

# Is curvature in typeface the solution for a better customer experience when using chatbots?

*An experiment on influencing the customer experience.*

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## Abstract

The world shifted from interacting solely offline to more and more interaction taking place online. With this shift, chatbots are becoming an increasingly important way for companies to interact with their customers. In the service industry, chatbots are typically associated with practical experiences instead of meaningful and delightful experiences. However, there may be industries in which chatbots do also serve a meaningful and delightful purpose. Moreover, there are industries, such as the banking industry, where a chatbot must fulfil a meaningful and delightful experience, to be able to gain trust among customers in those chatbots. This research examines if curved typefaces used in chatbots have a direct effect on customer trust and if perceived warmth mediates this relationship. Additionally, this research tests if risk as perceived by the customer would influence the relationships between curvature, perceived warmth and trust.

The research is based on survey participants aged 18 years and older. The participants were randomly assigned to four conditions. All four groups watched a video of a chatbot interaction between a customer and a bank, which the participants had to evaluate. The results indicated that no direct effect exists between curvature in typefaces to trust and curvature in typefaces to perceived warmth, and no indirect effect exists between curvature in typefaces to trust through perceived warmth. This indicates that no statistical support was found for the above-mentioned mediated moderation model.

Notwithstanding, the gathered data does support the relationship between perceived warmth and trust; participants that perceived higher levels of warmth are less likely to trust the chatbot. Moreover, this research provides evidence that the customer's mood before the chatbot interaction positively influences the customer's perceived warmth and trust. This also holds for a customer's attitude towards the chatbot. Furthermore, this research supports the effect of perceived risk on trust; higher levels of perceived risk will lead to higher levels of customer's trust.

Even though this research does not provide evidence for the relationship between curvature in typefaces and trust, this research will provide managerial insights for companies into which elements of the chatbot do influence a customer's trust.

# 1. Introduction

## 1.1 Background

Since the first conversational agent was invented in the 1960's, the research on these conversational agents has been exponentially growing (Shum, He & Li, 2018). Conversational agents integrate computational linguistics techniques with the communication channel of the web to interpret and respond to statements made by users in ordinary natural language.

Conversational agents deliver high volumes interactive text-based dialogues (Lester, Branting & Mott, 2004). Chatbots are one class of conversational agents activated by natural language input (which can be in the form of text, voice, or both). Chatbots can provide conversational output in response to the user and, if commanded, can also execute tasks (Radziwill & Benton, 2017). After decades of research and development, we have seen much progress, from Eliza (Weizenbaum, 1966) and Parry (Colby, 1975) in the '60s and '70s, to Alice in 2009 (Wallace, 2009). Ever since the 1990s, the research on chatbots has been increasing (e.g., Price, 1990; Hemphill et al., 1990; Dahl et al., 1994; Walk et al., 2001, 2002).

Although chatbots have been around for a significant amount of time, the real interest began around the spring of 2016 (Brandtzaeg & Følstad, 2018). This sudden new interest in chatbots results from the major usage shift from online networks to mobile-messaging applications such as Telegram, Slack, Kik, Facebook Messenger, and Viber (Brandtzaeg & Følstad, 2018). More specifically, there has been a surge in service providers exploring and implementing text-based chatbots as the first line of support for customers seeking help. Moreover, information and customer service chat and commercial social media interactions are increasingly managed by chatbots (e.g., Følstad et al., 2019; Radziwill et al., 2017). Ever since this trend began, the mobile device market has been (and still is) exponentially growing. The current number of smartphone users in the world today is 6.648 billion, which means that 83.89% of the world population is using a smartphone (Statista, 2021). This number is expected to grow even further by several hundred million new users in the next few years (Mordor Intelligence, 2022). Thus, the mobile device market is becoming bigger every year, and with the mobile device market becoming bigger, the interaction between companies and their customers shifted from mostly offline to mostly online (Lynch & Kennedy, 2016). With this trend, chatbots are becoming an increasingly popular way for interacting with customers (Smutny & Schreiberove, 2020). Also, the chatbot market's current worth is nearly \$3 billion and is expected to exceed \$9 billion by 2024 (Nguyen, 2020). These numbers show that there

is not only a shift from offline to online communications between companies and customers, but the chatbot market is also expected to become much bigger.

Given the relative importance of chatbots in conversations between companies and their customers, one might expect that chatbots are a prioritized subject for companies. Nevertheless, there is still a lack of knowledge on chatbots. More specifically there is a lack of knowledge on how companies can strategically exploit the chatbot's potential to create a better customer experience (CX) (Kull et al., 2021). The growing importance of chatbots has led companies to study different (marketing) strategies to increase the acceptance of chatbots (Kull et al., 2021). These studies include technology design and how the design can influence the CX. This research can, for example, entail the study of the correct use of aesthetic elements, such as the correct use of typefaces to create a better CX (Stark, 2019). This connection between aesthetic elements and CX is also shown in the TRISEC framework as presented by Blazevic & Sidaoui (2022); this framework integrates technology design with CX and finds a link between these two concepts.

An important part of this CX in a chatbot interaction is the feeling of warmth towards the chatbot (Aiello et al., 2020). Measuring the warmth that customers feel within a human-computer interaction is dissimilar to measuring human-human interaction. Due to the different physiology and conscious awareness between humans and chatbots and the lack of internal morality of chatbots, it is difficult for humans to feel warmth toward chatbots (Balkenius et al., 2016; Glaskin, 2012; Paiva et al., 2017). Fiske (2018) measured the perceived warmth of humans towards chatbots using a six-item warmth scale, using trustworthy, well-intentioned, good, truthful, unbiased, and honest. They measured these six items on a Likert scale (Christoforakos et al., 2021). The items in the presented warmth scale reflect the cognitive element of warmth and, more importantly, imply that humans believe they can feel warmth in a chatbot.

CX, in turn, relates to a great extent to a person's feelings. Customers describe a great CX as an experience in which the company understood what they wanted, cared about them, did everything in their power to help, and made them feel like the most important person in the world (Shaw & Ivens, 2002). There is an uncountable number of references about CX, with only a few of them really understanding the meaning of CX (Jain et al., 2017). It is therefore, that companies do not fully control the CX. This lack of control of the concept can be due to CX's subjective nature (Verhoef et al., 2009). In addition, marketing research has been mainly focused on executive actions and results rather than on the underlying antecedents and consequences of CX (Verhoef et al., 2009). One way to understand CX is to

attribute feelings toward hedonic experiences (Voss et al., 2003). The hedonic experience of a customer regards a customer's moods, emotions, and hedonic value, in which the feeling of warmth can be seen as a customer's emotion (Schmitt, 1999). Previous literature stated that focusing on one experience element (hedonic experience) will provide valuable information (Kranzbühler et al., 2018; Palmer, 2010; Sidaoui et al., 2020).

This hedonic experience can be influenced in numerous ways. Setting a closer look at the chatbot context, a way to influence the hedonic experience is to change the chatbot design (Lo Presti et al., 2021). An important aspect of a text-based chatbot is its typeface; earlier research has already shown that changing the typeface (and more specifically, the level of curvature in typefaces) can, in fact, influence the hedonic experience (Chou, 2015; Kettle & Häubl, 2011; Ren et al., 2018; Tassiello, Viglia, & Mattila, 2018).

As stated before, chatbots are becoming an increasingly popular way to interact with customers. More companies use chatbots, and more and more industries are trying to get a hold of how to use chatbots in their communication with customers (Mogaji et al., 2021). The banking industry is one of these 'new to the game' industries. An increasing number of banks are now enabling the use of technology so customers can perform more tasks online instead of making the customers come to a physical bank to perform tasks (Mogaji et al., 2021). Privacy is one of the most important issues in communication between a bank and a customer. A bank preserves more confidential information on the customer than usual, making it riskier for customers to interact with a chatbot than in settings where less or even no detailed and personal information is needed (Doherty & Curran, 2019). This need for detailed and personal information is the main reason that trust is particularly important in the communication between chatbots and customers in the banking context. No trust in a chatbot in the banking context is detrimental when specifically looking at the banking context (Doherty & Curran, 2019). Making that trust as a CX outcome is a key factor for the banking service.

## 1.2 Research objective

This research aims to explore the effects of altering the curvature of typefaces on the customer experience through the hedonic experience of these customers while interacting with chatbots. More specifically, this research will test if curved (vs angular) typefaces significantly influence the perceived warmth of the customer (the hedonic experience) and if the increase in this hedonic experience will significantly increase the customer's trust in the chatbot.

This research will take place in the banking context; customers that will be participating will be exposed to a chatbot that will answer questions that could be asked to a chatbot performing for a bank. The perceived risk will be considered within the research because, in the banking context, the perceived risk can be both high and low (Kim et al., 2009).

This research adds to the existing literature because previous research has mainly been focusing on utilitarian experiences (Brandtzaeg & Følstad, 2017; Rzepka et al., 2020), with researchers studying ease of use and the swiftness of chatbots (Chopra, 2020; Helpshift, 2019), reflecting on a utilitarian experience rather than a hedonic experience (Voss et al., 2003). Next to that, the existing literature has been focusing more on how the content of the chatbots influences the machine-likeness of a conversational system (Candello et al., 2017); this research, however, will examine how the form of chatbots can influence a person's emotional state.

At this moment, it can be stated that there are several signs of scepticism toward transforming everyday life robots (Bartneck & Reichenbach, 2005). This can be due to the limited ability of chatbots to naturally interact with humans (Wiese et al., 2017). Chatbots are becoming increasingly important when interacting with customers (Smutny & Schreiberove, 2020); that being the case, it is important for companies to know how they can get a better understanding of how to beneficially influence the quality of interactions from chatbots to humans in general (Abubshait et al., 2021; Hortensius & Cross, 2018; Paiva et al., 2017; Wykowska et al., 2016). The fast bilateral communication that has been going on between companies and customers through chatbots is crucial for diverse communications between brands and their customers (Kaczorowska-Spychalska, 2019). It, therefore, is important for companies to know how they can strategically exploit the potential of chatbots to ultimately create a better CX, but at this point, little is known about that (Kull et al., 2021).

The related research question is:

*‘To what extent do curvature vs angular typefaces used in chatbots in a banking context influence the perceived warmth of the chatbot, creating a meaningful hedonic customer experience, and eventually lead to increased trust in the chatbot?’*

### 1.3 Relevance

This research will contribute to the academic field by providing evidence that the use of curvature vs angular typefaces creates a valuable hedonic CX by feeling warmth towards a chatbot, which leads to an increase in trust in the chatbot. This attribution advocates the role



of the hedonic experience, which relates to happiness and quality of life and needs to be further explored (Jain et al., 2017). Also, this research will contribute to the experiential marketing field; this field aims to provide research that links more intangible elements to customers' emotions (Gentile et al., 2007).

This research will contribute to the practical field by assessing how the use of different typefaces in chatbots can influence the feeling of warmth humans feel towards chatbots and the degree to which this feeling of warmth leads to an increase in the trust customers have in the chatbot. This research will not only break the utilitarian mindset (Brandtzaeg & Følstad, 2017; Rzepka et al., 2010) by providing evidence for the possibilities of chatbots to create meaningful hedonic experiences in the banking context, but the outcomes of this research will also be beneficial for developers of chatbots (Broadbent, 2017). Developers can make use of this research to know what typeface to use in chatbots to create a better CX. Therefore, these developers will eventually better understand how to create a successful chatbot. Managers, in turn, can use the outcomes of this research to best design chatbots to improve their customers' experience, making their customers happier and more loyal and, as a result, increase their company's financial situation. With chatbots becoming an increasingly used interaction method, understanding how to design chatbots to influence the CX is now more important than ever before.

#### 1.4 Thesis outline

To be able to formulate an answer to the above-stated research question, several chapters will be structured. The background, research objective and relevance of the research were presented in this chapter. In the following chapter (chapter 2), a literature review on relevant concepts will be discussed. Next, the proposed relations will be summarized and displayed in the conceptual model, and cumulatively the hypotheses. Afterwards, the methodology part will set out how the answer to the research question will be conducted; the methodology section will entail the following aspects: the research strategy, the construct measurement, the data preparation, the systematic literature review and eventually, the research. The outcomes of the conducted analyses will be summarized in the results chapter. Lastly, the results will be concluded, and the discussion section will set a critical light on the research.

## 2. Systematic Literature Review

In this section, the different concepts and their expected relations will be further elaborated on. Systematic literature review was conducted to develop an understanding of the existing literature and establish the research's foundation. This systematic literature will help develop the hypotheses so that later, the experiment can be conducted. The structure of this systematic literature review will be as follows: first, the concept of *curved vs angular typefaces* will be untangled. After that, a closer look will be set at *customer experience (CX)*, in which the differences between hedonic and utilitarian dimensions of the CX will be explained. Furthermore, a deeper understanding of the *hedonic experience* will be given, and the hedonic term *perceived warmth* will be introduced. Subsequently, the CX outcomes will be further elaborated on, with *trust* being the main term. Afterwards, the *SEC context*, and the level of *perceived risk*, will be explained. Lastly, all the concepts will be brought together into hypotheses and eventually, the conceptual model will be presented.

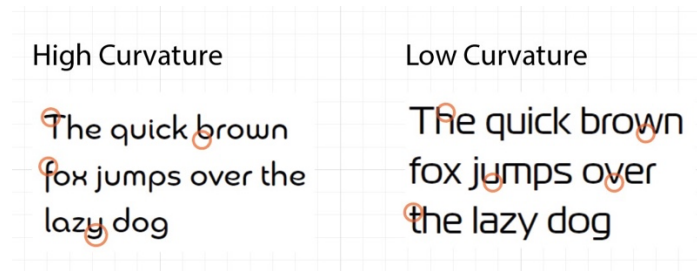
### 2.1 Curved vs. Angular Typefaces

People are frequently exposed to different kinds of typefaces in their everyday lives (Valesco et al., 2018). Research even shows that any kind of written communication is now mediated by typeface (Garfield, 2011; Hyndman, 2016). Not only do typefaces mediate each type of written communication, but it has also been proven that different typefaces have different connotations, and associations and can evoke different emotions (Rolschau et al., 2020).

One way of categorizing these different kinds of typefaces is through their curvilinearity (Valesco et al., 2018). The curvilinearity distinguishes curved typefaces from angular typefaces, with curved typefaces being round (i.e. curved, circular) and angular typefaces being straight (i.e. not curved) (Chen et al., 2021; van Leeuwen, 2006). Angular shapes are straight lines with sharp edges, whereas circular shapes are curved without sharp angles (Liang et al., 2013). The figure below (figure 1) shows a visual representation of more curved and more angular typefaces.

Figure 1:

*Representation of high curved vs low curved typefaces*



(Liang et al., 2013)

Curved typefaces are usually perceived as friendly, individual, unprofessional, and not technical (Mackiewicz & Moeller, 2004). Previous research has already demonstrated the benefits of curved typefaces in commercial settings (Chou, 2015; Kettle & Häubl, 2011; Ren et al., 2018; Tassiello, Viglia, & Mattila, 2018). Communications that use rounded typefaces are normally perceived as more personal, laborious, and emotion-laden; this contradicts communications displayed in more angular typefaces, which are usually considered impersonal, mass-produces, and less effortful (Childers, Pride, & Ferrell, 1980). The use of rounded communication gives the customer the idea that more effort was put into the text, thus conveying the feeling of warmth (Liu et al., 2019).

The use of a curved typeface may serve as a medium to increase the feeling of human warmth (Ren et al., 2018; Tassiello et al., 2018). This human touch is currently missing with the increase in mechanization, automation, and digitalization of modern life (Liu et al., 2019). Using curved font styles namely embodies human characteristics (Fluckiger, Tripp, & Weinberg, 1961; King & Koehler, 2000; Schroll et al., 2018). Recent research has shown that curved font styles create the feeling of human presence and enhances the customer's emotional attachment toward a chatbot (Schroll et al., 2018).

Angular typefaces, on the other hand, are associated with more negative emotions (Venkatesan et al., 2020). The angular typeface is perceived as unfriendly, professional, and technical (Mackiewicz & Moeller, 2004). Moreover, angular typefaces are described as machine-like and therefore lack the feeling of human presence in the chatbot (Tassiello et al., 2018).

Earlier research has already shown that altering the curvature in typefaces influences the CX (Mackiewicz & Moeller, 2004); modifying the curvature of typeface, will influence the feelings customers have towards the chatbot and hence will influence the hedonic experience.

## 2.2 Customer Experience, Hedonic Experience & Perceived warmth

CX derives from (a set of) interactions between the company and its customer; it evaluates the stimuli and expectations coming from that interaction (Gentile et al., 2007). The CX is a personal experience, which implies different levels of involvement, being rational, emotional, sensorial, physical, and spiritual (Gentile et al., 2007; Schmitt, 1999). The evaluation of this experience depends on the customers' expectations and the stimuli deriving from their interaction with the company and its offering in the different moments of contact or touch-points (Gentile et al., 2007). Schmitt (1999) formulated five strategic experiential modules (SEMs) to capture the total experience. The following dimensions were distinguished: 'Affective experiences (FEEL); creative cognitive experiences (THINK); Sensory Experiences (SENSE); social-identity experiences that result from relating to a reference group or culture (RELATE); and physical experiences, behaviours, and lifestyles (ACT).

Even though both Schmitt (1999) and Gentile et al. (2007) concluded that the affective, as well as the cognitive parts of the experience, occur; widely used models such as the technology acceptance model (TAM), the theory of reasoned action (TRA), and the theory of planned behaviour (TPB) imply that people are purely rational when it comes to the decision-making process (Moon et al., 2017). All models try to explain how customer behaviour works, but they lack an explanation of the affective experience (Moon et al., 2017); it, therefore, has been proposed to include these affective variables in the models (Conner & Armitage, 1998; Nejad et al., 2004).

The experiences people go through can be distinguished into utilitarian experiences and hedonic experiences. Utilitarian experiences describe a person's feelings towards the functionality of an object or product (Batra & Ahtola, 1990). Utilitarian derives from utilitarianism, which regards efficiency, helpfulness, practicality, and functionality (Voss et al., 2003). In a chatbot-specific setting, the motivations for the usage of chatbots can relate to utilitarian aspects such as productivity, efficiency, and convenience (Brandtzaeg & Følstad, 2017; Rzepka et al., 2020).

The second experience is the hedonic experience; the hedonic attitudes of customers are formed by past experiences of these customers (Voss et al., 2003). The hedonic attitudes and utilitarian attitudes form an integrative two-dimensional conceptualization of the total consumer attitudes (Voss et al., 2003). Attitudes can be described as emotionally infected filters needed to create an overview in a normally chaotic environment (Shrigley et al., 1988).

In 1982, Hirschman & Holbrook defined hedonic experience as: *'Facets of consumer behaviour that relate to the multisensory, fantasy and emotive aspects of product usage*

*experience*' (p. 92). In this definition, multisensory refers to the fact that there is more than one mode of experience (sound, taste, scent). Hedonic, in this definition, contains both the internal multisensory imagery (the recall of something or the fantasising of something) as well as the emotional arousal (fear, joy, rage) (Batra & Ahtola, 1990). Chatbots can evoke hedonic elements by changing their design (Overby & Lee, 2006). The motivations for using chatbots that relate to hedonic elements are passing the time, novelty, and social aspects (Brandtzaeg & Følstad, 2017; Rzepka et al., 2020).

One specific part that can influence the hedonic experience is customers' feelings when using a chatbot. The feeling that will be elaborated on in this paper is the feeling of perceived warmth. The feeling of warmth will increase the hedonic experience of a customer. Warmth has been defined as a positive, mild, volatile emotion (Lemmink & Mattsson, 2002). A concept involving physiological arousal and precipitated by experiencing directly or vicariously a love, family, or friendship relation (Aaker et al., 1986). Earlier in 1946, Asch used warmth to refer to a situation where people have good intentions towards others. Warmth perceptions usually generate positive emotions and determine how we interact with others (Aiello et al., 2020).

People's judgments are influenced by their first impressions, which often rely on two bipolar traits: warm vs cold. The distinction between the feeling of warm vs cold can best be described by the following example. When someone is viewed as warm (vs cold), the first impression will influence on the ensuing judgement of the target person (Choi et al., 2016). Whenever a group of people is asked to describe a certain person, and they describe him/her as warm, they target the person as more generous, happy, good-natured, caring, and sociable, than whenever they would have described the person as 'cold' (Asch, 1946).

This all is in line with other research that has been conducted, the feeling of perceived warmth means that something is associated with being friendly, affectionate, gentle, and having strong emotional attachments to their friends (John & Srivastava, 1999; Weiner & Greene, 2008; Kim et al., 2018). Warmth stereotyping suggests a personified attribute of an object. This means that whenever an object is perceived as either warm or cold, this judgement will be made in a similar way and with similar outcomes as when customers need to decide on whether a person is warm or cold (Aaker et al., 2010).

Perceived warmth as a hedonic measure of the CX is essential when evaluating the trustworthiness (Choi et al., 2016). If a customer feels a certain amount of warmth towards a message, this will eventually increase trust (Choi et al., 2016).

### 2.3 Trust (CX outcome)

To fully understand trust, one needs to consider that the essential prior concept for trust is trustworthiness (Christoforakos et al., 2021). The feeling of trust is an attitude a person takes to the trustworthiness of someone or something. Broadly speaking trustworthiness, is the property of someone or something they will do what they say they will do. If they fail, it will typically be outside their control (O'hara, 2012). Trustworthiness is not context-independent; one cannot be trustworthy in all contexts. O'hara (2012) sets an example to explain the importance of different contexts further. He stated that one might be seen as trustworthy as a car mechanic without being a trustworthy brain surgeon.

Thus, trust is a multi-dimensional phenomenon consisting of three dimensions of trust (Khodyakov, 2007), two of them being relevant to the definition of trust that will be used in this article. The first is 'thick interpersonal trust', also the first type of trust people develop in their lives. It defines people's trust in their relatives, family, and close friends. This 'thick interpersonal trust' is necessary for developing optimistic attitudes towards others, which is crucial for social interaction (Erikson, 1993). In this case, trust depends on similarity and strong emotional relationships.

The second relevant dimension of trust is the 'thin interpersonal trust', which relates more to the trust of out-groups (Khodyakoy, 2007), also known as 'process-based trust' (Zucker, 1986) or as Uslaner (2002) called it: 'generalized trust'. With thin interpersonal trust, one places trust in people (or things) whom they do not know well (Solomon & Flores, 2001). This dimension of trust makes a person most vulnerable but also makes the creation of trust possible (Khodyakoy, 2007). The best example is the one where people will enter a plane and trust the pilot flying the plane; even though they do not know the pilot, their trust is based on the image pilots carry out. A positive image of someone or something can thus influence the trustworthiness of a person or object (Zucker, 1986). Although thin interpersonal trust is associated with high risks, it can also highly influence the perceived trust in a certain person or object. This influence on the perceived trust makes the thin interpersonal trust dimension most suitable when looking at person-computer relationships.

Previous research has shown that no trust in the chatbot can be detrimental to the banking service context (Nguyen et al., 2013; Doherty & Curran, 2019). Therefore, studying customer trust in chatbot in the banking context is a strong predictor of the chatbot's success in this industry.

## 2.4 Perceived Risk and Service Type

Regarding human choice, the concept of risk is one of the most pervasive (Dowling, 1986). Risk can be defined as the situation in which a decision maker has a priori knowledge of both the consequences of alternatives and their probabilities of occurrence (Dowling, 1986). However, the concept of perceived risk bears a closer relationship with the concept of partial ignorance; neither the consequences nor the alternatives and their probabilities are accurately known (Bauer, 1960). Bauer (1960) originally defined perceived risk, and stated that perceived risk has a two-dimensional structure, namely, uncertainty and adverse consequences. Various marketing research has identified six perceived risk types: financial, performance, physical, psychological, social, and time risk (Kaplan et al., 1974, Peter & Tarpey, 1975, Roselius, 1971).

The perceived risks level varies among different exchange types (Lemon & Verhoef, 2016). An example of the differences in perceived risk among different exchange types could be that when customers buy a product, their perceived risk is lower than when they would buy a service of some kind (Murray & Schlacter, 1990).

Not only does the perceived risk differ between different exchange types, but it also varies between different types of services. These different services have been classified into three groups: search, experience, and credence services (Darby & Karni, 1973; Mitra et al., 1999; Nelson, 1970). The first level of service is the search group; these can be characterized by the lowest level of perceived risk (Blazevic & Sidaoui, 2022). The search services are the services delivered to the customer before purchasing the product or service (Nelson, 1970). The second level of service is the one of experience. The experience services are evaluated after the purchase and consumption of the product or service (Nelson, 1970); this second level of service has a higher level of perceived risk than the uncertainty level from search (Blazevic & Sidaoui, 2022). The service with the highest level of perceived risk are the credence services (Blazevic & Sidaoui, 2022). They can only be measured after a long period of time, long after the actual purchase and consumption of the product or service have taken place (Nelson, 1970).

This research will consider the perceived risk in the two most extreme forms: the search setting and the credence setting.

## 2.5 Hypotheses

### 2.5.1 Curvature in typeface as indicator for perceived warmth

*H1a: Curvature in typeface will increase the perceived warmth.*

The use of curved typefaces in commercial settings has been widely indicated as beneficial (Chou, 2015; Kettle & Häubl, 2011; Ren et al., 2018; Tassiello, Viglia, & Mattila, 2018). This benefit exists because using curved typefaces in chatbots creates a sense of humanness in the communication (Schroll et al., 2018). Meaning that when using a curved typeface in a chatbot, the user feels a human presence in a normally computer-based setting (Candello et al., 2017).

It thus is important for customers to feel like they are interacting with humans instead of computers; this will increase the perceived warmth (Candello et al., 2017). Previous research has already shown that using curved typeface, will directly beneficially influence the customer's trust in the interaction (Agustin & Singh, 2005; Schroll et al., 2018; Ren et al., 2018; Tassiello et al., 2018).

The expectation is that a chatbot with a curved typeface leads to higher scores of the feeling of perceived warmth compared to a chatbot with an angular typeface.

### 2.5.2 Perceived warmth as indicator for trust

*H1b: An increased feeling of warmth towards the chatbot, will increase the trust in the chatbot.*

The feeling of perceived warmth is important when creating positive judgment on someone or something (Choi et al., 2016). This is also the case in a 'business environment'; perceived warmth has been recognized as a critical source of corporate success because it affects the positive image and attractiveness of an organization (Aaker et al., 2010; Ellemers et al., 2011).

A link between perceived warmth and trust was already found in 2016 by Choi et al. In their research, they manipulated online messages in which they created a feeling of perceived warmth in these messages. They eventually found that when a person feels warmth through a message, this will increase the person's attitude towards the message and will increase their trust in it.

This is also supported by Ehrke et al. (2020). They stated that people are more likely to trust in-groups than out-groups. Nevertheless, when it comes to creating trust in out-group scenarios (which is the case when people make use of chatbots), they found that when people



experience a feeling of warmth (this can be in the person itself or in the message that is carried out), this, in turn, creates a feeling of trust in the person or message.

This relation between perceived warmth and trust has also been shown in the research conducted by Kim et al. (2018). In line with what the researchers as mentioned above found, they stated that the feeling of warmth towards something or someone increases the likeability to trust this person or object more than when they perceive a feeling of coldness.

Thus, it is expected that a higher perceived feeling of warmth, will lead to more trust in the chatbot (and therefore the message being carried out).

### 2.5.3 Curvature in typeface as indicator for trust

*H2: Curvature in typeface will (in) directly influence the trust*

Past research has already shown an indirect effect of curved typeface on trust. For example, a curved typeface increases emotional empathy and that in turn increases trust (Tassielo et al., 2018).

Although there already are (in)direct relations found within the presented model, it is expected that the indirect effect (see figure 2) has a more substantial positive impact on trust than the alternative direct effect.

### 2.5.4 The moderating effect of perceived risk in the service industry

H3a: Perceived risk will moderate the relationship between curvature in typeface and perceived warmth

H3b: Perceived risk will moderate the relationship between curvature in typeface and trust

H3c: Perceived risk will moderate the relationship between perceived warmth and trust

Additionally, the moderation effect of perceived risk will be measured on the proposed relations.

### 2.5.5 Control variables

#### 2.5.5.1 Age

The sensitiveness of feeling warmth and trust is different between different ages; this is because, with age, people undergo developmental transformations and are slightly becoming more symmetrical and egalitarian (Furman & Buhrmester, 1985). Research has found that

when maturing, it becomes increasingly more difficult to evoke feelings of perceived warmth and trust towards someone or something (Scharf & Shulman, 2005). It is expected that chance of feeling warmth and trust in an interaction will decrease when age increases.

#### *2.5.5.2 Gender*

There is an increasing amount of evidence that people who identify as females express a wide variety of emotions in a more intensive way than people who identify as males do (Brody, 1993). The same research also found a substantial difference in the feeling of warmth and trust between the different sexes; they concluded that persons who identify as females are more likely to feel warmth and trust than those who identify as males. Altogether, it is expected that the persons identifying as female will have a higher chance of feeling warmth and trust towards a chatbot.

#### *2.5.5.3 Educational level*

Previous research has shown that educational level differences influence the ability to feel emotions towards someone or something (Kirouac & Dore, 1985). It was stated that a higher educational level leads to a better understanding of people's emotions. It is expected that a higher educational level leads to higher levels of perceived warmth and trust.

#### *2.5.5.4 Level of English language*

The research that will be conducted will be completely in English. It is expected that the level of English that the participants master will influence the way that the chatbot will be experienced. People with lower levels of the English language will be less likely to feel warmth and trust towards the chatbot than people with higher levels of the English language.

#### *2.5.5.5 Curvature preference*

If people prefer curvature or angular typefaces, it is expected that this can influence their feelings towards the chatbot. When people prefer curved typefaces, it is expected that they will be more likely to feel warmth and trust towards the chatbot when it uses curved typefaces. As opposed to when people prefer angular typefaces; in this situation, it is expected that they will be less likely to feel warmth and trust towards a chatbot when it uses a curved typeface and vice versa.

#### *2.5.5.6 Attitude towards technology / chatbots*

Chatbots are a relatively new way (technology) to interact with customers. The Technology Acceptance Model (TAM) is a commonly used model to explain and predict people's attitudes regarding new technologies introduced by Davis in 1989. The model implies that the attitudes people have towards technology are normally based on the perceived ease of use and usefulness (King & He, 2006). It is to be expected that when people have a positive attitude towards new technologies (chatbots), they will be more sensitive to the feeling of warmth and trust in chatbots than those who have a negative attitude towards new technologies.

#### *2.5.5.7 Previous experience with chatbots*

In human-computer interaction, the perceived warmth that is felt is most likely to differ from when someone is present in a human-human interaction. Previous research found that people unfamiliar with interaction with chatbots will rate chatbots as less friendly and social than people who did have previous experience with chatbots (Ischen et al., 2020). Humans logically have more experience with human interaction than with computer interaction (Cross et al., 2019). This partly explains why people will respond to and perceive chatbots differently than they would respond to and perceive other humans (Cross et al., 2019). Chatbots do, however, (be it to a minimum), bring to mind imaginative perspective-taking levels by humans (Schmetkamp, 2020). That is why, when people are present in a situation in which they have to interact with a chatbot, it is expected that people who had previous experience with chatbots will have better accuracy of the representations of chatbots, in contradiction to people who did not have experience with chatbots yet (Lemon & Verhoef, 2016).

It is expected that people with more previous experience with chatbots will have a greater chance of feeling warmth and trust to a chatbot than people who do not have any experience with chatbots yet.

#### *2.5.5.8 Mood before*

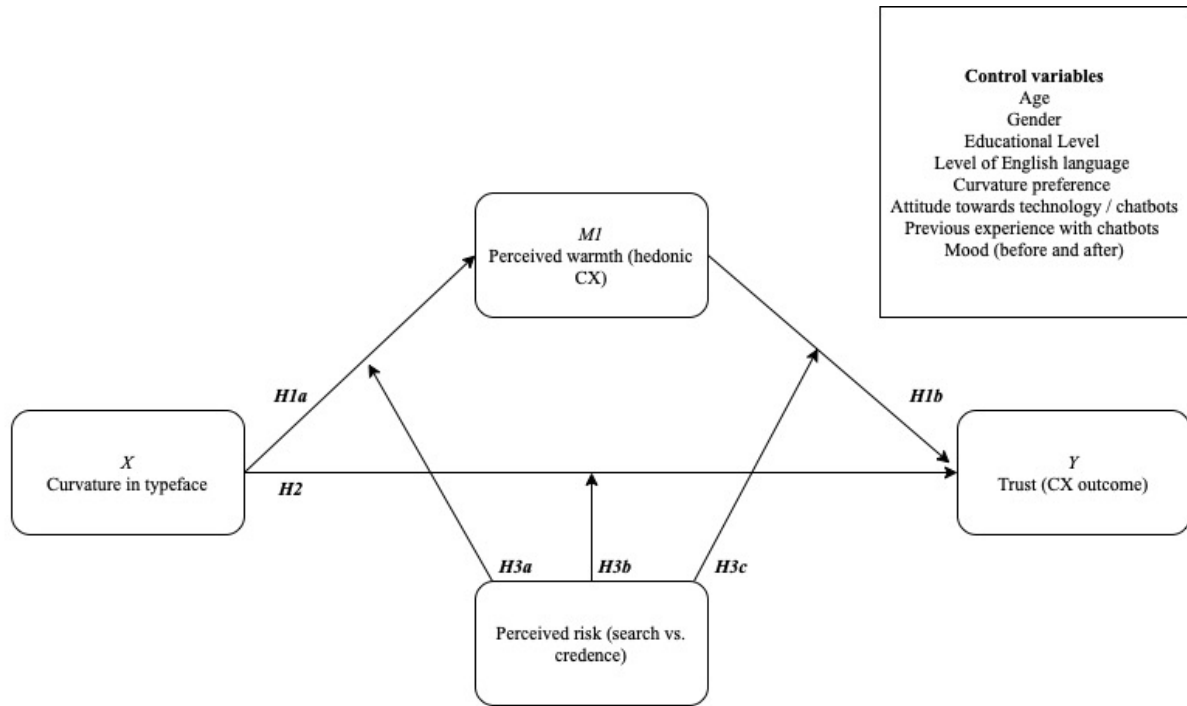
Previous research has shown that a customer's mood influences their emotional system (Lewis & Critchley, 2003). A better mood will lead to a more positive interpretation of the situation (Forgas et al., 1984). It is therefore expected that a better mood before the chatbot interaction will lead to higher levels of perceived warmth and trust.

## 2.6 Conceptual model

Taking all hypothesis and expected relations regarding the (in)direct effect of curvature in typeface on trust into account, the following conceptual model can be conducted (figure 2).

Figure 2

*Conceptual model of curvature of typeface on trust*



*(In)direct effects:*

*Ind: Curvature in typeface (X) - Perceived warmth (hedonic CX) (M1) - Trust (CX outcome)*

*Direct: Curvature in typeface (X) - Trust (CX outcome) (Y)*

The related hypotheses that are related to the presented conceptual model are:

*H1a: Curvature in typeface will increase the perceived warmth.*

*H1b: An increased feeling of warmth towards the chatbot, will increase the trust in the chatbot.*

*H2: Curvature in typeface will (in) directly influence the trust.*

*H3a: Perceived risk will moderate the relationship between curvature in typeface and perceived warmth.*

*H3b: Perceived risk will moderate the relationship between curvature in typeface and trust.*

*H3c: Perceived risk will moderate the relationship between perceived warmth and trust.*

### 3. Methodology

#### 3.1 Research strategy

To test the different hypotheses and eventually answer the research question, quantitative research will be conducted in the form of a survey. The survey will include many comparable objects that will be collected systematically (Vennix, 2019). To find statistical support for the proposed conceptual model, a large sample is needed to see if the model accurately represents the real world (Vennix, 2019). Note that this research is part of bigger research; not all variables mentioned in the questionnaire will be tested in the main experiment.

#### 3.2 Pre-tests

In the main experiment, two aspects will be manipulated. To determine the best-fit manipulations, a pre-test will be performed to check which typeface and which context is best suited for the proposed manipulations. In this pre-test, participants will be asked to complete an online survey to determine the right manipulations. To obtain useful information, a total of 30 respondents is needed for both the perceived risk pre-test and the typeface pre-test. These participants will be reached using convenience sampling. A total of 31 participants filled in the survey on context; for the typeface pre-test, this number was 45.

##### 3.2.1 *Pre-test perceived risk*

The respondents will be shown fictitious conversations (in the form of a video) with the chatbot of the bank 'Banko'. The chatbot uses formal language to avoid bias, and the avatar of the chatbot is neutral to avoid bias as well.

Participants will be exposed to two scenarios in which the perceived risk is expected to be either high (credence) or low (search). The description of the scenarios and the related chat flows are presented in appendix 1. After the participants were shown the video, participants will be asked to label the perceived risk of the scenario as either high or low.

According to the results, the context, which was expected to have the lowest perceived risk, indeed was perceived as a context in which the perceived risk is low ( $M = 1.48$ ,  $SD = .40$ ). The second context was perceived as riskier ( $M = 2.63$ ,  $SD = .72$ ). The Levene's Test for Equity showed a significant result ( $p < .05$ ), which means that the means of both groups significantly differ from zero.

The One-Way ANOVA showed a significant F, meaning that at least one value differs from another mean value. The results thus prove that the two contexts are perceived

differently in perceived risk and that this difference is statistically significant  $F(1, 60) = 61.334, p < 0.001, r = 0.71$ . The effect size shows that the effect of context on perceived risk is big.

In line with these results, the presented contexts will be used in the main test for both high and low perceived risk.

### *3.2.2 Pre-test typeface*

The second pre-test that will be conducted will be regarding the curved vs angular typefaces. The participants will be shown different typefaces and will be asked to rate these typefaces from 'very low curvature' to 'very high curvature'. A table of these typefaces can be found in appendix 2.

A total of twelve typefaces will be used to measure which typeface will be perceived as most curved and which typeface would be perceived as less curved. Results show that 'Dongle' was perceived as most curved ( $M = 4.38, SD = 1.24$ ), and 'Smooch Sans' was perceived as less curved ( $M = 2.34, SD = 1.41$ ). The independent samples T-test showed a significant Levene's Test for Equality ( $p < .05$ ), meaning that the means significantly differ from zero.

Afterwards, a One-Way ANOVA showed a significant F test, meaning that the test results prove that the respondents perceived the typefaces differently in terms of roundness and that these differences are statistically significant  $F(1, 382) = 14.855, p < 0.001, r = 0.193$ .

In line with these results, in the main test, 'Dongle' will be used as 'curved typeface' and 'Smooch Sans' will be used as 'angular typeface'.

### *3.2.3 Procedure*

The procedure that will be used can best be related to an experiment. The participants will be exposed to a chatbot that will give them banking advice. In the experiment, participants will be exposed to a video of a conversation between a chatbot and them in a banking context. This experiment will have a two x two structure, meaning that participants will be randomly assigned to one of the four conditions. Because, as mentioned before, two aspects will be manipulated.

The first manipulation will be the perceived risk in the conversation; the first group will be exposed to a conversation in which the perceived risk is low, and the second group will be exposed to a conversation in which the perceived risk is high. In line with the pre-test

outcomes, the conversation in which the perceived risk is high (credence) will contain a chatbot helping a customer opening a bank account. To open this new bank account, the customer must share personal (privacy-sensitive) details with the chatbot. The conversation in which the perceived risk is low (search) will contain a chatbot helping the customer make an insurance appointment at the local bank.

The second manipulation will be regarding curved vs angular typefaces, with one conversation shown in curved typeface (Dongle) and the other in angular typeface (Smooch Sans). Visual representations of the conversation can be found in figures 3-6, in the form of screenshots of the video that will be shown. To prevent confounding, the chatbot environment and text will be as neutral as possible. The final version of the chatbot conversation and introduction text can be found in appendix 3. Afterwards, the participants will be asked to fill in the survey (questions that will be asked in this survey can be found in appendix 4 and will be elaborated on later on).

Figure 3

*Banko conversation credence and angular*

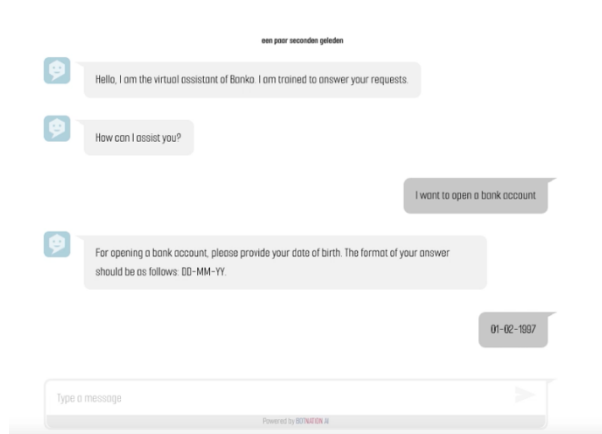


Figure 4

*Banko conversation credence and curved*

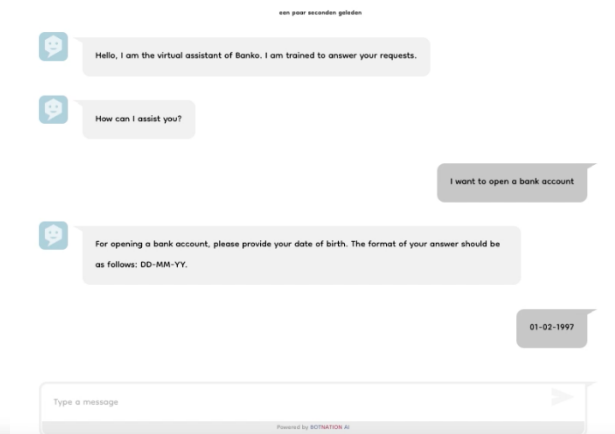


Figure 5

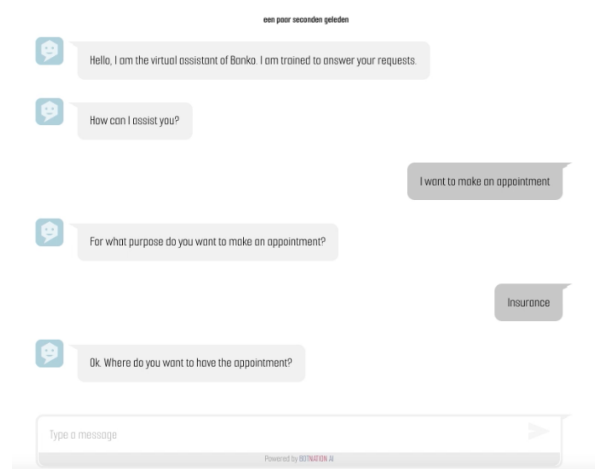
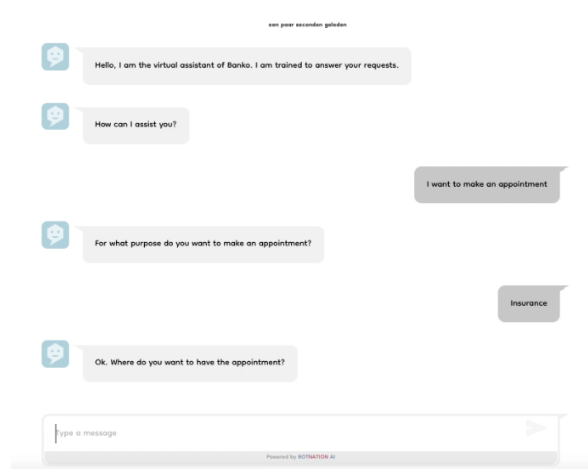
*Banko conversation search and angular*

Figure 6

*Banko conversation search and curved*

### 3.3 Analyses settings and methods

Multiple software tools will be used in this research. The different software tools are shown in the table below.

Table 1

*Software tools*

Software	Use	Source
Botnation	Botnation will be used to construct a true-to-real chatbot conversation that will be shown to the participants.	( <i>Botnation.ai</i> , n.d.)
SPSS IBM v. 25	SPSS is a statistical analytics program that is used for conducting research analyses.	( <i>IBM SPSS statistics</i> 25, n.d.)
PROCESS <sup>1</sup>	PROCESS is a software program that allows to estimate moderated mediation models.	(Hayes, 2012)
Qualtrics	Qualtrics allows to create and share surveys.	( <i>Qualtrics Online Survey Tool</i> , n.d.)

<sup>1</sup> PROCESS is a software program that allows to specify models and estimate mediated and moderated effects. Moreover, PROCESS makes it possible to add any number of predictor variables in a linear equation model (Hayes, 2012). PROCESS can be accessed via IBM SPSS.



### 3.4 Sample size main experiment

The sample size needed to conduct the main experiment will be determined using the amounts suggested by Hair et al. (2017). They stated that there should be at least 15-20 observations for each variable. The adequate number of observations is 30 per variable, meaning that for this research, a total of 300 observations is needed to become adequate.

The population of this research are persons  $\geq 18$  years. To reach this population, convenience sampling will be used. Convenience sampling is a non-probability sampling technique which considers the population at hand. Even though this technique is limited because external validity is not promoted (Field, 2017), convenience sampling is inexpensive, practical and easy to collect data.

The results show that 324 respondents successfully finished the survey. 49.1% of the population identified themselves as male, 50.3% as female, and .6% identified themselves as 'other' (nor male, nor female). The age varied between 18 and 84; 46% of the respondents were 24 years or younger, and 54% were older than 24 years old. The average age of the respondents was 26.9. 7.7% of the respondents stated that they had never interacted with a chatbot before. The majority (30.6%) of the population stated that they interacted with a chatbot 4-9 times in the past, and 25% of the population interacted with a chatbot  $>15$  times in the past.

One hundred fifty-four people were shown the video of the conversation within the search context, of which 74 people viewed the conversation with the curved typeface and 80 with the angular typeface. One hundred seventy respondents were shown the video of the interaction with the chatbot in the credence context, of which 85 people saw the conversation in curved typeface and 85 people in the angular typeface. An overview of the sample analysis per condition (search/angular, search/curved, credence/angular, credence/curved) can be found in table 2.

Table 2

*Sample analysis per condition*

Condition	N	Mean Age	Gender		
			Male	Female	Other
<b>Curved+Credence</b>	85	27.6	38 (44.7%)	46 (54.1%)	1 (1.2%)
<b>Curved+Search</b>	74	25.85	36 (55.3%)	37 (50%)	1 (1.4%)
<b>Angular+Credence</b>	85	28.94	47 (55.3%)	38 (44.7%)	-
<b>Angular+Search</b>	80	25.31	38 (47.5%)	42 (52.5%)	-
<b>Total</b>	324	26.9	159 (49.1%)	163 (50.3%)	2 (0.6%)

#### 3.4.1 Operationalization of the main model:

This section will discuss the operationalization of the concepts as presented in the conceptual model. In appendix 4, a table can be found with the different scales and corresponding measurement levels.

##### 3.4.1.1 Hedonic experience

Hedonic experience will be measured through the scale introduced by Voss et al. (2003). Participants will have to answer the questions on a 7-point semantic scale (*Not fun – Fun, Dull – Exciting, Not delightful – Delightful, Not thrilling – Thrilling, Enjoyable – Unenjoyable*).

##### 3.4.1.2 Perceived warmth

The concept of perceived warmth will be measured using a six-item warmth scale introduced by Fiske (2018). The six items that they introduced are trustworthy, well-intentioned, good, truthful, unbiased, and honest as items. The item trustworthy will be excluded from the six-item scale to minimize the confounding effects attributed to trustworthiness. The remaining five items will be measured on a seven-point Likert Scale (1= “does not apply at all”; 7= “applies fully”).

The questions that could be asked for measuring warmth could be:

*“I felt like the message of the chatbot was warm.”*

*“I felt like the chatbot was friendly.”*

*“I liked the chatbot.”*

*“I felt like the chatbot was sincere during our interaction.”*

#### *3.4.1.3 Trust*

The trustworthiness of the chatbot will be measured using a 7-point Likert Scale (1= “does not apply at all”; 7= “applies fully”) using the following items: sincerity, truthfulness, honesty, credibility, reliability, and overall trust in the chatbot, as introduced by Toader et al. (2019).

Questions that could be asked for measuring trust could be:

*“The chatbot seemed sincere during our interaction.”*

*“I felt that the chatbot was honest in our interaction.”*

*“I believe that the chatbot was truthful when conversing with me.”*

*“I believe that the chatbot was credible during our conversation.”*

#### *3.1.4.4 Perceived Risk*

The perceived risk will be measured using the SEC-scale (5-point scale) (Girard & Dion, 2010).

*“How risky do you feel it would be for you to interact with this chatbot?”*

*“How risky do you find the content of the interaction?”*

### *3.4.2 Operationalization of the control variables*

#### *3.4.2.1 Age*

Age will be measured using a median split on interval measurement level.

*“What is your age?”*

#### *3.4.2.2 Gender*

Gender will be measured on a nominal level; participants will be asked if they identify as male, female or other.

*“With what gender do you identify yourself most?”*

#### 3.4.2.3 Educational level

The educational level of the participants will be measured by asking them their highest finished education (*Primary school/ secondary school/ college (MBO)/ university of applied sciences (HBO)/ university bachelor/ university master/ PhD*).

#### 3.4.2.4 Level of English language

The level of English language will be measured on a CEFR scale. Participants can identify themselves as *Basic user/ independent user/ proficient user*

#### 3.4.2.5 Curvature preference

The curvature preference will be measured by showing participants the typefaces shown in figure 7. Velasco et al. presented the measurement in 2015. Participants are asked to identify the typeface that looks most attractive to them. “*Which of the following typefaces looks more attractive to you?*”.

Figure 7

*Curvature preference typefaces*



#### 3.4.2.6 Attitude towards technology/chatbots

Attitude towards technology/chatbots will be measured using a 7-point Likert Scale on interval level as derived from Davis (1989), (1= “does not apply at all”; 7= “applies fully”).

*“I prefer to encounter services digitally rather than face to face.”*

#### 3.4.2.7 Previous experience with chatbots

The previous experience will be measured on a nominal level (Ashfaq et al., 2020). The participants will be asked if they have had previous experience with chatbots; the question can be answered by ‘yes’, ‘no’ or ‘I do not know’.

The question that could be asked is:

*“Have you ever been served by a conversational agent in the past?”* And if yes, *“How often?”*

#### 3.4.2.8 Mood (before and after)

Mood will be measured both before and after the experiment by letting participants rate their mood on a 5-point Likert scale as presented by Peterson & Sauber (1983) (Extremely negative - Extremely positive).

### 3.5 Methodology section of the systematic literature review

Before developing the conceptual model, the literature was structured coherently, understandable, and verifiable. This was done by conducting a systematic literature review (SLR). This SLR was conducted in a group of four MBA students who pursue similar research goals. In this section, the phases of this SLR will be further elaborated on.

To start with the SLR, the team gathered and shared their leading questions alongside the relevant keywords. After the first meeting, there was a mutual understanding of the different research questions and key subjects. The relevant keywords were *Customer Experience*, *Font Style*, *Typeface*, *Text-based chatbots*, and *Conversational Agents*. After the team had decided on the important keywords, a suitable search engine was chosen. The platform that was chosen was Scopus, because Scopus provides access to high-quality papers and has the world's largest abstract peer-reviewed database in the relevant subject field of social science (Enago, 2021).

After the research questions were aligned, the key terms were decided upon; the team decided on fitting search terms, combined with appropriate operators and created a query, the final query can be found in appendix 5.

Scopus found a total of 618 articles that matched the query. Afterwards, these articles needed to be rated to check if they were suitable for the chosen research questions; inclusion and exclusion criteria needed to be established. These inclusion and exclusion criteria can be found in appendix 5.

The Scopus file was distributed in a google spreadsheet, and the team was divided into two groups (group A and group B), each consisting of two members. Group A (individually) reviewed the first 309 articles and included or excluded them based on the article's title, keywords, and abstract, using the inclusion and exclusion criteria. The same holds for Group B; they also (individually) reviewed the remaining articles and included or excluded them based on the criteria.

After all members reviewed the articles, the intercoder reliability was evaluated using Cohen's Kappa (Landis & Koch, 1977). The overall intercoder reliability can be labelled as

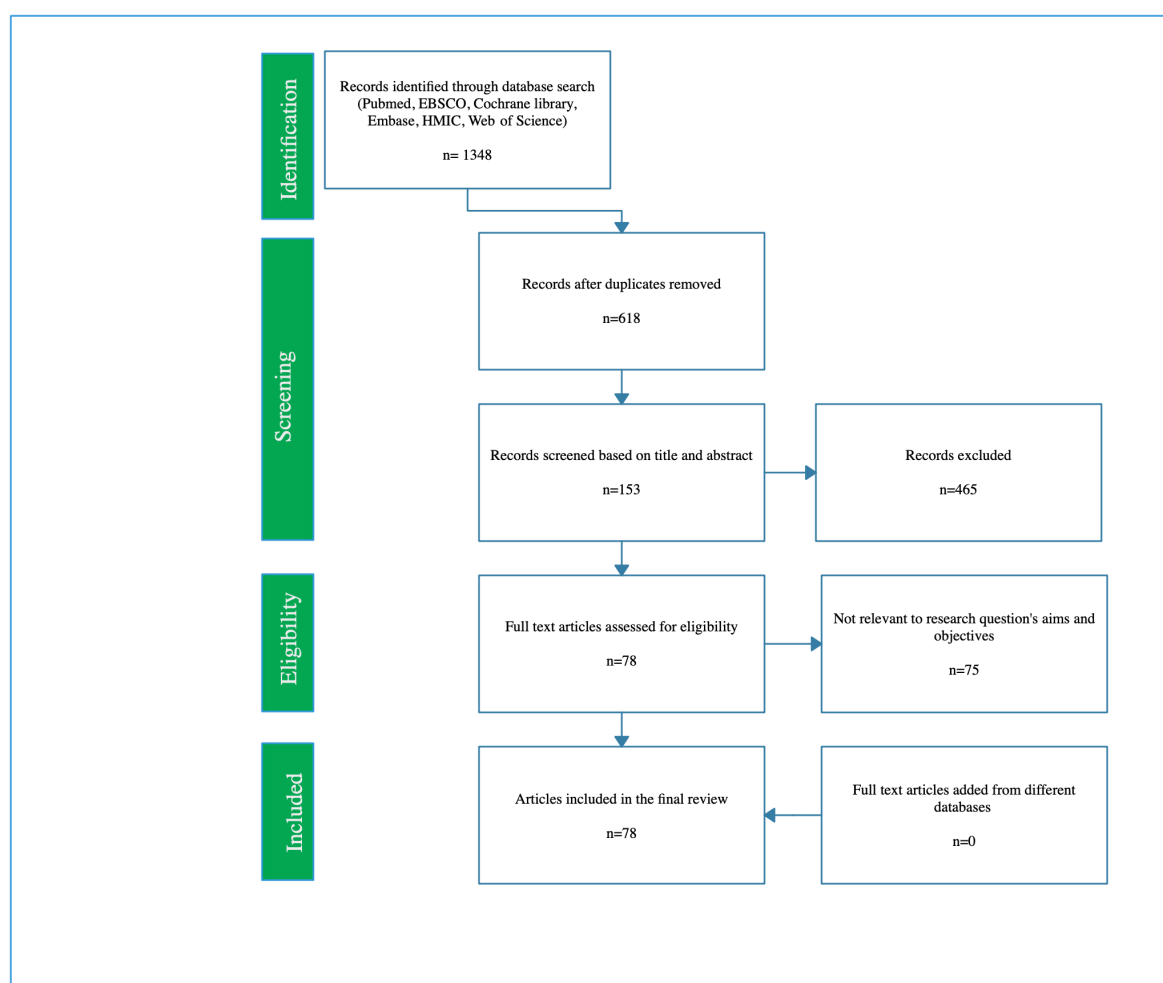
‘substantial agreement’ for both groups A and group B. A calculation of the intercoder reliability can be found in appendix 6. In group A total of 25 articles were differently included or excluded; this was the case for 23 articles in group B. After the misalignment between the different coders was corrected, the team began with their second screening.

After the first screening, a total of 465 articles were excluded. This means that a total of 153 relevant articles were left. These 153 articles were then individually reviewed based on the article’s introduction and discussion. The same inclusion and exclusion criteria were used for the second screening. The process resulted in the inclusion of 78 articles in total.

The systematic literature process is recapitulated in the Prisma flow diagram as presented below.

Figure 8

*Prisma flow diagram*



### 3.6 Data preparation and cleaning

#### 3.6.1 Checking data matrix

After enough respondents were gathered, the data was converted from Qualtrics to SPSS, and the missing scores were checked via descriptive analysis. Checking these values will ensure that no systematic errors in the survey will potentially affect the internal validity (Field, 2017). A total of 426 people responded to the online survey. Three responses were removed because they were completed from the 'Preview' mode. Seven respondents did not agree to participate in the survey after reading the conditions. Additionally, another 92 respondents were removed due to non-response. Altogether, 324 respondents were valid and complete.

#### 3.6.2 Missing values

A missing values analysis was conducted to determine where missing values can be assigned. The results show that throughout the survey, more participants decided to stop participating. This could imply that the survey was too long. To a large extent, the missing values can be assigned to the length of the survey. However, most of the missing values can be assigned to participants opening the survey, but closing it before filling in a single question.

#### 3.6.3 Manipulation check

A manipulation check on perceived risk was conducted using an independent samples t-test. A non-significant Levene's test on equal variances not assumed ( $p < .05$ ) showed that the participants indeed found the search scenario not risky and the credence scenario risky.

#### 3.6.4 Exploratory factor analyses

After excluding the missing values and checking the manipulation, an exploratory factor analysis (EFA) was conducted to confirm that the selected items appropriately measure the variables. EFA will help increase the internal consistency by matching the correct items with the variables (Field, 2017).

Before conducting the EFA, several assumptions were tested. The sample size is adequate to conduct an EFA; 324 people validly responded, whereas 100 are needed to perform the EFA. Since there was a total of 12 questions, 120 respondents were needed to meet the threshold of 5-10 participants per question, which is the case. The KMO is 0.836, which exceeds the threshold of 0.6, proving the adequacy of the sample size. Barlett's test of sphericity was statistically significant ( $<.05$ ), supporting the assumption that sufficient

correlations exist between the variables to proceed with the analysis. All questions had an extraction above .3, meaning that no problems are expected with any particular question.

Outcomes showed that using four factors was most appropriate to explain the total variance (eigenvalue > 1). Using three factors will explain 68.08% of the total variance. The Principal Component Analysis was used to extract the factors; oblique was selected as the rotation method in the Pattern matrix. Given that the sample size is 324, loadings are significant if they are above .30, but ideally, .35. The loadings of all items are shown in table 3.

Table 3

*Item loadings*

Items	Perceived warmth	Perceived risk	Trust
Warmth_1	0.884		
Warmth_2	0.866		
Warmth_3	0.808		
Warmth_4	0.694		
Risk2_1		0.734	
Risk1		0.614	
Risk2_4		0.535	
Risk2_3		0.520	
Risk2_2		0.506	
Trust_2			0.951
Trust_1			0.894
Trust_3			0.814

### 3.6.5 Reliability analyses

Afterwards, the reliability analysis was conducted. The reliability analysis determines the degree of internal consistency using Cronbach's Alpha. Besides, it determines if the elimination of certain items will increase the Cronbach's Alpha by at least >.05 (Field, 2017). According to the output, the scale used to measure perceived warmth demonstrates a high or 'very good' Cronbach's Alpha = .893. The 'Cronbach's Alpha if item Deleted' will be lower for all items. The Cronbach's Alpha for trust can be labelled as 'excellent' =.919. Deleting the 'Trust\_3' will lead to a significant increase in the Cronbach's Alpha =.926.



However, the Cronbach's Alpha increase does not outweigh the lost meaning by excluding the variable. Lastly, the Cronbach's Alpha for Perceived risk is 'good' =.716; deleting any item will not increase the Cronbach's Alpha.

### 3.6.6 Dummy variables

To start with the main analyses, some dummy variables had to be created since multiple control variables contained more than two levels. Dummy variables were created for '*Educational level*', '*Past Experience*', and '*Level of English language*'.

## 3.7 Research ethics

Regarding research ethics, the integrity principles proposed by the Dutch Code of Conduct for Scientific Research (2018) will be honoured. These integrity principles consist of honesty, scrupulousness, transparency, independence, and responsibility (KNAW et al., 2018). In this part, each of the principles will be discussed.

**Honesty** will be obtained by correctly referring to previous research. Previous research will be taken seriously. The findings of previous literature will not be misused or refrained differently so that the results will not be presented as more favourably or unfavourably than they actually are.

**Scrupulousness** is assured. The research will be reported aligning with the norms and rules set by the scientific community. These norms and rules regard referring in the official American Psychology Association (APA) style, whereby the source will be referred to so the authorship will be acknowledged. Besides, the presented research design includes a mediated moderation model and will be measured via the corresponding analysis procedures as verified in the academic context.

**Transparency** is established by guaranteeing the participants that their input remains confidential and anonymous. The participants needed to agree to conditions of sharing their data before the start of the survey. Also, the way that the gathered data is processed, used, and finally interpreted is displayed step by step in the methodology section.

**Independence** is achieved because there is no conflict of interest by third parties. After all, this research will be solely performed for the research institution of Radboud University.

**Responsibility** has been taken into account; the SLR helped to expand the knowledge about computer science and psychology that normally is missing in a business student. Also,

the conducted research is scientifically and societally relevant in that chatbots will become increasingly important in modern-day life; therefore, creating a valuable customer experience is important for both scientific and social reasons.

Moreover, to further align with these principles, the participants will be informed of the research goal and can withdraw from participation at any time. Additionally, no minors will be taking part in the experiment.

## 4. Results

### 4.1 Assumptions testing

Before conducting the main tests, the associated assumptions per analysis were assessed. After minor adjustments were made, all assumptions were met. An elaboration on these assumptions and the decisions that were made can be found in the appendices. The assumptions for hypothesis 1a can be found in appendix 7, for hypothesis 1b in appendix 8, for hypothesis 2 in appendix 9, for hypothesis 3a in appendix 10, for hypothesis 3b in appendix 11, and for hypothesis 3c in appendix 12.

### 4.2 Main tests

#### 4.2.1 The effect of curvature on perceived warmth

H1a: The use of curved typefaces in chatbots will increase the perceived warmth more than when making use of angular typefaces.

Results show that no significant relationship exists between curvature and perceived warmth  $F(1, 323) = .459, p = .498$ . Also, no significant relationship was found between curvature and typeface in both specific contexts, nor in the search context ( $F(1, 152) = .052, p = .821$ ), nor in the credence context ( $F(1, 168) = .620, p = .432$ ). Thus, adjusting the curvature in typefaces does not significantly influence the perceived warmth. Therefore, hypothesis 1a must be rejected.

#### 4.2.2 Perceived warmth as indicator for trust

H1b: *An increased feeling of warmth towards the chatbot, will increase the trust in the chatbot.*

Trust can be characterized by a medium effect size  $R^2 = .385$ . Outcomes show that there is a significant relationship between perceived warmth and trust,  $F(1, 322) = 198.286, p < .05$ , with  $B = -.092$ . Additionally, results show that this relationship is slightly stronger in the search context ( $F(1, 152) = 99.61, p < .00$ ),  $R^2 = .396, B = -.097$ ), in comparison to the credence context ( $F(1, 168) = 91.56, p < .00$ ),  $R^2 = .353, B = -.085$ ). Thus, higher levels of perceived warmth will lead to a decrease in trust. This means that perceived warmth significantly predicts trust, but will not increase the trust and therefore, hypotheses 1b is not supported.

### 4.2.3 Curvature in typeface as indicator for trust

*H2: Curvature in typeface will (in) directly influence the customer trust*

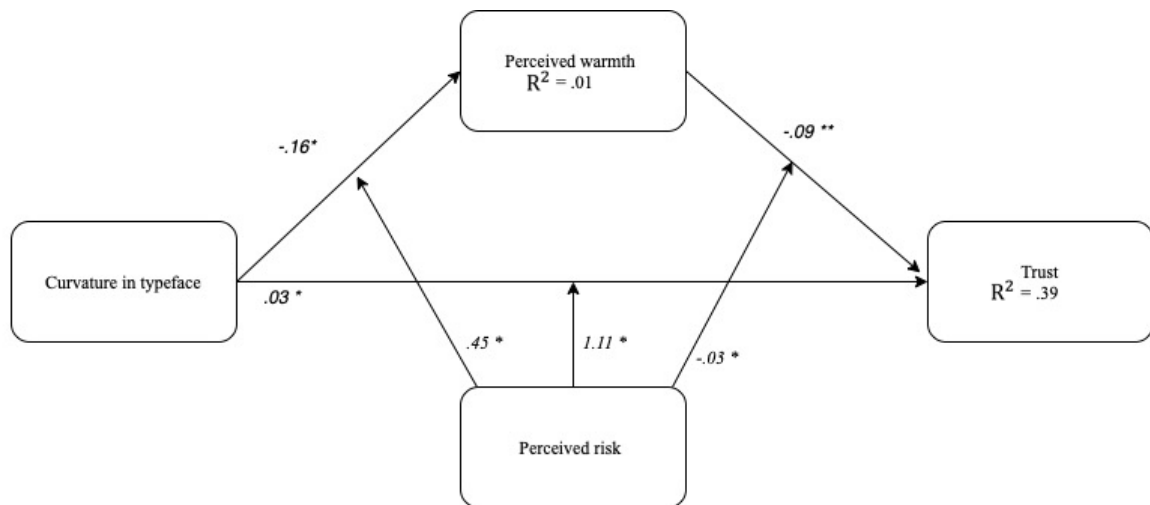
This research expects that the long way specific indirect effect of curvature on trust best explains the relationship between X and Y, rather than the direct relationship between X and Y.

The results show no significant direct relationship between curvature and trust,  $F(1, 322) = 2.374, p = .16$ . Moreover, no significant indirect relationship was found between curvature and trust through perceived warmth,  $Ind = -.01, SE = .03, 95\% [-.06, .04]$ .

No significant relationships were found between curvature in typefaces and trust, nor in the credence setting  $F(1, 168) = .212, p = .645$ , nor in the search setting  $F(1, 152) = 3.126, p = .079$ . Data shows that curvature in typefaces does not significantly influence trust, nor directly, nor indirectly. Thus, hypothesis 2 must be rejected.

Figure 9

*Results: Mediated moderation model*



Symbol Meaning:  $*$  =  $p > .05$ ,  $**$  =  $p < .05$

Table 4

*Output mediated moderation analyses without covariates*

	B	SE (HC0)	t	p
Predictors				
Outcome: Perceived warmth ( $R^2 = .01$ ) (H1a)	<b>(-).16</b>	.21	(-).77	.44
Outcome: Trust ( $R^2 = .39$ ) (H1b)	<b>(-).09</b>	.01	(-)14.04	.00
Outcome: Trust ( $R^2 = .39$ ) (H2)	<b>.03</b>	.02	1.42	.16
Indirect effect on trust	<b>B</b>	<b>BootSE</b>	<b>95% CI</b>	
Ind ( $x > m > y$ )	<b>(-).01</b>	.03	[-.06, .04]	

#### 4.2.4 The moderating effect of perceived risk

H3a: Perceived risk will moderate the relationship between curvature in typeface and perceived warmth.

The interaction effect of curvature and perceived risk on perceived warmth showed a non-significant result,  $F(1, 324) = .13, p = .72$ . Meaning that perceived risk does not significantly influence the relationship between curvature in typeface and perceived warmth. For this reason, hypothesis 3a must be rejected.

H3b: Perceived risk will moderate the relationship between curvature in typeface and trust.

The interaction effect of curvature in typeface and perceived risk on trust, showed a non-significant result,  $F(1, 323) = 1.11, p = .29$ . It can therefore be concluded that perceived risk

does not significantly moderate the relationship between curvature in typeface and trust, so hypotheses 3b must be rejected.

H3c: Perceived risk will moderate the relationship between perceived warmth and trust.

No significant interaction effect was found between perceived warmth and perceived risk on trust,  $F(3, 320) = 67.62, p = .332$ . Thus, perceived risk does not significantly moderate the relationship between perceived warmth and trust. Hypothesis 3c must therefore be rejected.

Table 5

*Overview hypotheses*

Hypothesis	Supported / not supported
<i>H1a</i> : The use of curved typefaces in chatbots will increase the perceived warmth more than when making use of angular typefaces.	Not supported
<i>H1b</i> : An increased feeling of warmth towards the chatbot, will increase the trust in the chatbot.	Not supported
<i>H2</i> : Curvature in typeface will (in) directly influence the customer trust.	Not supported
<i>H3a</i> : Perceived risk will moderate the relationship between curvature in typeface and perceived warmth.	Not supported

<i>H3b</i> : Perceived risk will moderate the relationship between curvature in typeface and trust.	Not supported
<i>H3c</i> : Perceived risk will moderate the relationship between perceived warmth and trust.	Not supported

### 4.3 Post hoc analyses

This research supports the relationship between perceived warmth and trust. However, to eliminate the risk that this significant relationship exists due to confounding covariates, the effect of these covariates on trust will be tested.

Outcomes of the analyses of the covariates show that ‘attitude towards technology / chatbots’ significantly predicts the trust customers have in a chatbot,  $B = -.013$ ,  $t(-2.228)$ ,  $p < .05$  (see table 7). Meaning that an increase in the attitude customers have towards technology/chatbots will lead to a decrease in their trust in the chatbot. Perhaps the attitude towards technology/chatbots further explains the relationship between perceived warmth and trust. As beforementioned perceived warmth is a significant predictor of trust ( $F(1, 322) = 198.286$ ,  $p < .05$ , with  $B = -.092$ ). However, results show that perceived warmth, with an  $R^2$  of .385, is a statistically better predictor than the attitude towards technology/chatbots with an  $R^2$  of .108. This means that perceived warmth predicts trust more than the attitude towards technology/chatbots does. Also, a significant relationship between mood before and trust was found,  $B = .02$ ,  $t(1.64)$ ,  $p < .05$ , with an  $R^2$  of .175, meaning that an increase in the mood before the chatbot interaction, will lead to more trust. Even though mood before thus is a predictor for trust, the  $R^2$  shows that perceived warmth predicts trust more than mood before does. All other covariates do not significantly predict trust (see table 6).

Table 6

*Output mediated moderation analyses with covariates*

	B	SE (HC0)	t	p
Predictors				
Outcome: Perceived warmth ( $R^2 = .18$ )				
Curvature ( <i>H1a</i> )	<b>(-) .01</b>	.19	(-).07	.94
Attitude	<b>.31</b>	.04	7.08	.00
Mood before	<b>.30</b>	.10	3.04	.03
Previous experience	<b>(-) .03</b>	.06	(-).60	.55
Age	<b>(-) .00</b>	.00	(-).34	.74
Gender	<b>(-) .16</b>	.14	(-)1.14	.25
Educational level	<b>(-) .00</b>	.06	(-).06	.95
English level	<b>(-) .04</b>	.13	(-).30	.77
Curvature preference	<b>(-) .46</b>	.63	(-).73	.46
Outcome: Trust ( $R^2 = .39$ )				
Curvature ( <i>H2</i> )	<b>.02</b>	.02	1.27	.21
Perceived warmth ( <i>H1b</i> )	<b>(-) .08</b>	.01	(-)11.83	.00
Attitude	<b>(-) .01</b>	.01	(-)2.23	.03
Mood before	<b>.02</b>	.01	1.64	.01
Previous experience	<b>(-) .01</b>	.01	(-)1.29	.20
Age	<b>.00</b>	.00	.63	.53
Gender	<b>.00</b>	.02	.06	.95
Educational level	<b>.01</b>	.01	1.53	.13
English level	<b>(-) .04</b>	.02	(-)2.63	.10
Curvature preference	<b>.03</b>	.08	.37	.71
Indirect effect on trust				
Ind ( $x > m > y$ )	<b>(-) .02</b>	<b>BootSE</b> .03	<b>95% CI</b> [-.06, .03]	



#### 4.4 Ad hoc analyses

This research does not statistically support the (in) direct relationships between curvature in typeface and trust. Nevertheless, several variables were tested in a chatbot context. In this part, potential other relationships will be unravelled.

##### 4.4.1 Unravelling the effect of perceived risk

In this research, perceived risk was seen as a moderator. No moderation effects were found. However, perceived risk did significantly affect trust. A significant relationship was found between perceived risk and trust  $F(1, 322) = 33.273, p < .05, B = .082$ , with an  $R^2$  of .094. Meaning that higher levels of perceived risk will lead to an increase in trust.

##### 4.4.2 Unravelling the effect chatbot communication has on customer's mood

To test if a customer's mood is affected by communicating with a chatbot, the mood before as well as after the chatbot conversation. An independent samples T-test showed a significant Levene's test on equal variances assumes ( $p < .05$ ). Meaning that no significant differences were found between the mood before communicating with the chatbot and after communicating with the chatbot.

## 5. Discussion

### 5.1 Key contributions

The key contributions of this research are: (1) altering the curvature in typefaces will not (in)directly affect the trust in the chatbot, as well as that altering the curvature in typefaces will not directly affect the perceived warmth experienced by the customer. Evidence was found that when altering the perceived warmth in a chatbot, this will lead to lower levels of trust in the chatbot (2). The trust in chatbots, is affected by the perceived risk a customer experiences during the conversation (3), and (4) a customers' mood before conversating with a chatbot, as well as their attitude towards chatbots/technology will influence the trust in the chatbot.

#### 5.1.1 Theoretical contributions

Although several previous papers state that using curved typefaces will increase the perceived warmth customers experience (Agustin & Singh, 2005; Candello et al., 2017; Chou, 2015; Kettle & Häubl, 2011; Ren et al., 2018; Schroll et al., 2018; Tassiello, Viglia, & Mattila, 2018), this research provides evidence that (1) in the presented chatbot conversation, this is not the case, nor in a service setting where the perceived risk is low nor in a service setting where the perceived risk is high. This finding can contribute to the existing literature on chatbots, in a sense that further investigation of the effect of specifically curved vs angular typefaces at this point does not provide more information on how to influence the customer experience.

Regarding the second contribution, (2) the  $R^2$  of the dependent variable was moderate, meaning that the data had explained a moderate amount of variance. Evidence was found that perceived warmth does, in fact, significantly influence the trust in a chatbot. However, as opposed to what previous papers (Ehrke et al., 2020; Choi et al., 2016; Kim et al., 2018) state, perceived warmth will negatively influence a customer's trust in the chatbot. Altering the warmth in the chatbot will, therefore, only lead to lower levels of trust in the chatbot.

Although the third contribution does not derive from the presented conceptual model, a conclusion can be drawn on the effect of perceived risk. The third contribution, (3) namely, states that perceived risk plays a role in the customer experience. In a situation where the perceived risk is higher, customers will experience more perceived trust, as opposed to a situation where the perceived risk is lower. Notwithstanding, several studies have already

focused on perceived risk and trust in a banking context and found that banks should lower their perceived risk to earn trust from their customer (Littler & Melanthiou, 2006; Martins et al., 2014; Namahoot & Laohavichien, 2018; Zhao et al., 2010), this research shows contradicting results. Moreover, this research provides evidence for the influence of perceived risk on customer's trust while communicating with a chatbot. This contributes to the existing literature because it shows that earlier proven relationships can contradict when the nature of the communication (the shift from online to offline) is different.

The last theoretical contribution (4) consists of the influence of a customer's mood and their attitude towards technology/chatbots on the likelihood of them experiencing trust towards a chatbot. The better the mood before communicating, the more likely a customer is to trust towards the chatbot, and the better the attitude towards technology/chatbots, the less likely the customer is to experience warmth and trust towards the chatbot. The chatbot conversation itself will not significantly influence a customer's mood.

#### 5.1.2 Managerial contributions

Pertain to the essential contributions; this research states that (1) curvature does not significantly influence trust and perceived warmth in a chatbot, (2) higher levels of perceived warmth will lead to a decrease in trust in a chatbot, (3) perceived risk will influence the perceived warmth and trust, and (4) a customer's mood and their attitude towards technology/chatbots will influence their trust.

The implication for the practical field is that a chatbot designer should not focus on, nor invest time in, changing a chatbot's typeface to create a better customer experience. This finding will not only save time, but also money; there is no need to pay for upgrades to get access to multiple typefaces, as it will not influence the customers' trust, nor its perceived warmth. Moreover, the mentioned saved time can now be used to focus on altering chatbot features that do influence the trust. One of them is trying to get the chatbot to radiate low levels of warmth, as higher levels of warmth will only lead to less trust in the chatbot.

Also, this research contributes to the practical field as it proves the influence of perceived risk. Higher levels of perceived risk will lead to higher levels of perceived warmth and trust in the chatbot. Chatbot creators can create situations where customers experience higher levels of risk.

Lastly, chatbot builders can look closely at how mood influences a customer's trust. In practice, this could mean that those chatbot builders, or more specifically website builders, can think of ways to positively influence a customer's mood before interacting with the chatbot.

## 5.2 Limitations and future work

### 5.2.1 Limitations

There are several limitations to consider for this research. The first limitations regard the experimental setting. Firstly, the non-significant (direct and indirect) results of curvature on the specific customer experience can be because the typefaces as used in the experiment are neither extremely curved nor extremely angular. The choice was made to use typefaces that are likely to be implemented in a chatbot. Extremely curved or angular typefaces could have created a situation in which the experiment felt further away from reality. However, it must be considered that the typefaces used in the experiment may not have been different enough to get significant results.

Also, the main questionnaire lacked the 'typeface manipulation check', meaning that it was not tested if participants who were shown the curved typeface also experienced the typeface as being curved and vice versa for the angular typefaces. One can, therefore, not be sure if participants understood what was manipulated in the experiment.

Furthermore, although a considerable number of participants took part in the experiment, this research contains a 2x2 structure. Therefore, the number of participants per condition is questionable. A higher number of participants per condition could have led to data that would have supported the suggested model.

Additionally, critical light must be shed to the video that was shown to the participants. Although it was considered that showing participants a video of a chatbot conversation will be the closest possible to reality with the available means, a real interaction with a chatbot would have been even closer to reality. It could be that participants could not see themselves interacting with the chatbot in the way the video suggested; the questionnaire lacked the question to test if this was indeed the case. In that sense, a real conversation with a chatbot would have been more reliable.

Another experimental limitation that must be considered is the effect that the environment of the chatbot may have had. The environment of 'Botnation' was made as neutral as possible. However, 'Banko' did have an avatar, and this avatar may have been of influence on the participants 'customer experience'. Also, the video showed 'type a message'

at the bottom, where customers normally would have typed a message to the chatbot. Notwithstanding, the instructions mentioned that participants would not be able to actually type a message. It may have occurred that participants tried to type a message to the chatbot, and their behaviour and feelings were influenced because they could not type a message.

Other limitations regard analyses in PROCESS. One of the disadvantages of PROCESS is that the estimation procedure is solely based on the observed variables. Since the latent variables are not included, the measurement error in the estimation process is less profound (Hayes, 2012)

### 5.2.2 Future work

Firstly, one could consider researching how this specific model would hold up between different industries. Notwithstanding, the model in the presented banking industry is not holding up; it could be that this model will be holding up in other industries. Namely, previous research reports have already shown different valuations of specific hedonic experiences between industries (Babin et al., 1994; Khedhaouria & Beldi, 2014). Additionally, since cultural aspects determine the likelihood of feeling perceived warmth and trust (Costa et al., 2001; Wright & Ehnert, 2010), one could research the presented model among different countries.

Secondly, the feeling of perceived warmth or trust can be experienced hours, days or even weeks after the interaction took place (Bargh & Shalev, 2012). It could be that customers do feel the predicted warmth and trust towards a chatbot, but these feelings occur after time has passed. To get a deeper understanding of the effects of the chatbot interaction, future research can focus on the long-term effects of this chatbot interaction.

Thirdly, future work can focus more on the role of perceived risk in the chatbot interaction. Although the gathered data in this research does not support the presented model, evidence was found that perceived risk plays a role in the customer experience. This could be interesting for future research; how can companies influence this perceived risk to make it beneficial for the customer experience (trust)? Additionally, a negative relationship was found between perceived warmth and trust (in the specific banking context); a closer light can be shed on how to lower the perceived warmth in the chatbot interaction to gain trust in the chatbot.

Moreover, a significant relationship was found between a customer's mood before interacting with the chatbot, and the and trust. A better understanding of how companies can

influence the mood of customers before the chatbot interaction could be an interesting field of research.

Lastly, as mentioned before, for this research, the choice was made not to use extreme forms of curved vs angular typefaces. Future work may consider using extreme curved and extreme angular typefaces to research the effect on the customer experience. Also, other elements of the typeface (i.e. colour, boldness, italic) can be considered to see their effect on the customer experience.

### 5.3 Conclusion

Chatbots are becoming an increasingly important way to interact with customers. Nowadays, these chatbots in the service industry are mostly associated with practical, utilitarian experiences. This practical view of chatbots in the service industry underestimates the power of hedonic experiences in the service sector. This research tried to tie the power of curvature in typefaces and the hedonic experience by testing the effect curvature in typefaces on trust directly and indirectly, via perceived warmth. Additionally, this research tested if perceived risk played a moderating role in these relationships. The results, however, do not support the proposed relationship of curvature in typeface on perceived warmth as a specific hedonic experience, nor did the results support the proposed relationship of curvature in typeface on trust as a specific customer experience outcome.

Moreover, no evidence was found of the moderating role of perceived risk on any of the relationships. Results did provide evidence for the relationship between perceived warmth and trust. Even though it was expected that perceived warmth positively influence trust, it was proven that this relationship existed oppositely. Higher levels of perceived warmth will lead to lower levels of trust.

To return to the research question:

*‘To what extent do curvature vs angular typefaces used in chatbots in a banking context influence the perceived warmth of the chatbot, creating a meaningful hedonic customer experience, and eventually lead to increased trust in the chatbot?’*

It can be concluded that curvature in typefaces does not significantly influence the perceived warmth of the chatbot, and it does not influence the trust in the chatbot, nor directly nor indirectly.

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# Appendix

## Appendix 1

Scenario's and chat flows pre-test perceived risk

### Introduction:

*In the following experiment, you will be shown two chatbot conversations between a bank (messages on the left side of the chat) and a client (messages on the right side of the text). A chatbot is a form of artificial intelligence (AI) that simulates human conversation through a live chat interface. It offers self-service solutions based on the information it receives.*

*In the experiment, you will be shown two videos of a chatbot conversation between you and the fictitious bank 'Banko'. Before each video, a short introduction that explains the context of the conversation will be shown. After each video, a set of questions will be asked. Please look at the videos carefully, since you need them to answer the questions.*

### Scenario 1 (high perceived risk)

*Imagine that you have just moved to another country; you need to open a new bank account with a local bank in order to pay for day-to-day life. You have explored your options online and found a bank where you can quickly open a bank account through a text chatbot. In this conversation, the chatbot will ask for some personal details including your date of birth and your phone number. Also, you will have to upload a copy of your identification document (e.g., passport, ID-card) and a picture of yourself that clearly shows your face. Afterward, you will be directed to the mobile application of the bank to sign some documents and finish the application for your account. Once the application is finished and accepted, you will receive a confirmation message with your account details and when you will receive your card.*

### Chatflow 1 - Scenario 1:

<b>Banko</b>	Hello, I am the virtual assistant of Banko. I am trained to answer your requests. How can I assist you?
<b>Customer</b>	I want to open a bank account.

<b>Banko</b>	For opening a bank account, please provide your date of birth. The format of your answer should be as follows: DD-MM-YY.
<b>Customer</b>	01-02-1997
<b>Banko</b>	According to your age, you are eligible for opening a bank account. Please provide your phone number. The format of your answer should be as follows: +00 6 012345678
<b>Customer</b>	+31 6 23722845
<b>Banko</b>	A registration link has been sent to your phone number. Enter the 8 digits you have received. The format of your answer should be as follows: 0000 0000
<b>Customer</b>	1920 2816
<b>Banko</b>	To proceed with your application, please upload a copy of your identification (passport or ID-card).
<b>Customer</b>	<i>Copy of identification</i>
<b>Banko</b>	Now please upload a photo of your face to complete verification.
<b>Customer</b>	<i>Photo of face</i>
<b>Banko</b>	You are verified. Please use the following link to download our mobile application or go to the App Store / Google Play Store. Sign up in your application with the following activation code <i>1845</i> and digitally sign the documents that are presented to you. Once the registration is finished and accepted, you will receive a confirmation message with your bank account details and more information on when you will receive your card.

Do you have any other questions for me?

**Customer** No

**Banko** I hope to have informed you sufficiently. For more information visit [www.banko.nl](http://www.banko.nl)

### **Scenario 2 (low perceived risk):**

*Imagine that you are at home and you are planning to visit a bank branch because you want to talk to a representative in person about the insurance options the bank provides. You know you can book an appointment online on the date and time that you prefer. You visit the bank's website and you read that you can use a text chatbot to book an appointment. In the conversation with the chatbot, it shows you the available time slots at the branch that's in your chosen area, and asks you to choose the date and time of your preference. You will be asked to fill in your email address to confirm your appointment. Once you give the information, the chatbot confirms the appointment and sends you an email with all the details which you need to take to your appointment.*

### **Chatflow 2 - Scenario 2:**

**Banko** Hello, I am the virtual assistant of Banko. I am trained to answer your requests.  
How can I assist you?

**Customer** I want to make an appointment.

**Banko** For what purpose do you want to make an appointment?

**Customer** Insurance

**Banko** Ok. Where do you want to have the appointment?



**Customer** Nijmegen

**Banko** In the area of Nijmegen, the closest Banko branch is on Hertogstraat 16, 6511 SC Nijmegen. Here are the first three available time slots for Banko Hertogstraat:

1. May 30, 2022: 9:00-9:15
2. May 30, 2022: 11:15-11:30
3. May 31, 2022: 14:00-14:15

Please type the number of the time slot that you want to book. If you do not want to book one of these appointments, please call 0900 0028 to make an appointment.

**Customer** 2

**Banko** Your appointment is confirmed. Below you will find the details of your appointment:

Branch: Banko Hertogstraat (Hertogstraat 16, 6511 SC Nijmegen)

Time: 11:15-11:30

Representative: Mrs. Stella Griep

To receive a confirmation email, please provide your email address.

**Customer** karel.willems@gmail.com

**Banko** Thank you. A confirmation email is sent to your email address. Please show this email at your appointment as verification. Do you have any other questions for me?

**Customer** No

**Banko** I hope to have informed you sufficiently. For more information visit [www.banko.nl](http://www.banko.nl)

## Appendix 2

Typefaces used in pre-test for curvature

Typeface	Sample
<i>Dongle</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Dosis</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Gayathri</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Josefin</i> sans (regular)	The quick brown fox jumps over the lazy dog.
<i>Khand</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Nunito</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Open</i> Sans (regular)	The quick brown fox jumps over the lazy dog.
<i>Poppins</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Quicksand</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Roboto</i> (regular)	The quick brown fox jumps over the lazy dog.
<i>Smooch</i> Sans (regular)	The quick brown fox jumps over the lazy dog.
<i>Varela</i> Round (regular)	The quick brown fox jumps over the lazy dog.

## Appendix 3

### Chat flows main experiment

#### Introduction

Dear respondent,

Thank you for participating in our study. We are Business Administration Master's students at Radboud University and are conducting research on chatbots and customer experience. A chatbot is a form of artificial intelligence (AI) that simulates human conversation through a live chat interface. It offers self-service solutions based on the information it receives. Your response will help us understand how people perceive chatbots. Our target audience involves people who are above 18 years old, and this is why you are asked to participate.

The survey consists of one video of a human-chatbot interaction followed by a questionnaire. The video shows a conversation between a chatbot of a fictitious bank named "Banko" (messages on the left side of the chat), and you (messages on the right side of the text). You are asked to watch the video and then answer the questions carefully. The survey will approximately take 7-10 minutes to be completed.

Please note that all data collected is confidential, will be processed anonymously, and will only be used for this research. If you feel like it, you are free to leave the survey at any time. If you have finished the survey but want to withdraw or have any other questions, please send an email to [idse.tenbrinke@ru.nl](mailto:idse.tenbrinke@ru.nl). We truly appreciate your insight and your time. Thank you in advance.

**\*\*This test includes a video that appears better on a big screen. Completing it on your laptop/PC is highly recommended. Also, please watch the videos in full screen mode.\*\***

#### Search setting:

*In this chatbot conversation, you, as a customer of Banko want to make an appointment with a bank representative. You decide to plan the appointment through the bank's chatbot. Please watch the video carefully before continuing to the questionnaire.*

**Banko**                      Hello, I am the virtual assistant of Banko. I am trained to answer your requests.

How can I assist you?

**Customer**                I want to make an appointment.

**Banko** For what purpose do you want to make an appointment?

**Customer** Insurance

**Banko** Ok. Where do you want to have the appointment?

**Customer** Nijmegen

**Banko** In the area of Nijmegen, the closest Banko branch is on Hertogstraat 16, 6511 SC Nijmegen. Here are the first three available time slots for Banko Hertogstraat:

1. May 30, 2022: 9:00-9:15
2. May 30, 2022: 11:15-11:30
3. May 31, 2022: 14:00-14:15

Please type the number of the time slot that you want to book. If you do not want to book one of these appointments, please call 0900 0028 to make an appointment.

**Customer** 2. May 30, 2022: 11:15 – 11:30

**Banko** Your appointment is confirmed. Below you will find the details of your appointment:

- Branch: Banko Hertogstraat (Hertogstraat 16, 6511 SC Nijmegen)
- Time: 11:15-11:30
- Representative: Mrs. Stella Griep

To receive a confirmation email, please provide your email address.

**Customer** karel.willems@gmail.com

**Banko** Thank you. A confirmation email is sent to your email address. Please show this email at your appointment as verification. Do you have any other questions for me?

**Customer** No

**Banko** I hope to have informed you sufficiently. For more information visit [www.banko.nl](http://www.banko.nl)

**Credence setting:**

*In this chatbot conversation, you have just moved to another country and need to open a bank account to pay for your day-to-day life. You have chosen to open an account at Banko through the bank's chatbot. Please watch the video carefully before continuing to the questionnaire.*

**Banko** Hello, I am the virtual assistant of Banko. I am trained to answer your requests.  
How can I assist you?

**Customer** I want to open a bank account.

**Banko** For opening a bank account, please provide your date of birth. The format of your answer should be as follows: DD-MM-YY.

**Customer** 01-02-1997

**Banko** According to your age, you are eligible for opening a bank account.  
Please provide your phone number. The format of your answer should be as follows: +00 6 012345678

**Customer** +31 6 23722845

<b>Banko</b>	A registration link has been sent to your phone number. Enter the 8 digits you have received. The format of your answer should be as follows: 0000 0000
<b>Customer</b>	1920 2816
<b>Banko</b>	To proceed with your application, please upload a copy of your identification (passport or ID-card).
<b>Customer</b>	<i>Copy of identification</i>
<b>Banko</b>	Now please upload a photo of your face to complete verification.
<b>Customer</b>	<i>Photo of face</i>
<b>Banko</b>	<p>You are verified. Please use the following link to download our mobile application or go to the App Store / Google Play Store. Sign up in your application with the following activation code <i>1845</i> and digitally sign the documents that are presented to you. Once the registration is finished and accepted, you will receive a confirmation message with your bank account details and more information on when you will receive your card.</p> <p>Do you have any other questions for me?</p>
<b>Customer</b>	No
<b>Banko</b>	I hope to have informed you sufficiently. For more information visit <a href="http://www.banko.nl">www.banko.nl</a>

## Appendix 4

### Measurement scales used

Construct	Items	Scale	Source
CX - hedonic value	<p>I have found the interaction not fun/fun</p> <p>I have found the interaction dull/exciting</p> <p>I have found the interaction not delightful/delightful</p> <p>I have found the interaction not thrilling/thrilling</p> <p>I have found the interaction enjoyable/unenjoyable</p>	<p>Not fun - Fun</p> <p>Dull - Exciting</p> <p>Not delightful - Delightful</p> <p>Not thrilling - Thrilling</p> <p>Enjoyable - Unenjoyable</p> <p><i>*7-point semantic scale</i></p>	Voss et al., 2003
Perceived Risk	<p>How risky do you find the content of the conversation with the chatbot in this scenario?</p> <p>How risky would it be to interact with the chatbot in this scenario?</p> <p>How likely do you feel interacting with the chatbot in this scenario would lead to a loss because of: 1) financial risk involved? 2) the risk of performance</p>	<p>Not risky at all - Extremely risky</p> <p>Not risky at all - Extremely risky</p> <p>Not risky at all - extremely risky</p> <p><i>*5-point scale</i></p>	Girard & Dion, 2010

	<p>failure of the chatbot?</p> <p>3) the time involved in solving problems with the chatbot features?</p> <p>4) the way that is dealt with your privacy regarding the information and documents you have sent to the chatbot?</p>		
Perceived warmth	<p>I felt like the message of the chatbot was warm.</p> <p>I felt like the chatbot was friendly.</p> <p>I liked the chatbot.</p> <p>I felt like the chatbot was sincere during our interaction.</p>	<p>strongly disagree- strongly agree</p> <p><i>*7-point Likert Scale</i></p>	Fiske, 2018
Trust	<p>I felt that the chatbot was honest in our interaction</p> <p>I believe that the chatbot was truthful during the conversation.</p> <p>I believe that the chatbot was credible during our conversation</p>	<p>Strongly agree - Strongly disagree</p> <p><i>*7-point Likert Scale</i></p>	Toader et al., 2019



Control variables			
Age	What is your age?	Free	-
Gender	What is your gender?	Male/female/other/ would rather not say	-
Educational level	What is your highest finished education?	Primary school/ secondary school/ college (MBO)/ university of applied sciences (HBO)/ university bachelor/ university master/ PhD	-
Level of English language	What is your level of English language?	Basic user/ independent user/ proficient user  <i>*CEFR scale</i>	<a href="https://www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions">https://www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions</a>
Curvature preference	I like/dislike this typeface	Strongly like - strongly dislike  <i>*7-point Likert scale</i>	Velasco et al., 2015 (figure 7)
Attitude towards technology/chat bots	I prefer to encounter services digitally rather than face to face  If I can choose freely, I would choose to encounter services through a chatbot, rather than face to face	Strongly agree - Strongly disagree  <i>*7-point Likert-scale</i>	Davis, 1989
Previous experience with chatbots	Have you ever been served by a conversational agent in the past?  If yes, how often?	Yes/no/I don't know  1-3 times per year 4-9 times per year	Ashfaq et al., 2020

		10-15 times per year > 15 times per year	
Mood (before)	You would say your mood before the experiment was:	Extremely negative - Extremely positive  <i>*5-point Likert scale</i>	Peterson & Sauber, 1983 (as described in Sidaoui et al, 2020)
Mood (after)	You would say your mood after the experiment is:	Extremely negative - Extremely positive  <i>*5-point Likert scale</i>	Peterson & Sauber, 1983 (as described in Sidaoui et al, 2020)

## Appendix 5

SLR, final query and inclusion/exclusion criteria

### Final query

TITLE-ABS-KEY ( ( typeface\* OR font OR fonts OR "font style\*" OR typography OR "serif\*" OR "font shape" ) AND ( "customer experience\*" OR "consumer experience\*" OR "user experience\*" OR "emotion\*" OR "hedonic" OR "utilitarian" OR "trust" OR "affect" OR "perception" OR "conversational agent\*" OR "chatbot\*" OR "robot\*" ) ) AND ( LIMIT-TO ( SRCTYPE,"j" ) ) AND ( LIMIT-TO ( SUBJAREA,"COMP" ) OR LIMIT-TO ( SUBJAREA,"PSYC" ) OR LIMIT-TO ( SUBJAREA,"BUSI" ) OR LIMIT-TO ( SUBJAREA,"ARTS" ) OR LIMIT-TO ( SUBJAREA,"SOCI" ) OR LIMIT-TO ( SUBJAREA,"NEUR" ) ) AND ( LIMIT-TO ( LANGUAGE,"English" ) ) AND ( LIMIT-TO ( DOCTYPE,"ar" ) )

### Inclusion and exclusion criteria

	Inclusion Criteria	Criteria type:	Exclusion Criteria	Criteria type:
1	Include articles that refer to branding, marketing, and advertising	Setting	Exclude articles that the abstract does not clearly mention the research problem, the objectives, the methodology, or the results	Abstract
2	Include articles that link typeface to any aspect of customer experience (like hedonic/utilitarian values, emotions, feelings, cognition, etc.)		Exclude the articles that focus on user experience (e.g. the objective is to develop or test a specific algorithm, or mobile app on a specific population) and the medical field.	Setting

3	The title mentions at least one of the search terms; some of the articles that were found do not mention any of the search terms and are therefore irrelevant	Title	Exclude articles that examine the response of a specific population (e.g. students, people with vision loss, etc) on a specific chatbot design (e.g. question design)	Setting
4	The abstract must explicitly mention the research problem, the objectives of the study, the methodology that was followed, and the results. That is to evaluate the quality of the paper and check if we can get important insights for our topic;	Abstract	Exclude articles that focus on embodied robots and voice-based assistants (such as Cortana, Siri, Alexa, etc.)	Settings
5	Include articles that test typeface/font impact in any context (e.g. like packaging, logos, messenger texting)	Settings	Exclude articles that focus on irrelevant experiences (e.g. accommodation experience)	Condition or exposure of interest
6	Include articles that focus on typeface/font characteristics (e.g. font width, font height, font curvature)	Settings	Exclude articles that examine the brain activity and brain/human responses to irrelevant stimuli (e.g. specific words or letters)	Setting
7	Include articles that examine the brain activity and brain responses to visual elements (e.g. fonts, shapes, colors, background color)	Setting	Exclude articles that examine the emotional impact of words (message content) and not the text design	Study design

8	Include articles that focus only on English alphabet/characters		Exclude articles that focus on reading performance, learning, and education	Setting
9			Exclude articles with title and/or abstract that is not in English	
10			Exclude articles that examine Japanese/Chinese alphabet	
11			Exclude articles that the objective is to compare different populations/ population responses	

## Appendix 6

### Calculation of the intercoder reliability

Total articles: **618**

#### First Screening:

- Team 1: **309 each**
- Team 2: **309 each**

#### Group A:

##### First Screening:

- Disagree = **37**
- Agree = **272**

With whose decision we went:

Coder 1: **11** | Coder 2: **26**

Include: **13** | Excluded: **24**

Totally: Include: **76** | Excluded: **233**

Both coders agreed to include: **65**

Both coders agreed to exclude: **209**

Only the first coders wants to include: **8**

Only the second coder wants to include: **29**

% of agreement: **88.10289389067523%**

Cohen's k: **0.6988721115850626**

**Substantial agreement**

#### Group B:

##### First Screening:

- Disagree = **25**
- Agree = **284**

With whose decision we went:

Coder 1: **18** | Coder 2: **7**

Include: **14** | Excluded: **11**

Totally: Include: **76** | Excluded: **233**

Both coders agreed to include: **63**

Both coders agreed to exclude: **219**

Only the first coder wants to include: **10**

Only the second coder wants to include: **15**

% of agreement: **91.85667752442997%**

Cohen's k: **0.7805198890445822**

**Substantial agreement**

Definitions of cohen's kappa (Landis & Koch, 1977):

- 0.01 - 0.20 slight agreement
- 0.21 - 0.40 fair agreement
- 0.41 - 0.60 moderate agreement
- 0.61 - 0.80 substantial agreement
- 0.81 - 1.00 almost perfect or perfect agreement

## Appendix 7

H1a

### ANOVA assumptions

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
<b>Independence</b>	-	The research design is an experiment setting, which means that the variety of the sample was controlled, and it was ensured that all respondents are independent, and that the data was randomly sampled. The conditions were randomized through Qualtrics, so each respondent was exposed to a random condition.	Met	-
<b>Scale of measurement</b>	Dependent variable on continuous scale / Outcome variable is not nominal nor ordinal	Dependent variable is on continuous scale and outcome variable is not nominal, nor ordinal	Met	-
<b>Normality</b>	Skewness and kurtosis between -1 and 1	Skewness (-.317) and kurtosis (-.277)	Met	-



<b>Homogeneity</b>	Non-significant ( $p > .05$ ) Levene's tests	$p > .05$	Met	-
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## Appendix 8

H1b

### Simple linear regression / hierarchical regression assumptions

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
<b>Linearity</b>	Significant linearity test ( $p < .05$ )	$P = .000$	Met	-
<b>Homoscedastic</b>	Observation are consistent	See scatterplot 1 in SPSS doc	Met	-
<b>Normality</b>	Skewness and kurtosis between -1 and 1	Skewness (-.317) and kurtosis (-.277)	Met	-
<b>Independence</b>		See scatterplot 2 in SPSS doc	Met	-

## Appendix 9

H2

### ANOVA assumptions

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
<b>Independence</b>	-	The research design is an experiment setting, which means that the variety of the sample was controlled, and it was ensured that all respondents are independent, and that the data was randomly sampled. The conditions were randomized through Qualtrics, so each respondent was exposed to a random condition.	Met	-
<b>Scale of measurement</b>	Dependent variable on continuous scale / Outcome variable is not nominal nor ordinal	Dependent variable is on continuous scale and outcome variable is not nominal, nor ordinal	Met	-
<b>Normality</b>	Skewness and kurtosis between -1 and 1	Skewness (-1.171) and kurtosis (1.641)	Not met	'Trust' was transformed

				into <i>'Trust_Log'</i>
<b>Homogeneity</b>	Non-significant ( $p > .05$ ) Levene's tests	$p > .05$	Met	-

## Appendix 10

H3a

### ANOVA assumptions

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
<b>Independence</b>	-	The research design is an experiment setting, which means that the variety of the sample was controlled, and it was ensured that all respondents are independent, and that the data was randomly sampled. The conditions were randomized through Qualtrics, so each respondent was exposed to a random condition.	Met	-
<b>Scale of measurement</b>	Dependent variable on continuous scale / Outcome variable is not nominal nor ordinal	Dependent variable is on continuous scale and outcome variable is not nominal, nor ordinal	Met	-
<b>Normality</b>	Skewness and kurtosis between -1 and 1	Skewness (-.317) and kurtosis (-.277)	Met	-

<b>Homogeneity</b>	Non-significant ( $p > .05$ ) Levene's tests	$p > .05$	Met	-
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## Appendix 11

H3b

### Assumptions ANOVA:

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
<b>Independence</b>	-	The research design is an experiment setting, which means that the variety of the sample was controlled, and it was ensured that all respondents are independent, and that the data was randomly sampled. The conditions were randomized through Qualtrics, so each respondent was exposed to a random condition.	Met	-
<b>Scale of measurement</b>	Dependent variable on continuous scale / Outcome variable is not nominal nor ordinal	Dependent variable is on continuous scale and outcome variable is not nominal, nor ordinal	Met	-
<b>Normality</b>	Skewness and kurtosis between -1 and 1	Skewness (-1.171) and kurtosis (1.641)	Not met	'Trust' was transformed

				into <i>'Trust_Log'</i>
<b>Homogeneity</b>	Non-significant ( $p > .05$ ) Levene's tests	$p > .05$	Met	-



## Appendix 12

H3c

### Assumptions linear regression:

Assumption	Threshold	Result	Met / Not met	(Optional) Solution
Sample size	15 – 20 per variable	324	Met	-
Linearity	Significant linearity test ( $p < .05$ )	$P = .000$	Met	-
Homoscedastic	Observation are consistent	See scatterplot 1 in SPSS doc	Met	-
Normality	Skewness and kurtosis between -1 and 1	Skewness (-.317) and kurtosis (-.277)	Met	-
Independence		See scatterplot 2 in SPSS doc	Met	-