer service chatbots. The study consisted of two parts. First, an explanatory part mainly based on the Corritore et al. (2003) framework on trust in websites (including users' perceptions of *ease of use, risk, expertise, predictability* and *reputation).* This framework was extended on the basis of related literature to include users' perception of *anthropomorphism* and *propensity to trust technology*. The studied factors were structured according to three high-level dimensions; chatbot-related, environment-related and user-related factors. The explanatory analysis showed that users' perceptions of *expertise* and *risk*, as well as users' *propensity to trust technology*, explained the most variance in trust. Second, an exploratory part where the respondents in their own words reported on what they considered to be important for their trust in the chatbot. Their responses made subject to thematic analysis. The categories identified in the exploratory analysis suggested users' trust to be affected by factors partly reflecting those of the explanatory analysis (such as *expertise, anthropomorphism, low risk* and *not trust relevant/no trust*), and partly new factors (such as *fast response*, *absence of marketing, brand* and *access to human operator*). Based on the findings from the explanatory and exploratory analysis, a new model of trust in chatbots for customer service is proposed. The model includes chatbot-related factors (*expertise*, *fast response*, *anthropomorphism*, *absence of marketing*), environment-related factors (*brand*, *low risk, access to human operator)* and user-related factors (*propensity to trust technology*).

Keywords: trust, chatbots, customer service, questionnaire study

Acknowledgment

The choice of theme for this master thesis was based on my curiosity for automation and artificial intelligence. I became fascinated by this technological revolution through reading several articles published in DN and other newspapers. The interest increased even more after I went through the course "Human, Technology and Organization" at the University of Oslo. To find a suitable organization to collaborate with, I addressed a number of relevant companies. The response was overwhelming, and it was quite challenging to decide which direction to go for. After discussions with the different interests and careful consideration, I was convinced that SINTEF, with their huge knowledge and research experience, would be the absolute right choice of collaboration.

I would like to thank my incredible supervisor Asbjørn Følstad at SINTEF. Thanks for your wise mentoring, your patience, keeping up with my many frustrations, sharing your knowledge, and last but not least - always being available. You pushed me to overcome big struggles and always to challenge myself. I would also like to thank my supervisor Cato Bjørkli at the University of Oslo for his good advising, and Knut Inge Fostervold who helped me with methodological challenges.

In addition to my supervisors, I would also like to thank the four companies who participated in this study. Your acceptance to link my questionnaire to your customer service chatbot was crucial for the recruitment of users that were willing to share their experiences.

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Finally, I would like to express my gratitude for the opportunity this master work has provided, to investigate a subject that really fascinates me. Through the work I have been inspired to dig deeper, and gain more knowledge and understanding of the challenges and implications of this technological revolution.

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Cecilie Bertinussen Nordheim

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Introduction

In today's society, most if not all sectors digitize and automate in order to become more efficient. According to Frey and Osborne (2013), the increasing availability and sophistication of software technologies disrupt labour markets by making workers redundant. Within this context, a significant change is companies' introduction of chatbots as a supplement to human customer support. Chatbots are computer programs interacting with humans through natural language (Abu Shawar & Atwell, 2007). The purpose of chatbots is to simulate a human conversation in response to natural language input through text or voice (Dale, 2016). In Norway, several banks have introduced text-based chatbots. Here, customers are invited to address their customer service enquiries directly to a chatbot. For example, a customer of a bank may ask the customer service chatbot about mortgage for young adults, and immediately be answered through chat.

Although chatbots are the object of a recent surge of interest, chatbot research and development dates back to the 1960's (Weizenbaum, 1966). The renewed interest can largely be attributed to two developments. The developments within machine learning and artificial intelligence (AI) have made chatbots easier to train and implement, due to strengthened capabilities for identifying users' intents and sentiment, and improved natural language processing (Brandtzaeg & Følstad, 2017). Furthermore, chatbots have gained renewed interest due to changes in the availability and popular uptake of messaging platforms. This channel enables businesses to reach their target audience anytime and anywhere through platform such as Facebook Messenger, Slack, WhatsApp or WeChat (Zumstein & Hundertmark, 2017).

As they proliferate on messaging platforms, and increasingly are implemented as digital assistants by large technology companies, the use of chatbots is gradually becoming a part of people's everyday life (Accenture, 2016). Chatbot technology has been introduced in a variety of online environments such as e-commerce, daily news and delivery services. Lately, there has been a substantial growth in the development of chatbots for customer service and marketing (Zumstein & Hundertmark, 2017). Servion (2017) has recently predicted 95% of all customer interactions to be handled by AI-applications within 2025, including live telephone and online conversations.

The current and predicted impact of chatbots and AI-applications in customer service illustrates the fast growing change that makes it essential to gain knowledge about how chatbots are used and perceived by users. In spite the early optimism concerning the launch of chatbot technologies, by e.g. Facebook and Microsoft, theorists have noted users' adoption of

chatbots to be less substantial than hoped (Simonite, 2017). The potential of chatbots have seemingly not yet been realized as expected by the technology industry. One reason might be that many chatbots currently on the market have failed to fulfil user's needs due to a relatively high frequency of meaningless responses, unclear purposes or insufficient usability (Coniam, 2014). Lack of user focus by developers seems to be prominent.

For a new technology as chatbots to be taken up and used as intended by technology companies and service providers, it is essential that users have trust in the service. Trust has been argued to be a critical success factor in an online environment (Corritore, Kracher, & Wiedenbeck, 2003). Furthermore, the humanlike qualities of chatbots, such as their natural language interaction, may make trust particularly important (Holtgraves, Ross, Weywadt, & Han, 2007).

The concept of trust is widely applied when discussing individuals and society. More recently, trust has been established as an important concept in studies of machines and technology. The idea of discussing trust in relation to technology may seem controversial (Chopra & Wallace, 2003). Nevertheless, researchers increasingly consider it relevant to investigate users' trust in different technologies (e.g. Hancock et al., 2011). Trust has been shown to be important for users' uptake of new technologies (e.g. Corritore et al., 2003). Following this, the uptake of chatbots among consumers depends on users trust. Without trust, the potential in chatbots may not be realized.

Although a considerable amount of research has been conducted on trust in the interpersonal and societal domain, and also on users trust in various technologies, studies addressing trust in chatbots are scarce. The lack of research implies that there is a knowledge gap concerning the factors that affect humans' use of chatbots. As basis for a framework of trust in customer service chatbots, a relevant related model on trust in websites was presented by Corritore et al. (2003). In their model, drawing upon the preceding trust literature, ease of use, risk, and four credibility factors (honesty, expertise, reputation, predictability) were argued as the main factors affecting users' trust in websites.

As a first step towards the needed knowledge on users' trust in chatbots, it was in this study considered beneficial to target chatbots within one particular domain. It was decided to scope it to customer service chatbots mainly for three reasons: (1) customer service is an important domain for use of chatbots, (2) customer service represents a domain were humans potentially will be replaced by machines, and (3) it is a requested knowledge for practitioners. This made the study feasible, due to narrowing it down to one application where chatbots have been used in a relatively uniform manner.

The thesis aims to contribute some of the knowledge needed to understand users' trust in customer service chatbots. This knowledge is considered important both to strengthen our understanding of chatbots and chatbot use, to help companies to make good strategies for chatbot design and implementation, and in enabling them to make customers satisfied in an increasingly digitized world. This motivates the following research question, which will be presented in more detail in the section Research question and hypothesis:

Which factors affect users' trust in chatbots for customer service?

The next chapter provides an overview of relevant background literature. The background presentation is divided into two main parts; one about automation and chatbots, the other about the trust construct. In the first part, the topic of automation and recent developments within AI and machine learning will be presented. Thereafter, review of the origin of chatbots and current applications is provided, complemented by a short review of literature about user perception and experience with chatbots. In the second part, an overview of the trust construct is provided, through exploration of trust in the interpersonal domain, organizations, online, and in relation to technology. Lastly, factors that on the basis of the literature seem most promising to affect users' trust in chatbots will be summed up in a table.

Chatbots and related technology

Automation and human technology relations

To better understand the role chatbots have achieved today, it is useful to reflect upon automation and humans' relation to technology. We are moving into a new time age, where the technology options are enriched (Brynjolfsson & McAfee, 2017). This means that a lot of our daily interactions depend on complex and autonomous technology. A lot of tasks and skills humans used to be responsible for have been replaced by automated systems (Hoff & Bashir, 2014). Automation has been described as "the execution by a machine agent (usually a computer) of a function that was previously carried out by a human (Parasuraman & Riley, 1997, p. 231) and "technology that actively selects data, transforms information, makes decisions, or control processes" (Lee & See, 2004, p. 50).

Automation entails a wide range of benefits, such as improved safety, comfort and job satisfaction (Wickens, Lee, Liu, & Gordon-Becker, 2013). In contradiction, humans may trust automation at times it's not appropriate (Lee & See, 2004). By carefully designing and considering the human's role, this failure can be avoided (Wickens et al., 2013). If you ask the question "Do you trust the machines advice?" and the response is no, this can give serious consequences for the user, all depending on the performing task (Muir, 1987). The right

investment in technology can give rise for enhanced productivity, while machines that fail can lead to undesirable consequences. For large companies, a worst-case scenario can be substantial financial losses (Venkatesh, 2000).

In their book "Machine, Platform, Crowd" which is an continuation of their much referenced book "The Second Machine Age", Brynjolfsson and McAfee (2017) have provided several examples of how computerisation have taken a big step from being confined to routine manufacturing tasks. Google's driverless cars provide an example of possible automated tasks in the transport and logistic sector. Frey and Osborne (2013) discussed how the expected technological changes will affect human's work structure. Their analysis estimated 47% of US employments as belonging to the high risk category, which means that associated occupations are highly susceptible to be automated in just a few decades.

The past section has shown the increasing potential automation serve, and how this can give rise to a range of benefits. However, automation can also entail challenges if not designed with the user in focus. The next section will take a deeper look at the concepts of machine learning and AI, and how developments in this domain have enriched the potential for technological entities.

The changes brought about by machine learning and AI

An important premise for the current development of chatbots is the advances within machine learning and AI. These advances are explicitly dedicated to the progress of algorithms that permit cognitive tasks to be automated (Frey & Osborne, 2013). Machines can through machine learning and AI be capable of performing tasks that earlier were considered to require human judgement (Brynjolfsson & McAfee, 2017). Use of AI is seen in a range of sectors, it has for instance made it possible to identify rare and devastating side effects of medications (Dietterich & Horvitz, 2015).

Machine learning is an approach to AI where systems learn by gradually improving own ability to analyse and predict, through exposure to large amounts of data. Areas that have seen the great impact includes speech recognition, image classification and machine translation (Brynjolfsson & McAfee, 2017). The big advances in machine learning is predicted over the longer-term to have substantial beneficial influences on healthcare, education, transportation, commerce and general science (Dietterich & Horvitz, 2015). It is clearly proved that whenever the option is available, relying on data and algorithms alone usually lead to a better decision than human experts (Brynjolfsson & McAfee, 2017).

Machine learning is quite similar to humans way of learning (Brynjolfsson & McAfee, 2017). That's why performance for systems based on machine learning often is compared to

performance for humans. Liu, Shi, and Liu (2017) have provided an example of this. They presented IQ of different AI systems, such as Google and Apple's "Siri". The winner of this test was Google, not far away from passing the average IQ of a six-year-old human. If this development continues, it will not be long before AI systems will reach and also pass the average IQ of a human.

In sum, this section has shown how the developments within machine learning and AI have provided increased technological options. The renewed interest in chatbots is strongly driven by this development, which makes chatbots capable of handling more tasks. The following section will elaborate on chatbots and its origin.

The emergence of chatbots

Murgia, Janssens, Demeyer, and Vasilescu (2016) suggest that human-chatbot interaction soon will be important in domain specific knowledge sharing, like question and answer websites. The introduction of AI and machine learning has increased the potential and capabilities chatbots can serve. Chatbots are gradually standard feature embedded in smartphones and web interfaces (Portela & Granell-Canut, 2017). The substantial uptake of messaging platforms such as Facebook Messenger and WeChat motivate service providers to reach out to customers through chatbots (Dale, 2016).

Conversational systems such as chatbots have been referred to with a variety of names (Ciechanowski, Przegalinska, Magnuski, & Gloor, 2018). In this thesis they are referred to as chatbots, and are investigated in the context of text-based chatbots for customer support purposes. Though chatbots for customer service typically are text based, voice-based chatbots are also available on the customer market. Apple's "Siri" is an example of a leading voice-based chatbot (Dale, 2016).

Chatbots as a technology is not new. The roots of conversational systems go back to Weizenbaum's computer programme "Eliza"; a computer programme that made natural language conversation with a computer possible through text-based interaction. Eliza simulated a therapist that users could chat with (Weizenbaum, 1966). Since then, there has been substantial progress in developing natural language processing tools that understand both spoken and written language (Baron, 2015). Shah, Warwick, Vallverdú, and Wu (2016) compared current chatbots to Eliza, and found these to have superior conversational abilities than their predecessor.

A way of testing chatbots' ability to appear intelligent is the well-known "Turing test". Here, human judges converse with a partner that is either human or chatbot, without knowing its true nature. The test criterion is whether the human judges are able to distinguish between

a human and a chatbot (Turing, 1950). This test is implemented yearly at the Loebner prize, where the chatbot appearing most humanlike win. To date, no computer program has managed to convince the judges at the Loebner prize that they were human, not a robot (Baron, 2015). The fact that chatbots continuously improve, has raised optimism about building chatbots that one day might pass the Turing test (Dale, 2016).

This section has shown that chatbot technology already have a broad history. The next section will dig deeper into the context of this study, customer service chatbots and briefly describe other chatbot applications.

Chatbot applications

The main reason for humans to use chatbots is productivity, meaning quicker answer with less effort. Moreover, chatbots have been implemented with a variety of purposes, such as provide information, social and emotional support, entertainment or link users to other humans or machines (Brandtzaeg & Følstad, 2017).

Customer service is a domain where chatbots have achieved strong and growing interest (Accenture, 2016). The renewed interest in chatbots is also partly driven by the development within e-commerce and e-service to incorporate natural language interfaces (Holtgraves et al., 2007). In Norway we are witnessing a change in how customers are offered assistance. Chatbots are gradually becoming a regular function in customer service platforms in banks, insurance, consulting and industry. The humanlike conversation of chatbots gives customers the opportunity to type questions, and in return get meaningful answers to those questions in everyday language (Crutzen, Peters, Portugal, Fisser, & Grolleman, 2011). Chatbots can thereby be used to deal with many of the routine queries that typically make up most service request (Accenture, 2016). Furthermore, chatbots never require vacation, get grumpy or tired. According to Brynjolfsson and McAfee (2017), the initial step of listening and understanding will be the hardest part of automating customer service.

Chatbots has also been proven useful in other domains. Within the health domain, chatbots have been evaluated favourably in comparison to information lines and search engines in answering adolescent's questions to sex, drugs and alcohol (Crutzen et al., 2011). A study in the educational domain found that students were overwhelmingly positive to use chatbots as a mean for learning and practise of a foreign language (Fryer & Carpenter, 2006) Recently, the use of chatbots have been discussed in the domain of human resources services, as a way of recruiting candidates for jobs, supposedly facilitating the recruitment process (Monsen, 2018).

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This section has shortly addressed some of the application forms where chatbots have been implemented. Currently, chatbot technology is implemented mainly as a supplement to human customer support in an attempt to digitize companies. The next section will elaborate on some of the studies which have highlighted the users' perception and experiences with chatbots.

User perception and experience with chatbots

A successful implementation of new technology is mainly determined by the users' perception and experience. Research in the field of chatbots has established interesting findings about the user perception. Hill, Ford, and Farreras (2015) compared human-human interaction online with a human-chatbot interaction. The results revealed human-chatbot interactions to have longer duration and involve shorter messages than human-human interactions. Also, the human-chatbot interaction lacked the richness in vocabulary compared to a conversation with a human. Corti and Gillespie (2016) found users to invest a higher effort to repair misunderstandings when the chatbot was perceived as human, compared to the perception of the chatbot being automated.

Several studies have investigated users' experiences with chatbots. For example, Murgia et al. (2016) studied the human-chatbot interaction in the context of a question-answer website. In their experiment, the preliminary results indicated that humans either don't fully trust suggestions given by a chatbot, or they expected chatbots to provide better answers than humans.

In sum, this section has shortly demonstrated some of the available research on people's perceptions and experiences with chatbots. However, the current literature has not shed light on the factors contributing to users trust in customer service chatbots. The following pages will discuss the trust construct, and how this can be decisive for people's use of chatbots. The second part of the background is structured into five sections; general information about the trust construct, trust in the interpersonal domain, organizational, online, and technology. First, trust will be discussed as a construct and how it can be a decisive factor for use.

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Trust

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The trust construct

Trust has for decades been a subject of ongoing research, so far without any universally accepted definition. It extends as important across a wide field, ranging from psychology to human computer interaction (HCI) (Corritore et al., 2003). According to

Mayer, Davis, and Schoorman (1995), trust is "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other part" (p. 712). In the area of automation, Gregor and Madsen (2000) see trust as "the extent to which a user is confident in, and willing to act on the basis of the recommendations, actions, and decisions of an artificially intelligent decision aid" (p. 1). Generally, both definitions seem to state the importance of an individual who willingly put oneself in the hands of another party.

Trust can be viewed as an important component in the development and maintenance of happy and well-functioning relationships (Simpson, 2007). Wang and Emurian (2005) stress a trusting relationship to consist of two parties; a trustee and a trustor. In this study, the trustor is the user/customer, and the trustee is the chatbot. Trust emanates from a person and is an act of a trustor. Trustworthiness is on the other hand characteristic of the object of trust, here stated as the chatbot (Corritore et al., 2003). On the basis of value in different domains, trust has been viewed as an attitude, an intention or a behaviour (Gregor & Madsen, 2000; Mayer et al., 1995; Moray, Inagaki, & Itoh, 2000).

Lately, the topic of trust has generated increased attention in the domain of automation and technology. Lee and See (2004) are one of many researchers appraising trust as significant to the understanding of human and automation partnership. Trust is in general described to belong to interactions among conscious beings. For many, the notion of trust implies both the involved parties to be able to be vulnerable, experience betray and extend goodwill (Friedman, Khan, & Howe, 2000). However, according to Wickens et al. (2013), trust is important when dealing with any entity, no matter if it is a salesperson or an automated device.

With regard to automation, trust has been perceived as a dependent factor for people's decision about monitoring and use (Merritt & Ilgen, 2008). Different studies have shown that people tend to rely on automation they trust and keep distance to automation they don't trust (Lee & Moray, 1992; Lewandowsky, Mundy, & Tan, 2000; Muir & Moray, 1996). Distrust is not always severe, but can make people reject good and effective assistance (Wickens et al., 2013). Corbitt, Thanasankit, and Yi (2003) investigated consumers' perception of trust build on the internet. They showed how people having higher levels of trust in e-commerce were more likely to use e-commerce. The same pattern is conceivable related to use of chatbots in customer service, where low usage can be attributed a low trust.

In the context of chatbots, including chatbots for customer service, a broader uptake arguably depends on users' trust in this technology. In particular, as chatbots possess humanlike qualities such as the ability to convers. Holtgraves et al. (2007) found chatbots to be viewed as having humanlike personalities, and that respondents kept much of the same social convention when talking to a chatbot as when to a human. As shown in the previous section, there exist several studies on how user perceive or experience chatbots, but not on trust in chatbots.

This section has described how researchers are connecting trust to automated systems and also intention to use. To gain knowledge of factors affecting trust in chatbots for customer service, definitions of trust in other domains will be explored. The next section will present literature about trust in the interpersonal domain, an extensively studied research area.

Trust in interpersonal relations

Theories of interpersonal relationships have established trust as a social glue in relationships, groups and societies (Van Lange, 2015). In the interpersonal perspective, trust is a psychological state of an actor against a partner, where the actor to some extent is interdependent (Simpson, 2007). For many, trust involves three components: (1) the properties of the self/the person, (2) the specific partner in dialogue, and (3) the specific goal in the situation. If one of the three components changes, an individual's perceptions, thoughts, actions and feelings of trusting another will possibly also change (Hardin, 2003).

One of the big contributors to research of trust in the interpersonal domain was Rotter. Rotter (1967) defined trust as "an expectancy held by an individual or group that the word, promise, verbal or written statement of another individual or group can be relied upon" (p. 651). For him, trust was regarded as a personality trait. General work in the interpersonal domain has confirmed that trust typically operates higher when people believe their partners are more committed to the relationship, and have more motivations and benevolent intensions (Simpson, 2007). This shows how interests by one part can't be achieved without reliance upon another. Interdependence is one of two conditions with mostly agreement in the trust literature (Rousseau, Sitkin, Burt, & Camerer, 1998).

This section has briefly presented conceptualizations of trust in the interpersonal domain, where interdependence between two parties is highlighted in accordance to trust. The next segment will cover trust in an organizational context, particularly by looking at Mayer et al. (1995) model.

Trust in an organizational context

Mayer et al. (1995) have made one of the most influential and accepted definitions of trust (Rousseau et al., 1998). In their definition, vulnerability is a critical element. They did especially stress humans to willingly put themselves at risk or in a vulnerable position. This means they transfer responsibility for actions to someone else, otherwise trust won't be an important part of a relationship. The level of risk has been highlighted as dependent for trust, a factor which is also stated important in their model of organizational trust (Mayer et al., 1995). Risk is one of the two conditions with partly agreement in the literature, and has by psychological, sociological and economic conceptualizations been defined as important for trust (Rousseau et al., 1998).

In Mayer et al. (1995) model of factors contributing to trust in an organizational context, three factors of perceived trustworthiness were defined: ability, benevolence and integrity. The three characteristics of the trustee will thereby determine trustworthiness, and help building a foundation in the development of trust. The group of skills, competencies and characteristics that makes the trustor influence the domain is defined under ability. Benevolence is the degree to which the motivations and intents of the trustee are in line with those of the trustor. The extent to which the trustee hold on to a set of principles the trustor finds acceptable, is the one Mayer et al. (1995) call integrity. Ability and integrity are factors that appear promising to transfer to a human-chatbot interaction Benevolence is on the other hand a factor that is not conceivable important in relation to chatbots.

Mayer et al. (1995) model did also include peoples' propensity to trust, which is evaluated as a stable within-part factor. This was regarded as the general willingness to trust others. Applied to technology, propensity means one is willing to depend on technology across situations and technologies (Mcknight, Carter, Thatcher, & Clay, 2011). Jian, Bisantz, and Drury (2000) indicated humans' general propensity to trust automated system as a baseline measure for predicting trust. Moreover, Merritt and Ilgen (2008) showed how humans with high level of trust propensity were more likely to put a greater trust in an automated system. It can thereby be reasonable to think that humans trust in chatbots is affected by human's general tendency to trust technology.

In sum, this section has provided a short overview of a much cited model of trust. Four of the factors in the model; risk, ability, integrity and propensity to trust, seem to be promising factors for trust in customer service chatbots. The next section will elaborate on trust in an online context.

Trust in an online context

The framework of Corritore et al. (2003) is a regularly cited framework addressing trust in an interactive system as websites. Chatbots does also represent an interactive system, where both systems are depending of the important online user interfaces. Corritore et al. (2003) framework posit similarities with the above mentioned Mayer et al. (1995), and may seem to be motivated by that model. Furthermore, Corritore et al. (2003) model is identified by extensive offline literature deemed applicable to an online context. In the model, there are two categories of factors impacting an individual's degree of trust in a website: the perceived and the external factors. The external factors exist implicitly and explicitly in a trust context. The perceived factors are the individuals' perception of the external factors. These perceived factors will be emphasised in this study. Corritore et al. (2003) proposed that the perception of the three factors, i.e. ease of use, risk and credibility, impact the user's decision to trust in an online environment.

First, Corritore et al. (2003) argue ease of use as one of the three perceived factors impacting users' trust. This is incorporated from the Technology acceptance model (TAM), a model that describes the factors that need to be present for humans to use technology (Davis, 1989). Corritore et al. (2003) framework defines perceived ease of use as a reflection of how simple the website is to use. Different e-commerce studies, for example Gefen, Karahanna, and Straub (2003) found perceived ease of use to be associated with increased trust. Similarly, Li and Yeh (2010) argued ease of use to have a significant explanatory power in building trust for vendors in mobile commerce. Ease of use appears prominent for trust in nearby context, and will also be a reasonable factor to affect users' trust in chatbots for customer service.

Second, risk is included in the trust model of Corritore et al. (2003) due to its prevalence as a key factor of trust in the offline literature, as well as indications of being important in online trust. They defined risk as the likelihood of an undesirable outcome. This factor also seems to be motivated by the preceding literature on trust, e.g. Mayer et al. (1995) who defined risk as necessarily for trust. In the context of customer service chatbots, perceived risk arguably is low, though issues pertaining to getting hacked, fooled, waste time, or getting an incorrect answer may be relevant. When chatbots become more advanced and involve a higher engagement of the user, the risk will undoubtedly get higher. As risk, by many researchers have been viewed as important for trust, there are reasons to believe this factor will play a role in the context of trust in chatbots for customer service.

Third, credibility is the last of the three perceived factors argued by Corritore et al. (2003) to influence users' trust in an online environment. Credibility gives a reason to trust

and function as a positive signal of the trustworthiness in the object. The perceived factor credibility is further divided into four: honesty, expertise, predictability and reputation. Honesty concerns well-intentioned and truthful action, and shares much of the same characteristics as Mayer et al. (1995) factor benevolence. This factor will not be regarded as a possible factor explaining trust in chatbots.

Expertise, as one of the four credibility factors is highlighted by Corritore et al. (2003) to affect the users' decision to trust. They defined expertise as the perceived knowledge or competence a website has. This is corresponding to Mayer et al. (1995) ability. Transferred to chatbots, expertise will be the perceived knowledge or competence, a factor conceivable to impact users trust in chatbots for customer service.

Predictability is also by Corritore et al. (2003) stated as one of the four credibility factors impacting users' decision to trust. This covers the trustors expectation that the website will act consistently, and that future transactions will continue to be successfully completed. Predictability have similarities with Mayer et al. (1995) integrity factor, the extent to which the actions are congruent with words. In the field of human-computer interaction, trust can be affected by the consistency of the machines output given the same input (Merritt & Ilgen, 2008). Muir and Moray (1996) explored predictability to be significantly related to subjective trust. Here, a chatbots way of being predictable and acting consistently can be assumed to play a role for the users trust.

Reputation is the last of four credibility factors suggested to be included in the model on online trust. Reputation of a website defines the quality of recognized past performance (Corritore et al., 2003). Hoff and Bashir (2014) claimed an operators trust in an automated system to be biased by the systems established reputation. For example, trust is said to be influenced by e-commerce reputation in general (Corbitt et al., 2003). Others have shown humans to display a higher tendency to trust automation when it is portrayed as a reputable system, by other words having a good, positive evaluation (De Vries & Midden, 2008). In this context, it can be reasonable to believe that a chatbots' reputation will impact humans trust in chatbots for customer service.

This section has provided strong reasons for including Corritore et al. (2003) framework as a starting point for the perceived factors influencing trust in chatbots for customer service. Ease of use, risk, expertise, predictability and reputation appears as promising factors. However, as also stated by the authors, the model does not cover all possible scenarios where humans interact with internet technologies. The next section will

thereby explore how trust in technology has been investigated and if other factors appears important.

Trust in technology

Trust is not limited to the interpersonal domain and can in many ways define how people interact with technology. There even exist parallels between interpersonal trust and trust in automation (Hoff & Bashir, 2014). What makes trust in humans to differ from trust in machines is by Lee and See (2004) said to be machines lack of intentionality, traits like loyalty, benevolence and values critical to the development of trust in human partners.

To consider trust in the context of robots, Hancock et al. (2011) conducted a comprehensive meta-analysis of the existing literature. They formulated a triadic model of trust, where the influencing factors were categorized in human-related, robot-related and environmental-related. The result revealed robot-related characteristics, especially its performance, as having the greatest influence on trust. The environmental-related characteristics had a moderate effect in this relationship. Chatbot-related factors, hence, characteristics with the chatbot is also conceivable to play a dominate role for users trust in customer service chatbots.

Individual differences have in some cases also been proven central in explaining differences in the perception of technological entities. Shah et al. (2016) made a study on the evaluation of conversational systems, where differences were found between age groups and the genders. Younger age groups evaluated the systems higher than older age groups. The same pattern was evident for females; they also evaluated the system higher than men. Based on this, it is reasonable to investigate whether age and gender will influence users' trust in customer service chatbots.

The rapid technological developments and natural language processing has blurred the distinction between humans and machines (De Visser et al., 2016). Some type of humanness is seen in chatbots, which makes it important to evaluate anthropomorphism in this context. Anthropomorphism defines the degree to which an intelligent agent like a chatbot is displayed with human characteristics (De Visser et al., 2016). Reeves and Nass (1996) concluded in their study that humans treat new technologies as real people, prolonged as trust entities.

With chatbots increasing linguistic capabilities, it is expected that the users are likely to ascribe human traits to chatbots. This will be to the point where simply looking at a generated dialog or interacting with a chatbot, and then distinguish this from a human will be a difficult and frightening task (Candello, Pinhanez, & Figueiredo, 2017). During a ten year perspective, Nass and Moon (2000) performed a set of experiments showing that humans

behaved in the same way with computers, as they did with real people. The authors identified social categories as something people relied on when interacting with computers. Apple, as one of the big technology companies launched a major upgrade of their voice-based chatbot "Siri" summer 2017. This was not just an upgrade based on smaller technological attributes, but a main focus of making "Siri" more humanlike (Matney, 2017).

This section has indicated the importance of evaluating trust in relation to technology. It has also shown that individual differences in age and gender can affect human's perception. The most prominent finding is that humans to some degree view technological entities, as entities displaying humanlike qualities. Furthermore, the big companies' effort to make machines more humanlike indicates the importance of considering its role in relation to users' trust. The next chapter will give a summary of the factors that this literature review points out as the most promising for evaluating the perceived factors influencing trust in chatbots for customer service.

Summarising the literature review

As a summary of this literature review, factors appearing most promising for understanding trust in customer service chatbots are presented in table 1. The summary is done with a starting point in Corritore et al. (2003) framework. However, based on the rest of the literature, other factors are also included.

The factors are structured according to three high-level dimensions: chatbot-related, environment-related and user-related factors. This structuring of the factors are motivated by Hardin (2003) who viewed trust as three factors: the self, the partner and the goal in the situation. A resembling structure in three levels is found in Hancock et al. (2011) meta-analysis, structured into human-related, robot-related and environmental-related factors.

Table 1.

Descriptions of factors

Dimension	Factor	Content	Reference
Chatbot-related factors	Expertise	Expertise is seen as a factor associated with credibility, a cue for trusthworthiness. In the context of an automated system, trust has been argued to be mainly based on users' perceptions of the systems's expertise. Here, the chatbots expertise is assumed to impact users' trust.	Corritore et al. (2003) Muir & Moray (1996)
	Predictability	Predictability is also seen as a factor associated with credibility, and concerns the trustors' expectation that an object of trust will act consistently in line with past experience. If the user perceives the chatbots as predictable, this may lead to a feeling of trust in the chatbot.	Corritore et al. (2003) Fogg et al. (2001)
	Anthropomorphism	Humans have been found to apply social rules, such as politeness, in their interactions with computers. Furthermore, users have been found to perceive chatbots as having humanlike personalities. Because of this, it may be assumed that anthropomorphism potentially may impact trust in chatbots.	Nass et al. (1999) Nass et al. (1994) Holtgraves et al. (2007)
	Ease of use	Ease of use has been seen as an antecedent to trust. It has been found to have a positive relationship with consumers' trust in interactive systems such as websites.This gives reason to assume that ease of use may be a factor potentially affecting trust in chatbots.	Corritore et al. (2003) Gefen et al. (2003)
Environment-related factors	Risk	Peoples' perception of risk has been shown to affect online trust. Some trust theorists have also argued that trust is more relevant in contexts characterized by risk. This higlighting of the relation between risk and trust suggest that trust in chatbots may be dependent on risk perceptions.	Corritore et al. (2003) Rousseau et al. (1998)
	Reputation	Reputation, like expertise and predictability, is also seen as a factor associated with credibility. Reputation of websites defines the quality of recognized past behaviour. It is reasons to believe that other peoples' assessment of the chatbot may affect its reputation, and in this way affecting how users experience trust in the chatbot.	Ganesan (1994) Corritore et al. (2003)
User - related factors	Propensity to trust technology	There is substantial individual variation in humans' general willingness to trust others, referred to as propensity to trust. In this context, this propensity will be seen as a general propensity to trust in technology. It seems reasonable that propensity to trust technology affects trust in chatbots.	Mayer et al. (1995) McKnight et al. (2011)

The literature also suggests a positive relationship between peoples trust in a technology and intention to use (Lee & Moray, 1992; Merritt & Ilgen, 2008). Other factors, such as age and gender has by some researchers been claimed as contributing to differences in the evaluation of automated systems (e.g. Shah et al., 2016).

The literature review has mentioned other factors of relevance to trust, which do not seem particularly relevant for trust in chatbots and hence not included in the above overview. An example of such a factor is benevolence, a factor highlighted by Mayer et al. (1995). Another example is honesty (Corritore et al., 2003), which seems to be motivated by the Mayer et al. (1995) benevolence factor. These two factors were not found to be promising for explaining trust in chatbots as they are considered incapable of lying or serving an egocentric profit motive.

The summary in table 1 provides an overview of factors standing out in the literature as most promising for explaining users trust in customer service chatbots. The next chapter describes the research question and a hypothesis for this thesis.

Research question and hypothesis

User uptake of chatbots is less extensive than anticipated. For users to take advantage of this technology, they should trust it. There are currently no available studies that investigate trust in the context of chatbots. It is especially important to gain knowledge regarding trust in chatbots within customer service, since this is rapidly growing area of chatbot use. Hence, the following research question was formulated for this study:

Which factors affect users' trust in chatbots for customer service?

This research question requires a two-folded investigation, including an explanatory and an exploratory part. The explanatory part is needed to investigate promising factors from the trust literature. The exploratory part is needed since the available trust literature doesn't explore trust in chatbots, which means that it is essential to check whether there are other factors relevant for trust in chatbots than those identified in the literature on trust in other comparable technology. Based on the literature, the following hypothesis is stated for the explanatory part:

H: Trust in chatbots is hypothesized to be affected by expertise, predictability, anthropomorphism, ease of use, risk, reputation and users' propensity to trust technology.

Method

The project

This master project is conducted in cooperation with SINTEF and their ongoing research program on chatbots. The goal of this research was to identify the factors contributing to users' trust in chatbots for customer service. Four companies were, by the author of this thesis onboarded as collaborators for recruiting study respondents. The construction of the questionnaire and the analysis was mainly done by the author, with assistance and feedback from the two supervisors; Associate Professor Cato Bjørkli from the University of Oslo, and Senior Scientist Asbjørn Følstad, Department of Software and Service Innovation at SINTEF. Analysis of data was also supported by Knut Inge Fostervold, Associate Professor at the University of Oslo.

Research design

The research design comprised of an explanatory part and an exploratory part. The explanatory part followed a correlational design (Svartdal, 2009), where relationships between trust and related factors from the literature were studied. The exploratory part was set up as a qualitative study, to investigate whether other factors were relevant beyond those identified from the general trust literature.

The data collection was implemented through an online questionnaire study containing two parts, respectively reflecting the explanatory and exploratory aims of the study; in the following, these are referred to as the *explanatory part* and the *exploratory part.* In the explanatory part, the identified factors were investigated through the respondents' answers to different measurement instruments. The purpose of this was to study the degree to which these factors explain variation in trust, but not to make claims on causal relations. The qualitative analysis of the exploratory part was conducted on data gathered from the respondents' answers to an open-ended question.

Study context

Four Norwegian companies from the finance and energy sector, providing customer service through chatbots, were onboarded as collaborators for recruiting study respondents. Collaborating with four companies was useful to minimize the risk of getting inadequate data. It was also unproblematic to analyse data from these on an aggregated level, as the companies mainly had implemented their chatbots in the same way and for the same purpose.

The onboarding process started by contacting 12 different Norwegian companies, all having implemented chatbots. Of the contacted companies, four declined the invitation. From the remaining eight invited companies, the companies were onboarded if they complied with the following three criteria: (1) should have tested their chatbot for some time, (2) should be a chatbot used for customer support purposes, and (3) the chatbot should be constructed in a way that the customer could experience some potential risk of using it. Four of the companies were found to comply with these criteria, and hence, onboarded. Two of the initially invited companies that responded positive were not included in the study, since their chatbot weren't used for customer support purposes. Finally, two invited companies were not included in spite that they complied with the criteria, because they were not able to start up data collection sufficiently early.

Respondent recruitment

It was in this study seen as desirable that respondents had some experience from chatbot interactions. The respondents were thereby invited to join as part of the dialogue with

the customer service chatbot supported by one of the four onboarded companies. The invitation was presented immediately after the respondents had finished the dialogue with the chatbot. This enabled the respondents to report on their experience with the chatbot, while this was still fresh in their memory. The respondents were sampled by an invitation, with an incentive of winning an iPad as part of the chat.

The four different companies presented the invitation to the questionnaire in the chat dialogue with some variation. Three had the questionnaire triggered by selected words. This required users of the customer service chatbot to write predefined words as "ok", "thanks", "bye", "see you" for triggering the pop up of the questionnaire. The fourth had a person that manually established a link to the questionnaire in the chat dialogue after users had finished their requests.

Material and measures

There is to date no established measurement instruments accommodated for the study of trust in chatbots and associated factors. The measurement instruments for this study were therefore established by adopting measurement instruments from the literature. The questionnaire included one dependent variable (trust) and seven factors from the literature, assumed to explain variation in trust (*expertise*, *predictability*, *anthropomorphism*, *ease of use*, *risk*, *reputation*, and *propensity to trust technology*)[1]. The questionnaire also included a measure on "intention to use", which was included to check for its relation to trust. Possible gender and age differences were also included in the questionnaire, as well as the two background variables, "level of education" and "amount of earlier use". In the following, the variables and measurement instruments are briefly described. The entire questionnaire and a complete overview of the measurement instruments and their basis in the literature is provided respectively in Appendix A and B.

Trust. The dependent variable trust was measured by a combination of items from two scales. Three items were adopted from Corritore, Marble, Wiedenbeck, Kracher, and Chandran (2005) who looked at trust in websites, detail the measurement instrument applied by Corritore et al. (2003). Two items were adopted from Jian et al. (2000) who looked at trust in automated systems. Cronbach's alpha was .76.

Expertise. This factor was measured by a combination of items from two scales, as well as a self-composed item. Two of the items were adopted from a scale to measure

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[1] For purposes of readability, the factors from the explanatory analysis and the categories identified in the exploratory analysis are written in italic in the thesis.

expertise in the context of websites (Corritore et al., 2005) and two from a scale to measure ability in an organizational context (Mayer et al., 1995). Cronbach's alpha was .96.

Predictability. This factor was measured by five items adopted from a scale to measure predictability of a website (Corritore et al., 2005). Cronbach's alpha was .87.

Anthropomorphism. This factor was measured by five items adopted from a scale on anthropomorphism (Ho & MacDorman, 2010). Cronbach's alpha was .95.

Ease of use. This factor was measured by a combination of items from two scales. Three of the items were adopted from a scale to measure ease of use of a website (Corritore et al., 2005) and two were adopted from a scale to measure perceived ease of use by using chart-masters (Davis, 1989). Cronbach's alpha was .86.

Risk. This factor was measured by five items adopted from a scale to measure risk of using a website (Corritore et al., 2005). Cronbach's alpha was .92.

Reputation. This factor was measured by a combination of items from two scales. Three of the item were adopted from a scale to measure reputation of a website (Corritore et al., 2005) and two items were adopted from a scale to measure reputation of a store (Jarvenpaa, Tractinsky, & Saarinen, 1999). Cronbach's alpha was .87.

Propensity to trust technology. This factor was measured by a combination of items from two scales. Two of the items were adopted from a scale to measure propensity to trust (Cheung & Lee, 2001) and three items were adopted from a scale to measure trusting stance – general technology (Mcknight et al., 2011). Cronbach's alpha was .91.

Intention to use. Intention to use chatbots was measured by a combination of three scales. Two items were adopted from a scale to measure behavioural intention (Zarmpou, Saprikis, Markos, & Vlachopoulou, 2012), two items were adopted from a scale to measure intention to use (Venkatesh & Davis, 2000), and one were adopted from a scale to measure intention to use a system (Venkatesh, Morris, Davis, & Davis, 2003). Cronbach's alpha was .96.

All of the scales were originally in English, which required a translation into Norwegian. To make sure the meaning of the original items was captured in the translation, these were checked by one of the thesis supervisors. A 7-point scale was chosen due to wish of having a neutral midpoint, as well as it was desired to have more variation than expected from a 5-point scale. All the variables appeared with high inter-item reliability of Cronbach's alpha above .70. Values that are higher than .70 is regarded as reflecting respondents answers with adequate internal consistency (Svartdal, 2009).

Open-ended question. The questionnaire also included an open-ended question, which was the basis for the exploratory part of study. Here, the respondents were encouraged to report in free text on their thought on trust in the chatbot they had used for customer service. The question was "*What makes you experience trust in this chatbot*"[2].

Measurement instruments for three elements not included in the analysis. The questionnaire also included measurements for three elements which is not analysed in this study. First, likeability was measured, but excluded from further analysis due to its loading on the same factor as anthropomorphism. The two variables appeared as measuring the same latent variable and indicated a lack of strong distinction for the respondent's perception. Second, usefulness was also tested in the questionnaire. Initially it was discussed to have a more complex model in which usefulness could be relevant. However, as it during the analysis was found that a simpler model would be more adequate, usefulness was not included in subsequent analysis. Third, the questionnaire did also include a second open-ended question: "What could be changed for you to gain more trust in this chatbot?"[3]. The intended recipients of the findings generated from this question were the collaborating companies, and the data was intended as a basis for reflection on possible changes in chatbot design. Due to space limitations, and to reduce complexity in presentation, the analysis and discussion of the data from this question were not included in this thesis.

Development of the questionnaire. The questionnaire was piloted on eight people with a variation in background and age. This gave useful feedback for adjusting the questionnaire, clarifying and correcting what was difficult to understand for respondents.

Most of the pilot feedback concerned structure and layout. An example of a pilot feedback was that the open-ended question contained an insufficient amount of available lines where users could write. The expansion of lines made more space for respondents. One change that was important to clarify was that some of the items in the pilot included questions, and not statements. As an example, *"To what extent did you experience this chatbot as natural?"[4],* which was changed to "*The chatbot appears as natural*"[5]. This made it easier and more meaningful for respondents to evaluate from strongly disagree to strongly agree.

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[2] *"Hva gjør at du opplever tillit til denne chatboten?"*
[3] *"Hva kunne vært forandret for at du kunne fått mer tillit til denne chatboten?"*
[4] *"I hvilken grad opplevde du chatboten som naturlig?"*
[5] *"Chatboten fremstår som naturlig"*

Analysis

Preparing for analysis. Before the analysis could start, the data was quality checked. Specifically, respondents not satisfying a set of predefined criteria were filtered out. There were a total of five criteria: (1) minimum 18 years old, (2) not give the same score for more than 90% of the questionnaire items, (3) completed more than 50% of the questionnaire, (4) answers reflecting that the respondents have recognized the three reversed questions as such and (5) provide a meaningful answer in the open-ended question.

The raw data included the responses from 175 chatbot users. Of these, 21 were excluded from subsequent analysis in line with the criteria above. Four were under the age of 18. One had no variation in the answers. Seven had completed less than 50% of the questionnaire. Five had answers indicating that they had misunderstood the three reversed questions; giving the same score regardless of items belonging to the same factor being reversed or not. Three had nonsense (joke) answers in the open-ended question. Finally, one had no answers. The answers of the remaining 154 respondents were included in the subsequent analysis.

Validation. An exploratory factor analysis was carried out to check whether the items intended to measure one factor loaded on the same latent factor, and also if it was necessary to exclude some items before continuing on with analysis. Each measurement instruments had consciously been constructed with five items. This was to make option for deleting items if some of them made trouble in the measurement instruments. Overall, the exploratory factor analysis revealed a relatively good factor structure for most of the factors, but with some exceptions. As illustrated in table 2, there appeared some cross-loadings and low factor loadings. Items intended to measure one factor also loaded on other factors. Such cross-loadings may indicate that some factors to some extent have overlapping characteristics. In addition, some of the items belonging to the variables were having weak factor loading, just below .30. This cross-loadings and low factor-loadings was not unexpected due the construction of the measurement instruments.

The dependent variable trust did appear with cross-loadings, as well as some weak factor loadings. As trust is a broad construct, this was not unexpected. Items intended to measure trust were thereby constructed to make sure the whole spectre of the construct was captured in the items. *Reputation* had also a reversed item showing cross-loadings. This item was thereby deleted before calculating the mean score of the factor. *Ease of use* did surprisingly also have items not behaving as expected. Two items did not load on the same factor as the other items from *ease of use* and were therefore excluded from the analysis. The adjusted changes made a better factor structure, with not too many cross-loadings and low

factor loadings. Moreover, all the factors had high Cronbach's alpha ($\alpha => .70$). It was nevertheless a limitation in the measurement instruments, this will be discussed in the section Limitations and future research.

Table 2.

Explorative factor analysis – Pattern Matrix

Factor	1	2	3	4	5	6	7	8	9
Trust1	0,43								-0,35
Trust2		-0,29							-0,34
Trust3_RE								-0,29	-0,42
Trust4_RE									-0,73
Trust5	0,33								-0,27
Intention to use1					-0,74				
Intention to use2					-0,85				
Intention to use3					-0,86				
Intention to use4					-0,73				
Intention to use5					-0,86				
Expertise1	0,89								
Expertise2	0,72						0,26		
Expertise3	0,74						0,29		
Expertise4	0,64								
Expertise5	0,75								
Predictability1				0,79					
Predictability2				0,79					
Predictability3	0,33			0,67				-0,33	
Predictability4				0,61					
Predictability5	0,59			0,37					
Anthropomorphism1							0,69		
Anthropomorphism2							0,83		
Anthropomorphism3							0,76		
Anthropomorphism4							0,75		
Anthropomorphism5							0,81		
Ease of use1				0,30				0,62	
Ease of use3			-0,26					0,64	
Ease of use4	0,37							0,54	
Risk1			0,71						
Risk2			0,76						
Risk3			0,86						
Risk4			0,89						
Risk5			0,86						
Reputation1						-0,91			
Reputation2						-0,85			
Reputation3						-0,69			
Reputation4						-0,56	0,28		0,33
Propensity to trust technology1		-0,82							
Propensity to trust technology2		-0,84							
Propensity to trust technology3		-0,75							
Propensity to trust technology4		-0,86							
Propensity to trust technology5		-0,88							

Note. Rotation method: Oblimin with Kaiser Normalization. Factor loading under .25 is deleted from the matrix. _RE means the items are reversed

Quantitative analysis. In the subsequent analysis, the data from the verified measurement instruments from the explanatory part were used. Analysis were conducted by the use of SPSS (Statistical Package for the Social Sciences), version 25. First, background information of the sample was explored. Then, the items connected to each variable were calculated for mean. Thereafter, descriptive statistics were calculated for all of the variables, to check mean, standard deviation and skewness. A correlation analysis was performed to explore the relationship between the variables. Since trust is regarded as the dependent

variable, a multiple regression analysis was conducted to investigate the degree to which the seven factors predict trust.

Furthermore, the relationship between trust and intention to use were investigated. For this purpose, a simple linear regression model was used. Finally, a t-test was used to check for gender differences, and a best line of fit was applied to check for linear, quadratic, or cubical relations between age and trust.

Qualitative analysis. The qualitative data concerned responses about the users` experience of trust in chatbots. These data were made subject to a thematic analysis. Following Ezzy (2002), the thematic analysis was carried out in three steps. Ezzy is using the steps from grounded theory to support a thematic analysis. He claimed that the three steps with motivation from grounded theory could be used for conducting a thematic analysis. A thematic analysis allows themes to emerge from the data, rather than applying predefined themes. In the course of the analysis process, each theme is presented as a category used for coding the text. In the following text, to simplify reading, themes presented as categories are referred to by the term *categories*. Table 3 provides an example of a theme emerging and categorized by the use of the three steps described by Ezzy.

Table 3.

Example of a three step coding based on Ezzy's steps for thematic analysis

The three steps	The aim with the coding	Example
Step 1 - Open Coding	Explore the data, identify initial categories and associated initial codes.	In step one, there was identified a number of categories covering the width of respondents' feedback. This initial identification gave a total of 42 categories, with a great width and some overlap in the categories. For example, relevant, understanding, precise, direct, logical and professional answers were among the categories identified in the initial coding.
Step 2 - Axial coding	Specifying the conditions that give rise to a category, review data to confirm associations and new categories.	In step two, the initially identified categories in step one were reviewed. It was found that many of the categories concerned similar content. For example, the initial categories relevant, understanding, precise, direct, logical, and professional answers were found to reflect four higher-level categories: correct answer, interpretation, concrete answer and eloquent answer.
Step 3: Selective coding	Identify the core categories, examine the relationship between the core categories and other categories, and compare with pre-existing theory.	In step three, the categories identified in step two were now explored relative to the previous literature, specifically the factors from the explanatory part of the study. For example, it was found that the four higher-level categories in the example of step two reflected much of the same content from the explanatory factor expertise. At the same time, the expertise category from the exploratory part appeared with more nuance and depth than the expertise factor from the explanatory part. Moreover, the initially identified categories correct answer, interpretation, concrete answer and eloquent answer were now seen as sub-categories of the category expertise.

To validate the coding categories which represented the themes, the author of this thesis and another analyst coded the data independently to check for inter-coder agreement. Inter-coding agreement was checked by calculating Cohens kappa, a measure for calculating the agreement between two analysts (Svartdal, 2009). Both analysts coded each respondent's answer in accordance with the coding categories. Thereafter, the coding conducted by each

analyst was compared. Detailed descriptions of each category are provided in Appendix C.

The calculation of Cohens kappa revealed that four of the identified categories in the data had an inter-rater agreement around .60. Since the original distinction made by Cohen, it has been disagreements about the right and acceptable distinction for agreement. According to McHugh (2012), agreement around .60 can be too low. She understood Cohens kappa of .40-.59 as weak, .60-.79 as moderate, .80-.90 as strong and >.90 as almost perfect. Cohen (1960) had .40-.60 as moderate, .61-.80 as substantial and .81-1 as almost perfect. The goal was to get it closer to .80 than .60. By redefining the explanation given to the categories and have the two analysts to code the four categories again, all got a high Cohens kappa. A few was around >.70, but most of them around >.80, and thereby defined as strong agreement. See results table 8, page 29 for detail of the Cohens kappa.

Some of the respondents' answers touched upon more than one category. This is for example seen in this response "*It responds quickly, concise and persistent. In addition, I am aware that all correspondence is without personal information and is therefore completely comfortable with everything being saved. (P3)*"[6] This response fits the three identified categories *fast response*, *low risk* and *expertise - concrete answer*. The examples of the categories will in the result section only be explained by examples containing one category. All examples are presented in English, and the original answers in Norwegian are provided in footnotes.

Ethical consideration

The study was reported and approved by Norwegian Social Science Data Services (56727). The completion of the study is consciously done to minimize the effort required of the respondents. The collected data was not containing health sensitive information, and it was no assumed any reasonably negative effect by participating in the study. All respondents were given an informed consent that had to be approved before starting the questionnaire. Here, the information about the study was presented, clearly telling the respondents what was demanded. The respondents could at any point leave the questionnaire, without expressing their reason to do so. No personal data was collected, apart from the gathering of the respondents' email address. This was collected in a separate form, with no connection to the questionnaire. The collection of email address was done to enable a participant lottery as incentive to participate, with an iPad as the prize, and also for the purpose of gathering

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[6] *"Den svarer raskt, konsist og presist. I tillegg er jeg klar over at all korrespondanse er uten personopplysninger og er derfor helt komfortabel med at alt blir lagret"*

respondents that were willing to participate in an interview study followed up by SINTEF research program on chatbots.

Results

The following chapter describes the results from the analysis, organized in three parts. First, the sample will be presented. Second the results from the explanatory part of the study, including presentation of the quantitative data are outlined. Last, the results from the exploratory part, containing the qualitative data from the study will be presented.

About the respondents

Respondent demographics. The sample consisted of a quite even gender distribution, out of the 154 included respondents, 48% were women and 52% were men. One person did not report gender. The youngest in the sample was 18, and the oldest 83 years. Mean age was 41 ($SD = 13.89$). Twenty did not report their age. The majority of respondents reported to have higher education. 43% reported four or more years of higher education; 36% reported one to three years of higher education.

The respondents' previous experiences. As illustrated in figure 1, the respondents in the study were fairly new to the use of chatbots within customer service. In total, 56.9% reported to have used chatbots one to three times before. At the end of the scale, 19% had used a chatbot more than 10 times before.
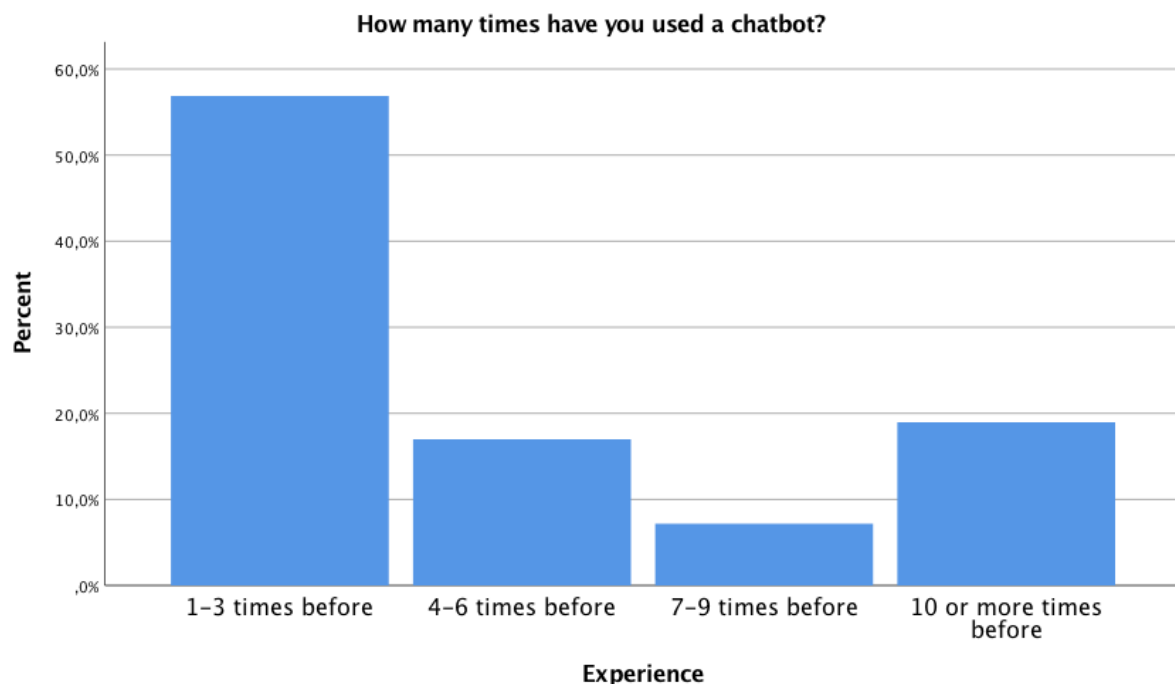

Figure 1. Histogram of the respondents' previous use of chatbots.

Results from the explanatory part of the study

This section presents the results from the explanatory part of the questionnaire, where respondents answered different measurement instruments of factors standing out as promising from the trust literature.

An overview of the studied variables. Table 4 presents a descriptive overview of the dependent variable trust, the seven factors assumed to affect trust in customer service chatbots and intention to use. The highest mean was seen in *ease of use* with 6,29 of 7 ($SD = 1,10$). This finding indicated that respondents experienced the chatbot as easy to use. *Ease of use* also had a notable skew. This was the only factor with a skew above two, which indicates that its distribution is not normal (West, Finch, & Curran, 1995). The second highest mean was found in trust ($M = 5.57$, $SD = 1.19$) and intention to use ($M = 5.62$, $SD = 1,47$).

Table 4.

Sample size (N), mean (M), standard deviation (SD) and skewness (skew) for the nine variables

Variable	N	M	SD	Skew
Trust	154	5,57	1,19	-0,95
Intention to use	150	5,62	1,47	-1,25
Expertise	154	5,32	1,72	-1,06
Predictability	153	5,54	1,27	-0,67
Anthropomorphism	154	4,78	1,66	-0,58
Ease of use	154	6,29	1,10	-2,21
Risk	154	2,12	1,34	1,42
Reputation	149	4,25	1,40	-0,05
Propensity to trust technology	154	5,12	1,28	-0,56

Correlation between the variables. A correlation analysis was conducted to explore the relationship between the measured variables. As illustrated in table 5, there were consistently high and significant inter-correlation between the variables. The highest correlation was found between *expertise* and trust, which means that high scores on *expertise* also gives high scores on trust, $r (154) = .66$, $p < .001$. The correlation analysis also revealed a high positive relationship between *anthropomorphism* and trust, $r (154) = .61$, $p < .001$, and *ease of use* and trust, $r (154) = .60$, $p < .001$.

Table 5.

Correlation between the variables

Variable	1	2	3	4	5	6	7	8	9
1. Trust									
2. Intention to use	.58***								
3. Expertise	.66***	.57***							
4. Predictability	.58***	.43***	.61***						
5. Anthropomorphism	.61***	.58***	.73***	.51***					
6. Ease of use	.60***	.51***	.56***	.57***	.52***				
7. Risk	.-52***	.-47***	.-34***	.-42***	.-34***	.-55***			
8. Reputation	.45***	.58***	.50***	.35***	.61***	.41***	.-37***		
9. Propensity to trust technology	.33***	.52***	.14	.20**	.22**	.32***	.-30***	.37***	

Note. ** p < .05, *** p < .001.

Investigating the effect of gender and age. An independent samples t-test was conducted to explore gender differences in trust. The results indicated that there were not significant differences on trust between woman and men, $t (151) = -.28$, $p = .78$. A linear regression analysis was used for testing the effect of age. This confirmed age to not be important for trust; a line of best fit was established to investigate linear ($R^2 = .006$), quadratic ($R^2 = .0005$) and cubical ($R^2 = .011$) relations.

Multiple regression analysis – explaining variation in trust. Multiple regression analysis was used to test if the seven chatbot-, environment- and user-related factors significantly predicted respondents' ratings of trust. The results of the regression indicated the seven predictors explained 58% of the variance in trust (*adjusted $R^2 = .58$, F (7,141) = 30.28*, p < .001). Of the seven predictors, the analysis revealed three to be particularly important to explain the variation in trust: *expertise* ($\beta = .33$, $p < .001$), *risk* ($\beta = -.21$, $p < .05$) and *propensity to trust technology* ($\beta = .14$, $p < .05$). *Expertise* had the highest standardized regression coefficient, see table 6.

Table 6.

Standardized regression coefficient (β) and t-values (t) for seven variables predicting trust

	Trust	
Independent variable	β	t
Expertise	.33	3.75 ***
Predictability	.13	1.77
Anthropomorphism	.17	1.96
Ease of use	.11	1.43
Risk	-.21	-3.22 **
Reputation	.03	-.44
Propensity to trust technology	.14	2.28 **

Note. ** p < .05, *** p < .001.

Simple linear regression between trust and intention to use. A simple liner regression analysis was used to test if trust in chatbots predicts intention to use. The result of the regression indicated that trust explained 34% of the variance in intention to use chatbots (*adjusted R^2 = .34, F (1,148) = 75.91, p < .001*). See table 7.

Table 7.

Standardized regression and t-value for trust predicting intention to use

Independent variable	Intention to use	
Trust	β	t
	.58	8.71***

*Note. *** p < .001.*

Results from the exploratory part of the study

This section presents the results from the exploratory part in the questionnaire where respondents freely could write their thoughts in response to an open-ended question: "*What makes you experience trust in this chatbot?*". Table 8 presents the final set of categories identified in the thematic analysis. The table also shows which of the three high-level dimensions each category belongs to, as well as a short description, frequency, and Cohens kappa for each category.

Table 8.

Results from the open-ended question: What makes you experience trust in this chatbot?

Dimension	Category	Explanation	Frequency	Cohens kappa
Chatbot-related categories	Expertise - Correct answer	Customers reporting that the chatbot providing accurate and relevant information is important for trust.	41 (28,1%)	0,83
	Expertise - Interpretation	Customers reporting that the chatbot correctly interprets and understands the question, as well expressing clear when they do not understand, is important for trust.	14 (9,6%)	0,96
	Experise - Concrete answer	Cusomers reporting that the chatbot providing concrete, clear and easily understandable answers is important for trust.	24 (16,4%)	0,77
	Expertise - Eloquent answer	Customers reporting that the chatbot providing logical, reasonable and professional answers is important for trust.	14 (9,6%)	0,84
	Fast response	Customers reporting trust to be dependent on a quick response from the chatbot.	27 (18,5%)	0,89
	Anthropomorphism	Customers reporting trust to be dependent on the chatbot's humanlike characteristics, such as being nice and polite.	9 (6,2%)	1
	Absence of marketing	Customers reporting to feel trust because of the absence of marketing, and that the chatbot seems to put the customers first.	6 (4,1%)	0,83
Environment-related categories	Low risk	Customers reporting to feel trust on the basis of not needing to specify personal or sensitive information in the chat.	9 (6,2%)	1
	Brand	Customers reporting to feel trust in the chatbot in consequence of their trust in the company.	25 (17,1%)	0,83
	Access to human operator	Customers reporting that having an opportunity to be transfered to a human operator is important for trust.	7 (4,8%)	0,92
User-related categories	Not trust-relevant/ No trust	Customers reporting not to consider trust as relevant, or reporting not to have trust in chatbots due to their limited capabilities.	11 (7,6%)	0,78
	Miscellaneous	Various answers with no direct fit to the other categories, and not forming distinct categories.	15 (10,3%)	0,76

Note. Frequency is calculated on the basis of the 146 respondens answering this question.

Chatbot-related categories. Results from the thematic analysis revealed chatbot-related categories as important for users trust in chatbots for customer service. This is shown in the four categories: *expertise*, *fast response*, *anthropomorphism* and *absence of marketing*. *Expertise* is further divided into four sub-categories, specifically *correct answer*, *interpretation*, *concrete answer* and *eloquent answer*; all of these reflecting important aspects of the *expertise* category.

Expertise – Correct answer (28,1%). The user reports strongly suggested that the correctness and relevance of the chatbots' answers were important for trust. This sub-category of *expertise* was the one with the absolutely highest frequency; 28,1% of the respondents' answers were interpreted as reflecting this category. It seems like respondents were highly sensitive to answers being correct for developing trust. A correct answer was important for

saving users' time, as well as not wasting their time if they not got the requested information. The sub-category *correct answer* is reflected in the following statements:

> *"I experience trust when the chatbot gives a correct answer to my question" (P126)*[7]
> *"Because I get answers to my questions" (P37)*[8]

Expertise – Interpretation (9,6%). The user reports indicated that the chatbots' interpretation of the question was important in the development of trust. This sub-category of *expertise* illustrated the users wish of perceiving the chatbot to understand the asked question and thereby manage to help. It did also mean that the chatbot was honest about the questions it not was capable of answering. The chatbot interpretation seemed important for not wasting the time of the user, as well as avoiding the need for contacting human customers support. The sub-category *interpretation* is exemplified in the statements below:

> *" ....it perceives the problem and has several solutions" (P29)*[9]
> *"It is honest about saying what it can and cannot do" (P74)*[10]

Expertise – Concrete answer (16,4%). The user reports strongly indicated that whether the chatbot formulate the answers concrete was important for users trust. This was also a sub-category of *expertise* and concerns users' appreciation of concrete, short, precise and clear answers from the chatbot. A concrete answer seemed to be important due to users wish for answers that were not misleading or could easily be misinterpreted. Furthermore, concrete answers have also been compared with the appreciated concrete answer from a human operator. The sub-category *concrete answer* is exemplified below:

> *"It answers short and precise to my question" (P48)*[11]
> *"Clearly answers that does not allow for misinterpretations…."* (P59)[12]

Expertise - Eloquent answer (9,6%). The user reports suggested that users trust was dependent on whether the chatbot formulated the answers in a professional way. Comments from this sub-category of *expertise* revealed that users appreciated answers that appeared as professional, credible and reasonable. Moreover, that the answer appeared logical and not stupid. The sub-category *eloquent answer* is exemplified below:

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[7] "Opplever tillit når det chatboten svarer er korrekt info på det jeg spør om"
[8] "Fordi jeg får svar på mine spørsmål"
[9] "....oppfatter problemet og har flere løsninger"
[10] "Den er erlig til å siga ifra vad den kan og vad den ikke kan"
[11] "Den svarade kort och precis på min fråga"
[12] "Tydelig svar som ikke gir rom for feiltolkning...."

> *"I got good answers to my questions. The way the robot formulates seems professional and knowledgeable" (P121)[13]*
>
> *"....It is logic behind the answers I get, even if I don't ask bank-related questions" (P91)[14]*

Fast response (18,5%). The user reports strongly indicated that users trust was dependent on a fast response from the chatbot. The fast response appears to be appreciated, as it makes the chatbot an efficient way to get help. Some respondents have compared the chatbot used in customer service with human customer support, and noted that the chatbot can be a quicker way to get the requested support. The fast response has by some also been mentioned to clearly indicate that it was a robot the users were talking to. *Fast response* is exemplified in the following statements:

> *"It did right away understand what I wanted and could quick help me" (P133)[15]*
> *"Quick answer. Do not have to wait in que" (P1)[16]*

Anthropomorphism (6.2%). The user reports indicated that some users wished the chatbots with humanlike characteristic, and that this can be important for trust. For example, in the form of getting polite answers, or using colloquial expressions. A humanlike answer seemed important because this is what customers are used to when chatting with customer service, and therefore experienced as a more familiar form of conversation. Some even reported they hadn't noticed it wasn't a human if the chatbot hadn't stated this by itself. Examples of the category *anthropomorphism* are provided below:

> *"....and was polite" (P72)[17]*
>
> *"....and the chatbot did also say thanks when I said thanks for the answer. This makes it more human and trust engaging" (P51)[18]*

Absence of marketing (4,1%). The user reports indicated that some of the respondents highlighted the perception of chatbots as being objective and not selling, and in this way considered as an important factor for users' trust. Users seemed to value answers directly related to the question, and not leading the users on to other thoughts. *Absence of marketing* is reflected in the following statements:

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[13] "Jeg fikk gode svar på det jeg lurte på. Måten roboten formulerer seg virker profesjonell og kunskapsrik"
[14] " .... Der er logik bag de svar jeg får på mine spørsmål, også når jeg stiller "ikke-bank orienteret" spørsmål"
[15] "Den forstod hva jeg ville frem til med en gang og kunne hjelpe meg raskt"
[16] "Raskt svar. Slipper å vente i kø"
[17] "....og var høflig"
[18] ".... chatboten sa også takk, når jeg skrev takk for svaret. Noe som gjør den mer "menneskeaktig" og tillitsinnbydende"

"....I trust that the chatbot answers me objective. No buying pressure☺"(P10)[19]

"Provides information that is experienced fact-based, not normative or selling" (P104)[20]

Environment-related categories. Three categories emerged in this dimension after conducting a thematic analysis: *brand*, *low risk* and *access to human operator*.

Brand (17,1%). The user reports strongly suggested that their trust in chatbots was dependent on their trust in the company, hence, the perceived *brand*. That meant that the customers' previously established positive relationship with the company was crucial. Respondents will trust that the company has done a good job in developing the chatbot. It was also mentioned that they thought their companies appeared as serious and only provided secure solutions. Furthermore, some mentioned that they trust the developers of chatbot to make sure "human error" was not apparent. Examples of answers from this category are:

"I'm trusting the company I contact, and then I also expect the chatbot to reflect that credibility" (P154)[21]

"I'm trusting the ones who has programmed the chatbot to gives it good input, and in that way give good answers" (P105) [22]

Low risk (6,2%). The user reports suggested that for some users, trust was dependent on the perceived low risk in the situation. The users noted that when they didn't need to provide any personal or sensitive information in the conversation, the level of risk was perceived as low. Some users reported that for more personal questions, risk would be perceived as higher, which negatively affected their willingness to trust the chatbot. It seemed like the users found it important to know how the security was covered. In addition, some users expressed how they felt happy about being reminded to not specify sensitive information when they were not in the private chat. This category is reflected in the following statements:

"When I contacted the chatbot, I only had a general question, which did not concern me personally. The trust was by this high since the case wasn't directly personal, the case could have been different if my need was of a more personal character" (P60)[23]

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[19] "...Jeg stoler på at den svarer meg objektivt på hva som er mulig. Ingen kjøpepress :)"
[20] "Gir informasjon som oppleves faktabasert, ikke normgivende eller selgende"
[21] "Jeg stoler på selskapet jeg kontakter og da regner jeg også med at chatboten gjenspeiler den troverdigheten"
[22] "Jeg har tillit til at de som har programmert den har fått god input slik at chatboten gir gode svar"

"Because I do not specify any personal information" (P57) [24]

Access to human operator (4,8%). The user reports indicated that trust for some were dependent on the access to a human operator. This means that some valued the opportunity to be transferred to a human operator if the chatbot couldn't help, and that this was important for users trust in chatbots for customer service. Below are statements exemplifying this category:

"....And that the answers refer to relevant URLs, and customer service if necessarily" (P90)[25]

"....and transferred to a human when required" (P65) [26]

User-related categories. User-related categories represent individual differences in factors impacting users trust in chatbots for customer service. The only category appearing in this dimension was *not trust relevant/no trust*.

Not trust relevant/ no trust (7.6%). The user reports indicated that some users expressed scepticism about relating the concept of trust to the use of chatbot technology. These respondents didn't consider trust as relevant or they didn't feel trust the way chatbots are constructed right now. That meant that some of the respondents regarded chatbots as having limited function and rather would have human contact. Examples of answers coded to this category are:

"Trust is a concept I will not use on not-living things. But I think that "easy" tasks, like in my case was fining an IBAN-number can be well suited for chatbots" (P8)[27]

"I do not have trust in this chatbot. I want to talk to humans. I do not like robots, and want to have human contact" (P21)[28]

Discussion

Summary of the results

The aim and research question of this study was to explore which factors that affect users' trust in chatbots for customer service. The results of the study have provided insight to the perceived factors that predict users' trust in chatbots for customer service.

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[23] "Denne gangen jeg hevende meg til deg hadde jeg kun et generelt spørsmål, og angikk ikke personlig informasjon knyttet til meg som person. Tilliten var dermed stor fordi saken ikke var direkte personlig, saken kunne stilt seg annerledes dersom mitt behov var av mer personlig karakter"

[24] "Fordi eg oppgjer ingen hemmelig informasjon"

[25] "....Og at svarene viser til relevante nettsider, og til kundeservice når det er nødvendig"

[26] "....og henviste til et menneske ved behov"

[27] "Tillit er et begrep jeg neppe vil bruke om ikke-levende ting. Men jeg tror at "enkle" oppgaver - som i mitt tilfelle å finne et IBAN-nummer - er velegnet for bruk av chatbot"

[28] "Jeg har ikke tillit til chatboten. Jeg vil snakke med mennesker. Jeg liker ikke roboter og vil ha menneskekontakt"

In the explanatory part, seven factors identified in the background literature, in particular on the basis of the framework of Corritore et al. (2003) were investigated. These were: *expertise, predictability, ease of use, reputation, risk*, as well as *anthropomorphism* and *propensity to trust technology*. All the seven factors correlated with trust. The hypothesis for the explanatory part was only partly supported, not all of the seven factors seemed to explain trust similarly. *Expertise*, *risk* and *propensity to trust technology* were the factors explaining most variance in trust. In the exploratory part, which consisted of an open-ended question, the intention was to investigate whether other factors than those analysed in the explanatory part were perceived as relevant for trust. The intention was also to see whether the factors from the explanatory part were reflected in the exploratory part, and possibly expanded or detailed. The reoccurring and reflected factors were*: expertise (correct answer, interpretation, concrete answer, eloquent answer)*, *anthropomorphism, low risk* and *not trust relevant/no trust.* New categories were *fast response*, *absence of marketing, brand* and *access to human operator*. The two different part of the questionnaire study provided new and complementary insight, which motivated a suggestion of a new three high-level dimensions' model presented at the end of the discussion.

In the below section, the results will be discussed in deeper detail. First, the results from the explanatory part, then those from the exploratory part. Thereafter, the factors appearing as important from the explanatory part will be compared to, and extended with, the findings from the exploratory part. On this basis, an initial model of factors affecting users' trust in chatbots for customer service is proposed.

Findings from the explanatory part

Murgia et al. (2016) argued that human-chatbot interaction may soon be commonplace. Within customer service, the use of chatbots is taken up as a promising supplement. Van Doorn et al. (2017) recently predicted technology to radically and rapidly change the nature of customer service experiences by 2025. The major advancement he claimed, is that technologies in the future can engage customers at a social level and facilitate relationships between service robots and humans.

Trust as important for use. Despite the major developments in chatbots, Ciechanowski et al. (2018) claimed that the user has largely been neglected. They considered the understanding of the user as key to designing better chatbots. The use of chatbots within customer service has not been as high as anticipated. Wickens et al. (2013) argued for the need to be considerate of trust issues when users are dealing with any entity, whether this entity is a customer service person or an automated agent. In the context of chatbots,

including chatbots for customer service, a broader uptake arguably depends on users' trust in this technology.

The results from this study have suggested support for connecting trust toward users' intention to use. That is, users who feel trust in chatbots, also have an intention of using chatbots for customer service. Similar findings have also been made in earlier studies, e.g. Lee and Moray (1992) who stated an operators' trust to an automated system as influencing the operators intention for use. Within the field of HCI, it is widely acknowledged that humans will use machines they trust more than machines they don't trust (Merritt & Ilgen, 2008).

Promising factors affecting users' trust in chatbots for customer service were established through the analysis of the conducted questionnaire. The hypothesis was partly supported, although not all the initially proposed factors played a similar role in explaining variances in trust. All the factors were significantly correlated with trust, but not all seemed to explain trust equally. The chatbot-related factor *expertise*, environment-related factor *risk* and user-related factor *propensity to trust technology* were in the multiple regression analysis seen as significantly predicting trust.

Chatbot-related factors. The defined chatbot-related factor *expertise* was the factor with the highest positive correlation with trust. *Expertise* did also appear as the factor with highest standardised coefficient in the multiple regression analysis. That users' perception of *expertise* is important for trust is not unexpected. Expertise, and related constructs such as ability, competence and knowledge has extensively been discussed as an important factor for perceived trustworthiness, see for example Butler (1991). Muir and Moray (1996) similarly argued trust in automated machinery mainly as a consequence of the users' perception of the machines expertise. Corritore el al. 2003 highlighted expertise as one of the perceived credibility factors impacting users' decision to trust in websites. They viewed expertise as a cue for trustworthiness, in the same way perceived *expertise* can be a cue for decision to trust in customer service chatbots.

Another chatbot-related factor from the explanatory part, with partly support for predicting users' trust, was *anthropomorphism*. Anthropomorphism concerns users' tendency to attribute humanlike qualities to non-human things. Previous studies have suggested that humans apply socially learned roles, such as politeness, when interacting with machines (Nass, Moon, & Carney, 1999). There is currently a continuous concern for making computers, robots or for example voice-based personal assistants to be perceived as more humanlike and natural (Luthra, Sethia, & Ghosh, 2016). The fact that humans apply

humanlike qualities to machines, makes it possible that humans also prefer getting responses from chatbots that appear humanlike. In this study, *anthropomorphism* approached a significant contribution in the multiple regression analysis with an p-value just above the criteria <.05. Although not significant at the criteria, it appeared with a high correlation with trust. This show some support for users' perception of *anthropomorphism* as an important factor affecting trust in chatbots for customer service.

       Environment-related factors. The chatbot-related factors were not alone in affecting users trust in chatbots. The environment-related factor *risk*, as motivated from Corritore et al. (2003) model did also appear significant in predicting trust. Users' perceived *risk* had a significant negative correlation with trust. That is, users seeing the interaction with the chatbot as less risky also reported higher levels on trust in the chatbot. The multiple regression analysis did as well identify *risk* as a significant predictor for the users trust in chatbots for customer service. Risk has been one of the two conditions with most agreement in relation to factors important for trust (Rousseau et al., 1998). According to the obtained analysis, when users consider the situation as involving higher risk, the trust declines. The same customer service situation can apparently be perceived different in regard to risk. In the future, when the chatbot supposedly should help a customer with a huge mortgage involving higher risk, users trust may appear different. Then it might be even more important to ensure that other factors affecting users' trust is present, in addition the operating of security.

       User-related factors. As a user-related factor, peoples' *propensity to trust technology* did in the multiple regression analysis appear important in predicting users' trust. In the current literature, it is suggested that just as people may differ in their general tendency to trust, they may differ in their propensity to trust technology (Atoyan, Duquet, & Robert, 2006; Muir & Moray, 1996). Merritt and Ilgen (2008) showed how humans with high level of propensity to trust were more likely to put a greater trust in an automated system. Similarly, Chopra and Wallace (2003) argued that people with high propensity to trust were more likely to trust in a particular instance. Based on the conducted analysis, users with higher *propensity to trust technology*, also have a higher trust in chatbots.

       Factors with limited effect on users' trust. Of the initially hypothesized factors to influence trust, three factors *(predictability, ease of use* and *reputation)* did not contribute significantly to explain trust in the multiple regression model, in spite of being significantly correlated with trust. The chatbot-related factor *ease of use* was overall evaluated high by respondents, showing that users evaluate the chatbot for customer service as easy to use. Moreover, *ease of use* did not appear with an accepted normal distribution. That the users

experienced the chatbots as so easy to use may be a possible reason for why it did not predict trust. *Ease of use* was neither mentioned in the freely open-ended question, which partly support the factor to not have any especially impact on trust.

The chatbot-related factor *predictability* was not perceived as important for users trust in chatbots for customer service as hypothesized. *Predictability* was substantially correlated with *expertise* ($r = .61, p < .001$). This might be the reason to why *predictability* did not contribute significantly in the multiple regression analysis. *Predictability* can in this context seem redundant. It can be speculated that the construct of predictability may possibly be seen as an aspect of the expertise construct, and, hence, not contribute independently to a users' trust perceptions.

The last limited supported relationship in the explanatory analysis is between the environment-related factor *reputation* and trust. In this study, *reputation* was expressed as the overall impression, hence, the reputation users' have established of the chatbot. As chatbots still is an emerging technology, with relatively low uptake in the intended user population, this might explain why this factor not appeared relevant. In addition, the mean of the factor was close to four, which in the questionnaire was stated as a neutral response. Although *reputation* did not appear important here, a category with substantial similarity to the reputation-construct of Corritore et al. (2003) was established in the exploratory part of the study. At a later stage, were people are more familiar with chatbots, and have a more frequent use of them, the stated factor *reputation* might be more relevant.

The effect of age and gender. There were not found any gender or age differences in this study. However, such differences have been identified in other studies. Shah et al. (2016) did in their comparison of the conversational ability in new chatbots versus the old Eliza find females and younger user to rate the conversation more favourably than men and older age groups. The reason to absence of individual differences might be that the respondents in this study are more than average assertive when it comes to use of technology, thereby shadowing possible gender and age effects. In addition, respondents had limited use and experience with chatbot technology. It can be speculated that this initial test phase of chatbots in customer service outweighs possible gender and age differences.

To sum up, this section has addressed the factors identified through the explanatory part, to affect users' trust in chatbots for customer service. The conducted analysis revealed the perceived chatbot-related factors *expertise* and a*nthropomorphism*, environment-related factor *risk* and user-related factor *propensity to trust technology* as factors predicting users trust. The next section will discuss the result from the exploratory part of the questionnaire.

Findings from the exploratory part

The aim of also including an exploratory part in the questionnaire was to identify any other factors that not were covered by the hypothesis grounded in this studies` literature review. Respondents answered the open-ended question "What makes you experience trust in this chatbot?". Some of the categories identified through the answers reflected the factors from the explanatory part and also gave a more nuanced understanding of these in the context of chatbots for customer service. Most of the occurring categories were chatbot-related factors. This is in accordance with the results obtained in the meta-analysis of Hancock et al. (2011), where factors related to the robot were suggested as having greatest influence on users' trust.

Chatbot-related factors. In the exploratory part, the category *expertise* was identified as reflecting and complementing the factor *expertise* from the explanatory part of the study. *Expertise* was identified as a much mentioned category in the thematic analysis, suggesting it can be a possible relevant factor for trust. Moreover, the thematic analysis gave a more nuanced understanding of *expertise* in the context of chatbots for customer service. It showed that perceived *expertise* was a more complex and comprehensive category than initially established in the explanatory part. Through the exploration of categories emerging from the respondents freely written comments, different aspects of *expertise* were identified. The four identified sub-categories of *expertise* were *correct answer, interpretation*, *concrete answer* and *eloquent answer. Expertise,* as motivated by Corritore et al. (2003) was then indicated as an important factor for users' trust. The importance of expertise has similarly been identified in an online context of intelligent software agents. Detweiler and Broekens (2009) found a strong correlation between users trust in a software agent and the perceived ability of the software agent. The exploratory part of the study has by this enabled us to understand which aspects of *expertise* that really matters for users' trust in chatbots for customer service.

Correct answer is the sub-category of *expertise* with the highest frequency from the thematic analysis. This sub-category explained that respondents are highly sensitive to answers being correct, for developing trust. If the chatbot cannot answer, respondents have mentioned it to be waste of time. Research on trust and HCI has argued how automation errors negatively affect trust, and that this is one of two mainly supported conclusions (Merritt & Ilgen, 2008). For chatbots, wrong answers can make people decline its offers for assistance in the future.

Interpretation, another sub-category of expertise was by some users highlighted as important for trust. This sub-category defines the chatbots understanding of the question, what

means that the chatbot is correctly responding according to the request, and are honest if they do not understand. *Interpretation* shows similarities with another sub-category of *expertise*, *correct answer*. For both the sub-categories, it is important that the users perceive the chatbot to understand the asked question, and thereby manage to help. Dietvorst, Simmons, and Massey (2015) found users to have less trust in machine advises after witnessing machines doing mistakes. This can partly relate to the chatbot providing a correct answer and having a good interpretation of the asked question.

Concrete answer* and *eloquent answer* are indicated also as two important sub-categories of *expertise*. Users seem to value a concrete answer from the chatbot, what means that the answer is perceived as precise and clear. *Eloquent answer* concerns users' wish for answers that appears as professional, logical and reasonable. In consequence, it may be an idea for designers and developers of chatbots to put effort into the content given by the chatbot. According to Shelat and Egger (2002), information content has been identified as a strong cue for trustworthiness. Similar, Corbitt et al. (2003) found perceived site quality to be a strong predictor of trust in e-commerce.

A new category emerging from the thematic analysis was users wish of getting a *fast response*. This is also a highly mentioned chatbot-related category, which can be conceivable as a relevant factor for users' trust. The highlighting of this factor might be a results of users' wish of perceiving use of chatbot as an effective way of getting help. This echoes Brandtzaeg and Følstad (2017), who found productivity to be the most expressed reason for humans to take advantage of chatbot technology. They argued that the majority of chatbot users seek quick and consistent feedback when they need assistance or help. In the customer service domain, this makes sense. Some of the statements also showed a comparison of chatbot service as faster option than human customer support. The *fast response* has also been mentioned as a too clear indication of the chatbot being perceived as a robot. It can be speculated that a short delay in the answer can be important for users who wish the chatbots to behave more humanlike.

It was in the exploratory part found a category reflecting and complementing the factor *anthropomorphism* from the explanatory part. This category illustrates user wish of perceiving the chatbot with humanlike qualities, such as nice and polite. Anthropomorphism has gained increased focus in establishing successfully human and machines interactions. De Visser et al. (2016) argued anthropomorphism as a critical variable that should be carefully incorporated into any general theory of human-agent trust. Although *anthropomorphism* was not frequently mentioned by respondents as a category, the fact that it was reflected also in

the exploratory part indicates it as a relevant factor. Moreover, research on anthropomorphism has suggested that people prefer to interact with humanlike robot, with the capability of expressing emotion, have eye contact and have a humanlike voice (Dautenhahn, Ogden, & Quick, 2002). However, in contrast to these findings, De Angeli, Johnson, and Coventry (2001) claim anthropomorphism in HCI to be a complex phenomenon which by the user possibly can elicit strong negative reactions. In robotics, too excessive similarities can give rise to negative emotions, known as the "Uncanny Valley" (Mori, MacDorman, & Kageki, 2012). A critical issue for chatbot developers will obviously be how humanlike a chatbot should be. However, this study has indicated that users' perception of *anthropomorphism* is an important factor affecting trust for customer service chatbots.

Absence of marketing has in the thematic analysis been identified by a few respondents as an important category. This chatbot-related category indicates how users feel trust when the chatbot is perceived as objective and not selling in the chat. As this category was mentioned as important for trust by some respondents, this can conceivable be an important factor. *Absence of marketing* show similarities with honesty and benevolence, factors that initially was stated as not promising from the literature review. The benevolence factor outlined by Mayer et al. (1995) concerns the extent to which a trustee is believed to have good wishes for the trustor, apart from any egocentric profit motives. High benevolence is inversely related to motivation to lie. Honesty is by Corritore et al. (2003) characterized as well-intentioned and truthful actions. *Absence of marketing* can in this way seem to reflect much of the same content as benevolence and honesty. An answer which sets the user first, provides valuable and not selling information, can in this way be speculated as an important factor for users trust in chatbots for customer service.

Environment-related factors. The environment-related category *low risk* has been seen to reflect and give a more nuanced understanding of the *risk* factor from the explanatory part of the study. *Low risk* means that users' feel trust as a result of not being forced to share personal or sensitive information in the chat. Corritore et al. (2005) found in their tested model of factor impacting trust in a website that high risk were associated with low trust. In contradiction to this, Mayer et al. (1995) explained trust as not relevant unless there were risk involved. However, in this study context, there are reasons to believe users trust is dependent on not having risk in the situation. That means they feel trust in the absence of requests to share personal information. Some even said their trust perceptions would be different if they have to share more personal information. McKnight, Choudhury, and Kacmar (2002) discussed trust as having a central role in helping consumers to overcome perception of risk.

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Consumers who feel trust are comfortable with sharing personal information, acting on Web vendor advices and making purchases. Detweiler and Broekens (2009) investigated an online context where user had to depend on intelligent software agent to accomplish a task. Their research revealed a strong negative correlation between perceived risk and trust. Although there seem to be different opinions of the relevance of perceived risk, trust in chatbots for customer service does in this study indicate to be dependent on perceived *low risk*. In the future, chatbots are likely to become more advanced and demand bigger involvement of the users. For example, a user might have to specify personal information in the chat. Then it will be important that other factors affecting users' trust are present.

     Brand is a partly new category emerging from the thematic analysis. This environment-related category was frequently mentioned by respondents and will conceivable be a relevant factor for users' trust in chatbots. *Brand* show similarities with the *reputation* factor from the explanatory part of the study. However, *reputation* from the explanatory part was only testing the reputation of the chatbot, here *brand* is the reputation of the company behind the chatbot. Respondents did in general claim their trust in chatbots for customer service to be dependent on the perception of the *brand*. *Brand* is actually quite similar Corritore et al. (2003) reputation factor, defined as the website reputation to influence decision to trust. Different studies have highlighted the perception of *brand* as important for trust. Jarvenpaa et al. (1999) tested factors contributing consumers trust in an internet store. The finding of their study showed that the established reputation in the internet store affected users trust. Similarly, Corbitt et al. (2003) derived reputation in general to influence trust in e-commerce.

     The thematic analysis also revealed another environment-related category as important for users' trust, that is, *access to human operator*. This category was by some respondents evaluated important and can thereby be a relevant factor for users' trust in chatbots for customer service. *Access to human operator* concerned users' wish of getting transferred to a human if necessary. It can be speculated that *access to human operator* is echoing the *brand* category. That means that customers' already established relationship with the company, where customers are familiar with the way help is provided, may still need to be available when chatbots are implemented.

     User-related factors. Only one category emerged as user-related, that was *not trust relevant/not trust*. This category is seen in users who don't see trust as relevant or don't experience trust in chatbots. The category seems to have similarities with *propensity to trust* from the exploratory part, and thereby reflecting this factor. Users who initially are positive

about technology, will probably easier experience trust in chatbots. The ones who are more sceptical and may find trust controversial to connect with use of technology, will not see trust as decisive for use of chatbots. Humans' general propensity to trust automated systems has been mentioned by Jian et al. (2000) to provide an anchor in the development of trust in an automated system. Moreover, they stated humans' general propensity to trust automated system as providing a baseline measure to predict trust. Future research should test whether this factor only directly affect trust in chatbots, or if it functions as a moderator between to variables, like it did in Mayer et al. (1995) framework for organizational trust.

Altogether, this section has discussed the main findings from the exploratory part of the questionnaire study. Based on the thematic analysis, some categories were reflecting the explanatory part and some new categories occurred. This gave a more nuanced understanding of the factors from the explanatory part, and thereby indicating which categories being relevant to include as important factors impacting trust. The next section will include findings from both the explanatory and exploratory part, and suggest a possible model of factors affecting trust in chatbots for customer service.

Towards a model of factors affecting trust in customer service chatbots

The factors initially hypothesized as affecting trust in the explanatory part were *expertise*, *predictability*, *anthropomorphism*, *ease of use*, *risk*, *reputation* and *propensity to trust technology*. Following the analysis of the data from the explanatory part of the questionnaire, the factors indicated to be of especially relevance were: *expertise*, *risk*, *propensity to trust* and partly *anthropomorphism*. *Ease of use*, *predictability* and *reputation* were not suggested as important factor for a proposed model. The categories identified in the exploratory analysis suggested users' trust to be affected by factors in part reflecting those of the explanatory analysis (such as *expertise*, *anthropomorphism, low risk* and *not trust relevant/no trust*), and in part other factors (such as *fast response*, *absence of marketing, brand* and *access to human operator*). *Expertise* was a key factor in explaining trust in the explanatory part, and did in the exploratory part give a more expanded understanding of the factor. Hence, different aspect of the *expertise* factor emerged as important for users' trust: *correct answer*, *interpretation*, *concrete answer* and *eloquent answer*.

Based on the findings from the explanatory and exploratory analysis, a new model of trust in chatbots for customer service will be proposed (see figure 2). The factors were structured according to a three high-level dimensions' model: chatbot-related, environment-related and user-related factors. Chatbot-related factors included *expertise*, *fast response,*

anthropomorphism, and *absence of marketing*. Environment-related factor included *low risk*, *brand* and a*ccess to human operator*. The only user-related factor of relevance was *propensity to trust technology*. As some of the proposed factors emerging from the thematic analysis had relatively low frequency, future research particular need to investigate whether these really should be considered important in affecting users' trust in chatbots for customer service.
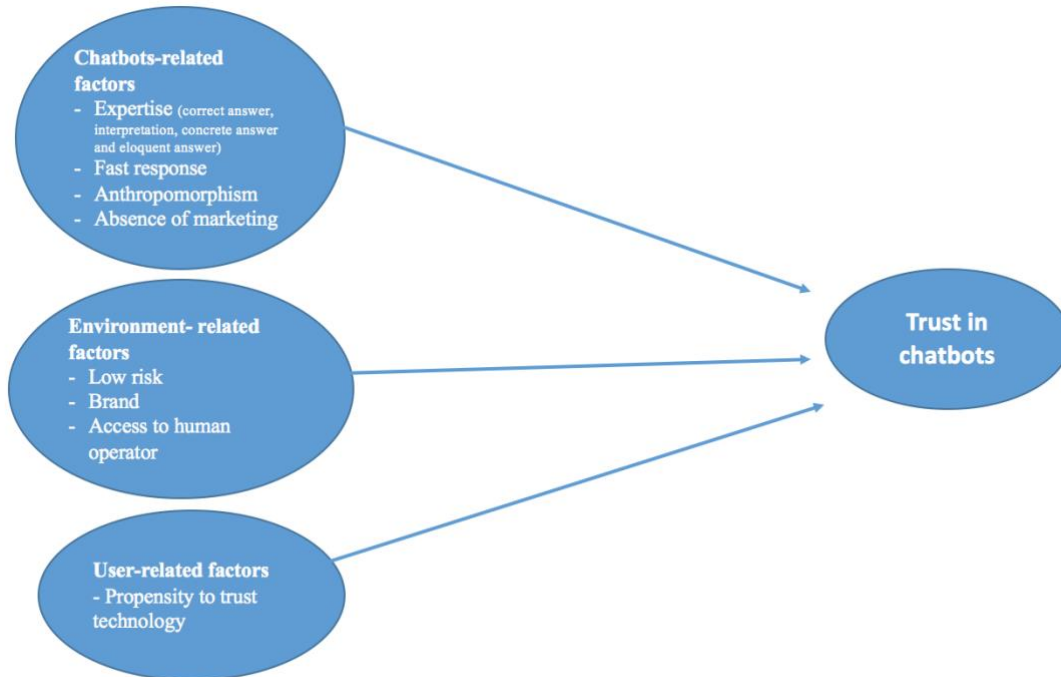
Figure 2. A proposed model of factors affecting users' trust in chatbots for customer service.

The proposed trust model includes factors that users were found to perceive as important for their trust in chatbots, following their relatively limited experience with chatbots for customer services. However, trust over time is also dependent on how a technology like chatbot actually works, not just how it is perceived following limited experience. Whether trust is maintained over time is presupposed of chatbots being trustworthy. As argued by Corritore et al. (2003) framework for trust in websites, factors impacting trust are both perceptual and external. External factors exist explicitly or implicitly in a particular trust context, and perceived factor are an individuals' perception of the external factors. *External factors* refer to conditions that are objectively observable, and not just based upon subjective measures. In the short term, perceived expertise and actual expertise in a customer service chatbot may possibly be diverging. In a long term, however, these will likely converge, as the user gain experience on whether the help and suggestions provided by the chatbot actually is good. This indicates that future studies should account for the external factor, and see how this is impacting users' trust in chatbots for customer service.

In sum, the proposed model is a product of the findings from both the explanatory and exploratory part of the questionnaire. The model serves as a suggestion to what the designers and developers should highlight when they are constructing new chatbots, and how various changes can influence users trust in chatbots for customer service. In the next section, limitations and suggestion for future research are addressed.

Limitations and future research

This study discusses and presents factors assumed to influence users trust in chatbots for customer service. The findings and conclusion are however subject to several limitations in the study. Four key limitations are elaborated.

First, a questionnaire study will never be free for problems or potential source errors. As argued by Svartdal (2009), a source error in a questionnaire may occur when users answer the questions in accordance to what they think they should mean, and not how they actually perceives it. Use of questionnaire is also limited due to users' tendency to almost be consistent in agreement (or disagreement). Also, a correlational design, as in the explanatory part of the study, only implies opportunities for explaining and predicting variation in a dependent variable, not claims regarding causal relations (Svartdal, 2009). Future studies is recommended to use field studies and experiments that enable observation of behaviour that requires trust under different conditions. Currently, SINTEF are doing an interview study in their research program on chatbots to explore trust in chatbots from another angel, which also can provide more in-depth knowledge.

Second, the conducted analysis had generality issues. All the respondents had limited experience with chatbot as a technology. The majority of users had only tested chatbots 1-3 times before. Who can the findings generalize to? As the implementation of chatbots as a supplement to human customer support is new, there might be a risk that there are the more engaged and curious users who seek use of chatbots. It will be interesting for future research to check if the obtained results are prominent for all categories of chatbot users. Especially as time pass, and this technology no longer figures as new.

Third, the measurement instruments used in this study were not perfect. As it to date are no established measurement instruments accommodated for the study of trust in chatbots and associated factors, the measurement instruments were made by combining and adjusting scales from other measures. An exploratory factor analysis revealed that some of the items intended to measure one factor, were having cross-loadings and low factor-loading. This was especially the case for the dependent variable trust. As mention by Simpson (2007), trust is a

complex and multidimensional construct, making it difficult to measure and interpret. However, trust items were consciously made to capture the broad of the construct, but did by this made some challenges. Future research is recommended to test and verify the measurement instruments, in particular for the trust variable before conducting a new study. A new study should be conducted with an increase in respondents. Moreover, it can be interesting to check how the different variables is behaving in accordance to each other by conducting a path analysis, and as well explore if the propensity to trust variable is rather having an important moderating role between variables.

Fourth, this study is only conducted in the Norwegian marked, and it will be of value for future research to investigate if the proposed factors are valid for other countries as well. In Norway, people have a quite strong trust in the community, which can be an extra motivation for respondents to also trust in chatbots.

This study proposes and present a set of factors important for users trust in chatbots for customer service. Chatbot used for customer support purposes is an area of substantial growth and development, and ever more companies are implementing this technology. The study provides a first step towards a needed understanding of trust in chatbots. Though this study concerned chatbots in the domain of customer service, this gives indications of factors that may be important when chatbots are implemented also in other domains. Hopefully, the study can motivate and serve as basis for general research about trust in chatbots, and also to chatbots applied in domains such as education, health information and recruitment assistant.

This section has described some of the potential limitations in the study. Future research is encouraged to replicate this study some years in the future, to investigate if the same factors reoccur as important when chatbots are more advanced and users have gained more experience.

Conclusions

This study has provided a contribution, in response to the current gap in research literature about user's perception of factors affecting trust in chatbots for customer service. The results partly support the research hypothesis for the study, although the analysis showed that not all of the seven factors seem to explain trust similarly. However, through the exploratory analysis new factors emerged as important for users trust. The main findings are that users' trust in customer service chatbots can be affected by factors related to the chatbot, the environment, and the user. Four different chatbots-related factors appeared to influence trust, specifically the perception of *expertise*, *fast response*, *anthropomorphism* and *absence*

of marketing. The perception of *low risk*, *brand,* and *access to human operator* appeared as important environment-related factors. The only identified user-related factor was users' *propensity to trust technology*. Although chatbots used in customer service currently serve as a supplement, many theorists claim this technology soon will be replacing the human operator. Hopefully, the study may motivate future research in the field of chatbots. A main goal for chatbot developers and designers is to build platforms that can help users, facilitate their work and their interaction with computers by the use of natural language. To reach such a goal, it is crucial to build knowledge and be sufficient aware of the factors that affect users trust in chatbots.

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TRUST IN CHATBOTS FOR CUSTOMER SERVICE

Appendix A – The questionnaire

Chatbot-undersøkelse

Delta i spørreundersøkelse om chatbots

Vær med i trekningen av en iPad 32GB

Du inviteres med dette til å delta i en undersøkelse om brukeres opplevelse av chatbots; særlig hva som gjør at vi som brukere bli fortrolige, stoler på og ønsker å henvende oss til chatbots for å få svar og råd. Undersøkelsen gjennomføres som en del av et masterprosjekt ved Universitetet i Oslo, og er tilknyttet et større forskningsprosjekt om chatbots ledet av SINTEF. Du er invitert til å delta siden du har brukt en chatbot hos en av bedriftene som er tilknyttet prosjektet. Du må være 18 år eller eldre for å delta.

Spørreundersøkelsen tar 5-10 minutter. Du vil besvare spørsmål om din opplevelse av chatbots. Undersøkelsen er anonym. Svarene du gir vil ikke kunne spores tilbake til deg.

Alle deltagere i undersøkelsen kan være med i trekningen av en iPad 32GB. For å bli med i trekningen, må du legge igjen din epostadresse i et skjema etter at du er ferdig med undersøkelsen. Det er ingen kobling mellom skjemaet med epostadressen og skjemaet der du avga svarene dine.

Dersom du vil, kan du også registrere deg for å bli invitert til et eventuelt oppfølgingsintervju pr. telefon. Dette kan du gjøre i samme skjema hvor du registrer din epostadresse for trekning av iPad. Din epostadresse vil ikke brukes til andre formål enn denne undersøkelsen, og vil slettes så snart undersøkelsen er ferdig – ikke senere enn juni 2018. Frem til sletting lagres epostadressen på et filområde der kun ansvarlig for undersøkelsen har tilgang.

Deltagelse i undersøkelsen er frivillig. Du kan avslutte undersøkelsen når du ønsker. Du kan også trekke ditt samtykket for deltagelse på et hvilket som helst tidspunkt. I så fall vil epostadressen din umiddelbart slettes fra deltagerlisten.

Dersom du har spørsmål eller kommentarer til undersøkelsen kan du henvende deg til Cecilie Bertinussen Nordheim (ansvarlig for undersøkelsen), epost cecilbno@student.sv.uio.no, eller Cato Bjørkli (intern veileder av masterprosjektet), epost cato.bjorkli@psykologi.uio.no.

Jeg er informert med innholdet i, og formålet med undersøkelsen og samtykker i å delta.

☐ Ja

Sideskift
Din erfaring med chatbots

Chatbots er automatiserte digitale tjenester som brukere kan interagere med gjennom chattedialoger fremfor å kommunisere med et menneske. Denne tjenesten er bygget opp av regler og kunstig intelligens for å forstå dine spørsmål og gi deg et passende pre-definert svar. Chatbots har blitt et supplment innen kundeservice, der du som kunde kan få svar på generelle spørsmål døgnet rundt.

Hvor ofte har du brukt en chatbot?

○ 1-3 ganger

○ 4-6 ganger

○ 7-9 ganger

○ 10 eller flere ganger

Sideskift
Tillit til chatboten du nettopp har brukt - 1/2

Tenk på chatboten du nettopp har brukt. Beskriv i hvilken grad du føler tillit til denne chatboten i et kundeserviceperspektiv. Bruk din egen forståelse av hva tillit er ved besvarelse av spørsmålene under. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)

Jeg opplever denne chatboten som troverdig	○	○	○	○	○	○	○
Jeg tror ikke denne chatboten vil handle på en måte som er ufordelaktig for meg	○	○	○	○	○	○	○
Jeg er skeptisk til denne chatboten	○	○	○	○	○	○	○
Chatboten fremstår som villedende	○	○	○	○	○	○	○
Jeg opplever å ha tillit til denne chatboten	○	○	○	○	○	○	○

Sideskift   Side 4

Tillit til chatboten du nettopp har brukt - 2/2

Tenk på chatboten du nettopp har brukt. Beskriv i hvilken grad du føler tillit til denne chatboten i et kundeserviceperspektiv. Bruk din egen forståelse av hva tillit er ved besvarelse av spørsmålene under. Dette er den viktigste delen av spørreundersøkelsen, så vi håper du kan skrive litt i de to åpne spørsmålene under.

Hva gjør at du opplever tillit til denne chatboten? Fortell med egne ord.

Hva kunne vært forandret for at du kunne fått mer tillit til denne chatboten? Fortell med egne ord.

Sideskift   Side 5

Din opplevelse av denne chatboten - 1/3

Tenk på chatboten du nettopp har brukt. Basert på din erfaring, vis hvor enig eller uenig du er i disse påstandene ved å krysse av det tallet som du synes stemmer best for deg. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Jeg opplevde å få svar på det jeg lurte på	○	○	○	○	○	○	○
Chatboten fremstår som kunnskapsrik	○	○	○	○	○	○	○
Innholdet i denne chatboten reflekterer ekspertise	○	○	○	○	○	○	○
Jeg føler meg svært sikker på chatboten sin kompetanse	○	○	○	○	○	○	○
Chatboten er godt rustet til den oppgaven den er satt til å gjøre	○	○	○	○	○	○	○
Chatboten oppførte seg forutsigbart	○	○	○	○	○	○	○
Det var ingen overraskelser i måten chatboten svarte meg på	○	○	○	○	○	○	○
Chatboten oppførte seg som forventet	○	○	○	○	○	○	○
Jeg synes det er forutsigbart at chatboten har det innholdet den har	○	○	○	○	○	○	○
Innholdet i chatboten var i henhold til min forventning	○	○	○	○	○	○	○

Sideskift   Side 6

TRUST IN CHATBOTS FOR CUSTOMER SERVICE

Din opplevelse av denne chatboten - 2/3

Tenk på chatboten du nettopp har brukt. Basert på din erfaring, vis hvor enig eller uenig du er i disse påstandene ved å krysse av det tallet som du synes stemmer best for deg. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Det var enkelt for meg å lære hvordan jeg skal bruke denne chatboten	○	○	○	○	○	○	○
Jeg føler det er enkelt å få chatboten til å gjøre det jeg vil den skal gjøre	○	○	○	○	○	○	○
Chatboten er enkel å bruke	○	○	○	○	○	○	○
Min dialog med denne chatboten var klar og forståelig	○	○	○	○	○	○	○
Denne chatboten vil være fleksibel å samhandle med	○	○	○	○	○	○	○
Jeg føler meg sårbar når jeg snakker med denne chatboten	○	○	○	○	○	○	○
Jeg tror det kan være negative konsekvenser ved å bruke denne chatboten	○	○	○	○	○	○	○
Jeg føler det er usikkert å snakke med denne chatboten	○	○	○	○	○	○	○
Jeg føler jeg må være forsiktig når jeg bruker denne chatboten	○	○	○	○	○	○	○
Jeg føler det er risiko involvert ved å snakke med denne chatboten	○	○	○	○	○	○	○

Side 7

Sideskift

Din opplevelse av denne chatboten - 3/3

Basert på din erfaring, vis hvor enig eller uenig du er i disse påstandene ved å krysse av det tallet som du synes stemmer best for deg. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Chatboten er vel ansett av andre	○	○	○	○	○	○	○
Chatboten har et godt omdømme	○	○	○	○	○	○	○
Chatboten er respektert av andre	○	○	○	○	○	○	○
Jeg har hørt andre snakke positivt om denne chatboten	○	○	○	○	○	○	○
Jeg har hørt andre være kritisk til denne chatboten	○	○	○	○	○	○	○

Side 8

Sideskift

Ditt inntrykk av chatboten

Tenk på chatboten du nettopp har brukt. Basert på din erfaring, vis hvor enig eller uenig du er i disse påstandene ved å krysse av det tallet som du synes stemmer best for deg. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Chatboten fremstår som naturlig	○	○	○	○	○	○	○
Chatboten fremstår som menneskelig	○	○	○	○	○	○	○
Chatboten fremstår som tilstedeværende	○	○	○	○	○	○	○

Chatboten fremstår som realistisk	○	○	○	○	○	○	○
Chatboten fremstår som autentisk	○	○	○	○	○	○	○
Jeg liker denne chatboten	○	○	○	○	○	○	○
Chatboten fremstår som vennlig	○	○	○	○	○	○	○
Chatboten har en hyggelig fremtoning	○	○	○	○	○	○	○
Chatboten er behagelig å snakke med	○	○	○	○	○	○	○
Chatboten er imøtekommende	○	○	○	○	○	○	○

Side 9

Sideskift

Ditt syn på teknologi

I hvilken grad er du enig eller uenig med utsagnene nedenfor. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Min typiske tilnærming er å stole på ny teknologi	○	○	○	○	○	○	○
Generelt stoler jeg på ny teknologi inntil det gir meg en grunn til å ikke gjøre det	○	○	○	○	○	○	○
Selv under tvil vil jeg velge å stole på ny teknologi	○	○	○	○	○	○	○
Det er lett for meg å stole på ny teknologi	○	○	○	○	○	○	○
Min tendens til å stole på ny teknologi er høy	○	○	○	○	○	○	○

Ditt syn på chatbots

I hvilken grad er du enig eller uenig med utsagnene nedenfor. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt uenig)	2	3	4	5	6	7 (helt enig)
Ved å bruke chatbots som denne vil jeg få raskere svar på mine spørsmål	○	○	○	○	○	○	○
Ved å bruke chatbots som denne vil jeg få svar på mine spørsmål mer effektivt	○	○	○	○	○	○	○
Å bruke chatbots som denne øker min produktivitet	○	○	○	○	○	○	○
Chatbots som denne vil gjøre det enklere for meg å få svar på mine spørsmål	○	○	○	○	○	○	○
Jeg synes chatbots som denne er nyttig innen kundeservice	○	○	○	○	○	○	○

Side 10

Sideskift

Din videre bruk av chatbots

Vis hvor enig eller uenig du er i disse påstandene ved å krysse av det tallet som du synes stemmer best for deg. Angi ditt svar på en skala fra 1 (helt uenig) til 7 (helt enig).

	1 (helt	2	3	4	5	6	7 (helt

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TRUST IN CHATBOTS FOR CUSTOMER SERVICE

	uenig)						enig)
Hvis jeg har tilgang på chatbots som denne tenker jeg å bruke det	○	○	○	○	○	○	○
Jeg tror min interesse for chatbots som denne vil øke i fremtiden	○	○	○	○	○	○	○
Jeg vil bruke chatbots som denne så mye som mulig	○	○	○	○	○	○	○
Jeg vil anbefale andre å bruke chatbots som denne	○	○	○	○	○	○	○
Jeg planlegger å bruke chatbots som denne fremover	○	○	○	○	○	○	○

Side 11

Sideskift

Om deg

Til slutt vil vi gjerne ha noen få bakgrunnsopplysninger

Kjønn

☐ Mann

☐ Kvinne

Din alder

_____

Hvor mange år med utdanning har du fullført?

○ Ungdomsskolen

○ Videregående skole

○ Høyere utdanning (1-3 år etter videregående skole)

○ Høyere utdanning (4 år eller mer etter videregående skole)

Side 12

Sideskift

Takk for at du tok deg tid til å svare på denne spørreundersøkelsen. Hvis du ønsker å være med i trekningen av en iPad blant deltagerne trykker du deg inn på linken som dukker opp etter at du har sendt inn ditt svar på spørreundersøkelsen. Inne på den nye siden skriver du ned din epostadresse.

Dersom du har noen spørsmål eller kommentarer til undersøkelsen kan du henvende deg til Cecilie Bertinussen Nordheim på epost cecilbno@student.sv.uio.no, eller Cato Bjørkli på epost cato.bjorkli@psykologi.uio.no.

Se nylige endringer i Nettskjema (vv353_0rc1)

Appendix B – The measurement instruments

Variable	Initial source	My measurments intstruments	My measurements instruments in english
Trust	I believe this website is trustworthy (Corritore et al., 2005)	Jeg opplever denne chatboten som troverdig	I experience this chatbot as trustworthy
	I believe this website will not act in a way that harms me (Corritore et al., 2005)	Jeg tror ikke denne chatboten vil handle på en måte som er ufordelaktig for meg	I do not think this chatbot will act in a way that is disadvantageous for me
	I am suspicious of the system's intent, action, or outputs (Jian et al., 2000)	Jeg er skeptisk til denne chatboten	I'm suspicious to this chatbot
	The system is deceptive (Jian et al., 2000)	Chatboten fremstår som villedende	The chatbot appears deceptive
	I trust this website (Corritore et al., 2005)	Jeg opplever å ha tillit til denne chatboten	I trust this chatbot
Intention to use	Assuming I have access to the system, I intend to use it (Venkatesh and Davis, 2000)	Hvis jeg har tilgang til chatbots som denne tenker jeg å bruke det	If I have access to chatbots like this I will use it
	I believe my interest towards m-services will increase in the future (Zarmpou et al., 2012)	Jeg tror min interesse for chatbots som denne vil øke i fremtiden	I think my interest for chatbots like this will increase in the future
	I intend to use m-services as much as possible Zarmpou et al., 2012)	Jeg vil bruke chatbots som denne så mye som mulig	I will use chatbots like this as much as possible
	I recommend others to use m-services (Zarmpou et al., 2012)	Jeg vil anbefale andre å bruke chatbots som denne	I will recommend others to use chatbots
	I plan to use the system in the next <n> months (Venkatetesh et al., 2003)	Jeg planlegger å bruke chatbots som denne fremover	I plan to use chatbots like this in the future
Expertise	Self-composed	Jeg opplevde å få svar på det jeg lurte på	I experienced to get my question answered
	The website content reflects mastery of knowledge (Corritore et al., 2005)	Chatboten fremstår som kunnskapsrik	The chatbot appears knowledgeable
	The website content reflects expertise (Corritore et al., 2005)	Innholdet i chatboten reflekterer ekspertise	The content of the chatbot reflects expertise
	I feel very confident about top management's skills (Mayer et al., 1995)	Jeg føler meg svært sikker på chatboten sin kompetanse	I feel very sure about the chatbots competence
	Top management is very capable of performing its job (Mayer et al., 1995)	Chatboten er godt rustet til den oppgaven den er satt til å gjøre	The chatbot is well equipped for the task it is set to do
Predictability	The website content is what I expected (Corritore et al., 2005)	Chatboten oppførte seg forutsigbart	The chatbot behaved predictable
	There were no surprises in how the website responded to my actions (Corritore et al., 2005)	Det var ingen overraskelser i måten chatboten svarte meg på	There were no surprises in how the chatbot answered me
	The website is what I anticipated (Corritore et al., 2005)	Chatboten oppførte seg som forventet	The chatbot behaved as predicted
	I find it predictable that the website has the type of content it does (Corritore et al., 2005)	Jeg synes det er forutsigbart at chatboten har det innholdet den har	I think it is predictable that the chatbot has the type of content is does
	The website content is predictable (Corritore et al., 2005)	Innholdet i chatboten var i henhold til min forventning	The content of the chatbot was as expected

Anthropomorphisme	Fake – Natural (Ho & MacDorman, 2010)	Chatboten fremstår som naturlig	The chatbot is natural
	Machinelike – Humanlike (Ho & MacDorman, 2010)	Chatboten fremstår som menneskelig	The chatbot is humanlike
	Artificial – Lifelike (Ho & MacDorman, 2010)	Chatboten fremstår som realistisk	The chatbot is realistic
	Unconscious – Conscious (Ho & MacDorman, 2010)	Chatboten fremstår som tilstedeværende	The chatbot is present
	Artificial – Lifelike (Ho & MacDorman, 2010)	Chatboten fremstår som autentisk	The chatbot is authentic
Ease of use	Learning to operate this website was easy for me (Corritore et al., 2005)	Det var enkelt for meg å lære hvordan jeg skal bruke denne chatboten	It was easy for me to learn how to use this chatbot
	I found it easy to get this website to do what I wanted it to do (Corritore et al., 2005)	*Jeg føler det er enkelt å få chatboten til å gjøre det jeg vil den skal gjøre*	*I feel it is easy to get the chatbot to do what I want it to do*
	I found the website easy to use (Corritore et al., 2005)	Chatboten er enkel å bruke	The chatbot is easy to use
	My interaction with chart-master would be clear and understandable (Davis, 1989)	Min dialog med chatboten var klar og forståelig	My dialogue with the chatbot was clear and understandable
	I would find chart-master to be flexible to interact with (Davis, 1989)	*Denne chatboten vil være fleksibel å samhandle med*	*This chatbot is flexible to interact with*
Risk	I feel vulnerable when I interact with this website (Corritore et al., 2005)	Jeg føler meg sårbar når jeg snakker med denne chatboten	I feel vulnerable when I interact with this chatbot
	I believe that there could be negative consequences from using this website (Corritore et al., 2005)	Jeg tror det kan være negative konsekvenser ved å bruke med denne chatboten	I think it can be negative consequences when using this chatbot
	I feel it is unsafe to interact with this website (Corritore et al., 2005)	Jeg føler det er usikkert å snakke med denne chatboten	I feel it is unsure to talk to this chatbot
	I feel I must be cautious when using this website (Corritore et al., 2005)	Jeg føler jeg må være forsiktig når jeg bruker denne chatboten	I feel I must be caution when I use this chatbot
	It is risky to interact with this website (Corritore et al., 2005)	Jeg føler det er risiko involvert ved å snakke med denne chatboten	I feel there is risk involved by talking to this chatbot
Reputation	This store is well known (Jarvenpaa et al., 1999)	Chatboten er vel ansett av andre	The chatbot is well known by others
	The website is highly regarded (Corritore et al., 2005)	Chatboten har et godt omdømme	The chatbot has a good reputation
	The website is respected (Corritore et al., (2005)	Chatboten er respektert av andre	The chatbot is respected by others
	The website has a good reputation (Corritore et al., 2005)	Jeg har hørt andre snakke positivt om denne chatboten	I have heard other talking positive about this chatbot
	This store has a bad reputation in the market (Jarvenpaa et al., 1999)	*Jeg har hørt andre være kritisk til denne chatboten*	*I have heard other being sceptic to this chatbot*

Propensity to trust technology	My typical approach is to trust new technologies until they prove to me that I shouldn't trust them (McKnight et al., 2011)	Min typiske tilnærming er å stole på ny teknologi	My typical approach is to trust new technology
	I usually trust a technology until it gives me a reason not to trust it (McKnight et al., 2011)	Generelt stoler jeg på ny teknologi inntil det gir meg en grunn til å ikke gjøre det	I generally trust new technology until they give me a reason not to
	I generally give a technology the benefit of the doubt when I first use it (McKnight et al., 2011)	Selv under tvil vil jeg velge å stole på ny teknologi	Even under doubt I will chose to trust new technology
	It is easy for me to trust a person/thing (Cheung & Lee, 2001)	Det er lett for meg å stole på ny teknologi	It is easy for me to trust new technology
	My tendency to trust a person/thing is high (Cheung & Lee, 2001)	Min tendens til å stole på ny teknologi er høy	My tendency to trust new technology is high
Likeability	*Dislike – Like (Ho & MacDorman, 2010)*	*Jeg liker denne chatboten*	*I like this chatbot*
	Unfriendly – Friendly (Ho & MacDorman, 2010)	*Chatboten fremstår som vennlig*	*The chatbot is friendly*
	Unkind – Kind (Ho & MacDorman, 2010)	*Chatboten har hyggelig fremtoning*	*The chatbot has a nice appearance*
	Unpleasant – Pleasant (Ho & MacDorman, 2010)	*(Chatboten er behagelig å snakke med*	*The chatbot is comfortable to talk to*
	Awful – Nice (Ho & MacDorman, 2010)	*Chatboten er imøtekommende*	*The chatbot is accommodating*
Usefulness	*Using chart-master in my job would enable me to accomplish tasks more quickly (Davis, 1989)*	*Ved å bruke chatbots som denne vil jeg få raskere svar på mine spørsmål*	*By using chatbots like this I will get answers more quickly*
	Using chart-master would enhance my effectiveness on the job (Davis, 1989)	*Ved å bruke chatbots som denne vil jeg få svar på mine spørsmål mer effektivt*	*By using chatbots like this I will get answers to my questions more effectively*
	Using chart-master would improve my productivity (Davis, 1989)	*Å bruke chatbots som denne vil øke min produktivitet*	*Using chatbots like this will increase my productivity*
	Using chart-master would make it easier to do my job (Davis, 1989)	*Chatbots som denne vil gjøre det enklere for meg å få svar på mine spørsmål*	*Chatbots like this will make it easier for me to get answers to my questions*
	I would find chart-master useful in my job (Davis, 1989)	*Jeg synes chatbots som denne er nyttig innen kundeservice*	*I think chatbots like this is useful in customer service*

Appendix C – Thematic analysis from the open-ended question

Dimensjon	Kategori	Forklaring
Chatbot-relaterte kategorier	Ekspertise - Riktig svar *(Expertise - Correct answer)*	Dette handler om at kunden understreker riktige svar som viktig for tillit. Chatboten må derfor gi riktige opplysninger som både er relevant og faktabasert. Det handler også om at chatboten innehar nok kunnskap, og tilgang til å søke etter den informasjonen det blir spurt om.
	Ekspertise - Forståelse hos chatboten *(Expertise - Interpretation)*	Dette handler om at tillit til chatboten er avhengig chatboten sin forståelse av spørsmålet. Det viser at det er viktig at chatboten oppfatter problemet og har flere løsninger. Det vektlegges også at chatboten må være ærlig når den ikke forstår spørsmålet.
	Ekspertise - Konkret svar *(Expertise -Concrete answer)*	Dette handler om at brukere ønsker å få et presist og enkelt svar. Dette er noe som går igjen med andre beskrivelser som konsist, eksakt, direkte, klar, ikke generelt, ikke misledende og tydelig. En vektlegger også at samme svar må gis til alle.
	Ekspertise - Velformulert svar *(Expertise - Eloquent answer)*	Kommentaren peker på at kundens tillit er avhengig velformulerte formuleringer. Ord som benyttes er logisk/fornuftig/troverdig/ profesjonelt/rådgivende/tillitsvekkende, at svaret er gjennomtenkt og gir god/bra informasjon. Det handler også om at chatboten ikke sier noe som er dumt eller nedverdigende.
	Raskt svar *(fast response)*	Kommentaren viser at det å få et raskt svar har betydning for tillit. Andre ord som brukes er hurtig, kjapt og det å få svaret med en gang. Noen kommenterer at et raskt svar kan indikere at det er en robot.
	Antropomorfisme *(Anthropomorphism)*	Denne kommentaren handler om at brukeren vektlegger menneskelige egenskaper som viktig for tillit til chatboten. Dette er gjennom beskrivelser som hyggelig, høflig og bruk av et naturlig språk.
	Fravær av markedsføring *(Absence of marketing)*	Dette peker på brukere som mener tilliten kommer av at chatboten ikke forsøker å selge noe, eller setter bedriftens ønske fremst. Dette handler også om at chatboten setter kunden først og er saklig.
Situasjon-relaterte kategorier	Lav risiko *(Low risk)*	Dette viser til at kunden opplever tillit siden de ikke trenger å oppgi hemmelig eller personlig informasjon. Noen mener det kan stille seg annerledes om brukeren må dele mer. En mente det var viktig å vite at samtalen forblir privat.
	Bedriften *(Brand)*	Kommentaren viser at tillit til bedriften er avgjørende for tillit til chatboten. Dette kommer frem ved at det er bedriften bak de stolen på. Noen vektlegger også at de stoler på programmeringen som er gjort, og da også sørget for at chatboten svarer riktig og kommer med god informasjon.
	Tilgang til menneskelig aktør *(Access to human operator)*	Dette handler om at chatboten skal kunne overføre kunden til en menneskelig operatør hvis det er behov.
Bruker-relaterte kategorier	Ikke tillitsrelevant *(Not trust relevant/no trust)*	Kommentaren viser at tillit ikke er relevant i denne konteksten. Dette kommer frem ved kommentarer som mener chatboten er mer underholdning enn nyttig. Andre mener det kun er en maskin som svarer på enkle spørsmål og med en begrenset funksjonalitet. Det handler også om at brukere ikke føler tillit til chatboten, og heller vil snakke med mennesker.
	Diverse (Miscellaneous)	Kommentarer som ikke hører hjemme i de overnevnte kategorier.