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Humanizing the Machine: The Impact of Perceived Anthropomorphism on the Perceived Friendliness of AI Chatbots

Ana Beatriz Godinho Anastácio

Master in Marketing

Supervisor:

Ph.D, João Ricardo Paulo Marques Guerreiro, Associate Professor with Habilitation, Department of Marketing, Operations & General Management at Iscte Business School

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BUSINESS
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Department of Marketing, Operations and General
Management

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Resumo

Recentemente, chatbots equipados com inteligência artificial têm atraído marcas e consumidores sendo utilizados por um número crescente de empresas inclusive em funções de contacto com o cliente. Todavia, a sua eficiência depende da precisão funcional e das características sociais apresentadas. Gradualmente, os chatbots têm ocupado um papel semelhante ao de embaixadores da marca perante o consumidor. Sendo que as relações formadas entre consumidor e chatbot refletem-se na própria marca. Esta dissertação explora como a percepção de antropomorfismo influencia a percepção de amizade para com chatbots de AI, identificando-se quatro dimensões sociais chave tanto para o antropomorfismo como para a amizade: Presença social, amabilidade, empatia e competência. Baseado em estudos prévios conduzidos em ramos como interação humano-AI, relação com a marca e psicologia, criou-se um modelo conceptual para explorar como o antropomorfismo comportamental e certas dimensões sociais afetam a percepção de amizade por parte do utilizador. Foi realizado um questionário a 149 participantes com utilização regular de chatbots de AI revelando que o antropomorfismo afeta positivamente a percepção das dimensões sociais referidas. Adicionalmente, a maioria destes fatores também contribui positivamente para a percepção de amizade. Mas, ainda que seja sugerida uma ligação indireta, a análise revela que não há uma ligação direta entre a percepção de antropomorfismo e a percepção de amizade. Este estudo clarifica o caminho pelo qual a antropomorfização pode influenciar a percepção de amizade para com chatbots e, conseqüentemente, a marca que os utiliza, propondo um modelo unificado de múltiplas dimensões sociais, oferecendo também implicações teóricas e práticas.

Palavras-chave: AI Chatbots; Antropomorfismo, Percepção de Amizade; Interação Humano-AI; Relação Consumidor-Marca.

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Abstract

Recently, artificial intelligence chatbots have been garnering attention of brands and customers alike. This technology has become the brand representative of a growing number of businesses, commonly used in brand customer service and other customer-facing roles. Yet, their effectiveness is contingent upon not only functional accuracy but also on perceived social traits. As chatbots have gradually become akin to brand ambassadors, the relationships fostered between the chatbot and the consumer will be transferred onto the brand itself. This thesis explores how perceived anthropomorphism influences perceived friendliness towards AI chatbots, identifying four key social dimensions for both anthropomorphism and friendliness: social presence, warmth, empathy, and competence. Based on previous research within fields such as human-AI interaction, brand relationship and psychology, a conceptual model was created to explore how behavioral anthropomorphic design and social dimensions shape users' perception of friendliness. The empirical analysis of a survey with 149 participants with regular prior AI chatbot experience revealed that anthropomorphism enhances perceptions of social presence, warmth, empathy and competence and that most of these factors do contribute to a perception of friendliness as well. However, although the results suggest that there is an indirect link, the present study does not show a direct relationship between anthropomorphism and friendliness. This study provides a clearer pathway through which anthropomorphism can be shown to impact friendliness perception towards chatbots and, ultimately, the brand utilizing them. This thesis delivers a unified model of multiple social dimensions and their relationships, delivering theoretical and managerial implications for scholars and professionals.

Keywords: AI Chatbots; Anthropomorphism, Perceived Friendliness; Human-AI Interaction; Consumer-Brand Relationships.

JEL Classification System: M31; O30

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Glossary of Acronyms

AI: Artificial Intelligence

ToM: Theory of Mind

HCI: Human-Computer Interaction

CRM: Customer Relationship Management

LLM: Large Language Model

Chapter I: Introduction

Due to the quick advancements in deep learning and natural language processing applications (Pentina et al., 2023), artificial intelligence (AI) has been gaining recognition as a growing force in the marketing industry. The span of its impact ranges widely, from marketing strategies to customer relationship management (Davenport et al., 2020). However, as a growing, recently disseminated technology, its effects and impacts on consumers have captured the interest of marketing researchers and professionals alike, particularly AI-based technology that interacts directly with customers (Pentina et al., 2023). Among these technologies are chatbots. Allowing users to directly interact with the software by posing questions or commands in regular language, these programs converse with users utilizing natural language processing, machine learning and AI technology resulting in an interactive dialogue similar to human-like conversations (Deng & Yan, 2025).

While the use of AI-powered chatbots proposes several benefits to businesses, consumers remain skeptical about engaging with them (Araujo, 2018; Xu et al., 2022; Cheng et al., 2022; Gyeong & Chang, 2025). Hence, it is important for businesses to assess ways to diminish this reluctance and consider how to develop chatbots that can maximize positive business outcomes (Araujo, 2018; Xu et al., 2022). On that account, some research suggests that one efficient strategy to improve user experience in human-AI conversations is to increase the chatbot's anthropomorphism, that is, its likeness to a human (Roy and Naidoo, 2021; Gu et al., 2024). This allows businesses to take advantage of Human's inherent tendency to humanize non-human objects and entities with research defending anthropomorphism's positive business outcomes, particularly in enhancing acceptance and improving the experience of the user (Wu, 2024). Anthropomorphism can be divided into Visual Anthropomorphism (Ma et al., 2025) and Behavioral Anthropomorphism (Brandtzaeg et al., 2022). The latter one will be the type of anthropomorphism explored in this study. As this project's focus, the word anthropomorphism will be used specifically relating to behavioral anthropomorphism.

On the other hand, Marketing scholars claim that consumers can develop relationships with brands that align with friendships (Fournier, 1998, Brandtzaeg et al., 2022, Alvarez et al., 2023). This theory was pioneered by Fournier (1998) as part of a larger theory on consumer-brand connections. Friendship is one of the most important social bonds that individuals can develop, characterized by intimacy, reciprocity, empathy among others

(Brandtzaeg et al., 2022). As anthropomorphism in AI chatbots has been associated with a higher chance that the user will develop a friendship-like relationship with the chatbot (Brandtzaeg et al., 2022), some studies suggest that chatbots may influence consumer experiences as brand ambassadors, that are subsequently reflected on the brand supporting or contesting consumer-brand relationships (Roy & Naidoo, 2021; Magno & Dossena, 2022).

Yet, research on the topic is rather limited due to the recency of Artificial intelligence chatbot technology (Roy and Naidoo, 2021). This gap in the literature makes it challenging to completely understand how anthropomorphism of an AI chatbot impacts the perception of friendliness by the user. In order to answer this question, several social dimensions have been identified as key aspects that impact perceived anthropomorphism and friendliness, such as social presence, warmth, empathy and competence and are vital to influence these perceptions that are then reflected upon a brand (Roy & Naidoo, 2021; Magno & Dossena, 2022). Considering the current research gaps, this study aims to address the research question:

RQ: How does a perceived anthropomorphism influence perceived friendliness towards AI chatbots?

Furthermore, the present project has the following objectives:

- Examine the effect of perceived anthropomorphism on the perception of friendliness regarding AI chatbots.
- Investigate what social dimensions are most influenced by perceived anthropomorphism in AI Chatbots.
- Assess how the identified social dimensions shape perception of users' regarding AI chatbot friendliness.
- Produce theoretical and management implications for designing AI chatbots that supplement and strengthen positive customer-brand relationships, in particular relationships of friendship.

This dissertation is organized into six main chapters. Chapter 1 introduces the research topic while presenting the research question and objectives, followed by an outline of the project's structure. Chapter 2 will provide a review of the current literature based on previous published research. It starts by briefly exploring the psychology of friendship, and how the concept is applied to consumer-brand relationships and how these are being affected by AI Chatbots whose background will be concisely covered afterwards. This will be followed by

the current main theories on Human-AI Interactions, connecting these aspects with a delve into the concept of anthropomorphism and its impact. Then, connecting it all, AI-human social relationships will be discussed, focusing on the formation of friendship and what social dimensions are more relevant for this study's purpose and how it all impacts marketing, concluding with the development of the conceptual model and the hypotheses. Chapter 3 will detail the research methodology and procedure and survey design. For chapter 4, the process and the results of the analysis of the data acquired will be presented and the conceptual model previously elaborated will be completed. Chapter 5 will discuss these findings in depth, relating them to the existing literature. Finally, chapter 6 concludes the thesis by presenting a summary of the contributions, addressing limitations, deriving theoretical and management implications and suggesting pathways for future research.

Chapter II: Literature Review

1. The Psychology of Friendship and the Human Need to Connect

Humans have an innate need to search for social connections, and their survival hangs on the care bestowed by others (Eisenbruch & Krasnow, 2022). Friendship, a type of social connection, usually develops from initial social interactions that, through intimacy and commitment, turn into a deeper bond between individuals (Weber, 2024). These relationships are of high importance to one's psychological health throughout their life and can be considered among the most crucial bonds a person can make in their lifetime (Brandtzaeg et al., 2022).

Research on the topic of friendship is still underdeveloped, even after decades of research (Policarpo, 2015). It is yet difficult to present a single and unanimous understanding of what friendship is and what characteristics are most influential to the development of this connection (Brandtzaeg et al., 2022). Hence, due to the ambiguity of the term friendship, the definition provided by the dictionary of the American Psychological Association (2018) will be utilized: "A voluntary relationship between two or more people that is relatively long-lasting and in which those involved tend to be concerned with meeting the others' needs and interests as well as satisfying their own desires. Friendships frequently develop through shared experiences in which the people involved learn that their association with one another is mutually gratifying (APA, 2018)."

The Social Penetration Theory was developed by Irwin Altman and Dalmas Taylor in 1973 and aims to explain how, through self-disclosure, interpersonal relationships can grow and deepen from a superficial relationship into a more intimate one, as is the case with friendships (Carpenter & Greene, 2016). Moreover, given how relationships nowadays occur over different media, the Social Penetration Theory has been extended to online relationships and friendships, remaining highly valid in the digital age (Pennington, 2021).

Social Penetration Theory uses the "onion metaphor", suggesting that relationships have several layers with varying levels of intimacy and four different stages (Carpenter & Greene, 2016): Orientation stage, marked by superficial discourse and little self-disclosure; Exploratory Affective stage, where trust begins to develop and there is a sharing of feelings; Affective stage, this is when private topics start being discussed and there is a more profound emotional connection; and lastly, the Stable stage, this stage is the innermost "layer" and

where there is a deep intimacy and an open exchange in the relationship. Social de-penetration (or dissolution), may happen throughout this process in response to lower self-disclosure or conflict (Carpenter & Greene, 2016).

Another line of thought within social psychology suggests that there are two paramount dimensions of social perception (how humans perceive others in a social setting): Warmth and Competence (Eisenbruch & Krasnow, 2022). Both these dimensions are universal and fundamental to social judgement, throughout time, stimuli and culture (Kolbl, Ž., 2019). They are also seen as crucial aspects that allow individuals to evaluate each other and are known to impact the development of interpersonal trust (Al-Oraini, 2024).

However, the type of social relationship determines the preference for certain traits, such as proactivity being more relevant for close friendships than for distant connections (Abele & Brack, 2013). Still, traits like intelligence, trustworthiness, and cooperativeness were seen as “highly valued” across both circumstantial and deeper relationships (Abele & Brack, 2013). Additionally, research shows that being open to help seems to be more relevant than the ability to give aid when humans choose to form relationships, such as friendships. However, competence becomes increasingly relevant the more the other person needs the capacity of the second individual for their own goals or in relationships with larger social distances (Abele & Brack, 2013; Eisenbruch & Krasnow, 2022).

Although once social groups that were close in proximity and face-to-face were the norm, there has been an increase in computer-mediated communication that ultimately led to a new paradigm of “networked individualism” that expanded one’s personal relationships beyond physical proximity (Rainie & Wellman, 2012; Brandtzaeg et al., 2022). Technological developments have enabled humans to be in contact with each other in noncorporeal ways, utilizing technology as a medium to communicate without being physically present (Wellman et al., 2006; Rainie & Wellman, 2012), allowing humans to obtain their need for companionship, information, and belonging from outside their community (Brandtzaeg et al., 2025).

Scholars defend that the new reality of a “Networked Individualism” came about due to a “triple revolution”, three happenings that allowed for this transformation. According to Rainie and Wellman (2012), the three situations were: the rise of social networking, the power given to individuals by the internet, and the perpetual connectivity of mobile appliances and devices (Rainie & Wellman, 2012). These factors led to a networked society that is more permeable and less restrictive than a local social bubble, and with flatter hierarchies and that no longer

needs a physical location (Wellman et al., 2006). Current research builds on this theory and suggests that this new communication paradigm may have led to diminishing relevance of strong relationship ties. AI chatbots, as part of this new paradigm, may even reduce the importance of weak relationship ties and even replace them to some degree (Brandtzaeg et al., 2025).

Nowadays, AI chatbots are able to build upon the weakening of ties and the non-physicality of current communication to form a new way of human-machine communication, where the individual directly communes with technology (as a virtual entity) instead of using it simply as a medium (Croes & Antheunis, 2020; Brandtzaeg et al., 2025). Past research has shown that there is a possibility of human-AI friendships that can be understood to a certain degree, exhibiting a likeness to friendships between human counterparts (Brandtzaeg et al., 2022).

2. Consumer-Brand friendships

As mentioned previously, humans have an inherent need to create connections (Eisenbruch & Krasnow, 2022). Fournier (1998), pioneered the concept that brands and consumers may develop meaningful and lasting bonds, becoming valuable relationship partners, akin to real-life friendships and other interpersonal relationships. When it comes to types of relationships, Fournier's (1998) research identifies several kinds relating to friendship, among other types of relationships. Some of the relational ties discussed are: "Childhood Friendships", "Casual Friends/Buddies", "Compartmentalized Friendships" and "Best Friendships".

"Childhood friendships" with brands will have infrequent engagement, but carry an affection from past times, bringing comfort and familiarity to the consumer. "Casual Friends/buddies" represent a brand that will also have an infrequent engagement with the consumer, but are also low in intimacy, affection and expectations. "Compartmentalized Friendships" would be brands that have a specialized and situational relationship with the consumer, creating a volatility in terms of engagement. And "Best friendships" will cover brand relationships based on intimacy, honesty and reciprocity. This relationship happens voluntarily and involves common interests and personas (Fournier, 1998). These different types of connections are inserted in a larger group of relationships identified by Fournier and further developed by various authors since, becoming a reasonably mainstream issue for marketing professionals and scholars (Alvarez et al., 2023).

Humans have a tendency to humanize and to develop relationships with objects or brands (Jin & Qian, 2021; Prentice et al., 2023). In the case of Artificial Intelligence (AI), the emotional cues in the conversation between humans and AI, may lead to a feeling of connection with the AI-Agent and the development of an “anthropomorphized relationship” and generate feelings of friendship and even of love (Guerreiro & Loureiro, 2023). As of now, as technology develops and chatbots are being progressively integrated in the marketing strategies and customer relationship management of brands, chat-based AI are becoming representatives of the brand (Araujo, 2018; Roy & Naidoo, 2021) and have been shown to be able to enhance brand love (Tsai & Chuan, 2024).

Still, as mentioned before, consumers have also been shown to prefer contact with human agents and show some resistance to accept chatbot technology. This phenomenon has been shown consistently throughout research conducted in various European countries (Araujo, 2018). Thus, it is anticipated that if a chatbot incorporates human-like qualities and behavior, consumers resistance could be alleviated (Roy & Naidoo, 2021; Deng & Yan, 2025). Moreover, given that in digital interactions AI chatbot agents serve as representatives or as the “face” of a brand (Roy & Naidoo, 2021), if a friendship-like bond were to be formed with a chatbot it may supplement the brand’s friendship relationship with the consumer and strengthen the consumer’s emotional relationship with the brand.

3. Understanding Artificial Intelligence and Chatbots

With the rapid rise of artificial intelligence, consumer-brand friendship studies have to account for new forms of interaction with the consumer. With AI and chatbots acting as mediators of brand communication and directly impacting the relationship with consumers (Roy & Naidoo, 2021), it is essential to understand how the development of AI Chatbots came to be as it provides essential foundations for how humans moved from using AI as mere functional assistants to potential social partners (Al-Amin et al., 2024).

According to Haenlien and Kaplan (2019), the roots of Artificial Intelligence can be attributed to the American writer Isaac Asimov in 1942, upon the release of his science fiction short story called “Runaround”. This work is said to have inspired robotics, Artificial Intelligence, and computer science researchers. Artificial Intelligence became established as a subject of academic relevance within the 1950s, the term being first used by Marvin Minsky and John McCarthy in 1956 (Haenlien & Kapl, 2019; Kopalle et al., 2022). However, the real

usefulness of AIs created during the 1960s and 1970s fell short of the objectives it aimed to complete largely due to the lack of computational power to generate substantial outcomes (Haenlein & Kapl, 2019; Benbya et al., 2020).

Nowadays, and due to the growing relevance of big data and computational technological developments within the last decade, Artificial Intelligence has entered the business and public spheres (Haenlein & Kaplan, 2019). As artificial intelligence became more widely used by humans, a new paradigm called Generative AI was led by businesses. (Aydin & Karaarslan, 2023).

The development of AI technologies led to the development of Generative AI, a technology that can create novel and unique content utilizing data it has previously been fed (Aydin & Karaarslan, 2023). An example of this progress is ChatGPT, a text-based Generative AI. In 2022, the chatbot developed by OpenAI amassed one million users in five days and achieved 100 million users per month, two months following its launch, making it one of the quickest-growing end-user applications (Kanbach et al., 2024).

Sped by the introduction of OpenAI's ChatGPT in 2022, a generative AI chatbot, Generative AI has been drawing substantial attention in different areas (Brynjolfsson, 2023; Kanbach et al., 2024). This technology is, according to Pavlik (2023), "a type of AI that is able to generate new content, such as text, images, or music, based on certain inputs" giving it the ability to create output alike to the content it was trained on based on large databases (Aydin & Karaarslan, 2023; Pavlik, 2023). The emergence of Generative AI tools such as ChatGPT, Jasper, or Dall-E are, due to how easy and instinctive they are to use, is considered to have been a large step forward in the development of AI (Kanbach et al., 2024) making it more accessible to the large public and therefore garnering the attention of the public and businesses alike (Miyazaki et al., 2024)

AI-powered chatbots' origins can be traced back to the 1960s where software used pre-written responses and scripts to mimic a conversation based on cues given by the user (Reda, 2024). These models, however, struggled with contextual comprehension, which resulted in unnatural, inflexible, and predictable interactions. As of now, AI-powered chatbots, built using generative technologies, have become advanced instruments able to interact with the user and lead lifelike and purposeful conversations (Murár & Piatrov, 2024).

AI has been one of the most disruptive technologies to be introduced in large organizations (Benbya et al., 2020) and it is becoming an intrinsic part of modern marketing strategies, allowing for routine tasks to be automated and for individualized customer

interaction, giving businesses the ability to record and take note of their customer's preferences as improve the efficiency of marketing efforts (Murár & Piatrov, 2024). It is, however, particularly relevant to understand the impact of AI in the context of business when it comes to utilizing AI chatbots for customer relationship management (CRM), as it can influence consumer's attitudes towards a firm, customer satisfaction and the degree of emotional connection consumers have with a business (Araujo, 2018).

4. Theoretical Foundations of Human-AI Interactions and Anthropomorphism

After understanding the evolution of AI chatbots and how it became the modern technology known today, it is now necessary to delve into how humans interact and relate to machines and human-machine relationship theories.

One of the leading theories on the topic is the Theory of Mind (ToM) applied to Human-Computer Interactions (HCI). This theory, however, remains a controversial concept in HCI, with researchers split on its relevance and contribution to the topic (Ayache et al., 2022). The Theory of Mind (ToM) was originally coined by Premack and Woodruff in 1978, developed to investigate the cognition of primates and their ability to understand the mental states, beliefs, intentions, and desires of other individuals. This theory is naturally associated with the capacity to understand and predict the behavior of others (Ayache et al., 2022). ToM was translated to Human-Human interactions, and more recently, it has been applied to Human-Computer Interactions as researchers aim to develop AI with a “computational theory of mind”, aiming to further improve the technology with higher social intelligence and the ability to comprehend and expect the user intentions (Çelikok et al., 2019; Wang et al., 2024) and to better explain the human tendency to attribute mental states to AI (Wang et al., 2024).

This tendency can also be referred to as anthropomorphism, occasionally alternatively called “personification”. It is defined as the tendency to consider non-human entities or objects as having “human emotions, characteristics, and intentions”. Furthermore, it is related to the notion of Anthropocentrism, defined as the psychological phenomenon that defends the theory that humans, due to an inherent desire to connect socially, have an intrinsic propensity to humanize non-human entities (Wu, 2024).

The tendency to anthropomorphize objects and entities is inherent to humans (Wu, 2024), and studies have shown that even after being conscious that it is machine they are interacting

with, users respond socially to computers, as they would to other humans (Araujo, 2018). Still when it comes to technology, some literature, defends the usage of the “perceived anthropomorphism” as it is argued that a chatbot’s degree of anthropomorphism is more related to external improvements rather than to actual intrinsic properties (Song & Natori, 2024), claiming that the expression “perceived anthropomorphism” is better suited than the concept of anthropomorphism by itself, as it is not intrinsic to the chatbot (Ma and Huo, 2023). However, other authors defend that the word “anthropomorphism” can be used by itself to refer to “the attribution of humanlike properties, characteristics, or mental states to nonhuman agents such as AI chatbots” (Zhu et al., 2025). It has been shown that in some cases, anthropomorphism can aid and improve customer acceptance and enhance the user experience of the previously mentioned technology. However, it has also been recorded that, occasionally, customers can show reluctance to accept AI chatbots. (Song & Natori, 2024; Zhu et al., 2025).

Although anthropomorphism has been shown to have a positive impact on the acceptance of AI technology by customers (Song & Natori, 2024; Zhu et al., 2025), research also indicates a breaking point where anthropomorphism starts to negatively impact acceptance (Kim & Lee, 2025). Entities that are not human but are considered highly anthropomorphic can generate adverse reactions, such as being increasingly seen as a possible threat or a privacy concern, leading to diminished intentions in utilizing AI (Xie et al., 2023). Additionally, research shows that customer loyalty can be weakened by chatbot interactions that provoke “creepiness and unpleasant feelings” (Kim & Lee, 2025). A 2023 study concluded that users report that the quality of an AI interaction is better at a “medium” level of anthropomorphism. Furthermore, when the level of anthropomorphism is considered “high”, the beneficial effects of perceived anthropomorphism by a user are diminished and could actively make customers avoid chatbot interaction (Xie et al., 2023; Kim & Lee, 2025). These findings are consistent with the Uncanny Valley theory, proposed by Masahiro Mori in the 1970s. The Uncanny Valley is a phenomenon that can be characterized by the development of feelings of discomfort and negative sensations in humans when a non-human object reaches a certain threshold of likeness to a human (Gyeong & Chang, 2025).

As mentioned previously, some researchers argue that consumers seemingly show a reduced level of acceptance of AI chatbots (Cheng et al., 2022; Gyeong & Chang, 2025) and in a survey, comparing communication with a conversational AI chatbot and human staff, the great majority of participants showed preference for the human staff (Kim & Lee, 2025).

Regardless, marketing departments keep betting on this technology to avoid the risk of becoming obsolete by continual technological advancements in the field of AI. It is, therefore, crucial for marketers to understand and attempt to lower the skepticism consumers may have toward chatbots (Cheng et al., 2022; Kim & Lee, 2025). Ensuring that a brand's chatbot has the optimal amount of likeness to a real human being may help cull this problem and help with fostering better long-term brand relationships (Baudier & de Boissieu, 2025).

H1: Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Friendliness.

5. Measuring Chabot Anthropomorphism: Design, Perception, and Outcomes

According to Araujo (2018), one of the first aspects to consider when incorporating a chatbot within a business model, especially in customer relationship management, is how it is designed and its behavior affects the perception of the agent, and therefore the perception of the brand (Araújo, 2018). After exploring why humans can perceive AI as being human-like, there is a need to understand what design elements can influence how users anthropomorphize chatbots to allow for an operationalization of this phenomenon.

Research conducted in 2019 showed that consumers tend to perceive chatbots as low on human qualities (Roy & Naidoo, 2021), which means the user does not inherently see a high degree of anthropomorphism reflected in a chatbot. Therefore, there is a need to program and design chatbots to be more human-like. Early discussions suggested that adding visual, identity, and conversational cues could increase the humanness of chatbots, more specifically, a human appearance, “mimicking human languages”, “message interactivity”, “perceived helpfulness”, and “human-associated names” (Roy & Naidoo, 2021). Moreover, some authors defend that anthropomorphism's effects depend on the context in which the chatbot is being utilized, particularly between “hedonic” and “utilitarian” usage. In a hedonistic context, where the chatbot is utilized for amusement, it is suggested that there is a positive relationship between the quality of the interaction and the degree of anthropomorphism (Xie et al., 2023).

When it comes to marketing research, “Warmth” and “Competence” have been shown to have a relation to how consumers humanize brands (Aaker et al., 2012) and, therefore, a chatbot agent as a representative of a brand (Roy & Naidoo, 2020). In this specific case,

“Competence” of AI Chatbots, in particular has been shown to significantly impact trust and improve customer satisfaction (Al-Oraini, 2024). Additionally, “Social Presence” appears in relation to anthropomorphism in the sense that it represents the “feeling that another being also exists in the world and reacts to you” (Araujo, 2018).

H2a: The Perceived Anthropomorphism of an AI Chatbot positively influences the user’s perception of Social Presence.

H2c: The Perceived Anthropomorphism of an AI Chatbot positively influences the user’s perception of Warmth.

Marvin Minsky, one of the pioneers in artificial intelligence, is known to have proposed, in 1985, a radical idea: “AI should possess emotions”. Since then, several studies have been conducted on the technical possibilities and psychological responses of individuals to AI (Wu, 2024). Araujo (2018) also theorized in 2018 that the degree of anthropomorphism attributed to a chatbot depended on the software’s ability to fulfill human emotional needs. And to be capable of fulfilling that role, it should be equipped with the ability to perform social cues such as “empathy, humor, and personalization”. Furthermore, if these social behaviors are not included in the programming of the chatbot, it may lead to feelings of “disappointment” or “deceitfulness” in the user (Araujo, 2018; Deng & Yan, 2025).

H2b: The Perceived Anthropomorphism of an AI Chatbot positively influences the user’s perception of Empathy.

H2d: The Perceived Anthropomorphism of an AI Chatbot positively influences the user’s perception of Competence.

On the other hand, the context of the exchange has also been shown to influence the user's perception. In a hedonic context, anthropomorphism has been shown to have a stronger positive impact in the quality of Human-AI interactions. However, in a utilitarian context, the accuracy of the content is more relevant to the user, which, in turn, can make the chatbot appear more machine-like, and lessen their perceived anthropomorphism (Xie et al., 2023).

In the end, consumers have an inherent ability to attribute human characteristics to inhumane objects (Wu, 2024) and show a willingness to do so for chatbots as well, allowing for the development of “relational dynamics” similar to the ones experienced with human

service agents (Araujo, 2018). Still, in previous research, 86% of respondents said they would prefer to speak with human staff rather than with a conversational AI (Kim & Lee, 2025).

The understanding of the impact of chatbots and how customers respond to it is becoming an increasingly pressing matter to researchers and businesses alike, as technology evolves to mimic humans and the interest of marketers and brands towards this technology grows (Cheng et al., 2022). This leads to it becoming increasingly present in the service cycle of a business as companies implement technology to avoid staying behind (Araujo, 2018). However, how much AI chatbots actually improve user experience is dependent on how much this technology is accepted by the users themselves (Kim & Lee, 2025), and an adequate level of anthropomorphism may allow for a higher acceptance of conversational AIs (Araujo, 2018; Xie et al., 2023).

6. AI Chatbots and Social Relationships

Anthropomorphism can be a tool that facilitates Human-AI connection by allowing for interactions that resemble interpersonal dynamics (Araujo, 2018). AI technology has gradually become a regular part of everyday life and has begun seeping into sectors of activity that require a more humane touch, such as education and mental health (Freitas et al., 2022; Gur & Maaravi, 2024). Chatbots have been shown capable of conversations that are considered by the user as “empathetic” and “personalized”, being considered conversational partners, friends, or, in more extreme cases, the user can even see the chatbot as a romantic partner or developing relationships reportedly as profound as that of family, with user comparing it to a wife or a sister (Brandtzaeg et al., 2022; Skjuve et al. 2022).

H3b: The Empathy of an AI Chatbot positively influences the user’s perception of Friendliness.

Social chatbots have also been shown to have the potential to transform the “affective and social processes” of users, setting additional relationship expectations partially due to the ever-present, non-judgmental nature of AI (Skjuve et al. 2022; Gur & Maaravi, 2024). However, this kind of connection is not limited to chatbots meant inherently for social behavior, as research indicates that users have developed social relationships with AI agents

that were not programmed for companionship, but rather for secretarial and personal assistance tasks (Gur & Maaravi, 2024).

Research points out that users may develop a high level of attachment to AI chatbots that can result in a parasocial relationship. The theory of parasocial relationships was originally developed to explain one-sided relationships that are often seen in consumers of traditional media, where they reported feeling close bonds to characters and celebrities without having had a “real interaction” (Marriott & Pitardi, 2023). This theory has since been applied to AI Chatbot-Human relationships in an effort to better understand this new phenomenon (Maeda & Quan-Haase, 2024).

Due to the novelty of these technologies, the consequences of these relationships are still heavily unresearched, and their psychological, sociological, and even ecological impacts yet to be fully understood, raising new ethical dilemmas. What research is available suggests that these relationships may negatively impact users (Marriott & Pitardi, 2023; Gur & Maaravi, 2024). Lack of technical understanding by users, and imbalanced relationship dynamics in creating a relation with an algorithm may lead to consequences such as false beliefs, harmful decision-making, social avoidance, and distorted expectations when it comes to human-human relationships (Gur & Maaravi, 2024; Maeda & Quan-Haase, 2024).

Modern conversational AIs are Large Language Models (LLM), and function following an algorithm based in predicting the most probable token to follow the previous one, relying in language patterns rather than factual accuracy, leading to what is known as “hallucinations” (Freitas et al., 2022). As such, there is no accountability in providing reliable and credible outputs (Maeda & Quan-Haase, 2024), potentially leading to disastrous outcomes, particularly if they are used in ways they were not programmed for (Freitas et al., 2022; Maeda & Quan-Haase, 2024). Hence, there needs to be a balance between seizing opportunities given by these technological developments and using AI as brand ambassadors in a conscious and knowledgeable way, to potentiate a desired outcome.

7. Friendship Formation with AI Chatbots and Its Implications for Marketing

As AI chatbots grow more common in consumer environments, brands and businesses must consider how the design features and characteristics of an AI chatbot reflect onto their own strategy as an ambassador and a direct point of contact with the brand (Araujo, 2018; Xu et

al., 2022). And, as brand ambassadors chatbots can shape customer experiences in order to foster relationships that are then mirrored in the brand itself (Roy & Naidoo, 2021; Magno & Dossena, 2022).

Sherry Turkle, a professor at the Massachusetts Institute of Technology defended, in 2014, that an emotional relationship similar to those among family and friends can be developed between humans and computers (Wu, 2024). But, although AI chatbot-human relationships can be seen similarly to human-human relationships, according to research by Brandtzaeg et al. (2022), the artificiality of the chatbot can change the notion of friendship to the user, leading to a relationship crafted to correspond to the user's needs. This situation is, however, impossible to replicate in real life and live friendships, and may lead to a disturbed vision of what a friendship should be (Guingrich & Graziano, 2023).

In 2021 Skuve et al., proposed a model to explain Human-Chatbot Relationships in a structured framework. Derived from the traditional Social Penetration Theory and based on empirical interviews conducted with users who developed relationships of friendship with social chatbots. The model proposed includes 3 stages, the “explorative stage”, the “affective stage” and the “stable stage”, aiming to mirror how human relationships grow and evolve (Skjuve et al., 2021).

The explorative stage starts out mostly out of the user’s curiosity towards the chatbot. The interactions tend to be surface-level and exploratory of the chatbot's capacity and responses, while maintaining the emotional investment to a minimum. The next stage, the “affective stage”, is where users begin to voluntarily share increasingly personal information and feelings, engaging in affective exploration and an increase in emotional engagement. In this stage, the chatbot starts to be seen as an accepting, non-judgmental, and understanding entity. Then, as the relationship develops, it reaches the third stage, or the “stable stage”. This stage is characterized by the authors as the user and the chatbot having less frequent but equally meaningful interactions. Users interviewed reported positive impacts on their wellbeing, and the relationship was deemed to have considerable sentimental and social significance (Skjuve et al., 2021).

The development of emotional AI technology allowed anthropomorphism to be more evident in conversational contexts. This has added some warmth to these interactions, which allowed for the creation of “conversational and companionable AI” (Wu, 2024). Previous research has shown anthropomorphism in AI Chatbots to be linked to an increase in the likelihood that the user will form a friendship-like relationship with the chatbot, this effect

being shown both through behavioral anthropomorphism (Brandtzaeg et al., 2022) and visual anthropomorphism (Ma et al., 2025).

Visual Anthropomorphism is present through visual design cues, such as the avatar used for the AI chatbot. Research suggests that avatars, serving as a digital representation, make the amorphous nature of the chatbot more relatable and accessible to users (Ma et al., 2025). Furthermore, allowing for personalization of the visual representation of the chatbot has been shown to lead to a stronger emotional attachment to a brand or product (Ma et al., 2025). On the other hand, Behavioral Anthropomorphism refers to when chatbots exhibit human-like behaviors, allowing for them to be seen by users as suitable for conversations or more intimate relationships, such as friendships (Brandtzaeg et al., 2022).

In the end, users reported improved well-being, especially those experiencing loneliness and with few social channels. These relationships should not, however, substitute human friendships as they are not equivalent, but can be another source of support (Skjuve et al., 2021). Furthermore, although most of the current research on the topic admits that anthropomorphism and other social dimensions can be useful to enhance the experience of human-ai interaction, some authors suggest that anthropomorphic traits may cause them to feel negatively about artificial intelligence chatbot technology (Gu et al., 2024).

When it comes to brand relationships, research by Araujo (2018) suggests that relational dynamics, not dissimilar to those encountered with human service agents, can result due to consumers' disposition to anthropomorphize a chatbot (Araujo, 2018). So, when a chatbot serves as a brand's spokesperson it directly impacts customer satisfaction (Magno & Dossena, 2022) and consumers' emotional attachment to the brand can be strengthened by the friendship-like bond they have with the chatbot, which then transfers as positive aspects, such as repurchase intention and positive word-of-mouth (Magno & Dossena, 2022; Yun & Park, 2022; Baudier & de Boissieu, 2025). As AI technologies become more commonplace in business settings, it becomes increasingly more relevant to consider how an artificial intelligence chatbot plays into a brand's strategy (Araujo, 2018; Xu et al., 2022).

8. Social Dimensions, Anthropomorphism and Friendliness

Chatbots have gradually become regarded as “complex social partners” rather than simple knowledge providers, as technology advances. During this process research identified the social dimensions of social presence, perceived competence, and warmth as important

interconnected determinants of user acceptance and satisfaction (Deng & Yan, 2025). Previous authors have suggested that competence/helpfulness and friendliness/warmth can be considered important and interrelated in fostering relationships that are similar to one of friendship between a user and AI (Li et al., 2023). The overlap of these dimensions with those identified as key factors for stronger feelings of anthropomorphism emphasizes its role in the development of a positive relation with the user as anthropomorphism has been shown to increase the expectations of customers towards a chatbot's degree of independence and performance (Crollic et al., 2022).

Perceived Anthropomorphism has been shown to be heavily dependent on the following variables: Social Presence, Empathy, Warmth, and Competence (Araujo, 2018; Li et al., 2023; Feng et al., 2023; Lee et al., 2023; Sun et al., 2024). Furthermore, Empathy, Warmth and Competence are key determinants when it come to a perception of Friendship and are “fundamental and universal dimensions” of social judgement across “stimuli, cultures and time” (Kolbl et al., 2019; Qi et al., 2025). Hence, it can be predicted that there might be a positive relationship between Anthropomorphism and Perceived Friendship concerning Users and AI Chatbots.

8.1. Empathy and Warmth

Warmth and empathy are shown to be key factors in the anthropomorphism of AI chatbots. Warmth is a concept that envelops notions such as good-naturedness, friendliness, and kindness (Kolbl, Ž., 2019) and is often seen as the visible and conveyed result of empathy (Segal, 2024). Research found that some users of mental health chatbots that tended to consider chatbots as a “type of friend” would remark on the chatbots “empathic, warm and nurturing” behavior (Skjuve et al., 2021). This perceived warmth can be demonstrated through the chatbot's sensitivity and timely replies to the user and the very linguistic approach and style used (Deng & Yan, 2025).

In previous research, Warmth has been related to the assessment of friendliness and competence (Pizzi et al., 2023; Deng & Yan, 2025). Therefore, as Anthropomorphism is dependent on the perceived warmth and empathy, a higher degree of anthropomorphism would positively impact friendliness and competence (Al-Oraini, 2025; Ma et al., 2025; Deng & Yan, 2025). Furthermore, research also denotes that a perception of anthropomorphism leads to expectations of a higher service value due to “higher warmth and competence

ascribed to the object” and that users were more likely to develop relationships with a chatbot if it is built with specific character traits, like empathy, in mind (Skjuve et al., 2021; Pizzi et al., 2023).

H3c: The Warmth of an AI Chatbot positively influences the user’s perception of Friendliness.

Additionally, a higher degree of reported warmth has been linked to positively influencing user satisfaction. And, when paired with competence leads to higher trust, the development of a feeling of social presence and a deeper connection with the user (Al-Oraini, 2024, Deng & Yan, 2025).

8.2. Competence

Competence is often linked to concepts such as capacity, intelligence, and efficiency relating to a chatbot’s capability to execute assignments (Kolbl et al., 2019). Besides being vital to organizations, as AI chatbots start to headline Customer Service, it plays an important role in mediating social dimensions such as warmth (Chen et al., 2022, Deng & Yan, 2025).

The perception of competence is, according to Al-Oraini (2024) “the subjective appraisal or knowledge of individuals of their own or others’ degree of competence in a specific topic or skill” and a higher degree of reported competence can lead to a greater customer satisfaction and higher levels of retention and trust (Christoforakos et al., 2021, Al-Oraini, 2024; Deng & Yan, 2025). Moreover, the perception of competence can influence the impact of communication style on a user, particularly in the context of communication that is more Anthropomorphic. Therefore, competence is seen as a relevant social facet that leads to user satisfaction and contributing to users reporting increased pleasure in interactions with chatbots and repeated use, allowing for the development of a relationship with the user (Al-Oraini, 2024; Deng & Yan, 2025).

H3d: The Competence of an AI Chatbot positively influences the user’s perception of Friendliness.

Nonetheless, it is pertinent to mention that previous research in human-human interactions has suggested that when warmth perception increases, competence perception decreases, and those perceived as warmer are seen as less competent and vice versa (Simon et al., 2020). So, although perceived competence has been shown to impact perceived anthropomorphism (Christoforakos et al., 2021), it might negatively impact friendliness, according to traditional psychology (Abele & Brack, 2013; Simon et al., 2020; Eisenbruch & Krasnow, 2022).

8.3. Social Presence

Social presence is the subjective perception an individual has that “another person or entity is real and present” (Konya-Baumbach et al., 2023). Its role is particularly critical in online interactions, impacting the psychological response produced in the user and their attitudes (Deng & Yan, 2025). Ma et al. (2025), further reports that users feel an increased predisposition to interact emotionally with a system when they believe it to be more socially present. Producing greater feelings of connectedness and ease during interactions, allowing for a larger emotional engagement (Ma et al., 2025).

H3a: The Social Presence of an AI Chatbot positively influences the user’s perception of Friendliness.

Furthermore, previous research has indicated that when users understand a chatbot to be more anthropomorphic, it is seen as having a larger social presence, and as being more real and authentic (Marriott & Pitardi, 2023; Deng & Yan, 2025). Anthropomorphism allows a chatbot to produce a perception of social presence in the user, having been suggested that this social dimension can be an “underlying mechanism” that justifies the efficacy of chatbot anthropomorphism (Konya-Baumbach et al., 2023).

Research on the present topic is still limited (Roy and Naidoo, 2021). Still, despite the exponential increase in research regarding the topic of AI chatbots and anthropomorphism, there is a gap in current literature on the impact perceived anthropomorphism of AI chatbots has on perceived friendliness, particularly while exploring the relationship with the social dimensions presented as shared to both spheres. To address this gap, the present study proposes a model integrating the previously mentioned dimensions (social presence, empathy,

warmth and competence) and their relationship with perceived anthropomorphism and the perception of friendliness.

Chapter III: Conceptual Model and Hypothesis

Anthropomorphism has been shown to increase the expectations of customers towards a chatbot's degree of independence and performance (Crolic et al., 2022), improve the chances at a friendly relationship between user and AI chatbot (Brandtzaeg et al., 2022) and has been demonstrated to positively impact the acceptance of AI by customers (Song & Natori, 2024; Zhu et al., 2025), as previously mentioned. Moreover, previous authors have suggested that competence/helpfulness and friendliness/warmth can be considered important and interrelated in fostering relationships that are similar to one of friendship between a user and AI (Li et al., 2023).

Perceived Anthropomorphism has been shown to be heavily dependent on the following variables: Social Presence, Empathy, Warmth, and Competence (Araujo, 2018; Li et al., 2023; Feng et al., 2023; Lee et al., 2023; Sun et al., 2024). Furthermore, Empathy, Warmth and Competence are key determinants when it come to a perception of Friendship and are “fundamental and universal dimensions” of social judgement across “stimuli, cultures and time” (Kolbl et al., 2019; Qi et al., 2025). Hence, it can be predicted that there might be a positive relationship between Anthropomorphism and Perceived Friendship concerning Users and AI Chatbots.

Taking into consideration everything that has previously been discussed and according to current literature, the following hypotheses are predicted:

- *H1*: Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Friendliness.
- *H2a*: The Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Social Presence.
- *H2b*: The Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Empathy.
- *H2c*: The Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Warmth.
- *H2d*: The Perceived Anthropomorphism of an AI Chatbot positively influences the user's perception of Competence.
- *H3a*: The Social Presence of an AI Chatbot positively influences the user's perception of Friendliness.

- *H3b*: The Empathy of an AI Chatbot positively influences the user's perception of Friendliness.
- *H3c*: The Warmth of an AI Chatbot positively influences the user's perception of Friendliness.
- *H3d*: The Competence of an AI Chatbot positively influences the user's perception of Friendliness.

Hence, based on the proposed hypothesis, the following conceptual model (Figure 1) is proposed:

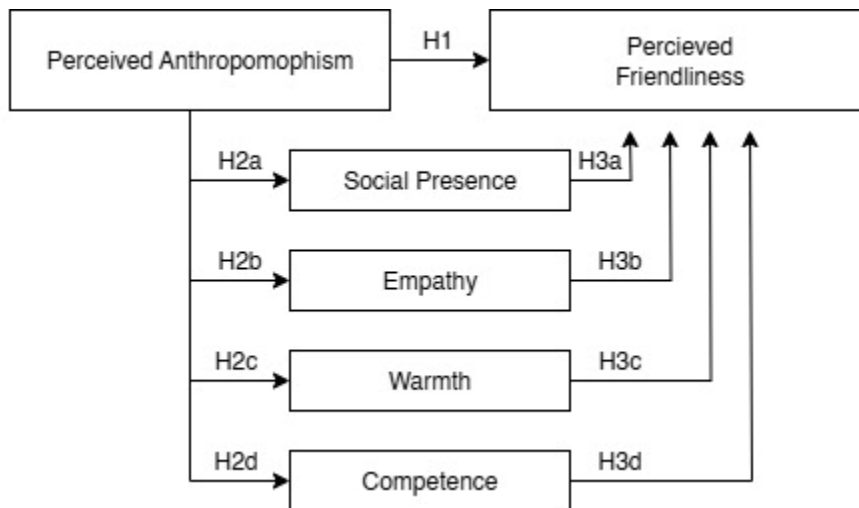


Figure 3.1: *Conceptual model*

Chapter IV: Methodology

1. Design and overview of the procedure

The research questions posed were tested through an online questionnaire, to gather quantitative data. In the questionnaire, the participants were requested to remember and think about their previous interactions with AI Chatbots, in order to find evidence of relationships between the proposed variables and the feeling of “friendliness”, to test the previously proposed hypotheses.

The survey was designed and conducted within the platform “Qualtrics”, and IBM SPSS software was used to then analyze the collected data.

The study used a convenience sampling approach, aiming to collect data from people who had interacted with AI Chatbots in the past. The participants were recruited through several channels, such as social media, internet forums, WhatsApp group invitations and other digital means to maximize the number of responses.

The recruitment message clearly outlined the objectives of the study, and its anonymity and specified that participation was only open to individuals who had interacted with chatbots. This information was also reinforced at the start of the questionnaire to ensure that every participant knowingly consented to the participation in the research being conducted and was aware of the restrictions to respond. To further verify this aspect two screening questions were included at the start of the questionnaire to ensure all participants were familiar with AI Chatbots. Participants were not allowed to proceed with the questionnaire if they answered negatively (“No” or “Never”) to the question. This ensured that participants had previous relevant experience and a history of interaction with AI Chatbots, and therefore guaranteeing the relevance of the data collected.

2. Procedure

The survey was comprised of 33 questions and 2 short explanatory texts to ensure the correct understanding of the tasks requested. Firstly, participants were presented with an introductory text, explaining the purpose of the questionnaire and ensuring anonymity. Followed by this text, a few relevant demographic questions and screening questions were presented regarding age, level of education, previous usage of AI Chatbots and frequency of use of AI Chatbots.

This section was intentionally kept brief due to the large volume of questions needed to adequately study the proposed variables. Limiting the number of demographic items ensured that the survey could be completed quickly and efficiently, thereby reducing participant fatigue and maximizing response rate.

3. Items and Measurements

To adequately study the six variables that comprise the previously presented conceptual model, the measures utilized in the questionnaire were adapted from various published research articles. The rating of the journal in which the research was published was considered as well as ensuring that those studies were similarly related to AI chatbots, to ensure further validation of the present research and allow for only light adaptations from the original scales. The items used were organized and condensed into a table, including aspects such as variable at study, title of the original study, adaptations made for this study, citations and the latest rating of the journal the research was published.

Firstly, the **Frequency** of AI Use was measured through the single item used by Scherr et al. (2025) utilizing a 7-point Likert-type scale (1=Never; 7=Almost every day). Participants that selected “Never” were not allowed to proceed with the questionnaire.

Secondly, to measure the perceived **Anthropomorphism** of an AI chatbot, focusing on behavioral cues, this study employed a four-item scale adapted from Lee et al. (2023), which in turn were based off a scale by Epley et al. (2008).

Social Presence was measured through the eight-item scale proposed in the same study by Lee et al. (2023). These items were originally based off a scale by Gefen and Straub (2003).

Afterwards, **Friendliness** was assessed using a three-item scale adapted from Cheng et al. (2022) which was previously based off Tsai and Huang (2002).

Subsequently, **Empathy** was measured utilizing a three-item scale from the same study by Cheng et al. (2022), that in turn were adapted from Cheng et al. (2018), Czaplewski et al. (2002), and de Kervenoael et al. (2020).

To assess **Warmth** this study employed a five-item scale adapted from El Hedhli et al. (2023) and previously adapted from Kervyn et al. (2012).

And lastly, to measure **Competence** a five-item scale was adapted from the same study by El Hedhli et al. (2023) that in turn was adapted from Lee et al. (2017).

All items previously mentioned were assessed utilizing a 5-point Likert-type scale (1 = Strongly Disagree; 5 = Strongly Agree). While some of the original scales mentioned above originally employed a 7-point Likert-type scale, since prior research that indicates that 5-point and 7-point scales can be rescaled and still allow for “quite comparable” data (Dawes, 2008), all scales were adapted to a five-point scale to guarantee consistency across all variables and ease of response for participants.

Chapter V: Results' Analysis and Discussion

In this section, the data collected from the previously described questionnaires will be subjected to a quantitative analysis. This will be done in order to then draw objective conclusions, supported by the data collected, that will be further discussed. To provide a better contextualization of the results, brief analysis will accompany the presentation of quantitative data. These results will then be further discussed.

1. Sample Details and Demographics

This study originally collected responses from a total of 192 total participants. However, 22.40% (N=43) responses were disregarded due to the screening criteria, to ensure data relevance and quality: 18.75% (N=36) respondents reported never having used an AI chatbot and were, therefore, ineligible for this study. An additional 3.64% (N=7) of participants revealed that although they had used AI chatbots, when asked about frequency of utilization they reported to never use AI Chatbots and were also disqualified from the research. Rejecting these responses helped guarantee a more relevant final sample (N=149) with adequate experience to assess the hypothesis under evaluation, and, thereby, supporting the validity of the study. Hence, this study is comprised of 149 participants that passed all screening questions, this is the value that will be used to further explore the data collected and to discuss findings.

As previously mentioned, out of the original 192 responses, 18.75% (N=36) reported having never interviewed with an AI Chatbot and were, therefore, disregarded. Of the remaining participants, after the two screening questions, 97.3% (N=145) reported having interacted with an AI Chatbot and 2.7% (N=4) were unsure if they had interacted with an AI chatbot. These participants remained in the analysis, as their responses may reflect experience with AI chatbots but lack of familiarity with the specific terminology.

The remaining participants were then asked about how frequently they used AI Chatbots. A minority of the sample, 4.0% (N=6) of the participants, reported using AI Chatbots about once a year. Otherwise, usage was more evenly distributed: 19.5% (N=29) reporting utilizing AI Chatbots several times a year; 14.1% (N=21) admitted to using AI about once a month; 20.1% (N=30) reported using AI Chatbots several times per month; 22.1% (N=33) reported using AI Chatbots once or twice a week; and 20.1% (N=30) reported using them almost every

day. This distribution suggests a certain variability of how frequently the participants use the technology at study, however 76.4% (N=114) reported at least a monthly usage of AI Chatbots, allowing for a significant familiarity with the technology.

In the final sample of 149 participants, the most prevalent age groups were 18 to 24 years (17.4%; N=26) and 25 to 34 years (35.6%; N=53), together accounting for more than half of the sample (53.0%; N=79). Participants aged 35 to 44 represented 16.1% (N=24), while 12.1% (N=18) were between 45 and 54 years. Additionally, 14.8% (N=22) were 55 to 64 years, 3.4% (N=5) were 65 to 74 years, and one participant (0.7%) was over 75 years of age.

Regarding educational background, 33.6% (N=50) of the sample held a bachelor's degree, and 34.9% (N=52) of the sample had a master's degree, still regarding higher education, 4.7% (N=7) reported a doctorate degree. Therefore, 73.2% (N=109) held at least a bachelor's degree, suggesting a highly educated sample. Furthermore, a small proportion of the sample reported less than high school education (2.0%; N=3) and 20.1% (N=30) had completed high school. One respondent (0.7%) preferred not to disclose their educational background.

It was then asked how the participants would rate their experience interacting with an AI Chatbot. The sample was mostly satisfied with their interaction with AI Chatbots with more than half of the participants (53.0%, N=79) reported being somewhat satisfied and 20.8% (N=31) affirming to be extremely satisfied. This corresponds to 73.8% (N=110) of the sample. On the other hand, 11.4% (N=17) reported being neither satisfied nor dissatisfied with their experience and 12.1% (N=18) reported being somewhat dissatisfied. A small proportion (2.7%, N=4) of the sample was extremely dissatisfied with their experience interacting with an AI Chatbot.

2. Reliability Analysis

A reliability analysis was conducted for each item and its respective constructs to provide information about the relationships between items and allow for a larger degree of confidence in the scales utilized. This analysis was not conducted for constructs composed of a single item, such as Frequency.

The construct with a larger degree of consistency within its items was Social Presence, reporting a Cronbach's alpha of ($\alpha=0.932$), followed by Anthropomorphism with a Cronbach's alpha of ($\alpha=0.869$), Friendliness with a Cronbach's alpha of ($\alpha=0.862$),

Competence and Warmth each with a Cronbach's alpha of ($\alpha=0.857$) and lastly Empathy with a Cronbach's alpha of ($\alpha=0.566$).

That being said, these reliability tests proved all constructs as highly reliable, ranking "Excellent" and "Good", with the exception of Empathy, ranking "Poor". Analyzing the Item Statistics, and conducting a Composite Reliability test, the result of the reliability improved only slightly to CR= 0.60. It could be verified that this might be due to the item EMP3 ("Chatbots are available whenever it's convenient for the user.") that presented a very low factor loading ($\lambda = 0.289$).

It was, however, observed that dropping the item would only result in a slight increase to the construct's Cronbach's alpha and Composite Reliability would still be under the recommended CR= 0.7, hence the item was retained to preserve the original validated scale, adapted from Cheng et al. (2022).

Authors mention that low reliability values might be due to a construct having a small number of items. These values can be influenced by the number of items in a construct, and a lower count of items may lead to a lower reliability altogether (Tavakol & Dennick, 2011; Sudina, 2023). Hence, although, it might not be a fully reliable measure, this construct will still be analyzed.

3. Descriptive Analysis

Since the participants were requested to answer the questionnaire items in a 5-point Likert-type scale (1= Strongly Disagree, 2= Somewhat Disagree, 3= Neither Agree nor Disagree, 4 = Somewhat Agree, 5= Strongly Agree), the ordinal responses may be treated as numerical values, and therefore, facilitating the interpretation and comparison across variables. The process of analyzing the data acquired started with conducting a descriptive analysis for every item within each variable (Table 1). After conducting the reliability analysis, the items were then grouped into composite variables, to be analyzed as a single parameter and allow for a simpler interpretation.

With this analysis it was possible to draw some observations:

Friendliness was the variable with the highest mean ($\bar{x}=3.87$), and, although the items defined to describe this variable were all rated very similarly by the participants ($\bar{x}_{FRD1}=3.79$; $\bar{x}_{FRD2}= 3.89$; $\bar{x}_{FRD3}=3.93$), FRD3 had the highest average score.

The variable with the second highest mean was Empathy ($\bar{x}=3.71$), with participants particularly agreeing with how chatbots are available whenever it's convenient for users ($\bar{x}_{EMP3}=4,24$).

Competence followed with a mean of 3,58 ($\bar{x}=3.58$). All items within this cluster had very congruent responses, which led to very similar mean scores ($\bar{x}_{CP1}= 3,64$; $\bar{x}_{CP2}= 3.69$; $\bar{x}_{CP3}= 3.52$; $\bar{x}_{CP4}=3.26$; $\bar{x}_{CP5}= 3.79$).

The values with the lowest means, meaning the participants mostly somewhat disagreed with the items proposed were Anthropomorphism ($\bar{x}=2.01$) and Social Presence ($\bar{x}=2.60$). While the items contained within the concept of Social Presence all showed a similar mean ($\bar{x}_{SOP1}=2.52$; $\bar{x}_{SOP2}=2.36$; $\bar{x}_{SOP3}=2.74$; $\bar{x}_{SOP4}=2.44$; $\bar{x}_{SOP5}=2.44$; $\bar{x}_{SOP6}=2.87$; $\bar{x}_{SOP7}=2.98$; $\bar{x}_{SOP8}=2.47$), the items within the cluster of Anthropomorphism showed a slight variation of mean scores ($\bar{x}_{ATP1}=2.56$; $\bar{x}_{ATP2}=1.84$; $\bar{x}_{ATP3}=1.84$; $\bar{x}_{ATP4}=1.81$). Participants particularly tended to disagree with concepts such as the chatbot having feelings (ATP2), emotions (ATP3) and a conscience (ATP4), while they were tending more neutral to the concept of the AI chatbot having intentions (ATP1).

Variable	Items	Mean	Std. Dev.
Competence ($\bar{x}=3.58$)	CP1	3.64	1.05
	CP2	3.69	0.97
	CP3	3.52	1.12
	CP4	3.26	0.08
	CP5	3.79	1.00
		3.58	
Warmth ($\bar{x}=3.09$)	WM1	3.26	1.04
	WM2	3.01	1.00
	WM3	3.09	1.177
	WM4	3.15	1.13
	WM5	2.94	1.17
		3.09	
Social Presence ($\bar{x}=2.60$)	SOP1	2.52	1.28
	SOP2	2.36	1.33
	SOP3	2.74	1.31
	SOP4	2.44	1.34
	SOP5	2.44	1.36
	SOP6	2.87	1.40

	SOP7	2.98	1.34
	SOP8	2.47	1.37
		2.60	
Empathy (\bar{x} =3.71)	EMP1	3.46	1.02
	EMP2	3.44	1.22
	EMP3	4.24	0.97
		3.71	
Friendliness (\bar{x} =3.87)	FRD1	3.79	0.90
	FRD2	3.89	0.84
	FRD3	3.93	0.92
		3.87	
Anthropomorphism (\bar{x} =2.01)	ATP1	2.56	1.23
	ATP2	1.84	1.11
	ATP3	1.84	1.13
	ATP4	1.81	1.03
		2.01	

Table 5.1: Descriptive analysis for each item

4. Hypothesis Testing

Firstly, a series of Person Correlation tests were conducted in order to check for linear relationships between variables. This test is adequate due to the constructs having been measured using Likert-type scales and then averaged, and can, therefore, be treated as continuous variables.

The Pearson Correlation tests (table 2) revealed that Anthropomorphism shows a relevant positive association with most variables. This relationship could be seen with social presence ($r = 0.557$; $p < 0.001$), warmth ($r = 0.454$; $p < 0.001$), competence ($r = 0.256$, $p = 0.002$) and empathy ($r = 0.223$; $p = 0.006$). Additionally, due to the value of $r > 0.5$, anthropomorphism presents a moderate positive correlation with social presence and with warmth and a low positive correlation with competence and empathy. On the other hand, the relationships of Anthropomorphism with Friendliness ($p = 0.101$) showed significance of $p > 0.05$ and was, thus, disregarded. Thus, it can be inferred that anthropomorphism does not have a direct relationship with Friendliness, rejecting H1.

Friendliness, alternatively, presented a positive significant relationship with Empathy ($r = 0.560$, $p < 0.001$), Competence ($r = 0.541$, $p < 0.001$), Warmth ($r = 0.512$, $p < 0.001$) and

Social Presence ($r = 0.403$; $p < 0.001$). Revealing moderate positive correlations to Empathy, Competence, Warmth and to Social Presence.

It is, however, worth mentioning that Empathy held a questionable Cronbach's alpha when conducting the reliability analysis, and should, thus, conclusions regarding Empathy be considered with some reservations.

		Competence	Warmth	Empathy	Friendliness	Anthropo- morphism	Social Presence
Competence	Pearson	1	.616**	.538**	.541**	.256**	.451**
	Correlation						
	Sig. (2-tailed)		<.001	<.001	<.001	.002	<.001
	N	149	149	149	149	149	149
Warmth	Pearson	.616**	1	.467**	.512**	.454**	.580**
	Correlation						
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001
	N	149	149	149	149	149	149
Empathy	Pearson	.538**	.467**	1	.560**	.223**	.378**
	Correlation						
	Sig. (2-tailed)	<.001	<.001		<.001	.006	<.001
	N	149	149	149	149	149	149
Friendliness	Pearson	.541**	.512**	.560**	1	.135	.403**
	Correlation						
	Sig. (2-tailed)	<.001	<.001	<.001		.101	<.001
	N	149	149	149	149	149	149
Anthropo- morphism	Pearson	.256**	.454**	.223**	.135	1	.557**
	Correlation						
	Sig. (2-tailed)	.002	<.001	.006	.101		<.001
	N	149	149	149	149	149	149
Social Presence	Pearson	.451**	.580**	.378**	.403**	.557**	1
	Correlation						

Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	
N	149	149	149	149	149	149

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5.1: *Pierson Correlation test results*

To further explore the variables presented, simple linear regressions will be computed between anthropomorphism and the four other variables that were shown to have a degree of correlation to it. Before conducting analyses, the assumptions for multiple linear regression must be tested for each of the regressions. The variables are continuous, and after a visual inspection, the histograms and P-P plots (Annex F) confirmed normality and linearity, respectively, for all regressions. No significant outliers were visible in each of the P-P plots and all of the four regressions scatterplots showed evidence of homoscedasticity for each simple linear regression. The normality of the residuals was verified with each of the histograms and the P-P plots, demonstrating an approximately normal distribution in all cases. The residuals are independent, as the regressions presented Durbin-Watson scores of 1.675 and 2.112 (Annex G), within the acceptable range, with H2a having a Durbin-Watson value of 1.875, H2b of 2.112, H2c of 1.675, and H2d of 1.758. Thus, all assumptions for all four of the simple linear regression were met and the regressions can be computed.

Firstly, looking at the linear regression between anthropomorphism and social presence we can see that $R^2= 0.311$ and $\beta = 0.557$ and looking at the ANOVA table $p < 0.001$. Thus, the regression is indeed significant, since $p < 0.05$. Then, observing the linear regression between anthropomorphism and competence it is visible that $R^2=0.059$ and $\beta = 0.256$ with $p < 0.002$. Thus, the regression is indeed significant. Subsequently, by computing the linear regression between anthropomorphism and warmth, it is observed that $R^2=0.201$ and $\beta = 0.454$ with $p < 0.001$. Hence, since $p < 0.05$, the regression is significant. Lastly, considering the linear regression between anthropomorphism and empathy we can see that $R^2= 0.043$ and $\beta = 0.223$ with $p = 0.006$, with the regression being, therefore, significant ($p < 0.05$).

After computing the linear regressions for all variables, the following conclusions can be drawn: anthropomorphism can positively predict social presence ($\beta = 0.557$; $p < 0.001$), explaining 31% of the variance ($R^2= 0.311$), therefore validating H2a. Furthermore, anthropomorphism can positively predict warmth ($\beta = 0.201$; $p < 0.001$) as well, being responsible for 20% ($R^2=0.201$) of the variation in warmth, supporting H2c. Interestingly,

although anthropomorphism and competence also have a positive relationship ($\beta = 0.256$; $p < 0.002$) it can only explain 5.9% ($R^2=0.059$) of the variation of competence. A similar situation happens with empathy: anthropomorphism can also positively predict empathy ($\beta = 0.223$; $p < 0.006$) with it explaining 4.3% of the variance ($R^2= 0.043$). This points to a modest positive effect of anthropomorphism on competence and on empathy, validating H2b and H2d, nonetheless.

Afterwards, a Multiple Linear Regression was computed to respond to H3a, H3b, H3c and H3d. The assumptions for multiple linear regression were tested. The variables are continuous, and a visual analysis of the histogram and P-P plot (Annex F) confirmed normality and linearity, respectively. The P-P plot also revealed that there are no significant outliers and the scatterplot also showed evidence of homoscedasticity. The normality of the residuals was verified with the histogram and the P-P plot, demonstrating an approximately normal distribution. The residuals are independent, as the Durbin-Watson score for this regression is 1.837 (Annex G). Finally, the values of tolerance were all above 0.1 and all VIF scores were under 10 (Annex G), showing no multicollinearity. Thus, all assumptions for multiple regression were met.

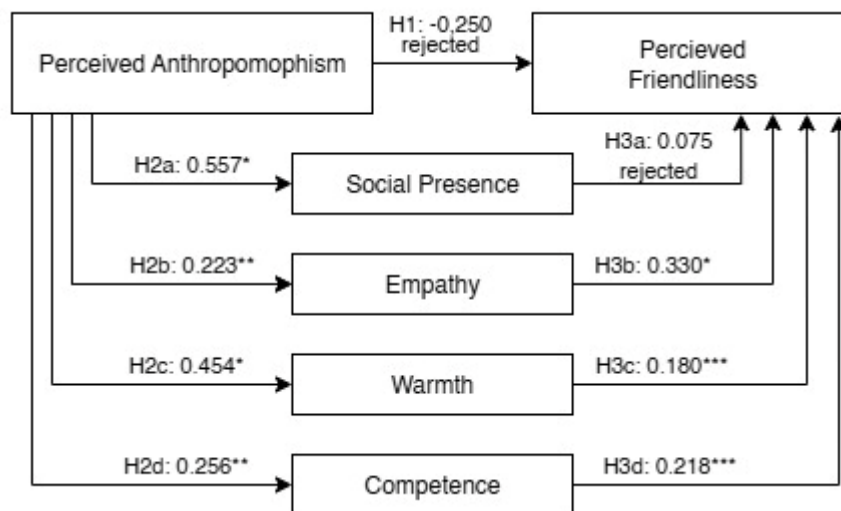
This Multiple Linear Regression was done to further explore and verify if there were relationships between friendliness and the four variables that were mentioned in the previously conducted Pearson’s Correlation tests: Social Presence, Competence, Empathy and Warmth. The test conducted indicated that the variables competence, empathy and warmth could significantly ($p < 0.001$) and positively predict friendliness, albeit at different levels ($\beta_{\text{SocialPresence}} = 0.075$; $\beta_{\text{Competence}} = 0.218$; $\beta_{\text{Empathy}} = 0.330$; $\beta_{\text{Warmth}} = 0.180$). While social presence had a ($p= 0.341$) therefore not significant. The remaining three variables were also shown to explain 42% ($R^2= 0.421$) of the variation in friendliness. Empathy is shown to present the stronger relation to friendliness ($\beta = 0.330$), followed by competence ($\beta = 0.218$). Warmth is shown to have a more reduced impact on friendliness than the other two variables tested ($\beta_{\text{Warmth}} = 0.180$). Summarizing, each of the other variables mentioned have a statistically significant impact on predicted Friendliness, hence, supporting H3b, H3c and H3d and rejecting H3a.

Hypothesis Test	Standardized Coefficients Beta	Std. Error	Sig. (p)	t	VIF
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H1: ATP → FRD	-0.250	0.107	<0.001	1.000	1.000
H2a: ATP → SOP	0.557	0.079	<0.001	1.000	1.000
H2b: ATP → EMP	0.223	0.066	0.006	1.000	1.000
H2c: ATP → WM	0.454	0.068	<0.001	1.000	1.000
H2d: ATP → CP	0.256	0.070	0.002	1.000	1.000
H3a: SOP → FRD	0.075	0.056	0.341	0.956	1.557
H3b: EMP → FRD	0.330	0.077	<0.001	4.286	1.485
H3c: WM → FRD	0.180	0.080	0.047	2.001	2.017
H3d: CP → FRD	0.218	0.081	0.013	2.525	1.871

Table 5.2: Multiple regression analysis results

Considering the analysis' performed, the conceptual model can be updated to reflect the outcome of this study:



* p<0.001; ** p<0.01; ***p<0.05

Figure 5.1: Final conceptual model

5. Discussion

The purpose of this study was to examine how the perceived anthropomorphism of AI chatbots influences users' perception of friendliness by analyzing literature supported social dimensions (Social presence, empathy, warmth and competence) related to both concepts. Aiming to clarify and further advance the understanding of how this growing technology impacts businesses and its users.

With that in mind, and after analyzing the current literature, 9 hypotheses were derived and tested. Overall, the findings partially support the proposed model. Although the results do not point to a direct relationship between perceived anthropomorphism and perceived friendliness, there is a high degree of convergence between the social dimensions that can predict anthropomorphism and the characteristics that drive the perception of chatbots as friendly.

5.1. Anthropomorphism and Friendliness (H1)

Hypothesis **H1** anticipated that anthropomorphism would directly predict perceived friendliness. Contrary to what was predicted, the analysis performed indicates that anthropomorphism does not directly translate into an increased perception of friendliness. These findings contrast with some of the prior research presented, but interestingly, they support the theories of authors such as Gu et al., (2024) suggesting that anthropomorphism may not be sufficient to impact the relationship with the user without mediating factors. These results, combined with the existing literature, and corroborating the findings of Gu et al. (2024) suggest that anthropomorphism should be understood as more of a catalyst, enabling the social qualities that do impact the perceptions of friendliness. And evidencing the value of the social dimension analyzed towards the perceptions of friendliness, as proposed by Deng and Yan (2025).

Thus, although the present research does not indicate a direct link between perception of anthropomorphism and perception of friendliness, since the social dimensions studied can be predicted by anthropomorphism and most of the same dimensions also independently predict friendliness. It can be deduced that this study suggests the existence of an indirect link between perceived anthropomorphism and perceived friendliness.

5.2. Anthropomorphism and related social dimensions (H2a – H2d)

Hypotheses H2a, H2b, H2c and H2d investigated whether anthropomorphism impacted the four social dimensions at study as was supported by the literature reviewed. Results confirmed that anthropomorphism positively predicted social presence (H2a), empathy (H2b), warmth (H2c) and competence (H2d), albeit at different levels, with social presence and

warmth presenting higher percentage of variance relative to the perceived anthropomorphism at 31% and 20% respectively.

The strength of anthropomorphism's effect on social presence, **H2a**, with a coefficient value $\beta = 0.412$, confirms that when chatbots are perceived as being more human-like, users tend to feel that they are interacting with a social entity that is real and present in conversation. This further corroborated Konya-Baumbach et al.'s (2023) research on the topic of anthropomorphism and social presence.

After social presence, warmth was the factor that was shown to be more closely linked to anthropomorphism ($\beta = 0.319$), **H2c**, supporting prior findings from authors like Roy and Naidoo (2021), Xu et al. (2022) and Al-Oraini (2024) reporting that when anthropomorphic features are present in AI chatbots, users report feeling more warmth from the chatbot.

The present study also suggests that empathy can be predicted by anthropomorphism, **H2b**, although with a modest but positive coefficient ($\beta = 0.062$). This means that human-like behavior contributes, at least partially, to a perception of empathy. Such is similarly defended by Gu et al., (2024), corroborating this study. These results, however, must be considered with some reservations due to the reliability analysis conducted.

Lastly, anthropomorphism significantly predicted competence, **H2d**, when examined through a simple regression analysis ($\beta = 0.256$; $p < 0.002$), as theorized by Roy & Naidoo (2021) and Christoforakos et al. (2021).

5.3. Friendliness and related social dimensions (H3a – H3d)

To finalize the discussion of the results, hypotheses H3a to H3d explored how the social dimensions of social presence, empathy, warmth, and competence influence the perception of friendliness. The results presented in this study mostly reflect the present literature, confirming a relationship between the three of the social factors studied and the perception of friendliness by the user.

Out of the social dimensions analyzed, empathy, **H3b**, was revealed to be the strongest predictor of friendliness presenting a coefficient value of $\beta = 0.329$. This finding supports theories that indicate emotional understanding as a key component of friendship and that being perceived as empathetic leads to higher levels of trust in chatbots (Gu et al., 2024).

Competence, **H3d**, was also able to positively predict perception of friendliness ($\beta = 0.205$). However, as was previously mentioned, the literature in this topic is split, with some authors supporting that higher rates of competence may negatively affect friendliness, particularly in human-human relationships as suggested by Simon et al., (2020) and Eisenbruch & Krasnow (2022). Still, this study is consistent with AI chatbot research that suggests competence may enhance the perception of friendliness, particularly due to its impact on reliability and trustworthiness, and has a particularly significant impact when also paired with relational dimensions like empathy (Roy & Naidoo, 2021; Gu et al., 2024). This helps justify why H3d is modestly supported.

Warmth, **H3c**, was also capable of positively predicting friendliness, presenting a positive coefficient ($\beta = 0.160$). This means that although it does not seem to be the most important factor when determining friendliness, its incorporation in AI chatbot design does contribute to the perception of friendliness. These conclusions are reflected in current literature, that present how warmth is a universal and fundamental concept when discussing social relationships (Eisenbruch & Krasnow, 2022), with Pizzi et al. (2023) defending its relevance towards friendliness.

Finally, the results report that social presence, **H3a**, has a non-significant effect on friendliness ($p= 0.341$), meaning that perceiving a chatbot as being socially present is not significant for friendliness to be established. So, it can be concluded that friendliness perception is dependent on other qualities at play, and that social presence is not enough to create a perception of friendliness, as defended by Deng & Yan (2025).

These results suggest that friendliness can be seen as a multidimensional outcome as supported by Deng & Yan (2025), emerging from emotional and functional social dimensions, with empathy and competence being the most relevant social function in the context of AI chatbots.

Chapter VI: Conclusion and Recommendations

1. Main Findings and Conclusions

As proposed in the introduction to this dissertation, this research aims to explore the influence of perceived anthropomorphism on perceived friendliness in AI chatbots, studying the role played by the following social dimensions: social presence, warmth, empathy, and competence. The goal was to contribute to a clearer understanding of how anthropomorphic design influences friendliness in human-AI interaction.

In this research it is possible to conclude that anthropomorphism does not directly impact friendliness. However, anthropomorphism does positively affect perceptions of social presence, warmth, empathy and competence. With social presence and warmth being significantly more affected than empathy and competence. Warmth, empathy and competence were also demonstrated to influence the perception of friendliness, while social presence was deemed negligible when observed with the other variables. Therefore, even if anthropomorphism does not directly impact friendliness, it can be deduced that an indirect relationship exists through the impact of the key social dimensions studied. As those social dimensions are affected by anthropomorphism and the same social dimensions are shown to affect friendliness, with the exception of social presence that when analyzed with the other social dimensions studied has no significant impact on friendliness.

This study, consequently, contributes to human-AI interaction literature due to providing a unified conceptual model integrating multiple key social dimensions. It also provides further clarity by suggesting that anthropomorphism alone does not guarantee a perception of friendliness and that it must be mediated, ideally, by warmth, empathy and competence. These results also contribute to Brand Relationship Theory, extending it to cover how consumers form friendship-like bonds with brands through the employment of AI interfaces and how to optimize a chatbot's design to improve business outcomes.

2. Managerial Implications

Firstly, regarding optimization of the design and development strategy of AI chatbots for customer-facing roles, findings suggest that anthropomorphic behavior needs to be supported by interactions that are able to convey warmth and empathy while demonstrating competence.

In addition, programming the chatbot to provide replies that communicate warmth and empathy to the consumer, such as with supportive phrasing, while not disregarding competence and efficiency can help boost perceived friendliness. This perception will ultimately reflect onto the brand itself, leading to a strengthening of the consumer-brand relationship and supporting a friendship-like bond.

3. Limitations and Future Research

The present study had some limitations. Firstly, the sample was limited to individuals that had previously used AI chatbots, this and due to the screening questions reduced the size of the available population and the responses gathered had to be cut down from the original 192 responses to 149 responses. Although it is above the minimum recommended sample size of 100 participants, it is still not an ideal number of responses and may impact the ability to generalize this study's findings. There was also the inclusion of four participants that were unsure if they had used artificial intelligence chatbots in the sample, and although this reflects real-world knowledge and awareness of AI, it may have introduced a small amount of noise to the measurements. Moreover, the questionnaire was to be answered through recollection of past experiences with AI Chatbots which introduces the possibility of those recalls being biased. Lastly, as mentioned during the analysis of the results, the reliability analysis produced a low Cronbach's alpha and Composite Reliability score for the empathy scale, suggesting that the construct may not have the desired consistency and reliability. Finally, some items in the questionnaire were adapted from a 7-point Likert scale to a 5-point Likert scale in order to maintain consistency throughout the survey.

To finalize, future research could explore additional social dimensions, such as trust to further explore the indirect relationship between anthropomorphism and friendliness. It could also explore the impact of visual anthropomorphism, as this research focused exclusively on behavioral anthropomorphism, not accounting for the usage of profile pictures and visualization aids often paired with AI chatbots.

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Appendices

Appendix A: Survey

Introduction

Thank you for agreeing to complete this survey. I am a master's student at ISCTE Business School. As part of my thesis, I am conducting a questionnaire to gather information on the perception of AI Chatbots. The questionnaire should take under 5 minutes to complete. Participation in this study is voluntary and anonymous. All responses will be kept strictly confidential and no identifying information will be collected. By proceeding, you confirm that you are 18 years or older and agree to take part in this research. You may withdraw at any time before submitting your answers. If you have any questions about the study, please do not hesitate to contact me at abgao@iscte-iul.pt. Thank you, once again, for your time and for your participation.

Q1 How old are you?

- Under 18 (1)
- 18 - 24 (2)
- 25 - 34 (3)
- 35 - 44 (4)
- 45 - 54 (5)
- 55 - 64 (6)
- 65 - 74 (7)
- Above 75 (8)

Skip To: End of Survey If How old are you? = Under 18

Q2 What is your educational background?

- Less than high school (1)
- High school graduate (2)
- Bachelor's degree (3)
- Master's degree (4)
- Doctorate degree (5)
- Other (6)
- Prefer not to say (7)

Q3 Have you ever interacted with an AI Chatbot? (ChatGPT, Preplexity, DeepSeek, Claude, etc.)

- Yes (1)
- No (2)
- I'm not sure (3)

*Skip To: End of Survey If Have you ever interacted with an AI Chatbot?
(ChatGPT, Preplexity, DeepSeek, Claude, etc.) = No*

Q4 How would you rate your experience interacting with an AI Chatbot?

- Extremely dissatisfied (1)
- Somewhat dissatisfied (2)
- Neither satisfied nor dissatisfied (3)

- Somewhat satisfied (4)
- Extremely satisfied (5)

Q5 How frequently do you use AI chatbots?

- Never (1)
- About once a year (2)
- Several times a year (3)
- About once a month (4)
- Several times a month (5)
- Once or twice a week (6)
- Almost every day (7)

Skip To: End of Survey If How frequently do you use AI chatbots? = Never

End of Block: Default Question Block

Start

Please think back to the last time you interacted with an AI Chatbot, such as ChatGPT, Preplexity, DeepSeek, Claude, etc. Answer the following questions while remembering your conversation and feelings while interacting with the chatbot. (ChatGPT, Preplexity, DeepSeek, Claude, etc.)

Q6 I believe that the chatbot is competent.

- Strongly disagree (1)
- Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

Q7 I believe that the chatbot is effective.

Strongly disagree (1)

Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

Q8 I believe that the chatbot is skilled.

Strongly disagree (1)

Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

Q9 I believe that the chatbot has the ability to implement its intention.

Strongly disagree (1)

- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q10 I believe that the chatbot is efficient.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q11 I believe that the chatbot has good intentions toward users.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q12 I believe that the chatbot is warm.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q13 I believe that the chatbot consistently acts with the users' best interest in mind.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q14 I believe the chatbot is kind.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q15 I believe that the chatbot is generous.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q16 Chatbots usually understand the specific needs of the users.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q17 Chatbots usually give users individual attention.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q18 Chatbots are available whenever it's convenient for the user.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q19 The chatbot had a kind service during the interaction.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q20 The chatbot provides the service in a friendly manner.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q21 The chatbot treats the user nicely.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q22 I think the chatbot has intentions.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q23 I think the chatbot has feelings.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q24 I think the chatbot has emotions of its own.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q25 I think the chatbot has consciousness.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q26 During the conversation, I felt that I was with a human.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q27 During the conversation, I felt a sense of human contact.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q28 During the conversation, I felt a sense of sociability.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q29 During the conversation, I felt a sense of warmth.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q30 During the conversation, I felt a sense of human sensitivity.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)

Strongly agree (5)

Q31 During the conversation, I felt that someone was talking to me

Strongly disagree (1)

Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

Q32 During the conversation, I felt that the conversation was involving.

Strongly disagree (1)

Somewhat disagree (2)

Neither agree nor disagree (3)

Somewhat agree (4)

Strongly agree (5)

Q33 During the conversation, I could mentally imagine the chatbot.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Appendix B: Sample Characterization (n = 149)

How old are you?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 24	26	17,4	17,4	17,4
	25 - 34	53	35,6	35,6	53,0
	35 - 44	24	16,1	16,1	69,1
	45 - 54	18	12,1	12,1	81,2
	55 - 64	22	14,8	14,8	96,0
	65 - 74	5	3,4	3,4	99,3
	Above 75	1	,7	,7	100,0
	Total	149	100,0	100,0	

How would you rate your experience interacting with an AI Chatbot?

		Frequência	Porcentagem	Porcentagem válida	Porcentagem acumulativa
Válido	Extremely dissatisfied	4	2,7	2,7	2,7
	Somewhat dissatisfied	18	12,1	12,1	14,8
	Neither satisfied nor dissatisfied	17	11,4	11,4	26,2
	Somewhat satisfied	79	53,0	53,0	79,2
	Extremely satisfied	31	20,8	20,8	100,0
	Total	149	100,0	100,0	

How would you rate your experience interacting with an AI Chatbot?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely dissatisfied	4	2,7	2,7	2,7
	Somewhat dissatisfied	18	12,1	12,1	14,8
	Neither satisfied nor dissatisfied	17	11,4	11,4	26,2
	Somewhat satisfied	79	53,0	53,0	79,2
	Extremely satisfied	31	20,8	20,8	100,0
	Total	149	100,0	100,0	

How frequently do you use AI chatbots?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	About once a year	6	4,0	4,0	4,0
	Several times a year	29	19,5	19,5	23,5
	About once a month	21	14,1	14,1	37,6
	Several times a month	30	20,1	20,1	57,7
	Once or twice a week	33	22,1	22,1	79,9
	Almost every day	30	20,1	20,1	100,0
	Total	149	100,0	100,0	

Appendix C: Reliability Analysis and Composite Reliability

Reliability Statistics - Competence

Cronbach's Alpha	N of Items
,857	5

Reliability Statistics - Warmth

Cronbach's Alpha	N of Items
,857	5

Reliability Statistics - Empathy

Cronbach's Alpha	N of Items
,566	3

Item-Total Statistics - Empathy

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Chatbots usually understand the specific needs of the users.	7,68	2,896	,472	,320
Chatbots usually give users individual attention.	7,70	2,388	,446	,346
Chatbots are available whenever it's convenient for the user.	6,89	3,745	,233	,652

Communalities

	Initial	Extraction
Chatbots usually understand the specific needs of the users.	,255	,515
Chatbots usually give users individual attention.	,251	,470
Chatbots are available whenever it's convenient for the user.	,055	,083

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,623	54,111	54,111	1,068	35,590	35,590
2	,869	28,954	83,065			
3	,508	16,935	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix^a

	Factor 1
Chatbots usually understand the specific needs of the users.	,717
Chatbots usually give users individual attention.	,685
Chatbots are available whenever it's convenient for the user.	,289

Extraction Method: Principal Axis Factoring.

- a. 1 factors extracted. 14 iterations required.

Reliability Statistics - Friendliness

Cronbach's Alpha	N of Items
,862	3

Reliability Statistics - Anthropomorphism

Cronbach's Alpha	N of Items
,869	4

Reliability Statistics - Social Presence

Cronbach's Alpha	N of Items
,932	8

Appendix D: Descriptive Statistics

Descriptive Statistics - Competence

Items	N	Minimum	Maximum	Mean	Std. Deviation
I believe that the chatbot is competent.	149	1	5	3,64	1,047
I believe that the chatbot is effective.	149	1	5	3,69	,972
I believe that the chatbot is skilled.	149	1	5	3,52	1,119
I believe that the chatbot has the ability to implement its intention.	149	1	5	3,26	1,081
I believe that the chatbot is efficient.	149	1	5	3,79	1,004
Valid N (listwise)	149				

Descriptive Statistics - Warmth

	N	Minimum	Maximum	Mean	Std. Deviation
I believe that the chatbot has good intentions toward users.	149	1	5	3,26	1,042
I believe that the chatbot is warm.	149	1	5	3,01	1,000
I believe that the chatbot consistently acts with the users' best interest in mind.	149	1	5	3,09	1,168
I believe the chatbot is kind.	149	1	5	3,15	1,125
I believe that the chatbot is generous.	149	1	5	2,94	1,170
Valid N (listwise)	149				

Descriptive Statistics - Friendliness

	N	Minimum	Maximum	Mean	Std. Deviation
The chatbot had a kind service during the interaction.	149	1	5	3,79	,897
The chatbot provides the service in a friendly manner.	149	1	5	3,89	,839
The chatbot treats the user nicely.	149	1	5	3,93	,920
Valid N (listwise)	149				

Descriptive Statistics - Anthropomorphism

	N	Minimum	Maximum	Mean	Std. Deviation
I think the chatbot has intentions.	149	1	5	2,56	1,227
I think the chatbot has feelings.	149	1	5	1,84	1,109
I think the chatbot has emotions of its own.	149	1	5	1,84	1,127
I think the chatbot has consciousness.	149	1	5	1,81	1,031
Valid N (listwise)	149				

Descriptive Statistics - Social Presence

	N	Minimum	Maximum	Mean	Std. Deviation
During the conversation, I felt that I was with a human.	149	1	5	2,52	1,277
During the conversation, I felt a sense of human contact.	149	1	5	2,36	1,331
During the conversation, I felt a sense of sociability.	149	1	5	2,74	1,306
During the conversation, I felt a sense of warmth.	149	1	5	2,44	1,337
During the conversation, I felt a sense of human sensitivity.	149	1	5	2,44	1,358
During the conversation, I felt that someone was talking to me	149	1	5	2,87	1,396
During the conversation, I felt that the conversation was involving.	149	1	5	2,98	1,343
During the conversation, I could mentally imagine the chatbot.	149	1	5	2,47	1,373
Valid N (listwise)	149				

Descriptive Statistics - Cluster Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Competence	149	1,00	5,00	3,5812	,83353
Warmth	149	1,00	5,00	3,0913	,88026
SocialPresence	149	1,00	5,00	2,6032	1,10280
Empathy	149	1,00	5,00	3,7114	,78620
Friendliness	149	1,00	5,00	3,8702	,78434
Anthropomorphism	149	1,00	4,25	2,0101	,95413
Valid N (listwise)	149				

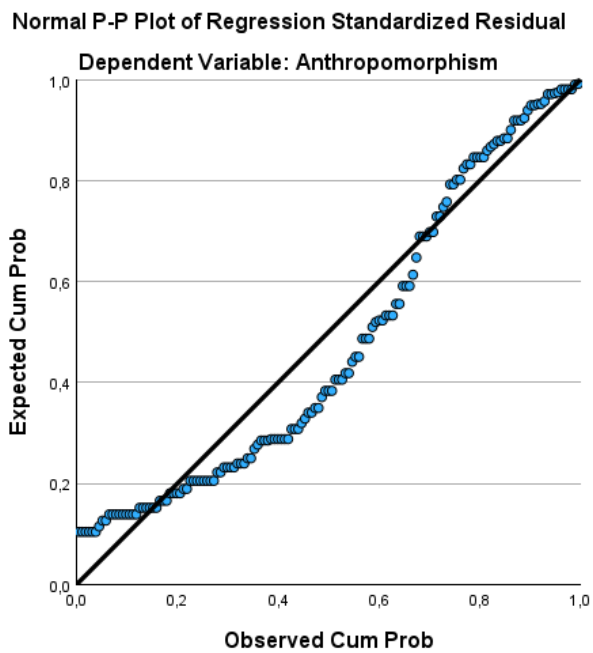
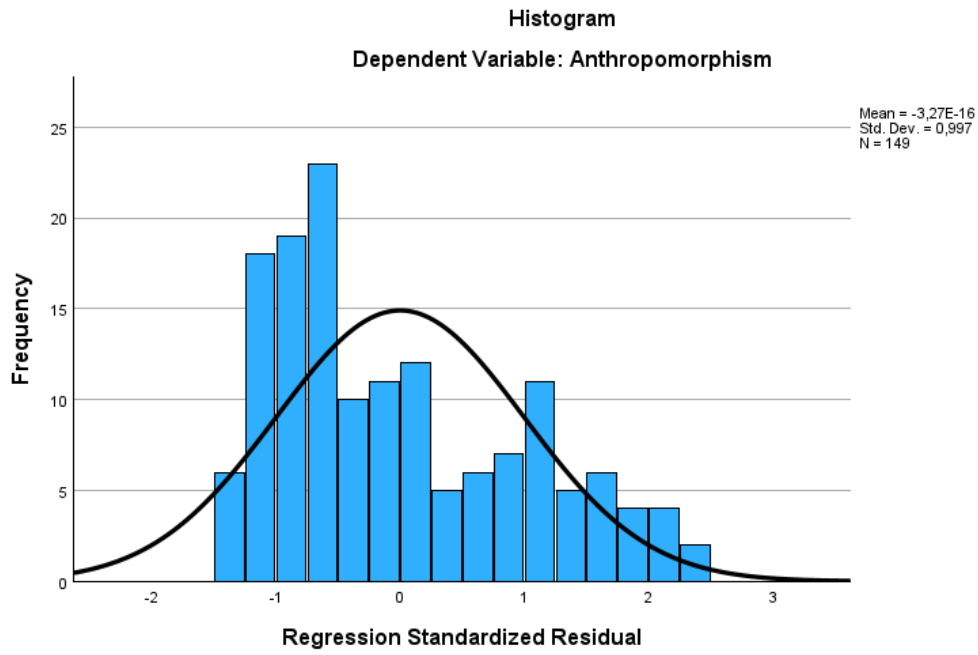
Appendix E: Correlations

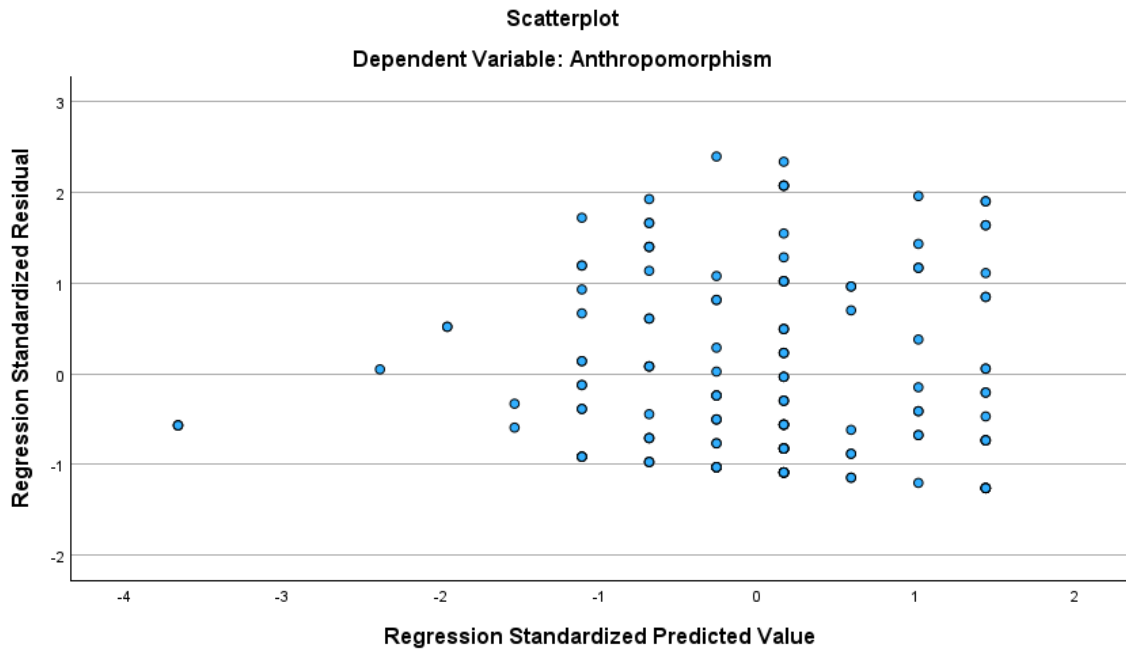
		Correlations					
		Competence	Warmth	Empathy	Friendliness	Anthropomorphism	SocialPresence
Competence	Pearson Correlation	1	,616**	,538**	,541**	,256**	,451**
	Sig. (2-tailed)		<,001	<,001	<,001	,002	<,001
	N	149	149	149	149	149	149
Warmth	Pearson Correlation	,616**	1	,467**	,512**	,454**	,580**
	Sig. (2-tailed)	<,001		<,001	<,001	<,001	<,001
	N	149	149	149	149	149	149
Empathy	Pearson Correlation	,538**	,467**	1	,560**	,223**	,378**
	Sig. (2-tailed)	<,001	<,001		<,001	,006	<,001
	N	149	149	149	149	149	149
Friendliness	Pearson Correlation	,541**	,512**	,560**	1	,135	,403**
	Sig. (2-tailed)	<,001	<,001	<,001		,101	<,001
	N	149	149	149	149	149	149
Anthropomorphism	Pearson Correlation	,256**	,454**	,223**	,135	1	,557**
	Sig. (2-tailed)	,002	<,001	,006	,101		<,001
	N	149	149	149	149	149	149
SocialPresence	Pearson Correlation	,451**	,580**	,378**	,403**	,557**	1
	Sig. (2-tailed)	<,001	<,001	<,001	<,001	<,001	
	N	149	149	149	149	149	149

** . Correlation is significant at the 0.01 level (2-tailed).

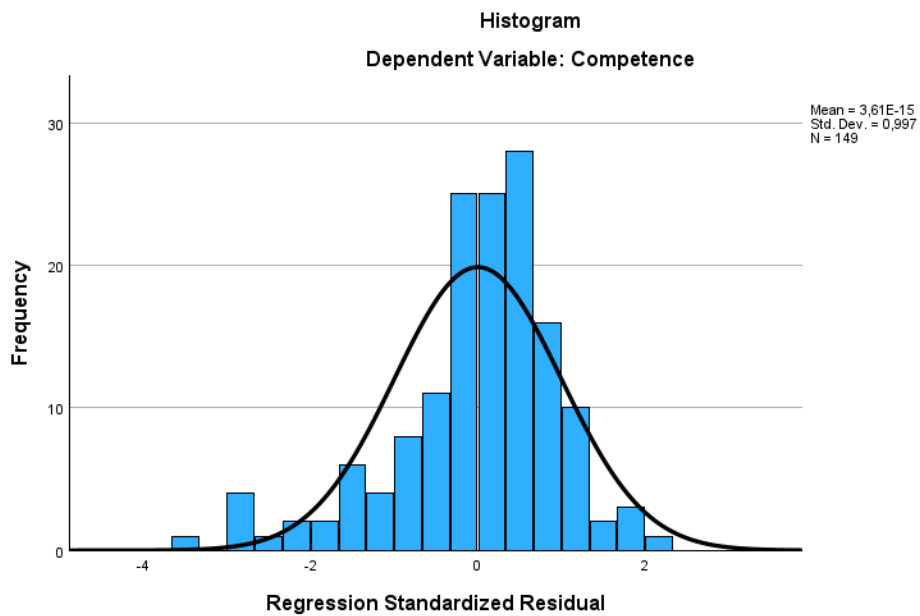
Appendix F: Regression Assumptions

Simple Linear Regression (H1)

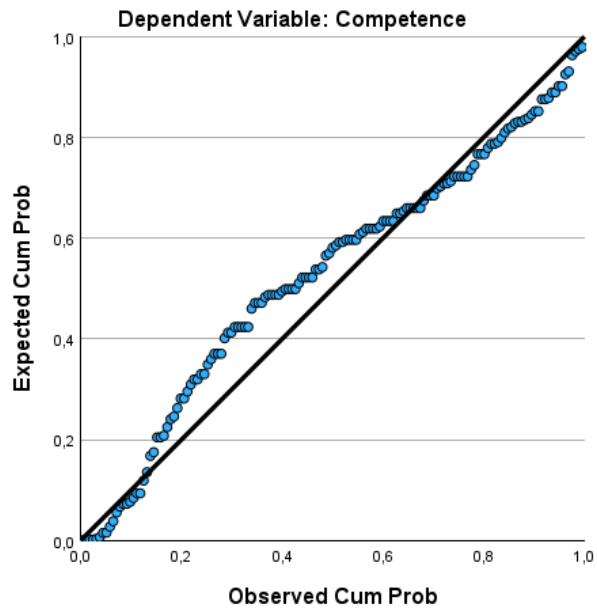




Simple Linear Regression (H2a, H2b, H2c, H2d)

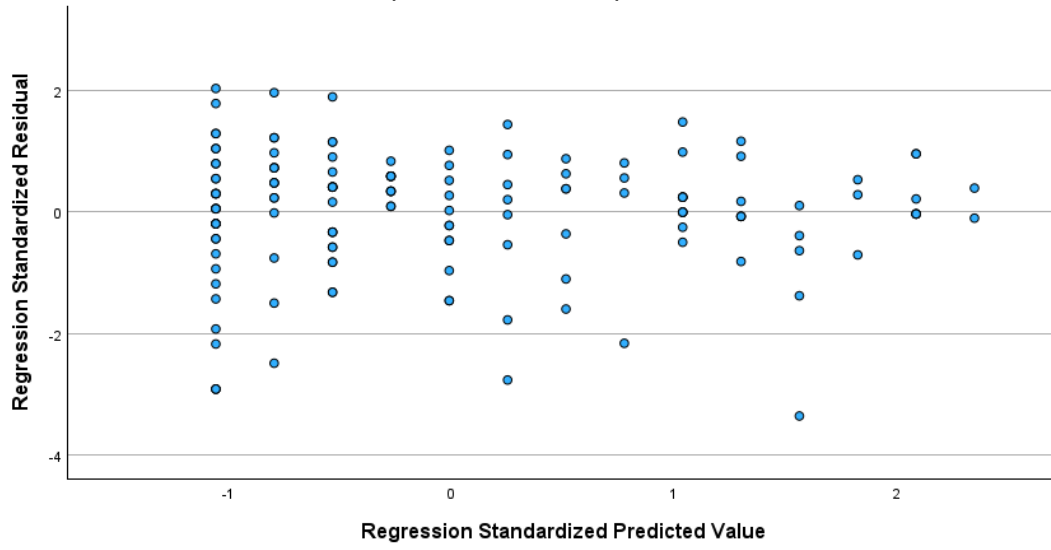


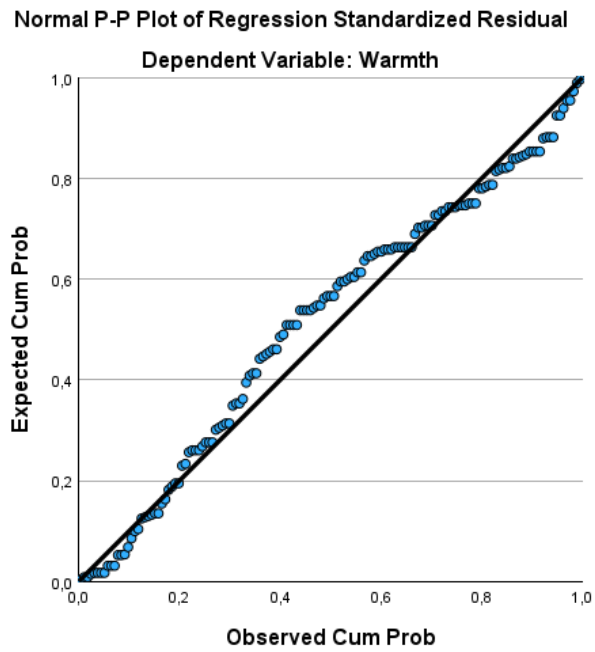
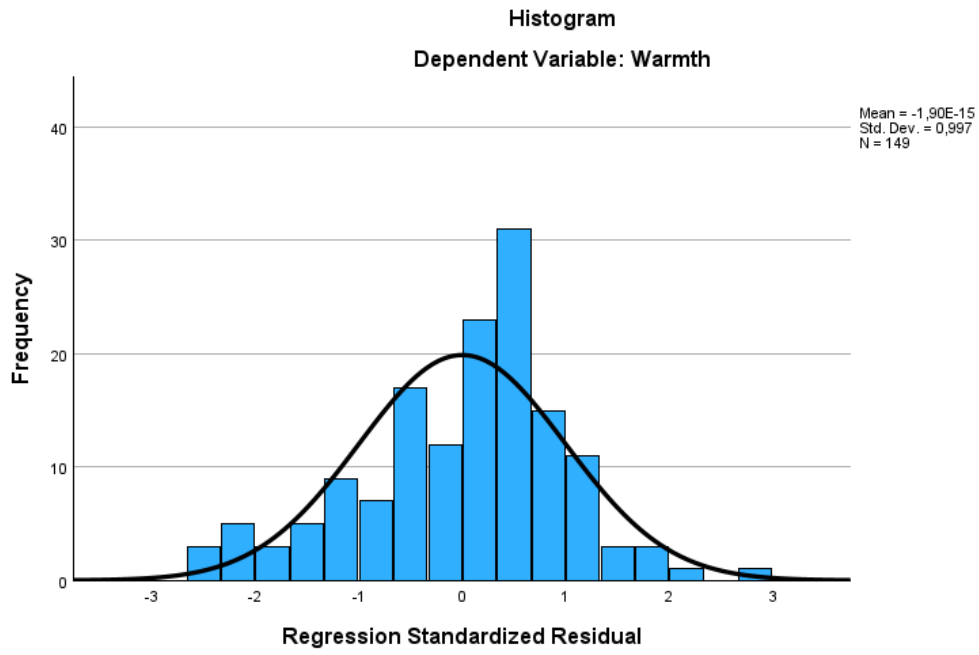
Normal P-P Plot of Regression Standardized Residual

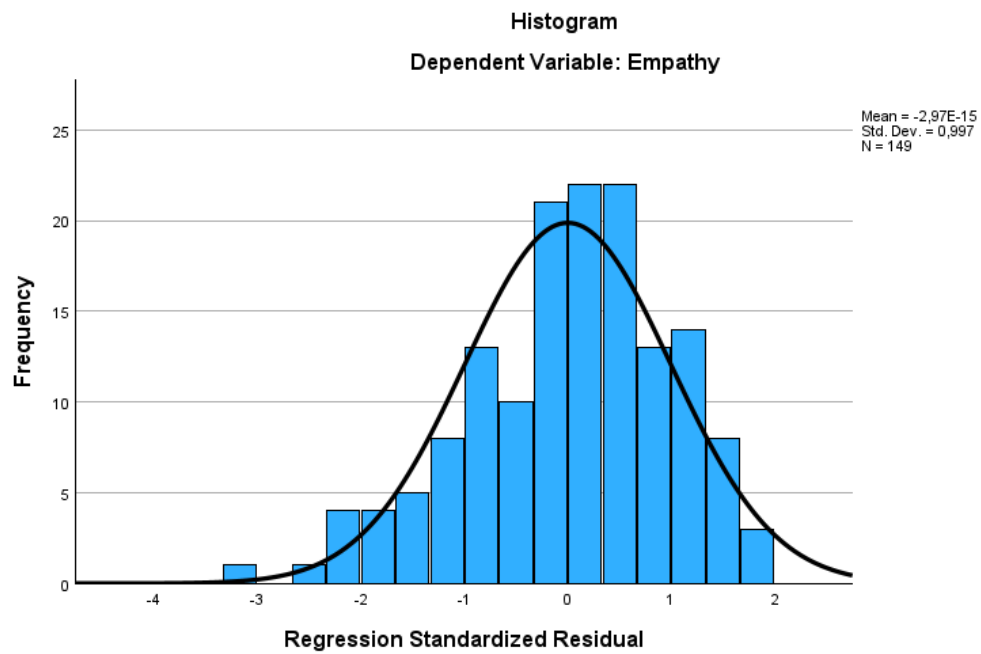
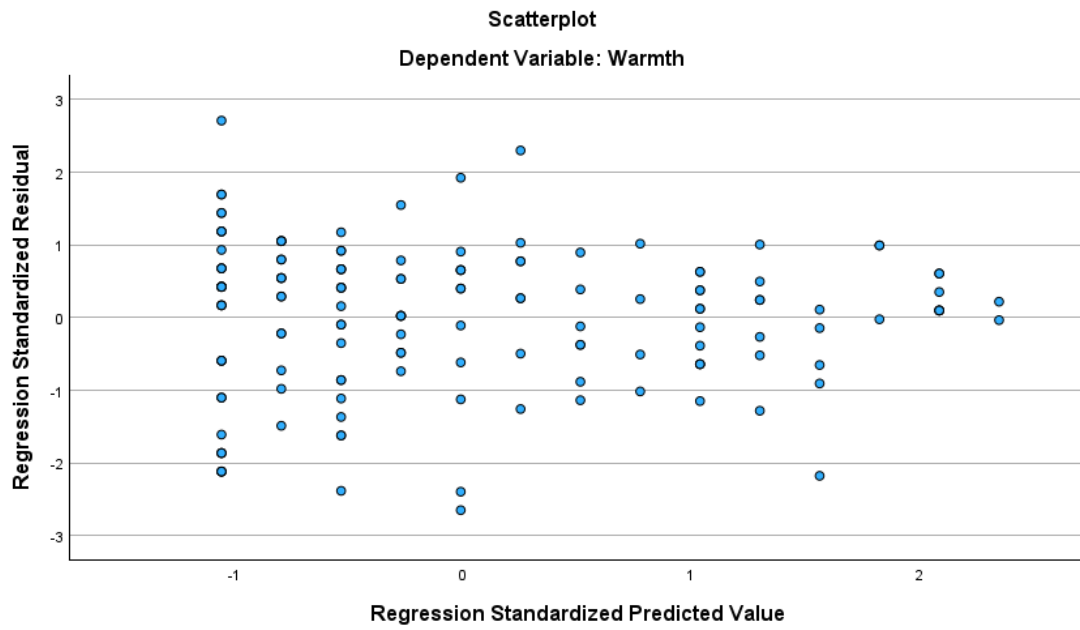


Scatterplot

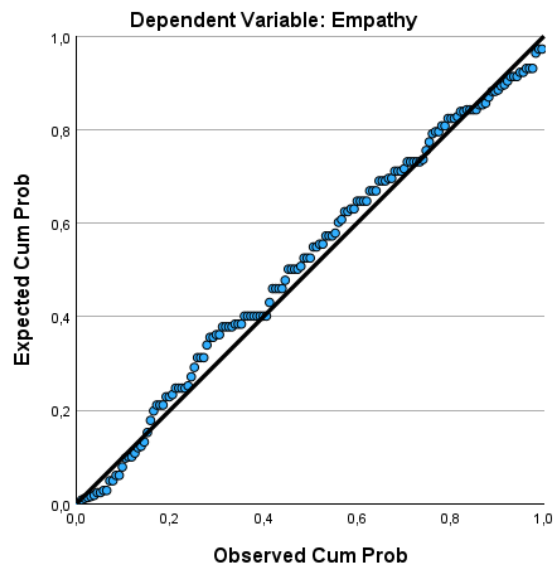
Dependent Variable: Competence



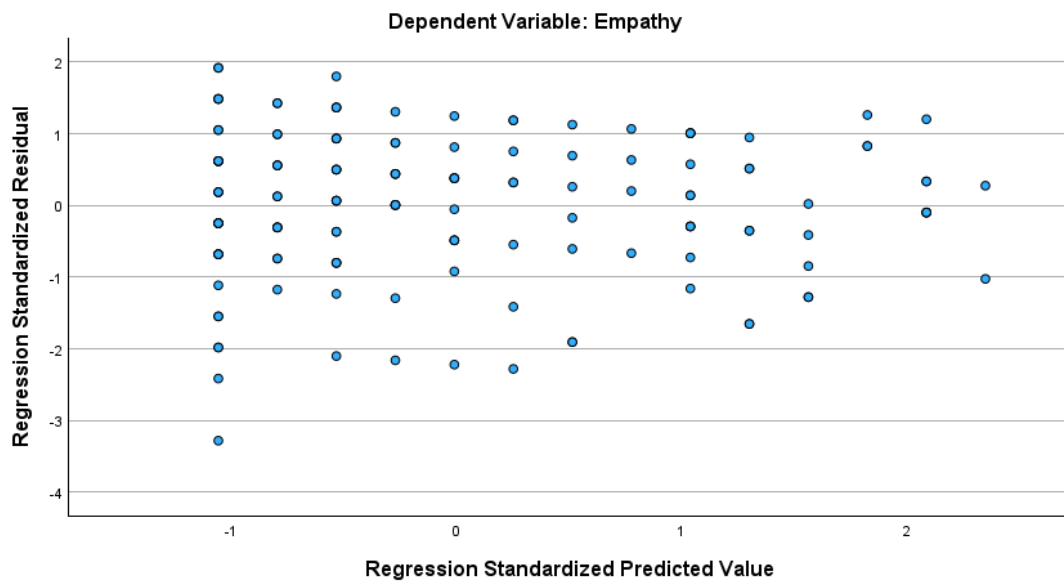


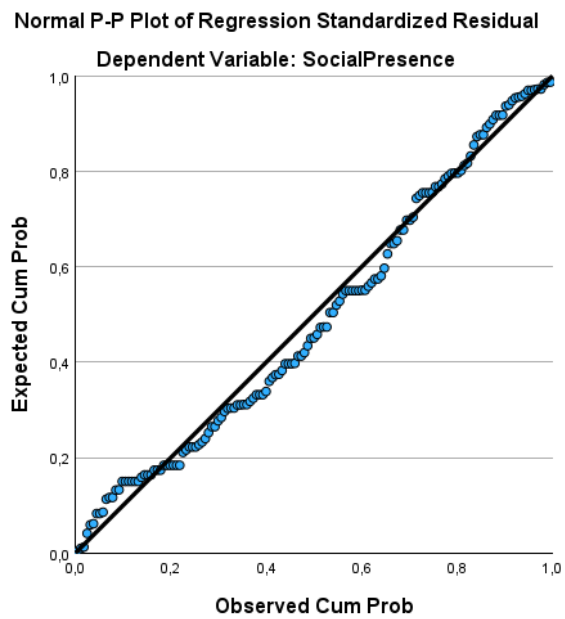
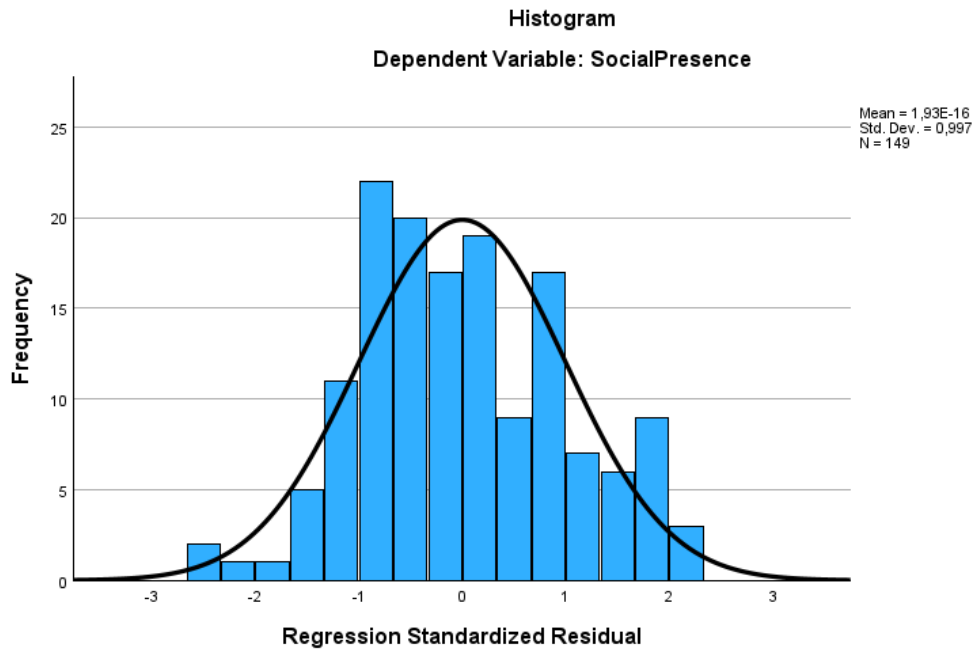


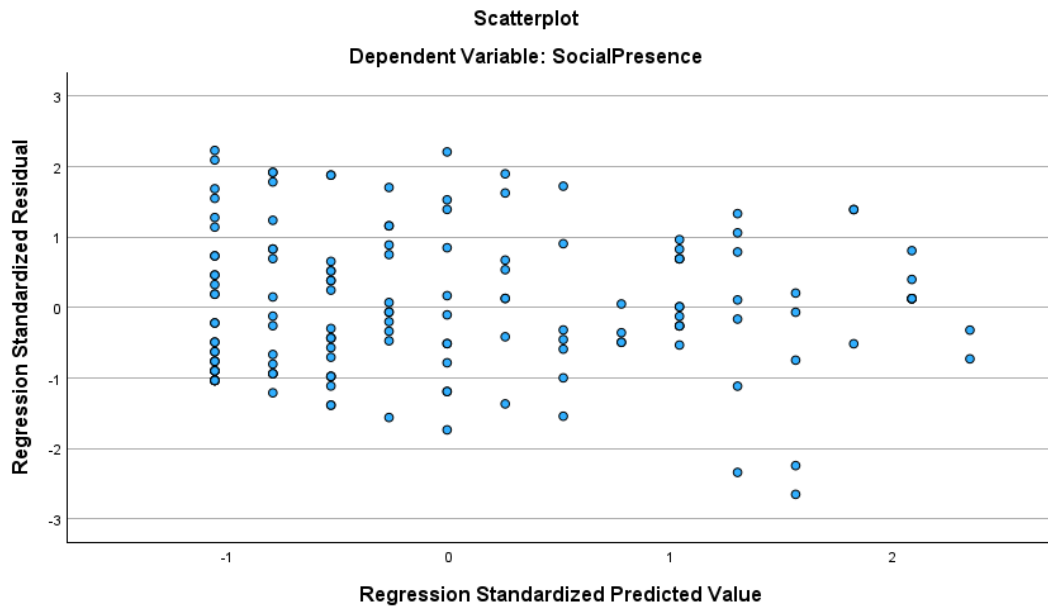
Normal P-P Plot of Regression Standardized Residual



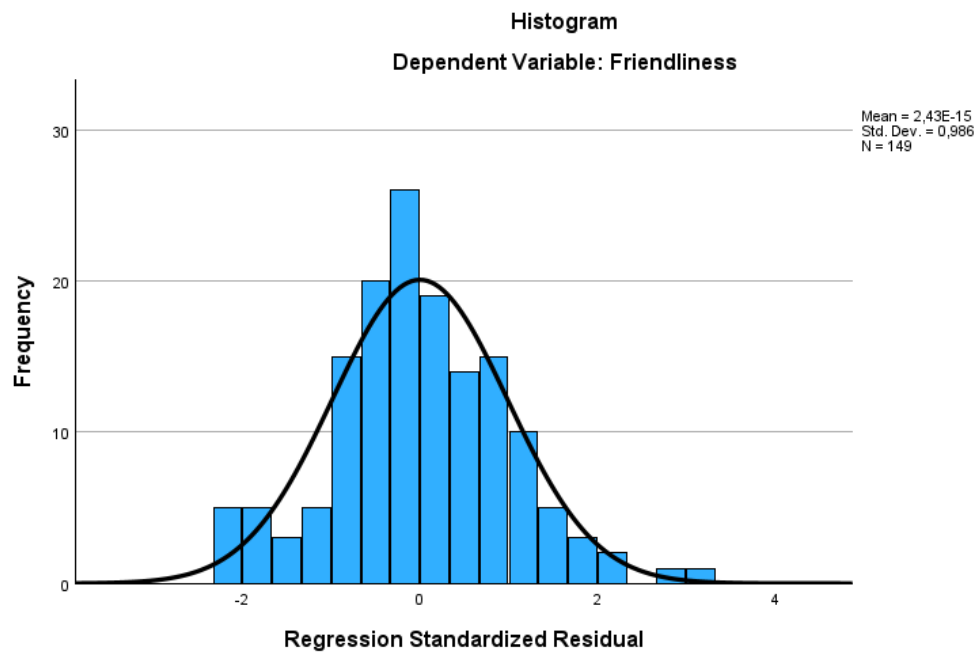
Scatterplot



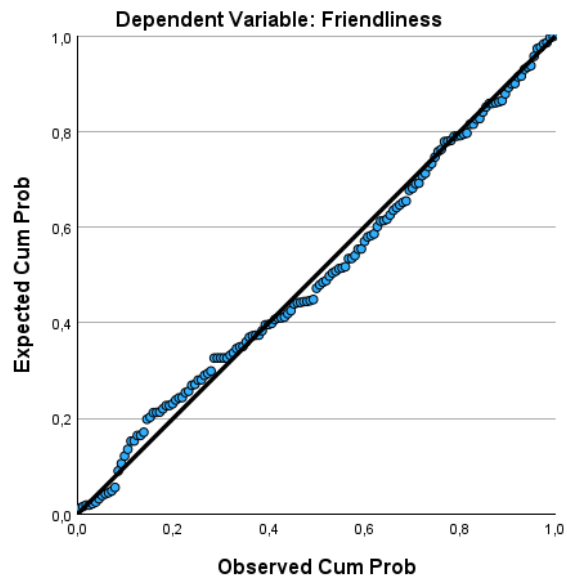




Multiple Linear Regression (H3a, H3b, H3c, H3d)

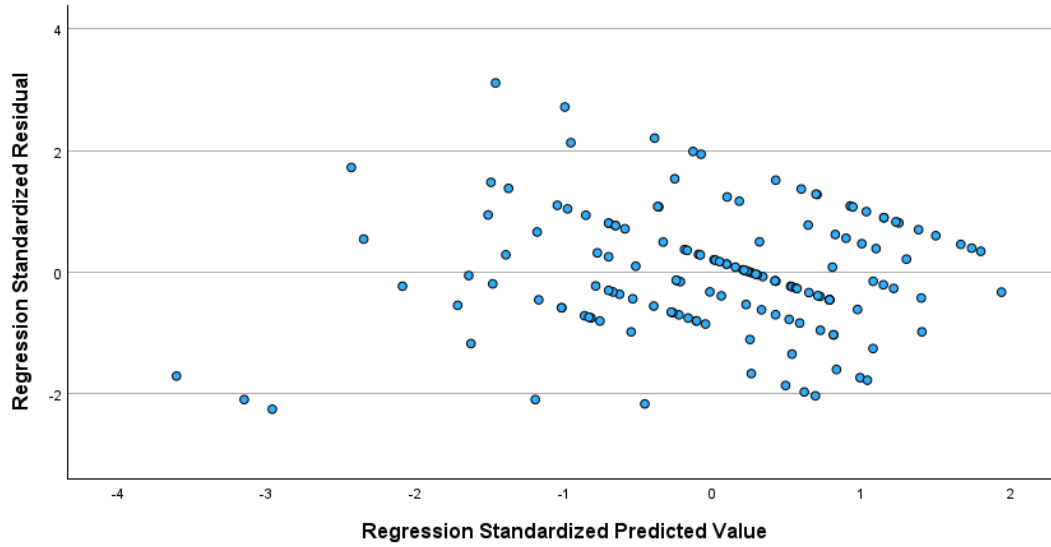


Normal P-P Plot of Regression Standardized Residual



Scatterplot

Dependent Variable: Friendliness



Appendix G: Linear Regressions

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,135 ^a	,018	,012	,94862	2,013

a. Predictors: (Constant), Friendliness

b. Dependent Variable: Anthropomorphism

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2,453	1	2,453	2,726	,101 ^b
	Residual	132,282	147	,900		
	Total	134,735	148			

a. Dependent Variable: Anthropomorphism

b. Predictors: (Constant), Friendliness

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1,375	,393		3,502	<,001		
	Friendliness	,164	,099	,135	1,651	,101	1,000	1,000

a. Dependent Variable: Anthropomorphism

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics				Durbin-Watson
						F Change	df1	df2	Sig. F Change	
1	,557 ^a	,311	,306	,91879	,311	66,214	1	147	<,001	1,875

a. Predictors: (Constant), Anthropomorphism

b. Dependent Variable: SocialPresence

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55,897	1	55,897	66,214	<,001 ^b
	Residual	124,095	147	,844		
	Total	179,992	148			

a. Dependent Variable: SocialPresence

b. Predictors: (Constant), Anthropomorphism

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1,309	,176		7,434	<,001		
	Anthropomorphism	,644	,079	,557	8,137	<,001	1,000	1,000

a. Dependent Variable: SocialPresence

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,223 ^a	,050	,043	,76899	2,112

a. Predictors: (Constant), Anthropomorphism

b. Dependent Variable: Empathy

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,552	1	4,552	7,698	,006 ^b
	Residual	86,927	147	,591		
	Total	91,479	148			

a. Dependent Variable: Empathy

b. Predictors: (Constant), Anthropomorphism

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3,342	,147		22,686	<,001		
	Anthropomorphism	,184	,066	,223	2,775	,006	1,000	1,000

a. Dependent Variable: Empathy

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change	Durbin-Watson
						F Change	df1	df2		
1	,256 ^a	,065	,059	,80860	,065	10,270	1	147	,002	1,768

a. Predictors: (Constant), Anthropomorphism

b. Dependent Variable: Competence

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6,715	1	6,715	10,270	,002 ^b
	Residual	96,113	147	,654		
	Total	102,827	148			

a. Dependent Variable: Competence

b. Predictors: (Constant), Anthropomorphism

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3,132	,155		20,222	<,001		
	Anthropomorphism	,223	,070	,256	3,205	,002	1,000	1,000

a. Dependent Variable: Competence

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Durbin-Watson	
						F Change	df1	df2		
1	,454 ^a	,206	,201	,78705	,206	38,131	1	147	<,001	1,675

a. Predictors: (Constant), Anthropomorphism

b. Dependent Variable: Warmth

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23,620	1	23,620	38,131	<,001 ^b
	Residual	91,059	147	,619		
	Total	114,679	148			

a. Dependent Variable: Warmth

b. Predictors: (Constant), Anthropomorphism

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2,250	,151		14,921	<,001		
	Anthropomorphism	,419	,068	,454	6,175	<,001	1,000	1,000

a. Dependent Variable: Warmth

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,652 ^a	,425	,409	,60296	1,837

a. Predictors: (Constant), Competence, SocialPresence, Empathy, Warmth

b. Dependent Variable: Friendliness

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38,695	4	9,674	26,608	<,001 ^b
	Residual	52,352	144	,364		
	Total	91,047	148			

a. Dependent Variable: Friendliness

b. Predictors: (Constant), Warmth, Empathy, SocialPresence, Competence

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1,279	,262		4,878	<,001		
	SocialPresence	,054	,056	,075	,956	,341	,642	1,557
	Competence	,205	,081	,218	2,525	,013	,534	1,871
	Empathy	,329	,077	,330	4,286	<,001	,674	1,485
	Warmth	,160	,080	,180	2,001	,047	,496	2,017

a. Dependent Variable: Friendliness