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Exploring the Impact of AI Anxiety on Self-AI Connection: The Mediating Role of Social Presence and Emotional Attachment

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September, 2024



**BUSINESS
SCHOOL**

Department of Marketing, Strategy and Operations

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ABSTRACT

As artificial intelligence becomes increasingly integrated into consumer interactions, understanding the complex emotional and behavioural responses it elicits is crucial for enhancing user experience and shaping future AI implementations. This thesis explores the phenomenon of AI anxiety, focusing on its impact on the emotional connection and self-AI connection between consumers and AI agents. Specifically, the study investigates the role of ethics violation anxiety and lack of transparency anxiety in influencing consumers' emotional attachment to AI systems, their perception of social presence in AI agents, and their self-AI connection. The research adopts a quantitative approach, collecting data through a survey distributed among individuals who have interacted with AI agents, resulting in a sample size of 321 respondents.

The results reveal that social presence has a significant positive impact on emotional attachment to AI. Ethics violation anxiety and lack of transparency anxiety do not directly diminish emotional attachment or social presence as previously hypothesized. Instead, the effects of these anxieties are partially mediated by emotional attachment and social presence, indicating that strong emotional ties and human-like interactions with artificial intelligence can mitigate the negative consequences of AI-induced anxieties.

The study contributes to the growing body of literature on AI-induced consumer anxieties, providing insights for marketers and AI developers on how to design AI interactions that foster emotional connections, reduce anxiety, and improve overall consumer experience. The findings hold significant implications for the development of AI systems that can build strong customer relationships with AI while addressing ethical and transparency concerns.

Keywords: Artificial intelligence; AI Anxiety; Self-AI Connection; Emotional Attachment; Social Presence

JEL Classification: M30 – General; M31 – Marketing, O300 – Technology

RESUMO

À medida que a inteligência artificial se torna cada vez mais integrada nas interações com os consumidores, compreender as respostas emocionais e comportamentais complexas que ela suscita é crucial para melhorar a experiência do usuário e moldar futuras implementações de IA. Esta tese explora o fenómeno da ansiedade relacionada com a IA, com foco no seu impacto na ligação emocional e na conexão entre o consumidor e os agentes de IA. Especificamente, o estudo investiga o papel da ansiedade por violação ética e da ansiedade por falta de transparência na influência sobre o apego emocional dos consumidores aos sistemas de IA, na sua perceção da presença social em agentes de IA e na sua conexão pessoal com a IA. A investigação adota uma abordagem quantitativa, recolhendo dados através de um inquérito distribuído entre indivíduos que interagiram com agentes de IA, resultando numa amostra de 321 respondentes.

Os resultados revelam que a presença social tem um impacto positivo significativo no apego emocional à IA. A ansiedade por violação ética e a ansiedade por falta de transparência não diminuem diretamente o apego emocional ou a presença social, como anteriormente hipotetizado. Em vez disso, os efeitos destas ansiedades são mediados pelo apego emocional e pela presença social, indicando que laços emocionais fortes e interações semelhantes às humanas com a inteligência artificial podem mitigar as consequências negativas das ansiedades induzidas pela IA.

O estudo contribui para o crescente corpo de literatura sobre as ansiedades dos consumidores induzidas pela IA, fornecendo informações valiosas para os profissionais de marketing e desenvolvedores de IA sobre como projetar interações com IA que promovam conexões emocionais, reduzam a ansiedade e melhorem a experiência global do consumidor. As conclusões têm implicações significativas para o desenvolvimento de sistemas de IA que possam construir relações sólidas com os clientes, ao mesmo tempo que abordam preocupações éticas e de transparência.

Palavras-chave: Inteligência artificial; Ansiedade em relação à IA; Conexão Self-IA; Apego Emocional; Presença Social

Classificação JEL: M30 – Geral; M31 – Marketing, O300 – Tecnologia

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List of Acronyms

AI – Artificial Intelligence

AVE – Total Variance Extracted

HTMT – Heterotrait-Monotrait ratio of correlations

PLS – Partial Least Squares

SEM – Structural equation model

VIF – Collinearity Statistics

SRMR – Standardized root mean square residual

NFI – Normed Fit Index

EA – Emotional Attachment

SP – Social Presence

EVA – Ethics Violation Anxiety

LTA – Lack of Transparency Anxiety

SAIC – Self-AI Connection

EA – Emotional Attachment

CI – Confidence Interval

1. Introduction

The rapid advancement of artificial intelligence (AI) has dramatically reshaped customer experiences across various industries, especially within marketing. AI systems are now more integrated into customer interactions through tools like recommendation agents, personal voice assistants, service robots, and others fundamentally altering the dynamics of consumer-brand relationships (Chi et al., 2020; Pantano & Scarpi, 2022). These systems are incorporated to personalize customer experiences by leveraging data to predict customer preferences and behaviour. This personalized approach strengthens customer engagement, leading to deeper emotional connections and improved brand loyalty (Cheng & Jiang, 2022; Huang & Rust, 2018). AI-powered customer service automation has eased the operational burden on businesses by reducing the need for human intervention, allowing companies to scale their customer service efforts more efficiently (Cheng et al., 2024).

The market for autonomous AI agents is expected to grow significantly over the next several years. By 2030, the global market is projected to reach approximately \$70.53 billion, driven by a compound annual growth rate (CAGR) of 42.8% from 2023 to 2030. This rapid growth is fuelled by the increasing integration of AI technologies across various industries such as retail, healthcare, financial services, and e-commerce. The use of AI agents in applications like autonomous vehicles, customer service, and data analysis is becoming more prevalent as businesses seek to enhance efficiency, reduce costs, and improve decision-making capabilities through automation and intelligent systems (Grand View Research, 2023). Companies are increasingly allocating significant portions of their budgets to AI technologies, with AI investment expected to grow rapidly over the coming years. By 2025, 30% of U.S. companies plan to invest \$10 million or more in AI, nearly doubling the number of companies at this investment level from 16% in 2023. This shift is part of a broader trend as AI moves from experimental phases to becoming an integral part of enterprise strategies, with many organizations focusing on scaling generative AI to unlock new revenue streams (EY, 2024).

While AI offers numerous advantages, it also introduces complex psychological challenges, with AI anxiety emerging as a significant factor influencing consumers' emotional responses and interactions (J. Li & Huang, 2020).

This topic is particularly relevant as consumers express growing concerns about AI. The European Commission has acknowledged public concerns about AI, noting in its 2020 report that citizens worry AI can have unintended effects or be used for malicious purposes. These anxieties are often based on misunderstandings and confusion about AI's capabilities, further

causing AI anxiety and affecting consumer trust in these technologies (European Commission, 2020).

This thesis aims to explore the intricate relationship between AI-induced anxiety and consumer behaviour, particularly focusing on two factors: ethics violation anxiety and lack of transparency anxiety.

AI systems are often perceived as "black boxes," making it difficult for consumers to understand how decisions are made. This lack of transparency raises concerns about fairness, bias, and the potential misuse of AI technologies. In particular, ethics violation anxiety arises when consumers fear that AI might act in ways that violate societal or personal ethical standards, which can significantly diminish trust in both the technology and the brand (Anderson & Leigh Anderson, 2007). Similarly, lack of transparency anxiety occurs when consumers are uncomfortable with the opaque decision-making processes of AI, leading to unease and mistrust (Clarke, 2019).

These anxieties are critical to understanding how emotional attachment and social presence influence the self-brand connection consumers develop with AI agents (Johnson & Verdicchio, 2017; Lopez & Garza, 2023). Therefore, the purpose of this research is to investigate these relationships. Additionally, this study seeks to explore the moderating role of social presence and emotional attachment. By understanding how these psychological and emotional factors influence consumer behaviour in the context of AI-driven interactions, the research aims to provide insights into how marketers and AI developers can mitigate these anxieties, fostering stronger consumer-AI connections that lead to positive customer experiences (Sun & Liang, 2023; van Straten et al., 2020).

Thus, the current study aims to explore the following research questions:

1. How do AI-induced anxieties, specifically ethics violation anxiety and lack of transparency anxiety, influence consumers' emotional attachment to AI agents and their overall self-AI connection?
2. To what extent do social presence and emotional attachment mediate the relationship between AI-induced anxieties and self-AI connection?

Artificial intelligence is a rapidly evolving field that continues to attract significant academic attention. Despite the progress made in understanding its impact on consumer behaviour and brand relationships, many areas remain unexplored, offering many opportunities for further research.

1.1 Research Outline

This master dissertation is structured into six comprehensive chapters, each designed to systematically address the research objectives and provide a clear path from conceptualization to conclusion.

The first chapter serves as an introduction to the research topic. It begins by identifying the research problem and discussing the relevance of the topic within the broader context of AI's role in customer interactions. This chapter also outlines the purpose of the research, the specific research questions that guide the study, and an overview of the dissertation structure, setting the foundation for the analysis that follows.

Chapter two is dedicated to the literature review, where key theoretical concepts are explored in depth. These include AI anxiety, emotional attachment, social presence, and the self-AI connection. The chapter also addresses specific factors of AI-induced anxiety, such as ethics violation anxiety and lack of transparency anxiety. By synthesizing existing research, this chapter lays the groundwork for the development of the research hypotheses.

Chapter three presents the research model. This section elaborates on the conceptual framework that guides the study, defining the relationships between the central constructs. The research hypotheses are integrated into this model, illustrating how the variables are expected to interact based on the literature review.

The fourth chapter focuses on the research methodology. It outlines the research design, data collection methods, and questionnaire used for gathering information. The chapter also provides insights into the sampling process, discusses the techniques used for data measurement and the validation of scales.

Chapter five presents the analysis of the data and the results of the study. It includes a discussion of the findings, along with an evaluation of the research hypotheses, exploring whether the data supports the theoretical predictions made in earlier sections.

Finally, chapter six summarizes the main conclusions of the research, highlighting both theoretical and practical contributions. The chapter concludes with a discussion of the study's limitations and offers recommendations for future research.

2. Literature review

2.1 AI and AI agents

According to Cukier (2019) the concept of Artificial Intelligence took its initial steps to prominence in 1955 when John McCarthy, along with Marvin Minsky, Claude Shannon, and Nathan Rochester, orchestrated a conference at Dartmouth. During this gathering, they proclaimed a fundamental idea, asserting that *"every aspect of learning or any other feature of intelligence can, in principle, be so precisely described that a machine can be made to simulate it"* (McCarthy et al., 1955: 12). This declaration at the Dartmouth conference marked a defining moment in the emergence and shaping of the field of Artificial Intelligence.

Within the rich history of artificial intelligence (AI) development, scientists have proposed numerous definitions, reflecting the absence of a commonly accepted definition. Generally, AI is referred to as the ability of a machine to learn from experience, adapt to new inputs, and execute tasks in a way similar to human capabilities (Duan et al., 2019). It aims to replicate the cognitive functions of the human brain by employing specialized software and algorithms to mimic human traits such as perceiving, reasoning, learning, interacting with an environment, problem-solving, and even exercising creativity. This is achieved through various techniques such as deep learning, neural networks, natural language generation, and speech recognition (Pantano & Scarpi, 2022; Xu et al., 2021).

AI is a crucial technological advancement that has enabled humans to replace manual labour with enhanced mental abilities and intellectual skills across various industries (Chien et al., 2020). It has a significant influence on fundamental sciences, industrial manufacturing, human life, social governance, and cyberspace. AI techniques are harnessed in a range of fundamental sciences such as information science, mathematics, medical science, materials science, geoscience, life science, physics, and chemistry. This utilization aims to advance the development of these sciences and expedite their applications for the betterment of humanity, society, and the global community (Xu et al., 2021).

Over the past several years, there has been rapid advancement in artificial intelligence, leading to its widespread application in a customer service context (Ameen et al., 2021). AI systems are now increasingly integrated into recommendation agent software (S. Zhang et al., 2021), serving on the frontlines of customer service and hospitality (M. Li et al., 2021), as personal voice assistants (Mou & Meng, 2023), and even as social companions (Pentina et al., 2023).

Service robots and intelligent assistants, whether in virtual or physical form, operate using AI technology and are categorized as AI agents (Chi et al., 2020).

AI agents have significantly transformed how we interact with the digital world by shifting from merely assisting with human tasks to becoming active collaborators. They are designed to perform various tasks, make decisions, and possess the ability to learn and adapt over time. (Franklin, 1997). These smart agents can work independently, respond to any change in their environment, and are built to analyse the provided data and carry out actions based on informed decisions. Data can be collected from various external sources, including sensor inputs, followed by processing, understanding, and analysing that information (Lior, 2020). Furthermore, recent innovations such as reinforcement learning and generative models have led to the development of groundbreaking tools like ChatGPT, Google Gemini, and Microsoft Copilot (Shakir, 2024). AI agents can enhance customer service automation and Customer Relationship Management (CRM), improving the customer experience while easing the workload on business operations (Cheng et al., 2024).

For instance, chatbots and virtual assistants simplify customer interactions by automatically responding to common questions. This enables quick resolution of typical issues and offers instant assistance to customers (Han et al., 2022). For instance, companies like Amazon and Apple utilize AI-driven chatbots to respond to customer inquiries, reduce waiting periods, and enhance both service efficiency and quality (Peters, 2023)

The rising importance of AI agents and consumers' interaction with them has significantly influenced brand marketing strategies (Vernuccio et al., 2023). As a result, researchers have increasingly focused on consumers' interactions with AI-based products, as evidenced by recent studies (Lv et al., 2021). In their research, Cheng and Jiang, (2022) found that AI-powered chatbots, by enhancing customer-brand relationships through marketing efforts like interaction, information accessibility, and entertainment, significantly strengthen consumer loyalty and brand resonance. Previous research has explored various aspects, such as the impact of AI on customer satisfaction and loyalty. Studies have also investigated how AI can enhance personalized customer experiences and improve customer retention (M. H. Huang & Rust, 2018). Research has also explored the factors influencing AI adoption or resistance. Findings indicate that while customers' emotional intelligence does not significantly influence their intention to adopt AI, positive attitudes shaped by cultural values and behavioural reasoning promote adoption, even in the presence of technological fears (Rasheed et al., 2023).

2.2 AI Anxiety

The rapid advancement of AI technology has given rise to a complex psychological phenomenon known as AI anxiety, significantly influencing individuals' perceptions of their future in critical areas such as education, employment, and personal lives (J. Li & Huang, 2020).

For instance, a report from the EU Commission (2020: 9) points out that “*citizens also worry that AI can have unintended effects or even be used for malicious purposes*”. This anxiety is often based on misunderstandings and confusion about what AI is and its capabilities. Accordingly, AI anxiety refers to a general emotional response characterized by fear, unease, or agitation about AI becoming uncontrollable, which discourages individuals from engaging with it (Johnson & Verdicchio, 2017). This phenomenon is notably significant because AI algorithms often operate with undisclosed mechanisms, leading consumers to feel misunderstood or discriminated against when they perceive biased predictions or categorizations made by AI (Puntoni et al., 2021).

Researchers define AI anxiety as an intense fear that arises due to issues caused by the transformations brought about by AI technologies in personal or social aspects of life (Kaya et al., 2022).

Johnson and Verdicchio (2017) identified three main factors contributing to this anxiety:

Factor 1: Sociotechnical Blindness - This occurs when there's a narrow focus on AI programs, overlooking the crucial role of human beings and social institutions in enabling AI to have meaning and impact.

Factor 2: Confusion about Autonomy - This factor arises from a misunderstanding of autonomy in both computational entities and humans, leading to misconceptions about the capabilities and independence of AI systems.

Factor 3: Inaccurate Conception of Technological Development - This factor stems from a flawed understanding of how technology evolves, potentially giving rise to unrealistic expectations or fears about the future capabilities and impacts of AI.

Wang and Wang (2022) in their research have organized AI anxiety into four dimensions:

The first dimension, Learning, is related to the anxiety individuals may feel concerning the constant need to learn and adapt to new AI technologies.

The second dimension, Job Replacement, involves the fear that AI technologies could replace human jobs, leading to unemployment.

The third dimension, Sociotechnical Blindness, is associated with the concern that individuals may not fully comprehend the implications and consequences of AI technologies.

The fourth dimension, AI Configuration, encompasses anxiety about how AI technologies are configured and controlled, along with the potential for these technologies to become uncontrollable.

Together, these dimensions create a comprehensive framework for understanding and measuring AI anxiety.

In another study, Li & Huang (2020) introduced additional elements to the concept of AI anxiety and identified eight factors contributing to AI-related anxiety, encompassing concerns like privacy violation, bias behaviour, job replacement, learning anxiety, existential risk, ethics violation, artificial consciousness, and lack of transparency.

Privacy violation anxiety. AI privacy violation anxiety refers to the fear, worry, or apprehension that individuals or society as a whole experience due to concerns about the potential violation of their privacy by AI technologies (Sætra, 2019). This anxiety arises from the increasing use of AI in various aspects of life, including data collection, analysis, and decision-making, which can encroach upon personal privacy in several ways (J. Li & Huang, 2020).

For example, H. Zhang et al (2023) illustrated that users of smart elderly care technologies often experience high levels of anxiety due to potential data breaches. Their study found that the implementation of advanced algorithms, like data encryption and blockchain, could significantly reduce these anxieties, lowering user concern from 70% to 50% (Zhang et al., 2023). Similarly, in the area of facial recognition payments, research has shown that while technology anxiety does not directly heighten privacy concerns, it does amplify vulnerabilities, leading to greater resistance to such technologies (X. Zhang & Zhang, 2024).

Mou & Meng (2023) in their study have shown that individuals with higher privacy concerns exhibit significantly greater resistance to Intelligent Virtual Assistants (IVAs) than those with lower privacy concerns. Users with high privacy concerns may feel a lack of control over personal information, decreasing their trust and increasing privacy anxiety and consumer resistance (Vimalkumar et al., 2021). Therefore, privacy violation anxiety can indeed make people scared to use IVAs and other AI agents due to privacy concerns (Mou & Meng, 2023). This resistance can extend to other AI agents, such as those used in targeted advertising and facial recognition, where unsupervised AI increases the risk of personal data leakage and privacy invasion (Evans, 2009). Privacy anxiety is increasingly prevalent with the growing use of biometrics, particularly in facial recognition for identity verification. Unauthorized access

or manipulation of personal data in these systems can result in serious consequences, heightening concerns around privacy (Erkin et al., 2009).

These studies highlight the importance of balancing the advantages of AI with the privacy concerns it generates, stressing the need to protect user privacy in order to foster trust in AI technologies.

Bias behaviour anxiety. In the context of artificial intelligence, bias and discrimination arise from the unfair treatment of individuals or groups due to biases in AI algorithms and systems (J. Li & Huang, 2020). AI algorithms are designed to make decisions and predictions based on data patterns (Bellamy et al., 2019). However, a significant challenge arises when these algorithms unintentionally reproduce biases and prejudices found in their training data or programming. This may lead individuals to perceive unfair treatment and to experience feelings of anxiety (Leavy, 2018).

Studies have demonstrated that biases can appear in different forms, such as unequal service offerings or communication styles that are less effective with specific demographic groups, leading to unfair treatment (Erkin et al., 2009). A clear example of bias can be found in AI-powered customer management systems, where algorithms rely on factors like gender, race, or socioeconomic status when making decisions. As a result, customers might experience different levels of service or attention based on these characteristics, which can reinforce inequality and contribute to discriminatory outcomes (Akter et al., 2023). Soni (2024) explored the effects of algorithmic bias in AI-driven target marketing, demonstrating that consumer profiles may be skewed by factors like purchasing history or geographic location, which frequently correlate with race and socioeconomic status. The study found that biased algorithms can lead to unequal treatment, with some groups receiving fewer or lower-quality offers, thereby negatively affecting customer equity.

Algorithmic price discrimination is also a prominent example of AI bias. This practice occurs when online retailers or platforms employ algorithms to set varying prices for customers based on factors like demographics, shopping histories, and online behaviours. Consequently, this practice can lead to consumer dissatisfaction and anxiety, as it may make individuals feel they are being treated unfairly (Wu et al., 2022).

These examples underscore the critical need to develop AI systems with robust bias detection and mitigation strategies to ensure fair and equitable treatment of all customers. When AI bias is left unaddressed, it can significantly harm individuals, leading to anxiety, aversion to AI, and negative emotions toward AI technology (Erkin et al., 2009).

Ethics violation anxiety. Ethics violation anxiety refers to the concern or worries that consumers may experience when they perceive that a brand or company has violated ethical standards (Campbell et al., 2022; Li & Huang, 2020). This anxiety is caused by the propaganda that AI may exhibit behaviours that violate the rules of human ethics when interacting with humans (Anderson & Leigh Anderson, 2007).

As the line between AI and humans continues to blur, the integration of autonomous AI agents into daily life will give rise to various ethical challenges. These challenges include the moral complexity surrounding the idea of humans developing romantic feelings for AI or forming relationships with AI companions. Additionally, if AI were to deceive humans, it would be similar to human dishonesty, raising concerns about the ethics of such behaviour (J. Li & Huang, 2020). In addition to these concerns, AI agents can subtly steer human behaviour toward unethical actions by providing inappropriate advice or examples. The inherent opacity and anonymity of AI further enable individuals to distance themselves from these unethical behaviours (Köbis et al., 2021).

This anxiety created by AI also can arise when consumers become aware that the content, they are viewing has been artificially created or significantly altered by AI, leading to a sense of deception or falsity. This can negatively impact the persuasiveness of the advertisement and the consumer's perception of the brand and attitude towards it (Kietzmann et al., 2018).

Lack of transparency anxiety. Lack of transparency anxiety is a term used to describe the unease or discomfort that individuals may experience when they are unable to fully understand or comprehend how artificial intelligence systems make decisions (Clarke, 2019; Lopez & Garza, 2023). This anxiety arises from the opaqueness of AI algorithms, as they often involve complex, black-box processes that are not easily interpretable by the end users (von Eschenbach, 2021). When people cannot understand the reasons behind the outcomes generated by AI, particularly when those outcomes are negative or unexpected, it can lead to a sense of unease, as they may question the fairness, bias, or reliability of the AI system. This anxiety can impact individuals' willingness to trust and use AI technologies and may hinder their adoption (Lopez & Garza, 2023).

Previous research has proposed that transparency is a critical factor in building and maintaining consumer trust and fostering positive attitudes and behaviours toward corporations (Kang & Hustvedt, 2014). Recent research finds that combining transparency with control features in privacy dashboards, allowing users to manage their data within the app, boosts trust and participation, whereas transparency alone can deter app usage by raising privacy concerns (Bemmann et al., 2022).

Job replacement anxiety. Job replacement anxiety arises from the fear that AI will take over a wide range of occupations. This anxiety is driven by concerns about being personally replaced by AI or by observing others' experiences with job displacement (Li & Huang, 2020). With the continuous improvement of AI capabilities, the likelihood of AI outperforming humans in various tasks, and doing so more efficiently, is increasing. This development could lead to a future where AI places significant constraints on human labour (Fast & Horvitz, 2017).

Granulo et al. (2019) explore the psychological responses to job replacement, revealing that individuals tend to prefer being replaced by humans rather than robots, as robotic replacement heightens feelings of economic threat.

Gondim et al. (2023) highlight that factors like income, job satisfaction, and qualifications play a significant role in shaping layoff anxiety, especially during times of economic crisis. Their research emphasizes that job replacement anxiety is not solely driven by technological advancements but is also influenced by the broader economic context, differing across various economic environments

Learning anxiety. AI anxiety stems from computer anxiety, often referred to as technophobia or computer phobia (J. Li & Huang, 2020), which is defined as the propensity of a person to be uneasy, apprehensive, or fearful about current or future use of computers (Parasuraman & Igbaria, 1990).

Learning anxiety is described as the anxiety that arises from either witnessing others' experiences or from the process of learning AI. It is associated with individuals' lack of self-confidence in their ability to learn AI, which they often perceive as a challenging task. Consequently, this perceived difficulty in mastering AI technology contributes to the development of anxiety (J. Li & Huang, 2020). Due to its algorithmic nature, AI can be challenging for most people to learn. The fact that AI systems have outperformed even highly skilled humans in certain fields further diminishes individuals' confidence in mastering AI (Granter et al., 2017). When AI is seen as a threat, along with the challenges of learning it, anxiety can arise (J. Li & Huang, 2020).

Existential risk anxiety. Anxiety about AI survival risk arises from media hype, which effectively communicates the notion that AI could potentially destroy humanity in the future (J. Li & Huang, 2020).

An existential risk is the danger that all intelligent life on Earth could lose its ability to survive, commonly understood as the threat of human extinction. In the context of AI, existential risk anxiety refers to the fear that AI could either eradicate Earth-originating intelligent life or drastically and permanently diminish its potential for future growth (Bostrom,

2002). In the coming decades, the emergence of super AI could lead to a perception of humans as mentally inferior. This possibility brings significant concerns about human safety, as there is no guarantee that these advanced AI systems will prioritize human well-being. The potential dangers are widely recognized as key factors that could trigger anxiety (Yampolskiy et al., 2016)

Artificial consciousness anxiety. Artificial consciousness anxiety refers to the inherent concern that the development of artificial consciousness may compromise or eliminate the uniqueness of human intelligence (Buttazzo, 2008). The emergence of self-conscious AI could lead to numerous challenges in human interactions. It may not only question the human status and impact human behaviour but also blur the distinction between humans and AI. This growing uncertainty could ultimately result in artificial intelligence becoming a new, separate species from humans (Yampolskiy et al., 2016).

The concept of AI anxiety is relatively new, and there is a noticeable gap in the existing literature regarding its connection to individuals' attitudes toward AI, social presence, emotional attachment, and self-AI connection.

As our research is centered on AI anxiety within the realm of marketing and customer interactions, it specifically focuses on how this anxiety influences consumer emotional responses. Therefore, our research focuses on two key factors related to AI anxiety: ethics violation anxiety and lack of transparency anxiety.

We chose not to address other types of AI-related anxieties because these concerns are more cognitively driven rather than emotionally centered or not directly relevant to customer experiences. Including them could detract from the primary aim of our study, which is to explore the emotional dynamics of customer anxiety triggered by AI interactions. By narrowing our focus, we ensure that the research remains tightly focused on the emotional triggers that are most relevant to understanding consumer responses to AI.

2.3 Emotional Attachment

Emotional attachment, a psychological concept, refers to the bond between an individual and a specific object. This bond provides psychological stability when the person is in the presence of the object (Bowlby J., 1969). Scholars, including Crowell (2008), contend that emotional attachment is an inherent and unconscious human need.

In the field of marketing research, the mechanism through which emotional attachment develops is frequently characterized as extending beyond one's deliberate control. This sets it

apart from other pertinent concepts, such as loyalty and involvement, which typically involve cognitive decision-making. In consumer-brand relationships, emotional attachment is considered a fundamental concept explaining long-term connections (Thomson et al., 2005). Thomson, MacInnis, and Park (2005) measured the strength of consumers' emotional attachments to brands and identified three first-order factors: affection (affectionate, friendly, loved, peaceful), passion (passionate, delighted, captivated), and connection (connected, bonded, attached).

This attachment extends beyond human relationships to include non-human entities and is observed in various contexts like places, pets, brands, and work projects, and is particularly pronounced in consumer products (Mugge et al., 2009). Furthermore, emotional attachment extends to AI agents and requires connective and affective feelings (Pelau et al., 2023)

In their research, Grisaffe & Nguyen (2011) identified five key factors that lead to emotional attachment to brands. These include superior marketing strategies, benefits derived by the user, differentiation in value, sensory pleasure, and sentimental or emotional memories associated with the brand. Additionally, they found that traditional customer outcomes, socialization processes, and influences across generations also contribute to the formation of emotional attachment to a brand. The researchers propose that these elements can be strategically used by marketers to foster emotional connections to their brands, thereby enhancing customer loyalty.

Emotional attachment can significantly enhance interactions with AI devices, as individuals who develop emotional bonds are more inclined to engage with and recommend these devices to others (Martelaro et al., 2016). Moreover, consumers emotionally attached to AI are often more forgiving of errors and more willing to offer constructive feedback to enhance the AI's performance. Consequently, the role of attachment in refining consumer-AI interactions lies in establishing a sense of trust and connection between the user and the AI, fostering a more enjoyable and effective experience (Pelau et al., 2023). Furthermore, the significance of emotional attachment is underscored in brand evaluation, attitude, and purchase loyalty. This means that consumers, having a robust bond with a brand, maintain a more reliable and stable relationship with it (Park et al., 2010). The study demonstrates that a group's emotional attachment to a technology can result in enhanced performance with that technology. Moreover, consistent research findings indicate a connection between emotional attachment to technology and the intention to use that technology (You & Robert, 2017). However, studies have shown that excessive use of technology, including smartphones and social networking sites, can increase anxiety by disrupting emotional regulation and encouraging avoidance-

based coping strategies (Marino et al., 2023). Emotional attachment to AI companions, although providing companionship, can also cause emotional harm when these systems reinforce biases or give harmful advice, resulting in ethical dilemmas and mental distress (Boine, 2023). Schwitzgebel (2023) explores the emotional and ethical confusion that users face when interacting with AI, especially when these systems trigger strong emotional responses, making it difficult to distinguish between human and machine behaviour. This ambiguity can lead to ethical anxiety, as users struggle with their emotional connections to AI while facing uncertain moral and ethical issues.

According to this analysis, the following hypothesis is proposed:

H1: Ethics violation anxiety is negatively associated with emotional attachment.

2.4 Self-AI connection

Scholars have been actively studying how consumers' behaviour relates to the way they connect with brands. Previous research has highlighted the important connection between the relationships people have with brands and how they see themselves. In this context, some researchers introduced the concept of self-brand connection, which indicates "the degree to which consumers have incorporated the brand into their self-concept" (Escalas, 2004). They used this concept to examine reference groups as a source of brand association. Their findings suggest that consumers are more likely to develop a self-brand connection when there is a strong association between consumers and reference groups. More specifically, consumers establish personal connections with a brand when it closely aligns with their self-concept, encompassing individual attributes, traits, and personal life experiences (Escalas & Bettman, 2005). Consumers choose to form relationships with brands because such connections contribute to their sense of identity and provide a means of self-expression to others.

Numerous studies collectively indicate that consumers experience a heightened sense of connection with brands that in some way represent who they perceive themselves to be or aspire to become (Ferraro, 2013; B. Huang & Philp, 2021). Furthermore, self-brand connection influences private and public consumer behaviour, encompassing aspects like word-of-mouth, personal brand relational quality, and post-purchase behaviour (van der Westhuizen, 2018). Scholars anticipate these connections will result in enduring positive brand attitudes and foster brand loyalty (Escalas, 2013).

However, previous research found that negative information about the brand can be negatively associated with self-brand connections. Consumers with high self-brand connections tend to experience a threat to their positive self-view when faced with negative information about a brand they are connected to, as they view the brand's failure as a personal failure (Cheng et al., 2012). Some individuals tend to abandon the brand when faced with negative information about it (Angle & Forehand, 2016). This could include news about a brand's involvement in unethical practices, product recalls due to safety concerns, poor customer service experiences, financial troubles, or any scandal that undermines the brand's reputation and the positive associations consumers have with it (Cheng et al., 2012). Anxiety is a common response when there's a threat to one's self-brand connection, particularly if the connection is strong and valued (Angle & Forehand, 2016).

In this research, within the construct of self-brand connection, the "brand" will be represented by an AI agent acting on behalf of the brand. Recent research indicates that individuals tend to form emotional connections with artificial intelligence. The concept of self-AI connection was first introduced by Huang & Philp (2021) and refers to the perceived personal connection that consumers develop with an AI system, particularly when the AI's algorithms mirror the consumers' personal behaviours and preferences.

Using the analysis of previous consumer behaviours, AI recommender systems provide personalized offers by accurately predicting their interests and preferences. Essentially, as the AI is intricately designed to mirror the consumer's identity, needs, and preferences, a profound sense of connection is fostered between the consumer and the AI (B. Huang & Philp, 2021). Their research suggests this self-AI connection can influence consumer behaviour, such as inhibiting their willingness to share negative word-of-mouth (NWOM) following a service failure by the AI. Consumers may refrain from sharing negative experiences because they feel that it reflects poorly on their own image, as the AI system is seen as a 'virtual self'. They suggest that service providers can offer tools that allow for a higher degree of personalization to enhance the self-AI connection. It is also beneficial for providers to explain how the AI algorithm works, so consumers understand that the AI is making predictions and choices that are meant to replicate their own behaviour. Some researchers suggested that the self-AI connection can act as a psychological mechanism to enhance customer engagement and build trust in AI (Sun & Liang, 2023; Umar Shakir, 2024). They argue that by forming an emotional connection with AI products, customers are more inclined to trust them. This emotional bond leads to more favourable attitudes towards the products.

As previously mentioned, the literature suggests that when consumers incorporate a brand into their self-concept, they establish a self-brand connection. This connection shapes their self-concepts and can result in emotional attachment, as the brand becomes symbolic of the user (van der Westhuizen, 2018b). The deeper integration of a brand into a consumer's identity strengthens the connection with the brand, representing a critical element of emotional attachment. This integration highlights the cognitive aspects of brand accessibility and its closeness to a consumer's self-concept, essential factors in the development of emotional attachment to a brand (Japutra et al., 2014; Thomson et al., 2005). The importance of the self is emphasized in consumers' emotional connections with brands (Mikulincer & Shaver, 2005). Consumers intentionally develop relationships with brands because these relationships help shape their self-esteem and serve as a means of expressing their identity to others (Fournier, 1998). People with a high level of self-brand connection tend to exhibit strong and long-lasting relationships and attachments to the brand (J. E. Escalas & Bettman, 2005).

According to this analysis, the following hypothesis is proposed:

H2: Emotional attachment to AI agents is positively associated with Self-AI connection.

2.5 Social Presence

Social presence theory, as defined Kwan Min Lee (2004: 45), is *"a psychological state in which virtual (para-authentic or artificial) social actors are experienced as actual social actors in either sensory or non-sensory ways"*. This means that social presence occurs when technology users do not notice the para-authenticity of mediated humans and/or the artificiality of simulated nonhuman social actors. Thus, social presence extends beyond mere awareness of the other agent; instead, it involves the perception of being socially and psychologically engaged in the interaction (Biocca et al., 2003).

Research has highlighted the importance of social presence in humans' perceptions of machine agents. Shin and Choo (2011) highlight that social presence amplifies the impact of perceived usefulness in robot interactions on developing positive attitudes toward the robot. Other studies have applied findings from social psychology to technology-mediated contexts to explore their relevance in interpersonal perceptions, demonstrating that interpersonal dynamics found in face-to-face contexts can be replicated in virtual environments with both agents and avatars (Oh et al., 2018). For instance, participants have been found to feel higher

levels of social presence when interacting with a virtual product recommendation agent whose appearance matched their ethnicity (Qiu & Benbasat, 2010). Additionally, the level of social presence can be influenced by the perceived agency of the virtual human, with people often feeling higher levels of social presence when they believe the virtual entity is controlled by an actual person rather than a computer program (Appel et al., 2012; Lim & Reeves, 2010; Oh et al., 2018).

Initially developed to connote individual perceptions of the presence of other humans in technology-mediated environments, the concept of social presence is being increasingly used in the context of customer interactions with technology (Biocca et al., 2003).

Research on virtual agents highlights the crucial role of social presence in influencing service encounters and users' attitudes toward agents (Verhagen et al., 2014).

Zhang and Rau (2022) found that social presence plays a mediator role between AI human-like appearance and user emotional attachment. Their research indicates that when AIs are designed with human-like features, such as human-like images, eye contact, voice, users tend to feel a greater sense of social presence, which in turn fosters stronger emotional attachment to these agents. Lee and Nass (2003) also explored non-embodied conversational agents, reaching similar conclusions. They found that linguistic cues can shape agents' personalities, and the social presence of these agents is more pronounced.

Based on this analysis, the following hypothesis is proposed:

H3: Social presence is positively associated with emotional attachment to AI agents.

Pu et al. (2022) explored the impact of transparency in social network services on self-disclosure and social presence. Their findings indicate that increased network transparency enhances both social presence and self-disclosure by giving users greater control over their information. Similarly, in another study researchers investigated the effects of avatar transparency in mixed reality (MR) collaborations. They concluded that reduced avatar transparency diminishes social presence, especially in augmented reality (AR) settings, where more vivid representations are generally favoured (Yoon B et al., 2023). In their study van Straten et al., 2020) also discussed how transparency about a robot's lack of human psychological capacities results in reduced social presence and heightened anxiety during children's interactions with the robot. Nevertheless, this transparency did not affect the children's feelings of closeness, as they continued to feel comfortable and form bonds with the robot despite the information provided.

Taking into account this analysis, the following hypothesis is proposed:

H4: Lack of transparency anxiety is negatively associated with social presence.

Thus, to summarize the proposed hypothesis:

H1: Ethics violation anxiety is negatively associated with emotional attachment.

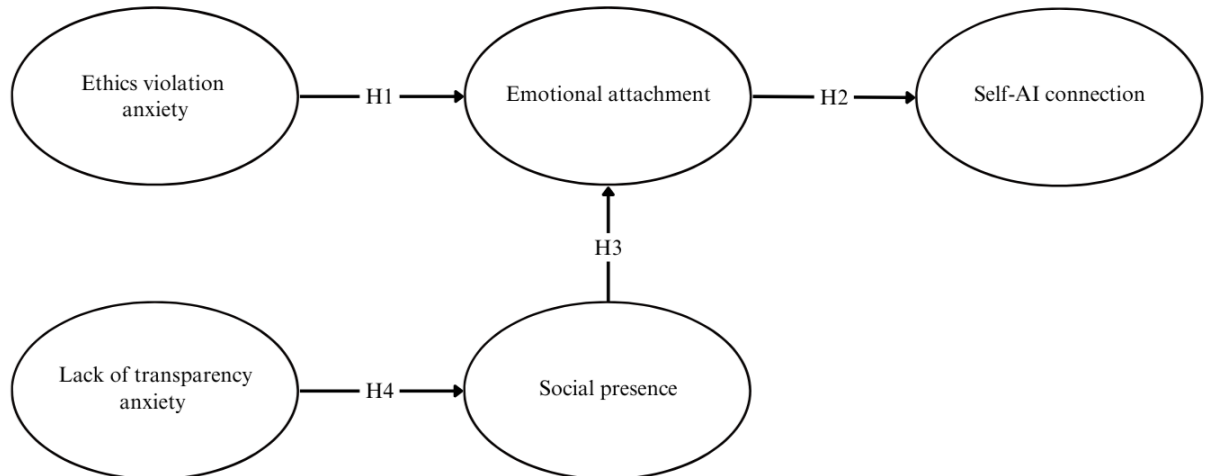
H2: Emotional attachment to AI agents is positively associated with Self-AI connection.

H3: Social presence is positively associated with emotional attachment to AI agents.

H4: Lack of transparency anxiety is negatively associated with social presence.

According to the information collected and the proposed hypothesis, the following research model was developed:

Exhibit 1 – Proposed research model



This model aims to illustrate the variables that possibly influence and mediate the relationship between customer anxieties and their connection with AI systems. The proposed model focuses on ethics violation anxiety and lack of transparency anxiety as key antecedents, exploring their effects on emotional attachment, social presence, and self-AI connection.

Through this model, the investigation seeks to analyse how ethics violation anxiety directly impacts emotional attachment (H1), which in turn influences the self-AI connection (H2).

Additionally, lack of transparency anxiety is hypothesized to affect social presence (H4), which subsequently enhances emotional attachment (H3).

The overall objective of this model is to understand the role of customer anxieties in shaping their responses to AI agents.

3. Methodology

3.1 Research Approach

This investigation aims to identify patterns and draw conclusions by testing the proposed hypothesis based on the literature review. Therefore, quantitative research was conducted to gather data to support the hypotheses and examine the relationships depicted in the conceptual model.

Specifically, it explores the relationships between Ethics Violation Anxiety (EVA), Lack of Transparency Anxiety (LTA), Emotional Attachment (EA), Self-AI Connection (SAIC), and Social Presence (SP).

Since the purpose of this analysis is the consumer and its attitude towards AI agents, the questionnaire survey method was chosen to test the research model.

3.2 Data Collection and sample

3.2.1 Questionnaire Development

Data was collected using an online questionnaire administered through Google Forms. The target population included consumers who have interacted with AI agents. The sample was selected using convenience sampling, given the constraints on time and resources. A total of 321 respondents participated in the study, providing a sufficient sample size for statistical analysis. Time frame where responses were accepted was between April 12th, 2024, and May 3rd, 2024.

The questionnaire was designed based on established scales from the literature. It comprised several sections, each targeting a specific construct within the conceptual model. The questions were formulated to measure Ethics Violation Anxiety (EVA) (J. Li & Huang, 2020), Lack of Transparency Anxiety (LTA) (J. Li & Huang, 2020), Emotional Attachment (EA) (Jiménez & Voss, 2014), Self-AI Connection (SAIC) (J. E. Escalas, 2004b), and Social Presence (SP) (A. Zhang & Patrick Rau, 2022).

3.2.2 Data Measurement and Scales

To achieve the objectives of this thesis, a crucial step was defining the scales based on the literature review. All the scales used were sourced from previous studies published in highly

ranked journals on the Scimago Journal Ranking. This approach helps ensure validity and reduces reliability issues. The exhibit below shows the number of items of each scale and associates each variable with its respective scale's author.

Exhibit 2 – Scales authors and number of items

Variable		Scale's Author	Nº of items
Dimensions of AI anxiety	Lack of transparency anxiety	J. Li & Huang, 2020	3
	Ethics violation anxiety	J. Li & Huang, 2020	2
Self-AI connection		Escalas, 2004	7
Social presence		Zhang & Patrick Rau, 2022	5
Emotional attachment		Jiménez & Voss, 2014	4

All of the items of the above scales were measured according a 7-point Likert scale from: 1 - Strongly disagree to 7 - Strongly agree.

3.2.3 Pre-Test

Before the full-scale data collection, a pilot test was conducted to ensure the clarity of the questions and the reliability of the scales used to create the questionnaire. The pilot test involved 13 participants who were representative of the target population, specifically people who regularly use AI agents for different purposes. Feedback from the pilot test was used to refine the questionnaire, ensuring that the questions were understandable and appropriately measured the intended constructs.

The data were analyzed using SmartPLS 4, where reliability analysis was conducted using the PLS-SEM algorithm. Item loadings were tested to ensure they were above 0.7, and composite reliability (ρ_c) was confirmed to be above 0.7. In Cronbach's alpha, some items were slightly below 0.7, but the survey was still proceeded with, as other test results were satisfactory. The pilot test results indicated that no significant revisions were needed.

3.2.4 Sample

The objective of this research is to understand consumers and their attitudes toward AI agents, the influence of AI-induced customer anxieties on emotional attachment, social

presence, and self-AI connection. As previously noted, convenience sample was gathered. The questionnaire link was distributed via different social media platforms, which led to a snowball effect in increasing the sample size.

The final sample comprised 321 respondents with the following demographic characteristics: 40.5% of the respondents were male, and 59.5% were female. Regarding age, 2.5% were younger than 18 years, 55.5% were between 18 and 24, 33% were between 25 and 34, 2.8% were between 35 and 49, and 2.5% were 65 or older.

In terms of occupation, 39.2% were employed, 27.7% were students, 20.6% were working students, 6.9% were unemployed, and 5.6% were self-employed. Regarding the frequency of AI agent usage, 48.5% of respondents used AI agents weekly, 23.4% used them monthly, 19.6% used them daily, 5.9% used AI agents rarely, and 3.1% were unsure about their usage frequency.

Concerning the duration of AI agent usage, 45.8% had used them for 6 months to 1 year, 32.1% for 1 to 3 years, 13.1% for less than 6 months, 7.2% for more than 3 years, and 1.9% had never used AI agents. For those who had never used AI agents, the questionnaire was concluded, and they did not participate further. The demographic information presented below is detailed in Table 1.

Table 1– Demographic information

N = 321	Demographic	%
Gender	Male	40.5
	Female	59.5
Age	Under 18	2.5
	18-24	55.5
	25-34	33
	35-49	6.2
	50-64	2.8
	65 or older	0
Occupation	Employed	39.4
	Student	27.7
	Working student	20.6
	Unemployed	6.9
	Self-employed	5.6
AI usage frequency	Weekly	39.4
	Monthly	27.7
	Daily	20.6
	Rarely	6.9
	Unsure	5.6
Duration of AI usage	6 months to 1 year	45.8
	1 to 3 years	32.1
	Less than 6 months	13.1
	More than 3 years	7.2
	Never used	1.9

The sample was deemed appropriate for the study, providing a broad representation of consumers who interact with AI agents. The data collection process adhered to ethical guidelines, ensuring the confidentiality and anonymity of all participants.

4. Results and discussion

The analysis was conducted using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 4. The research assessed the model in two phases: the outer model (also known as the measurement model) and the inner model (structural model), as outlined by (Jörg Henseler et al., 2015)). To evaluate the hypotheses, bootstrapping re-sampling was performed with 5,000 samples.

4.1 Outer model

This research evaluates the measurement model through three aspects: convergent validity, internal consistency reliability, and discriminant validity presented in the table 2

Almost all outer loadings exceed 0.7 (Hair et al., 2010), ranging from 0.716 to 0.951, and are statistically significant ($p < 0.001$). Indicators for the lack of transparency anxiety (LTA2) and self-brand connection (SAIC1) were deleted from the original model since their low outer loadings were below 0.7.

Additionally, both Cronbach's alpha and composite reliability for the constructs are well above the recommended threshold of 0.7 (Hair et al., 2010), indicating strong internal reliability. The average variance extracted (AVE) for all constructs is above 0.5, as shown in Table 2, demonstrating convergent validity (Hair et al., 2010).

Table 2 – Reliability and validity test for the complete data

Constructs	Items	Outer loadings	Cronbach alpha	CR	AVE
Dimensions of AI anxiety	Lack of Transparency Anxiety LTA1	0.853	0.685	0.864	0.760
	LTA3	0.890			
	Ethics Violation Anxiety EVA1	0.951	0.636	0.827	0.709
	EVA2	0.717			
Self-AI Connection	SAIC2	0.731	0.884	0.909	0.590
	SAIC3	0.858			
	SAIC4	0.790			
	SAIC5	0.734			
	SAIC6	0.851			
	SAIC7	0.766			
Social Presence	SP1	0.854	0.921	0.940	0.760
	SP2	0.880			
	SP3	0.817			
	SP4	0.908			
	SP5	0.897			
Emotional attachment	EA1	0.916	0.940	0.957	0.848
	EA2	0.936			
	EA3	0.911			
	EA4	0.922			

Table 3 – Discriminant validity of the constructs - Fornell–Larcker criterion

	EVA	EA	LTA	SAIC	SP
EVA	0.842				
EA	0.192	0.921			
LTA	0.366	0.063	0.872		
SAIC	0.192	0.764	0.177	0.768	
SP	0.182	0.623	0.256	0.675	0.872

Table 4 – Discriminant validity of the constructs – HTMT ratios

	EVA	EA	LTA	SAIC	SP
EVA					
EA	0.222				
LTA	0.613	0.078			
SAIC	0.243	0.816	0.230		
SP	0.245	0.666	0.317	0.733	

Note: Ethics Violation Anxiety (EVA), Lack of Transparency Anxiety (LTA), Social Presence (SP), Emotional Attachment (EA), Self-AI Connection (SAIC).

Two methods can be used to establish discriminant validity. The first one, the Fornell-Larcker criterion consists of two main conditions to ensure discriminant validity: the Average Variance Extracted (AVE) of each latent construct must be greater than 0.5, and the square root of the AVE for each construct must be greater than the highest correlation of that construct with any other construct in the model (Henseler, et al., 2015). Meeting these conditions ensures that a construct shares more variance with its indicators than with other constructs (Henseler et al., 2015). In this research, the AVE of each latent construct exceeds 0.5 and the square root of AVE of all constructs is higher than the correlation with any other construct, indicating discriminant validity. The second method, the Heterotrait-Monotrait ratio criterion (HTMT), requires that the ratios be lower than 0.85. In this research, all ratios fall between 0.222 and 0.816, indicating satisfactory discriminant validity within the data (Henseler et al., 2015).

Additionally, this study employs variance inflation factors (VIFs) to identify multicollinearity among the indicators. Hair et al. (2010) suggest that a VIF value below 10 is considered acceptable. In this model, all VIF values fall below 10, ranging from 1.277 to 4.549. Thus, the analysis confirms that multicollinearity is not a concern in this model.

4.2 Inner model

An analysis of the structural model fit indicates that the proposed model aligns well with the data (SRMR = 0.064, NFI = 0.804) (Henseler et al, 2015).

The evaluation of the structural model includes an examination of the R^2 estimates, Stone-Geisser's Q^2 value, effect size (f^2), path coefficients (β), and p-values, all of which are detailed in Exhibit 3 and Table 5.

Exhibit 3 – Research model with PLS-algorithm and bootstrapping results

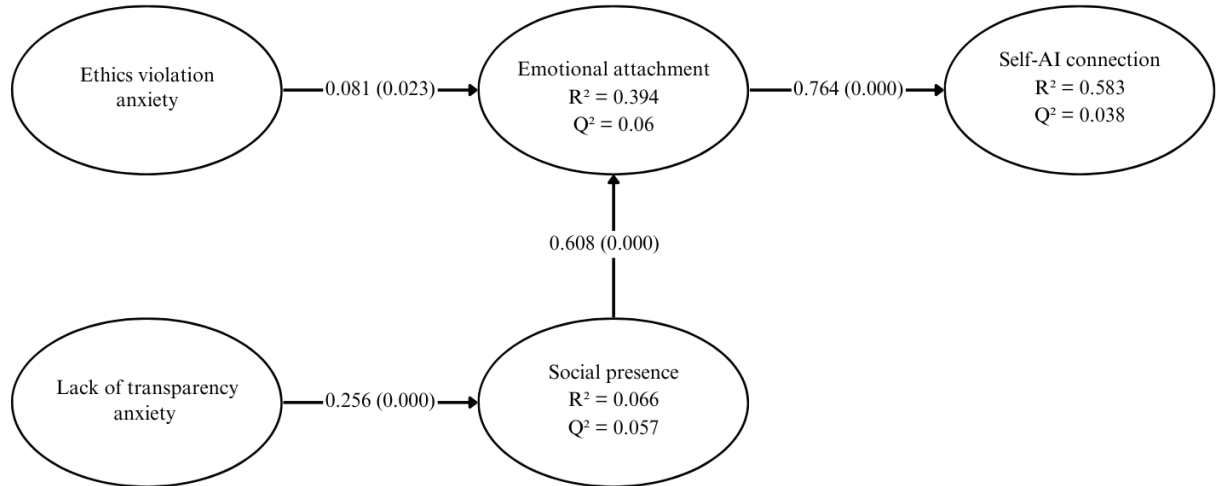


Table 5 – Structural Model Results

Hypothesized relationship	Proposed effect	Path coefficient	f^2	Results
EVA $\longrightarrow$ EA	Negative	0.081	0.011	H1: Not supported
EA $\longrightarrow$ SAIC	Positive	0.764	0.645	H2: Supported
SP $\longrightarrow$ EA	Positive	0.608	0.590	H3: Supported
LTA $\longrightarrow$ SP	Negative	0.256	0.070	H4: Not supported

Variance explained: EA ($R^2 = 0.394$), SP ($R^2 = 0.066$) and SAIC ($R^2 = 0.583$)
 Predicrive validity: EA ($Q^2 = 0.06$), SP ($Q^2 = 0.057$) and SAIC ($Q^2 = 0.038$)

The model predicts a 39.4% of the variance in emotional attachment, 58.3% of the variance in self-AI connection, which indicate moderate predictions, and 6.6% of the variance in social presence, indicating weak predictive capability (Henseler, et al., 2009).

The effect size (f^2) of against ethics anxiety in relation to emotional attachment and lack of transparency anxiety in relation to social presence suggests weak effect size at the structural level. In contrast, the effect size of emotional attachment in relation to self-AI connection, and social presence in relation to emotional attachment, is large (Cohen, 1988).

Additionally, the Stone–Geisser's Q^2 values for all dependent variables are greater than zero (Henseler et al., 2009), confirming the model's predictive validity.

Results demonstrated by Exhibit 3 for the model confirm that social presence ($\beta = 0.608$, $p = 0.000$) have a positive and significant influence on emotional attachment. Therefore, as social presence in AI agents increases, the higher is customers emotional attachment (H3 is supported). Regarding the emotional attachment ($\beta = 0.764$, $p = 0.000$) to self-AI connection, data identifies that there is a strong and positive relation among these constructs, thus confirming H2.

Results show that ethics violation anxiety ($\beta = 0.081$, $p = 0.023$) significantly impact emotional attachment, but in the opposite direction of the original hypothesis. While the hypothesis predicted a negative relationship, the findings reveal a positive one, leading to the rejection of H1. This suggests that EVA does not have the predicted negative influence on customers' emotional attachment. In contrast to the anticipated outcome, Vlachos et al. (2010) suggest that anxiety, particularly attachment anxiety, can enhance customer emotional attachment. They argue that anxiety multiplies the effects of emotional attachment on customer loyalty and word-of-mouth behaviour. In other words, consumers with higher levels of anxiety may place greater value on their emotional attachment to the firm, resulting in increased loyalty and a greater likelihood of positive word-of-mouth. This perspective may explain why H1 was not supported.

Regarding H4, lack of transparency anxiety ($\beta = 0.247$, $p = 0.000$) has a significant impact on social presence, but in the opposite direction of what was initially expected. Instead of the anticipated negative relationship, the results reveal a positive effect, leading to this hypothesis being also rejected. This suggests that LTA does not have the predicted negative influence on social presence. Flavián et al. (2024) propose that AI systems with a heightened perception of Automated Social Presence (ASP) can help ease psychological tensions. When social presence is perceived as stronger, consumers are more likely to feel understood rather than alienated, fostering a sense of connection. These perceptions enhance engagement and make interactions feel more human-like and personalized, which can mitigate anxieties related to transparency issues. Additionally, anxiety related to technology-based customer service, such as chatbots, can boost satisfaction when communication is social-oriented rather than task-focused. High-anxiety customers often seek emotional support, and when chatbots offer warmth and small talk, it helps them feel cared for, compensating for the impersonal nature of the technology. In such cases, anxiety can enhance the perception of social presence, leading to a better customer experience when managed effectively (Xu et al., 2022a). This could potentially explain why H4 was not supported.

4.3 Mediation analysis

This research follows (Cepeda-Carrion et al., 2018) for the mediation analysis. The bootstrapping procedure was used to compute 97.5% confidence intervals for the indirect effects.

We can talk about full mediation when the direct effect is not significant, but the indirect effect is significant. (Cepeda-Carrion et al., 2018).

Table 5 shows all the indirect effects in this model, showing that all of the indirect effects are significant.

In the context of this study, mediation analysis was conducted to investigate how Emotional Attachment (EA) and Social Presence (SP) mediate the effects of anxiety-related factors—Ethics Violation Anxiety (EVA) and Lack of Transparency Anxiety (LTA)—on Self-AI Connection (SAIC) and Emotional Attachment (EA).

The analysis revealed that the relationship between EVA and SAIC is partially mediated by EA, with an indirect effect path coefficient ($\beta = 0.062$, $p = 0.024$). While the direct effect of EVA on EA was modest ($\beta = 0.081$, $p = 0.023$), EA had a strong effect on SAIC ($\beta = 0.764$, $p = 0.000$) and with a VAF of 49.87%, this confirms partial mediation. Although the direct effect of EVA on SAIC is small, it remains significant, working indirectly through EA. This suggests that addressing ethics-related anxieties can indirectly enhance consumers' connection to AI by fostering emotional attachment. These findings are consistent with Schmalz and Orth (2012), which demonstrate that attachment can buffer the negative emotional and behavioural consequences of ethical violations to a certain extent. Emotional attachment fosters loyalty and even ambivalence toward a brand, allowing consumers to maintain a positive perception despite its ethical lapses. However, the buffering effect has its limits; when unethical behaviour is perceived as highly severe, even strong attachments may fail to protect the brand from negative consequences.

A partial mediation effect was found in the $SP \rightarrow EA \rightarrow SAIC$ path, where EA partially mediates the relationship between SP and SAIC ($\beta = 0.465$, $p = 0.000$). With a VAF of 50%, this indicates that while EA explains part of the effect of SP on SAIC, a direct relationship between SP and SAIC remains. This supports the idea that improved social presence strengthens consumers' emotional attachment to AI and also directly enhances their connection to it.

The relationship between LTA and SAIC, mediated through SP and EA, was examined with $LTA \rightarrow SP$ ($\beta = 0.256$, $p = 0.000$) and $SP \rightarrow EA$ ($\beta = 0.608$, $p = 0.000$). The indirect effect

through these mediators resulted in $\beta = 0.119$, $p = 0.000$, with a VAF of 50%, indicating partial mediation. While the indirect effect is modest, the partial mediation suggests that transparency anxieties influence SAIC both directly and indirectly through these sequential mediators. As previously mentioned, lack of transparency anxiety can sometimes have a positive association with social presence (Flavián et al., 2024). When social presence is perceived as stronger, it can enhance attachment. Considering that H2 and H3 were supported, this suggests that SP and EA can indeed mediate the relationship between LTA and SAIC.

Similarly, in the $LTA \rightarrow SP \rightarrow EA$ pathway, the analysis demonstrated that the influence of LTA on EA is partially mediated by SP ($\beta = 0.156$, $p = 0.000$), with a VAF of 49.94%. This further emphasizes the role of social presence in moderating the effects of transparency anxieties on emotional attachment.

The consistent partial mediation observed across these pathways, with VAF values near 50%, suggests that the relationships between the independent variables (EVA and LTA) and the dependent outcomes (SAIC and EA) are partly reliant on the mediators EA and SP. This underscores the significant role these mediators play in shaping consumer-brand relationships in the context of AI and anxiety-related concerns.

Table 6 – Mediation Analysis Results

Effect of	Indirect effect	CI Indirect		VAF	P values	Results
		2.5%	97.5%			
EVA $\rightarrow$ EA $\rightarrow$ SAIC	0.062	0.015	0.122	49.87%	0.024	Partial mediation
SP $\rightarrow$ EA $\rightarrow$ SAIC	0.465	0.386	0.546	50%	0.000	Partial mediation
LTA $\rightarrow$ SP $\rightarrow$ EA $\rightarrow$ SAIC	0.119	0.072	0.173	50%	0.000	Partial mediation
LTA $\rightarrow$ SP $\rightarrow$ EA	0.156	0.095	0.222	49.94%	0.000	Partial mediation

Note: The $VAF > 80\%$ indicates full mediation, $20\% \leq VAF < 80\%$ shows partial mediation, $VAF < 20\%$ assumes no mediation.

5. Conclusions

5.1 Theoretical Implications

The results of this study demonstrated that emotional attachment and social presence play crucial roles in shaping consumers' interactions with AI agents. Mediation analysis revealed that emotional attachment and social presence partially mediate the effects of ethics violation anxiety and lack of transparency anxiety on self-AI connection. This suggests that while addressing consumer anxieties through enhanced emotional engagement and social presence is important, these anxieties also have a direct effect on consumers' connection with AI agents.

The study did not find a direct negative relationship between ethics violation anxiety and emotional attachment. Contrary to expectations, AI-induced anxieties do not necessarily reduce emotional attachment. Moreover, anxiety may enhance emotional attachment because customers fear losing their connection to the brand. This increased emotional attachment can lead to higher customer loyalty and a greater likelihood of recommending the brand to other potential customers (Vlachos et al. 2010).

Similarly, there was no direct negative relationship between lack of transparency anxiety and social presence. High-anxiety customers, instead of being deterred, tend to seek emotional support through AI agents with a strong social presence. This enhances their sense of connection and improves their overall experience with the brand (Xu et al., 2022).

Additionally, social presence was found to have a positive influence on emotional attachment. As the perceived social presence of an AI agent increases, whether through human-like features or interactive behaviours, consumers are more likely to develop a deeper emotional attachment to the AI. This aligns with Yan et al. (2024) research and highlights the importance of designing AI agents with features that enhance social engagement to foster emotional connections.

Emotional attachment was shown to positively influence the self-AI connection. This connection fostered more meaningful information exchange, heightened enjoyment, and increased user involvement, ultimately enhancing the self-disclosure process and strengthening the relationship between individuals and AI (Pelau et al., 2023).

In summary, the findings of the thesis underscore the importance of emotional attachment and social presence in mitigating the negative effects of AI-induced anxiety, highlighting the potential for fostering stronger consumer-AI relationships through thoughtful design and interaction strategies.

5.2. Managerial implications

The managerial implications of this research suggest several strategic actions that businesses can take to improve customer interactions with AI agents. First, it is essential for managers to recognize that AI-induced anxieties, such as concerns over ethics violations and a lack of transparency, play a significant role in shaping customer emotional attachment and connection to brands. To address this, companies must prioritize transparency in their AI systems. For instance, this can be achieved by providing clear explanations of how step-by-step explanation of how the AI algorithm reached its decision for its recommendation and ensuring that AI algorithms operate ethically. The AI could provide transparency about what data was used and how each factor contributed to the decision. Additionally, by offering customers more control over their data and maintaining open communication channels, businesses can reduce anxiety and create better customer relationships with brands' AI agents. For example, an e-commerce platform can allow customers to manage their data preferences directly through a user-friendly dashboard, where they can choose what personal information the AI can use for recommendations.

In addition to transparency, businesses should focus on enhancing the social presence of AI agents. This can be achieved by humanizing AI interactions, which involve using personalized communication, adopting human-like characteristics, and ensuring that AI agents provide emotional support during customer service interactions. Service chatbots can be programmed to respond in a friendly, empathetic tone, addressing customers by name and referencing past interactions. Enhancing social presence not only mitigates the negative effects of AI anxiety but also fosters emotional attachment, leading to customers' self-AI connection and more engaging and satisfactory experience.

Similarly, emotional attachment plays a critical role in customer interactions with AI, moderating the relationship and acting as a buffer against the negative impacts of AI anxiety. Therefore, companies should focus on fostering emotional bonds between customers and AI by designing AI agents that are relatable and capable of creating meaningful connections with users. This could involve incorporating features that allow AI agents to adapt to customers' emotional states, enhancing the overall customer experience.

Additionally, brands should focus on enhancing the connection between individuals and AI systems. To foster a self-AI connection, AI systems must deliver personalized interactions that resonate with the user's unique needs, preferences, and behaviours. Investing in AI systems that personalize interactions based on user data can foster a stronger self-AI connection, leading

to increased brand loyalty and engagement. When customers perceive AI agents as closely aligned with their preferences and values, they are more likely to remain loyal to the brand.

5.3 Limitations and Future Research

Although this research makes a contribution to research on AI-induced customer anxiety and its impact on consumer's emotional attachment, self-AI connection, and social presence, it has several limitations that must be acknowledged.

First, the research employed a convenience sample of individuals who had interacted with AI agents, which limits the generalizability of the findings. A more diverse sample, encompassing a wider range of demographics and cultural backgrounds, would be necessary to enhance external validity. Additionally, the data collection took place over a relatively short period, which may not capture the evolving nature of consumer attitudes toward AI. Longitudinal studies would provide a more comprehensive understanding of how AI anxiety changes over time as consumers' interactions with AI agents continue to evolve.

Another limitation is the study's focus on specific factors of AI-induced anxiety, namely ethics violation and lack of transparency anxiety. Other important aspects, such as biased behaviour, job replacement, learning anxiety, artificial consciousness and existential risk, were not explored. Including these factors in future research could provide a more holistic view of the emotional responses to AI.

An additional limitation of this study was the exclusive use of surveys for data collection, which may not fully capture the complexity of consumer behaviours and attitudes. To overcome this limitation, future research could integrate behavioural or experimental methods to provide a more comprehensive and accurate understanding of consumer interactions with AI.

Furthermore, although the study focused on social presence and emotional attachment as primary moderators, it did not investigate other potential moderating variables, such as technological familiarity, trust in AI or AI anthropomorphism. Future research should consider incorporating more factors to gain a deeper insight into how various elements impact consumer interactions with AI.

By addressing these limitations and pursuing these future research directions, scholars can contribute to a more comprehensive understanding of AI anxiety and its implications for consumer behaviour and marketing strategies.

Bibliography

- Akter, S., Sultana, S., Mariani, M., Wamba, S. F., Spanaki, K., & Dwivedi, Y. K. (2023). Advancing algorithmic bias management capabilities in AI-driven marketing analytics research. *Industrial Marketing Management*, 114, 243–261. <https://doi.org/10.1016/j.indmarman.2023.08.013>
- Ameen, N., Tarhini, A., Reppel, A., & Anand, A. (2021). Customer experiences in the age of artificial intelligence. *Computers in Human Behavior*, 114. <https://doi.org/10.1016/j.chb.2020.106548>
- Anderson, M., & Leigh Anderson, S. (2007). Machine Ethics: Creating an Ethical Intelligent Agent. *AI Magazine*, 28(4), 15.
- Angle, J. W., & Forehand, M. R. (2016). It's not us, it's you: How threatening self-brand association leads to brand pursuit. *International Journal of Research in Marketing*, 33(1), 183–197. <https://doi.org/10.1016/j.ijresmar.2015.08.003>
- Appel, J., Von Der Pütten, A., Krämer, N. C., & Gratch, J. (2012). Does humanity matter? Analyzing the importance of social cues and perceived agency of a computer system for the emergence of social reactions during human-computer interaction. *Advances in Human-Computer Interaction*, 2012. <https://doi.org/10.1155/2012/324694>
- Autonomous AI and autonomous agents market report 2030*. (2023).
- Bellamy, R. K. E., Mojsilovic, A., Nagar, S., Ramamurthy, K. N., Richards, J., Saha, D., Sattigeri, P., Singh, M., Varshney, K. R., Zhang, Y., Dey, K., Hind, M., Hoffman, S. C., Houde, S., Kannan, K., Lohia, P., Martino, J., & Mehta, S. (2019). AI Fairness 360: An extensible toolkit for detecting and mitigating algorithmic bias. *IBM Journal of Research and Development*, 63(4–5). <https://doi.org/10.1147/JRD.2019.2942287>
- Bemmann, F., Windl, M., Erbe, J., Mayer, S., & Hussmann, H. (2022). The Influence of Transparency and Control on the Willingness of Data Sharing in Adaptive Mobile Apps. *Proceedings of the ACM on Human-Computer Interaction*, 6(MHCI). <https://doi.org/10.1145/3546724>
- Biocca, F., Harms, C., & Burgoon, J. K. (2003). Toward a More Robust Theory and Measure of Social Presence: Review and Suggested Criteria. *Presence: Teleoperators and Virtual Environments*, 12(5), 456–480. <https://doi.org/10.1162/105474603322761270>
- Boine, C. (2023). Emotional Attachment to AI Companions and European Law. *MIT Case Studies in Social and Ethical Responsibilities of Computing*. <https://doi.org/10.21428/2c646de5.db67ec7f>
- Bostrom, N. (2002). Existential risks: analyzing human extinction scenarios and related hazards. *Journal of Evolution and Technology*, 9(1).
- Bowlby J. (1969). Attachment and Loss. Vol. 1 Attachment. In *New York, NY: Basic Books*.
- Buttazzo, G. (2008). Artificial consciousness: Hazardous questions (and answers). *Artificial Intelligence in Medicine*, 44(2), 139–146. <https://doi.org/10.1016/j.artmed.2008.07.004>
- Campbell, C., Plangger, K., Sands, S., & Kietzmann, J. (2022). Preparing for an Era of Deepfakes and AI-Generated Ads: A Framework for Understanding Responses to Manipulated Advertising. *Journal of Advertising*, 51(1), 22–38. <https://doi.org/10.1080/00913367.2021.1909515>
- Cepeda, G., Nitzl, C., & Roldán, J. L. (2018). Mediation Analyses in Partial Least Squares Structural Equation Modeling. Guidelines and Empirical Examples. *Partial Least Squares Path Modeling: Basic Concepts, Methodological Issues and Applications*. <https://www.researchgate.net/publication/315697051>

- Cheng, S. Y. Y., White, T. B., & Chaplin, L. N. (2012). The effects of self-brand connections on responses to brand failure: A new look at the consumer-brand relationship. *Journal of Consumer Psychology*, 22(2), 280–288. <https://doi.org/10.1016/j.jcps.2011.05.005>
- Cheng, Y., & Jiang, H. (2022). Customer–brand relationship in the era of artificial intelligence: understanding the role of chatbot marketing efforts. *Journal of Product and Brand Management*, 31(2), 252–264. <https://doi.org/10.1108/JPBM-05-2020-2907>
- Chi, O. H., Denton, G., & Gursoy, D. (2020). Artificially intelligent device use in service delivery: a systematic review, synthesis, and research agenda. *Journal of Hospitality Marketing and Management*, 29(7), 757–786. <https://doi.org/10.1080/19368623.2020.1721394>
- Chien, C. F., Dauzère-Pérès, S., Huh, W. T., Jang, Y. J., & Morrison, J. R. (2020). Artificial intelligence in manufacturing and logistics systems: algorithms, applications, and case studies. In *International Journal of Production Research* (Vol. 58, Issue 9, pp. 2730–2731). Taylor and Francis Ltd. <https://doi.org/10.1080/00207543.2020.1752488>
- Clarke, R. (2019). Why the world wants controls over Artificial Intelligence. *Computer Law and Security Review*, 35(4), 423–433. <https://doi.org/10.1016/j.clsr.2019.04.006>
- Cukier, K. (2019). Ready for robots: how to think about the future of AI. *Foreign Aff.*, 98.
- Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. *International Journal of Information Management*, 48, 63–71. <https://doi.org/10.1016/j.ijinfomgt.2019.01.021>
- E. Han, D. Yin, & H. Zhang. (2022). Bots with Feelings: Should AI Agents Express Positive Emotion in Customer Service? *Information Systems Research*, 34(10).
- Erkin, Z., Franz, M., Guajardo, J., Katzenbeisser, S., Lagendijk, I., & Toft, T. (2009). Privacy-preserving face recognition. *Privacy Enhancing Technologies, 9th International Symposium*, 5672 LNCS, 235–253. https://doi.org/10.1007/978-3-642-03168-7_14
- Escalas, J. (2013). Self-Identity and Consumer Behavior. *JOURNAL OF CONSUMER RESEARCH*, Inc. •, 39. <https://doi.org/10.1086/669165>
- Escalas, J. E. (2004a). Narrative Processing: Building Consumer Connections to Brands. *Journal of Consumer Psychology*, 14(1–2), 168–180. https://doi.org/10.1207/s15327663jcp1401&2_19
- Escalas, J. E., & Bettman, J. R. (2005). Self-construal, reference groups, and brand meaning. *Journal of Consumer Research*, 32(3), 378–389. <https://doi.org/10.1086/497549>
- Evans, D. S. (2009). The Online Advertising Industry: Economics, Evolution, and Privacy. *Journal of Economic Perspectives*, 23(3), 37–60. <http://ssrn.com/abstract1086473>
- Fast, E., & Horvitz, E. (2017). Long-Term Trends in the Public Perception of Artificial Intelligence. *Proceedings of the AAAI Conference on Artificial Intelligence*, 31(1). www.aaai.org
- Ferraro R, K. A. M. T. (2013). Look at Me! Look at Me! Conspicuous Brand Usage, Self-Brand Connection, and Dilution. *Journal of Marketing Research*, 50(4), 477–488.
- Flavián, C., Belk, R. W., Belanche, D., & Casaló, L. V. (2024). Automated social presence in AI: Avoiding consumer psychological tensions to improve service value. *Journal of Business Research*, 175. <https://doi.org/10.1016/j.jbusres.2024.114545>
- Fournier, S. (1998). Consumers and Their Brands: Developing Relationship Theory in Consumer Research. *Journal of Consumer Research*, 24(4), 343–353.
- Franklin, S. (1997). Autonomous agents as embodied ai. *Cybernetics and Systems*, 28(6), 499–520. <https://doi.org/10.1080/019697297126029>
- Gondim, G., Carlotto, M. S., Carvalho, C., Mustafin, A. N., Nikolaevna Tuguskina, G., Vozárová, I. K., & Kotulič, R. (2023). Factors Affecting Job-Loss Anxiety: The Influence of Decent Work Policies and Corporate Sustainability in a Case Study of Economic Crises. *Social Sciences (MDPI)*, 12(11), 639. <https://doi.org/10.3390/socsci>

- Granter, S. R., Beck, A. H., & Papke, D. J. (2017). AlphaGo, deep learning, and the future of the human microscopist. In *Archives of Pathology and Laboratory Medicine* (Vol. 141, Issue 5, pp. 619–621). College of American Pathologists. <https://doi.org/10.5858/arpa.2016-0471-ED>
- Granulo, A., Fuchs, C., & Puntoni, S. (2019). Psychological reactions to human versus robotic job replacement. *Nature Human Behaviour*, 3(10), 1062–1069. <https://doi.org/10.1038/s41562-019-0670-y>
- Grisaffe, D. B., & Nguyen, H. P. (2011). Antecedents of emotional attachment to brands. *Journal of Business Research*, 64(10), 1052–1059. <https://doi.org/10.1016/j.jbusres.2010.11.002>
- Huang, B., & Philp, M. (2021). When AI-based services fail: examining the effect of the self-AI connection on willingness to share negative word-of-mouth after service failures. *Service Industries Journal*, 41(13–14), 877–899. <https://doi.org/10.1080/02642069.2020.1748014>
- Huang, M. H., & Rust, R. T. (2018). Artificial Intelligence in Service. *Journal of Service Research*, 21(2), 155–172. <https://doi.org/10.1177/1094670517752459>
- J A Crowell, R. C. F. P. R. S. (2008). Measurement of individual differences in adolescent and adult attachment. In *Handbook of attachment: Theory, research, and clinical applications* (pp. 599–634).
- Japutra, A., Ekinci, Y., & Simkin, L. (2014). Exploring brand attachment, its determinants and outcomes. *Journal of Strategic Marketing*, 22(7), 616–630. <https://doi.org/10.1080/0965254X.2014.914062>
- J.F. Hair, W. C. Black, B. J. Barbin, & R. E. Anderson. (2010). Multivariate Data Analysis (7th ed.). New York: Pearson Education Limited.
- Jiménez, F. R., & Voss, K. E. (2014). An alternative approach to the measurement of emotional attachment. *Psychology and Marketing*, 31(5), 360–370. <https://doi.org/10.1002/mar.20700>
- Johnson, D. G., & Verdicchio, M. (2017). AI Anxiety. *Journal of the Association for Information Science and Technology*, 68(9), 2267–2270. <https://doi.org/10.1002/asi.23867>
- Jörg Henseler, Geoffrey Hubona, & Pauline Ash Ray. (2015). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management and Data Systems*, 116(1), 2–20.
- Kang, J., & Hustvedt, G. (2014). Building Trust Between Consumers and Corporations: The Role of Consumer Perceptions of Transparency and Social Responsibility. *Journal of Business Ethics*, 125(2), 253–265. <https://doi.org/10.1007/s10551-013-1916-7>
- Kaya, F., Aydin, F., Schepman, A., Rodway, P., Yetişensoy, O., & Demir Kaya, M. (2022). The Roles of Personality Traits, AI Anxiety, and Demographic Factors in Attitudes toward Artificial Intelligence. *International Journal of Human-Computer Interaction*. <https://doi.org/10.1080/10447318.2022.2151730>
- Kietzmann, J., Paschen, J., & Treen, E. (2018). Artificial intelligence in advertising: How marketers can leverage artificial intelligence along the consumer journey. In *Journal of Advertising Research* (Vol. 58, Issue 3, pp. 263–267). World Advertising Research Center. <https://doi.org/10.2501/JAR-2018-035>
- Köbis, N., Bonnefon, J.-F., & Rahwan, I. (2021). Bad machines corrupt good morals. *Nature Human Behaviour*, 5(6), 679–685.
- Kwan Min Lee. (2004). Presence, Explicated. *Communication Theory*, 14(1), 27–50.
- Leavy, S. (2018). Gender bias in artificial intelligence: The need for diversity and gender theory in machine learning. *The 1st International Workshop IEEE Computer Society*, 14–16. <https://doi.org/10.1145/3195570.3195580>

- Li, J., & Huang, J. S. (2020). Dimensions of artificial intelligence anxiety based on the integrated fear acquisition theory. *Technology in Society*, 63. <https://doi.org/10.1016/j.techsoc.2020.101410>
- Li, M., Yin, D., Qiu, H., & Bai, B. (2021). A systematic review of AI technology-based service encounters: Implications for hospitality and tourism operations. *International Journal of Hospitality Management*, 95. <https://doi.org/10.1016/j.ijhm.2021.102930>
- Lim, S., & Reeves, B. (2010). Computer agents versus avatars: Responses to interactive game characters controlled by a computer or other player. *International Journal of Human Computer Studies*, 68(1–2), 57–68. <https://doi.org/10.1016/j.ijhcs.2009.09.008>
- Lior, A. (2020). Article 2 2020 Part of the Science and Technology Law Commons, and the Torts Commons Recommended Citation Recommended Citation Lior. In *Mitchell Hamline Law Review* (Vol. 46). <https://open.mitchellhamline.edu/mhlrAvailableat:https://open.mitchellhamline.edu/mhlr/vol46/iss5/2>
- Lopez, A., & Garza, R. (2023). Consumer bias against evaluations received by artificial intelligence: the mediation effect of lack of transparency anxiety. *Journal of Research in Interactive Marketing*. <https://doi.org/10.1108/JRIM-07-2021-0192>
- Lv, X., Liu, Y., Luo, J., Liu, Y., & Li, C. (2021). Does a cute artificial intelligence assistant soften the blow? The impact of cuteness on customer tolerance of assistant service failure. *Annals of Tourism Research*, 87. <https://doi.org/10.1016/j.annals.2020.103114>
- Marino, C., Manari, T., Vieno, A., Imperato, C., Spada, M. M., Franceschini, C., & Musetti, A. (2023). Problematic social networking sites use and online social anxiety: The role of attachment, emotion dysregulation and motives. *Addictive Behaviors*, 138. <https://doi.org/10.1016/j.addbeh.2022.107572>
- Martelaro, N., Nneji, V. C., Ju, W., & Hinds, P. (2016). Tell me more: Designing HRI to encourage more trust, disclosure, and companionship. *ACM/IEEE International Conference on Human-Robot Interaction*, 2016-April, 181–188. <https://doi.org/10.1109/HRI.2016.7451750>
- McCarthy, Minsky, Rochester, & Shannon. (1955). (2006). A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE. *AI Magazine*, 27(4), 12.
- Mikulincer, M., & Shaver, P. R. (2005). Attachment theory and emotions in close relationships: Exploring the attachment-related dynamics of emotional reactions to relational events. *Personal Relationships*, 12(2), 149–168. <https://doi.org/10.1111/j.1350-4126.2005.00108.x>
- Min Lee, K., & Nass, C. (2003). *Designing Social Presence of Social Actors in Human Computer Interaction*.
- Mou, Y., & Meng, X. (2023). Alexa, it is creeping over me – Exploring the impact of privacy concerns on consumer resistance to intelligent voice assistants. *Asia Pacific Journal of Marketing and Logistics*. <https://doi.org/10.1108/APJML-10-2022-0869>
- Mugge, R., Schoormans, J. P. L., & Schifferstein, H. N. J. (2009). Emotional bonding with personalised products. *Journal of Engineering Design*, 20(5), 467–476. <https://doi.org/10.1080/09544820802698550>
- Oh, C. S., Bailenson, J. N., & Welch, G. F. (2018). A systematic review of social presence: Definition, antecedents, and implications. In *Frontiers Robotics AI* (Vol. 5, Issue OCT). Frontiers Media S.A. <https://doi.org/10.3389/frobt.2018.00114>
- On Artificial Intelligence-A European approach to excellence and trust White Paper on Artificial Intelligence A European approach to excellence and trust. (2020). https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf.

- Pantano, E., & Scarpi, D. (2022). I, Robot, You, Consumer: Measuring Artificial Intelligence Types and their Effect on Consumers Emotions in Service. *Journal of Service Research*, 25(4), 583–600. <https://doi.org/10.1177/10946705221103538>
- Parasuraman, S., & Igararia, M. (1990). An examination of gender differences in the determinants of computer anxiety and attitudes toward microcomputers among managers. *International Journal of Man-Machine Studies*, 32(3), 327–340. [https://doi.org/10.1016/S0020-7373\(08\)80006-5](https://doi.org/10.1016/S0020-7373(08)80006-5)
- Park, C. W., Macinnis, D. J., Priester, J., Eisingerich, A. B., & Iacobucci, D. (2010). Brand Attachment and Brand Attitude Strength: Conceptual and Empirical Differentiation of Two Critical Brand Equity Drivers. *Journal of Marketing*, 74, 1–17.
- Pelau, C., Volkmann, C., Barbul, M., & Bojescu, I. (2023). The Role of Attachment in Improving Consumer-AI Interactions. *Proceedings of the International Conference on Business Excellence*, 17(1), 1075–1084. <https://doi.org/10.2478/picbe-2023-0097>
- Pentina, I., Xie, T., Hancock, T., & Bailey, A. (2023). Consumer–machine relationships in the age of artificial intelligence: Systematic literature review and research directions. In *Psychology and Marketing* (Vol. 40, Issue 8, pp. 1593–1614). John Wiley and Sons Inc. <https://doi.org/10.1002/mar.21853>
- Peters. (2023). *Amazon is building an AI-powered ‘conversational experience’ for search*. The Verge.
- Pu, W., Li, S., Bott, G. J., Esposito, M., & Thatcher, J. B. (2022). To Disclose or Not to Disclose: An Evaluation of the Effects of Information Control and Social Network Transparency. *Computers and Security*, 112. <https://doi.org/10.1016/j.cose.2021.102509>
- Puntoni, S., Reczek, R. W., Giesler, M., & Botti, S. (2021). Consumers and Artificial Intelligence: An Experiential Perspective. *Journal of Marketing*, 85(1), 131–151. <https://doi.org/10.1177/0022242920953847>
- Qiu, L., & Benbasat, I. (2010). A study of demographic embodiments of product recommendation agents in electronic commerce. *International Journal of Human Computer Studies*, 68(10), 669–688. <https://doi.org/10.1016/j.ijhcs.2010.05.005>
- Rasheed, H. M. W., He, Y., Khizar, H. M. U., & Abbas, H. S. M. (2023). Exploring Consumer-Robot interaction in the hospitality sector: Unpacking the reasons for adoption (or resistance) to artificial intelligence. *Technological Forecasting and Social Change*, 192. <https://doi.org/10.1016/j.techfore.2023.122555>
- Sætra, H. S. (2019). Freedom under the gaze of Big Brother: Preparing the grounds for a liberal defence of privacy in the era of Big Data. *Technology in Society*, 58. <https://doi.org/10.1016/j.techsoc.2019.101160>
- Schmalz, S., & Orth, U. R. (2012). Brand Attachment and Consumer Emotional Response to Unethical Firm Behavior. *Psychology and Marketing*, 29(11), 869–884. <https://doi.org/10.1002/mar.20570>
- Schwitzgebel, E. (2023). AI systems must not confuse users about their sentience or moral status. In *Patterns* (Vol. 4, Issue 8). Cell Press. <https://doi.org/10.1016/j.patter.2023.100818>
- Shin, D.-H., & Choo, H. (2011). Modeling the acceptance of socially interactive robotics. *Interaction Studies. Social Behaviour and Communication in Biological and Artificial Systems*, 12(3), 430–460. <https://doi.org/10.1075/is.12.3.04shi>
- Soni, V. (2024). Bias Detection and Mitigation in AI-Driven Target Marketing: Exploring Fairness in Automated Consumer Profiling. *International Journal of Innovative Science and Research Technology (IJISRT)*, 2574–2584. <https://doi.org/10.38124/ijisrt/ijisrt24may2203>
- Sun, Y., & Liang, Q. (2023). Research on the Relationship between Self-AI Connection and Customer engagement - Based on the Analysis of Customer AI Trust and AI

- Anthropomorphism. *ACM International Conference Proceeding Series*, 48–53. <https://doi.org/10.1145/3625469.3625504>
- Survey: *AI budgets expected to double in 2025*. (2024).
- Thomson, M., MacInnis, D. J., & Park, C. W. (2005). The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *Journal of Consumer Psychology*, 15(1), 77–91. https://doi.org/10.1207/s15327663jcp1501_10
- Umar Shakir. (2024, March 18). *From ChatGPT to Gemini: how AI is rewriting the internet*.
- van der Westhuizen, L. M. (2018a). Brand loyalty: exploring self-brand connection and brand experience. *Journal of Product and Brand Management*, 27(2), 172–184. <https://doi.org/10.1108/JPBM-07-2016-1281>
- van Straten, C. L., Peter, J., Kühne, R., & Barco, A. (2020). Transparency about a robot's lack of human psychological capacities: Effects on child-robot perception and relationship formation. *ACM Transactions on Human-Robot Interaction*, 9(2). <https://doi.org/10.1145/3365668>
- Verhagen, T., van Nes, J., Feldberg, F., & van Dolen, W. (2014). Virtual customer service agents: Using social presence and personalization to shape online service encounters. *Journal of Computer-Mediated Communication*, 19(3), 529–545. <https://doi.org/10.1111/jcc4.12066>
- Vernuccio, M., Patrizi, M., & Pastore, A. (2023). Delving into brand anthropomorphisation strategies in the experiential context of name-brand voice assistants. *Journal of Consumer Behaviour*, 22(5), 1074–1083. <https://doi.org/10.1002/cb.1984>
- Vimalkumar, M., Sharma, S. K., Singh, J. B., & Dwivedi, Y. K. (2021). 'Okay google, what about my privacy?': User's privacy perceptions and acceptance of voice based digital assistants. *Computers in Human Behavior*, 120. <https://doi.org/10.1016/j.chb.2021.106763>
- Vlachos, P. A., Theotokis, A., Pramataris, K., & Vrechopoulos, A. (2010). Consumer-retailer emotional attachment: Some antecedents and the moderating role of attachment anxiety. *European Journal of Marketing*, 44(9), 1478–1499. <https://doi.org/10.1108/03090561011062934>
- von Eschenbach, W. J. (2021). Transparency and the Black Box Problem: Why We Do Not Trust AI. *Philosophy and Technology*, 34(4), 1607–1622. <https://doi.org/10.1007/s13347-021-00477-0>
- Wang, Y. Y., & Wang, Y. S. (2022). Development and validation of an artificial intelligence anxiety scale: an initial application in predicting motivated learning behavior. *Interactive Learning Environments*, 30(4), 619–634. <https://doi.org/10.1080/10494820.2019.1674887>
- Wu, Z., Yang, Y., Zhao, J., & Wu, Y. (2022). The Impact of Algorithmic Price Discrimination on Consumers' Perceived Betrayal. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.825420>
- Xu, Y., Liu, X., Cao, X., Huang, C., Liu, E., Qian, S., Liu, X., Wu, Y., Dong, F., Qiu, C. W., Qiu, J., Hua, K., Su, W., Wu, J., Xu, H., Han, Y., Fu, C., Yin, Z., Liu, M., ... Zhang, J. (2021). Artificial intelligence: A powerful paradigm for scientific research. In *The Innovation* (Vol. 2, Issue 4). Cell Press. <https://doi.org/10.1016/j.xinn.2021.100179>
- Xu, Y., Zhang, J., & Deng, G. (2022a). Enhancing customer satisfaction with chatbots: The influence of communication styles and consumer attachment anxiety. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.902782>
- Xu, Y., Zhang, J., & Deng, G. (2022b). Enhancing customer satisfaction with chatbots: The influence of communication styles and consumer attachment anxiety. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.902782>

- Yampolskiy, R., Yampolskiy, R. V., & Spellchecker, M. S. (2016). *Artificial Intelligence Safety and Cybersecurity: a Timeline of AI Failures*. <https://intelligence.org/2014/01/28/how-big-is-ai/>
- Yan, J., Xia, S., Jiang, A., & Lin, Z. (2024). The effect of different types of virtual influencers on consumers' emotional attachment. *Journal of Business Research*, 177. <https://doi.org/10.1016/j.jbusres.2024.114646>
- Yoon B, Shin JE, Kim HI, Young Oh S, Kim D, & Woo W. (2023). Effects of Avatar Transparency on Social Presence in Task-Centric Mixed Reality Remote Collaboration. *IEEE Transactions on Visualization and Computer Graphics*, 29(11), 4578–4588.
- You, S., & Robert, L. P. (2017). *Emotional Attachment, Performance, and Viability in Teams Collaborating with Embodied Physical Action (EPA) Robots*.
- Zhang, A., & Patrick Rau, P. L. (2022). Tools or peers? Impacts of anthropomorphism level and social role on emotional attachment and disclosure tendency towards intelligent agents. *Computers in Human Behavior*, 138. <https://doi.org/10.1016/j.chb.2022.107415>
- Zhang, H., Li, C., Tian, X., & Shen, H. (2023). The algorithm and model of user data privacy protection psychological anxiety. *CNS Spectrums*, 28(S2), S114–S114. <https://doi.org/10.1017/s1092852923005394>
- Zhang, S., Meng, Z., Chen, B., Yang, X., & Zhao, X. (2021). Motivation, Social Emotion, and the Acceptance of Artificial Intelligence Virtual Assistants—Trust-Based Mediating Effects. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.728495>
- Zhang, X., & Zhang, Z. (2024). Leaking my face via payment: Unveiling the influence of technology anxiety, vulnerabilities, and privacy concerns on user resistance to facial recognition payment. *Telecommunications Policy*, 48(3). <https://doi.org/10.1016/j.telpol.2023.102703>
- Zhendong Cheng, Wenfang Fan, Bingjia Shao, Wenli Jia, & Yong Zhang. (2024). The impact of intelligent customer service agents' initial response on consumers' continuous interaction intention. *Journal of Retailing and Consumer Services*, 76(2).

Annex

Annex A: Questionnaire Form



Study about consumers' interactions with AI agents

Dear participant,

This questionnaire is conducted within the framework of the Thesis course unit of the Master's Degree in Marketing at ISCTE. The aim of this study is **to investigate the intricate dynamics surrounding consumers' interactions with artificial intelligence (AI) agents**.

The survey will only take about 3 minutes, so please take the time to read each question thoroughly.

Please note: There are no right or wrong answers. All provided data will be stored and analyzed anonymously, ensuring strict confidentiality. Your responses cannot be linked to you personally.

I kindly ask you to answer the questions with **spontaneity and honesty**.

Thank you for your participation!

Section 1 out of 5

To ensure accurate analysis and understanding of the participants, please provide the following demographic information.

Gender *

- ☒ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to say

Age *

- ☐ Under 18
- ☐ 18 - 24
- ☐ 25 - 34
- ☐ 35 - 49
- ☐ 50 - 64
- ☐ 65 and older

Occupation *

- ☐ Student
- ☐ Working Student
- ☐ Employed
- ☐ Unemployed
- ☐ Self-Employed
- ☐ Other: _____

How frequently do you use AI agents? *

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ Rarely
- ☐ I don't know/Not sure

How long have you been using AI agents? *

- ☐ Less than 6 months
- ☐ 6 months to 1 year
- ☐ 1 to 3 years
- ☐ More than 3 years
- ☐ Never used

Section 2 out of 5

As previously mentioned, the purpose of this study is to explore the complex dynamics associated with consumers' interactions with artificial intelligence (AI) agents.

For the purpose of this study, AI agents refer to software programs or systems that utilize artificial intelligence to independently or semi-autonomously perform tasks.

Examples include ChatGPT, Bing AI, Siri, Alexa, Google Assistant, and similar technologies.

Please rate the following statements; on a scale from 1 = strongly disagree to 7 = strongly agree.

I'm afraid that AI agent will monitor my behavior. *

1 2 3 4 5 6 7
Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

I'm worried that AI agent will collect too much of my personal information. *

1 2 3 4 5 6 7
Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

AI agent's predictions of my preferences, such as well recommended ads or web pages, make me feel that my privacy is violated. *

1 2 3 4 5 6 7
Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

It is unacceptable if AI agent is racially discriminatory. *

1 2 3 4 5 6 7
Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

It is unfair for an AI agent to set different prices (price discrimination) for different people. *

1 2 3 4 5 6 7
Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

AI agent treats different people differently, which can make me anxious.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

It's worrying if you do not know which part of AI agent has erred after AI agent makes a mistake.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I worry that people cannot figure out how AI agent makes decisions.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

The responsibility for addressing operational failures in AI agent may be confusing.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I worry that humans have special feelings (such as love or adoration) for AI agents.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I am disturbed that AI agent can deceive (for example, enticing people to buy goods).

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

AI agents reflects who I am. *

	1	2	3	4	5	6	7	
Strongly disagree	☒	☐	☐	☐	☐	☐	☐	Strongly agree

I can identify with AI agent. *

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I feel personal connection to AI agent. *

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I use AI agent to communicate who I am to other people.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I think AI agent helps me to become the type of person I want to be. *

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I consider AI agent to be "me" (it reflects who I consider myself to be or the way that I want to present myself to others). *

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

The AI agent matches me well. *

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I felt a sense of human contact with the AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I felt a sense of personalness with the AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I felt a sense of sociability with the AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I felt a sense of human warmth with the AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I felt a sense of human sensitivity with the AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

I have an emotional bond with AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

*
I am emotionally connected to AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

*
I am linked by feelings to AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree

*
I have feelings of attachment to AI agent.

	1	2	3	4	5	6	7	
Strongly disagree	☐	☐	☐	☐	☐	☐	☐	Strongly agree