Chatbot Design and UX Evaluation : Reviewing Design Factors (Tone, Avatar, Emotion, Interactivity) and How They Affect User Experience and Satisfaction

Desain Chatbot dan Evaluasi UX: Tinjauan Faktor Desain (Tone, Avatar, Emosi, Interaktivitas) dan Pengaruhnya terhadap Pengalaman serta Kepuasan Pengguna

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ABSTRACT

Background: *The rapid and dynamic evolution of Artificial Intelligence (AI) has fundamentally transformed the landscape of conversational agents. Consequently, the focus of chatbot development has shifted significantly from technical metrics—such as processing speed and accuracy—to emotional dimensions and a holistic User Experience (UX).* ***Objective:*** *This study aims to systematically analyze critical design factors, including conversational tone, visual avatars, emotional responsiveness, and interactivity, to determine their impact on user satisfaction.* ***Method:*** *To achieve this, a Systematic Literature Review (SLR) was conducted to synthesize empirical evidence from recent studies.* ***Result:*** *Based on 105 selected papers, the results indicate that Empathy and UX/Satisfaction are currently the most dominant and influential variables in the literature. Furthermore, Anthropomorphism is identified as a pivotal element in shaping user perceptions; by endowing chatbots with human-like characteristics, developers can significantly enhance the system's relatability and reduce the psychological distance between the user and the machine. The findings also highlight distinct design focuses across sectors: while E-Commerce emphasizes anthropomorphism and trust to foster brand loyalty, the Healthcare sector prioritizes deep empathy to position chatbots as emotional companions.* ***Conclusion:*** *Ultimately, it is concluded that integrating empathy and adaptive design elements is a strategic necessity. These elements are essential for establishing trust and creating Human-Computer Interactions (HCI) that are natural, meaningful, and sustainable in the long term.*

***Keywords*— chatbots, design, interface, user experience, human computer interaction**

ABSTRAK

Latar Belakang: Perkembangan Artificial Intelligence (AI) yang pesat dan dinamis telah mengubah secara mendasar lanskap agen percakapan. Perubahan tersebut menggeser fokus pengembangan chatbot dari aspek teknis, seperti kecepatan pemrosesan dan akurasi, menuju dimensi emosional dan pengalaman pengguna atau *User Experience* (UX) secara menyeluruh. **Tujuan:** Penelitian ini bertujuan menganalisis secara sistematis berbagai faktor desain kritis, meliputi nada percakapan, avatar visual, responsivitas emosional, dan interaktivitas, untuk mengetahui pengaruhnya terhadap kepuasan pengguna. **Metode:** Penelitian ini menggunakan metode *Systematic Literature Review* (SLR) untuk menyintesis bukti empiris dari berbagai penelitian terkini. **Hasil:** Berdasarkan 105 artikel terpilih, hasil penelitian menunjukkan bahwa empati dan UX/kepuasan pengguna merupakan variabel yang paling dominan dan berpengaruh dalam literatur. Selain itu, antropomorfisme menjadi elemen penting dalam membentuk persepsi pengguna. Pemberian karakteristik menyerupai manusia pada chatbot dapat meningkatkan kedekatan sistem dengan pengguna dan mengurangi jarak psikologis antara manusia dan mesin. Temuan penelitian juga menunjukkan adanya perbedaan fokus desain pada setiap sektor. Sektor *E-Commerce* menekankan antropomorfisme dan kepercayaan untuk membangun loyalitas terhadap merek, sedangkan sektor kesehatan memprioritaskan empati yang mendalam agar chatbot dapat berperan sebagai pendamping emosional. **Kesimpulan:** Integrasi empati dan elemen desain adaptif merupakan kebutuhan strategis dalam pengembangan chatbot. Kedua elemen tersebut diperlukan untuk membangun kepercayaan serta menciptakan interaksi manusia dan komputer atau *Human-Computer Interaction* (HCI) yang alami, bermakna, dan berkelanjutan dalam jangka panjang.

Kata Kunci: chatbot, desain, antarmuka, pengalaman pengguna, interaksi manusia dan komputer.

I. INTRODUCTION

Interface design and user experience (UI/UX) play a crucial role in human-computer interaction. Chatbots are conversational agents that mimic human interaction through text, speech, and visual communication [1]. Despite technological advances in the digital world, there remains a gap in understanding how different interface design elements, particularly the visual and audio representations of chatbot avatars, can impact the learning experience [2]. Research demonstrates that the emotional design of AI avatars plays a pivotal role in cognitive management, influencing the tone (warmth) of competency activities and thus linked to emotion-directed learning, thus creating an efficient and personalized environment that meets diverse cognitive and emotional needs [3]. These avatars enable students to engage in realistic scenarios, work in groups, and develop essential skills using adaptive and intelligent technology[4]. Avatars, or characters,

in AI technology will enhance user experience. Research suggests that creating libraries of AI-based avatars for use in various educational environments, such as immersive learning and massive open online courses, would be another desirable development [5]. Besides education, chatbots are hihgly functional for the needs of e-commerce applications. Chatbots are very important to improve the sustainability of e-commerce by providing efficient customer support [6]. A study confirmed the great potential of anthropomorphic cues in chatbot applications and showed that these cues are positively related to customer satisfaction and are mediated by the variables of enjoyment, attitude, and trust [7]. The study indicates that customer readiness characteristics (optimism and innovation), and human-like characteristics of the chatbot (empathy and social presence) have a positively influence customer trust in the chatbot, while perceived anthropomorphism has a negative influence on trust [8]. In a study [9], most customers prefer to switch to a human agent, especially when the chatbot service fails. Anthropomorphism does not always guarantee trust, especially if the bot fails to meet user expectations [10]. Therefore, developing chatbots in e-commerce is very challenging for customers. Other challenges in chatbot design include making users aware of the chatbot's context and avoiding negative stereotypes. In addition, it is also necessary to balance the chatbot's personality traits [11].

Chatbots have now become a key technology supporting automation in the service sector in digital interactions. Many sectors are now beginning to utilize chatbots to increase efficiency, reduce workloads, and expand access to information. However, the application of chatbot technology is not solely determined by a programming algorithm, but also heavily influenced by the quality of interface design and user experience (UI/UX). The Continuous Auditing (CA) design process has become a collaborative, cross-disciplinary effort that benefits from divergent thinking between business stakeholders who provide the "why" and "what," designers who provide conversational flows and dialogue, domain experts who provide content and context, developers who provide technical constraints, and end users who can identify gaps in the resulting iterative CA prototypes and fix them even before development begins [12]. Attribution Theory suggests that users attribute human traits such as empathy and trust to anthropomorphized systems [13]. For task-focused users, minimalist design can generate greater satisfaction by maximizing efficiency and clarity [10]. The incorporation of anthropomorphic features into technology design is not simply an aesthetic choice but a psychologically grounded strategy that can significantly enhance the user experience by fostering emotional engagement, reducing cognitive load, and increasing trust and satisfaction [13].

In today's digital age, conversational agents and virtual assistants such as Alexa and Google Assistant have become part of everyday life. The field of affective computing seeks to create systems that can detect, interpret, and respond appropriately to human emotions. Emotions play a crucial role in decision-making, memory, and well-being [14]. Chatbot users were found to prefer chatbot personalities that are proactive and intelligent, yet simultaneously caring and encouraging. However, these preferences vary depending on the intended use of the chatbot; chatbots on news or health websites are expected to be professional, while those on shopping websites should be relaxed and fun [11]. The implications of this research provide a better understanding of anthropomorphic chatbot design elements when designing chatbots for short-term interactions, and it offers actionable implications for practice that will enable more effective chatbot implementation [15]. In a survey, 149 users interacted with a chatbot over a period of time. The questionnaire survey revealed a significant positive correlation between the level of anthropomorphism in the role-playing chatbot and users' media dependency, with user satisfaction mediating this relationship [16]. Empirical analysis of 462 survey responses revealed that CASA factors (perceived anthropomorphic characteristics, perceived empathic ability, and perceived interaction quality) can effectively increase user trust in AI customer service after a failed interaction [17]. Another study showed that AI services significantly reduced the perceived warmth (tone) of customer service due to reduced perceptions of the AI staff as service providers. This loss of warmth subsequently led to lower customer continuance intentions for AI services [18].

Research involving 417 and 359 participants in the UK and Vietnam, respectively, concluded that AI developers should consider designing Virtual Call Assistants (VCAs) that provide informative responses (e.g., providing relevant information that can resolve customer queries) and credible responses (e.g., providing multiple options based on customer preferences in a neutral manner, and acknowledging their limitations when unable to assist customers with a particular request). Furthermore, it is important to design chatbots that customers enjoy interacting with, for example, equipping chatbots with the ability to crack jokes or use humor when appropriate [19]. The use of chatbots in the entertainment world (gamification) can assign roles based on user characteristics. Character.ai (c.ai) is an online platform where users create their own chatbots by filling out a simple character sheet outlining the bot's key traits and an initial prompt. Fans go to c.ai to create chatbots based on their favorite characters and synthetic worlds, remediating and remixing them in new ways to create opportunities for fun gameplay [20]. Digital Human Avatars (DHAs) are an emerging AI-powered avatar technology that combines advanced form realism and behavior to provide a human-like and interactive interaction experience. Industry data shows that DHAs can significantly increase user engagement and online conversion rates. [21]. Chatbots have become a key technology in supporting the automation of digital services across various sectors. The success of their implementation is not only determined by algorithms but also greatly influenced by the quality of interface design and user experience (UI/UX). Therefore, understanding anthropomorphic design elements and user experience is crucial for designing chatbots that are effective, adaptive, and tailored to user needs and context.

II. MATERIALS AND METHOD

This research is a Systematic Literature Review (SLR) with a qualitative thematic synthesis approach that focuses on the

evaluation of chatbot design and user experience (UX). The main objective of this research is to identify, categorize, and analyze design factors such as tone, avatars, emotions, and interactivity that influence user experience and satisfaction. Through this approach, the research not only reviews the findings of various previous studies but also builds a thematic synthesis that can provide a comprehensive understanding of how design aspects influence the effectiveness and acceptance of chatbots across various usage contexts.

A. *Search Sources*

A literature search was conducted across several reputable academic databases to ensure the quality and credibility of the sources used. The primary databases used included Scopus, ScienceDirect, SpringerLink, and the ACM Digital Library, as they provide internationally recognized, peer-reviewed scientific publications. Google Scholar and several international and national publications were also used as supplementary sources to access additional relevant literature not yet indexed in the primary databases. This selection of databases aimed to ensure a comprehensive research scope, encompassing the latest studies on chatbot design and user experience across various application domains. The literature selection strategy in this study was conducted using keywords specifically designed to find studies related to the evaluation of chatbot design and user experience. The keywords used included :

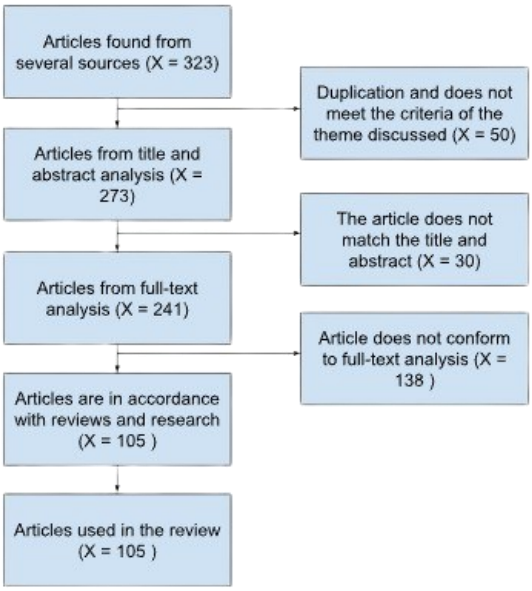
(chatbot* or “chat bot*” or “virtual assistant*” or “conversational agent*” or talkbot* or “talk bot*”) and (experience* or “user experience*” or “ux chatbot*” or “human computer interaction” or user* or design* or “chatbot design evaluation*”)

B. *Inclusion and Exclusion Criteria*

Inclusion and exclusion criteria were used to filter and select the literature used in the systematic literature review. Inclusion criteria included literature specifically addressing the topic of chatbot design and user experience (UX), allowing the research to focus on studies relevant to user interactions. Studies published both nationally and internationally were included to broaden the scope and broaden the perspective. There was no publication year restriction, ensuring that all relevant literature was considered. Furthermore, research highlighting chatbot UX design frameworks, models, or approaches was included due to their direct relevance to the research objectives. Conversely, exclusion criteria included literature that did not focus on chatbot design or UX, for example, research that focused solely on technical aspects without addressing user experience. Literature whose content was irrelevant to the research objectives was also excluded from the analysis.

C. *Selection Process*

After the literature was collected, a screening process was conducted to ensure its relevance to the research focus. The initial stage involved reviewing abstracts to assess whether the research content aligns with the topic of chatbot design and UX evaluation. Relevant literature was then analyzed in more depth through a comprehensive review of the articles.



Gambar 1. Article Selection Stage

To identify and categorize relevant themes related to human-chatbot interactions, this study employed a Systematic Literature Review (SLR) adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. While maintaining an inductive approach similar to Grounded Theory in allowing themes to emerge directly from the data, this study utilizes Thematic Analysis as the primary method for data synthesis. This approach was selected to rigorously map the landscape of existing research, quantify the prevalence of specific design factors, and synthesize qualitative findings into a coherent taxonomic framework[22]. The adoption of PRISMA ensures methodological rigor in the searching and screening processes, while Thematic Analysis provides a structured flexibility to analyze the multifaceted nature of User Experience (UX) across different industry domains[23]. In its implementation, this research was structured through several important and sequential stages to ensure methodological rigor and a comprehensive analysis:

a. Literature Identification: Collecting literature from various sources, such as journals, articles, and conference proceedings related to the research topic.

b. Study Selection : Screening based on predetermined inclusion and exclusion criteria to ensure only eligible literature is analyzed further.

c. Quality Evaluation : Assessing the quality of selected literature to ensure the validity and relevance of the information to be used.

d. Results Synthesis : Integrating findings from various studies to answer research questions and provide structured conclusions.

e. Results Reporting : Compiling the synthesis results in a systematic and structured format, so that they can make a significant contribution to the development of scientific knowledge on the topic being studied.

III. RESULT AND DISCUSSION

A. *Characteristics of Literature*

Tabel 1. Characteristics of Literature by Year

Year	Number of Papers
2019	[24], [25], [26]
2021	[27], [28], [29], [30], [31]
2022	[11], [32], [33], [34], [35], [36], [37], [38]
2023	[1], [6], [7], [8], [12], [15], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50]
2024	[5], [9], [14], [16], [17], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85]
2025	[2], [3], [4], [6], [10], [13], [18], [19], [20], [21], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104]

The publication trend table shows an increase in the number of studies related to chatbot design and user experience (UX) from year to year. In the early period (2019–2020), research addressing this topic was very limited, with only one publication per publication, indicating that the focus on chatbot design and UX aspects was not yet a major concern. Entering 2021 and 2022, a moderate increase occurred, with a total of around nine studies exploring user interface elements and interactions.

he most significant increase occurred from 2023 to 2025, with the number of publications jumping sharply from 12 studies (2023) to 19 studies (2024), reaching a peak of 21 publications in 2025. This surge indicates a significant shift in research interest in the human aspects of chatbot interactions, particularly with the development of generative AI technology and the increasing adoption of chatbots in various sectors such as e-commerce, education, and healthcare.

This trend confirms that researchers' attention is no longer solely focused on the technical capabilities of chatbots, but also on the emotional dimensions and user experience that determine the success of their implementation. Consequently, the 2023–2025 period signifies a phase of intensive exploration, marking the consolidation of the "Chatbot Design & UX" research field as a crucial subdiscipline within human–computer interaction (HCI) studies.

B. *Influential Design Factors*

Tabel 2. Influencing Factors

Factor	Number of Studies Discussing
Anthropomorphism	65
Empathy and Emotion	66
UX and Satisfaction	65
Interactivity	52
Trust	48
Personalization	33
Gender Ambiguity	15
Social Presence	26

Analysis of the research findings reveals a strong tendency for chatbot design research over the past five years to place greater emphasis on emotional aspects and social relationships than purely technical elements. Empathy and emotion factors rank highest in discussion, indicating the importance of chatbots' ability to understand and respond to users' emotional states in a more humane manner. The high number of studies highlighting anthropomorphism, user experience (UX), and user satisfaction also suggests that human perception of a chatbot's "personality" plays a significant role in determining the interaction experience.

Meanwhile, factors such as interactivity, trustworthiness, and personalization rank in the middle, indicating that the success of a chatbot design also depends on the extent to which the system adapts communication to the user's context. The low attention paid to social presence and gender ambiguity suggests that the dimensions of social identity and visual representation of chatbots remain relatively underexplored. Overall, these results demonstrate a shift in research focus toward creating chatbots that are more empathetic, adaptive, and capable of building positive emotional connections with users.

C. *Factor Analysis on Each Paper*

Tabel 3. Percentage of factors discussed

Factor	Percentage of Factors Against Paper	Percentage of Total Most Influential Factors
Anthropomorphism	58,25%	16,4%
Empathy and Emotion	64,08%	18,1%
UX and Satisfaction	63,11%	17,8%
Interactivity	50,49%	14.2%
Trust	46,60%	13,2%
Personalization	32,04%	9%
Gender Ambiguity	14,56%	4,1%
Social Presence	25,24%	7,1%

A literature review shows that Empathy/Emotion and UX/Satisfaction are the most dominant elements in chatbot development. A chatbot's ability to demonstrate empathy is considered the most influential variable, directly impacting UX, a key indicator of success. Furthermore, Anthropomorphism has also been shown to be an essential element in shaping user perceptions of a chatbot's persona.

Interestingly, Interactivity and Trustworthiness are ranked lower than emotional factors, indicating that current literature prioritizes the quality of emotional connection over mere technical functionality. Personalization and Gender Ambiguity were found to contribute only minorly to the overall design. Based on these findings, future chatbot development is strongly recommended to prioritize the integration of Empathy and Anthropomorphism to achieve optimal UX and user satisfaction.

D. *Identify The Domain of Each Paper*

Tabel 4. Domain of Each Paper

Domain	Amount	Domain of Each Paper
E-Commerce & Customer Service	25	[6], [7], [8], [9], [15], [17], [18], [19], [24], [32], [33], [34], [45], [54], [60], [61], [74], [75], [76], [77], [78], [83], [86], [87], [102]
Design	21	[10], [12], [14], [21], [30], [40], [41], [47], [51], [52], [53], [55], [56], [57], [63], [68], [72], [73], [93], [94], [95]
Health	21	[1], [11], [26], [29], [35], [38], [42], [43], [44], [50], [58], [59], [69], [79], [88], [89], [90], [91], [92], [100], [105]
Education	15	[2], [3], [4], [5], [25], [27], [37], [48], [65], [66], [67], [70], [71], [84], [99]
Entertainment	10	[16], [20], [28], [31], [80], [81], [82], [85], [103], [106]
Human Interaction	9	[13], [36], [46], [49], [62], [64], [96], [98], [104]
Animation	2	[39], [51]
Teamwork & Collaboration	2	[97], [107]

The analysis of the research landscape regarding chatbot design and User Experience (UX) reveals a distinct sectoral hierarchy. The primary focus of existing studies is overwhelmingly concentrated within e-commerce and customer service. This predominance underscores the critical role chatbots play in modern business ecosystems, where they are utilized not merely for automation, but as strategic tools to enhance service delivery, foster consumer trust, and streamline online transactions. In these high-stakes environments, the UX design often prioritizes reliability and trust-building to facilitate financial decisions.

Following this commercial dominance, the healthcare and education sectors represent a significant and growing portion of the literature. The rise in research within these fields signals a shift in the functional expectations of chatbots: moving beyond transactional utility toward roles defined by companionship, emotional support, and personalized instruction. In these contexts, the 'human' element of the chatbot—its ability to simulate empathy and patience—becomes a central design metric.

Conversely, the entertainment and general design sectors remain relatively underexplored. This is a notable gap in the current body of knowledge, particularly given the potential of these domains to leverage interactive and expressive elements for deeper user engagement. The lack of extensive research here suggests that the intersection of creative expression and conversational AI is still in a nascent stage compared to service-oriented applications.

Synthesizing these findings, a clear paradigm shift becomes evident. The trajectory of chatbot development is evolving from a focus on functional metrics—such as system efficiency, response speed, and task completion—toward affective and social dimensions. Contemporary research is increasingly concerned with the quality of social interaction, the nuances of anthropomorphism, and the capacity for empathetic response. Consequently, this literature review identifies a critical opportunity for future scholarship: to expand the application of emotional and empathetic design principles into underrepresented sectors that prioritize human creativity, immersion, and expression

Furthermore, realizing this potential requires a nuanced understanding of how anthropomorphic features are implemented. It is insufficient to merely overlay emotional traits onto existing functional systems; rather, researchers and designers must aim for a harmonious integration where a chatbot's 'Emotional Intelligence' (EQ) complements its 'Functional Intelligence' (IQ). Future investigations should specifically analyze how granular design elements—such as linguistic style, turn-taking latency, and visual avatars—can be fine-tuned to evoke 'social presence' without falling into the 'Uncanny Valley.' By mastering these subtle cues, the next generation of chatbots can transcend their current roles as passive tools, evolving into active, collaborative partners that enrich the human experience in creative and expressive domains.

E. *Design Factor Analysis on Domain*

Tabel 5. Distribution of Factors in Each Domain

Domain	Gender Ambiguity	Anthropomorphism	Emotional Empathy	Interactivity	Social Presence	Trust	Personalization	UX Satisfaction
Animation	0	2	2	1	2	0	1	1
Design	1	5	3	5	4	3	5	7
E-Commerce & Customer Service	0	11	5	6	10	7	1	9
Education	0	4	1	4	3	2	2	4
Entertainment	1	4	3	4	4	0	2	4
Health	0	3	3	6	2	2	3	4

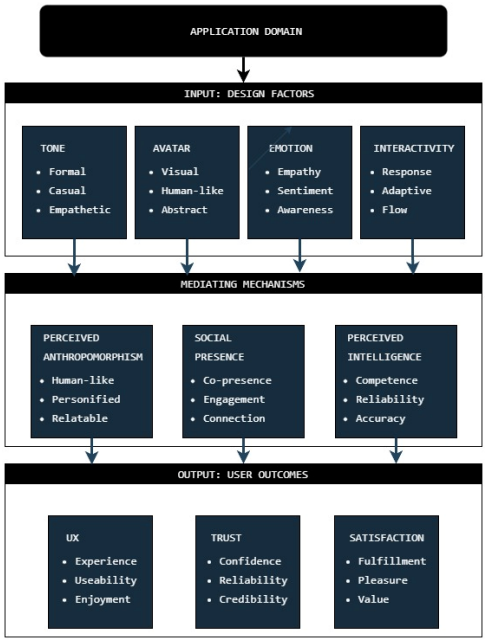
The analysis of the relationship between design factors and research domains reveals significant variations in focus across sectors. In e-commerce and customer service, anthropomorphism and social presence emerged as the most dominant factors, followed by trust, UX, and satisfaction. This pattern indicates that research in the commercial sector places greater emphasis on chatbots' ability to build social closeness and foster trust, as these two factors play a crucial role in influencing user decisions and loyalty to digital services.

In the design domain, all factors emerged relatively evenly, with UX, satisfaction, and interactivity dominating. This suggests that research in this sector focuses on exploring the aesthetics and holistic interaction experience, rather than solely focusing on the functional aspects of the system. Meanwhile, the healthcare sector emphasizes empathy, emotion, and interactivity. This finding aligns with the role of chatbots as emotional companions, which must demonstrate social sensitivity and provide adaptive responses to user conditions.

In the entertainment and education domains, interactivity, social presence, and UX and satisfaction are the primary concerns. This pattern underscores the importance of engaging and communicative design to maintain user engagement in both entertainment and learning. In contrast, gender ambiguity factors rarely emerged across domains, indicating that chatbot gender identity and character representation remains a relatively understudied issue. Overall, these results illustrate that each domain has different design priorities depending on the context of use, but all of them point to a common goal: creating chatbots that are more human, responsive, and oriented toward the user's emotional experience.

F. *Proposed Conceptual Framework: Mapping Design Factors to User Outcomes*

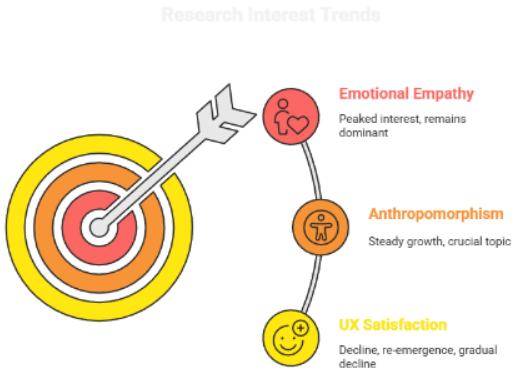
Based on the systematic analysis of 103 studies, this research synthesizes a conceptual framework that delineates the causal pathways between four core design factors—Tone, Avatar, Emotion, and Interactivity—and three critical user outcome measures: User Experience (UX), Trust, and Satisfaction. The framework, visualized in Figure 1, integrates empirical findings from diverse application domains and provides a structured model for both research and design practice.



Gambar 2. Conceptual Framework Mapping Chatbot Design Factors to User Outcomes

The framework posits that design factors influence user outcomes through both direct and mediated pathways. Direct effects are most pronounced when design elements align closely with user expectations in specific contexts. For

instance, appropriate Tone directly enhances Satisfaction in service recovery scenarios [34], while consistent Avatar design directly bolsters Trust in e-commerce interactions[7], [13] . However, the literature reveals that these relationships are often mediated by psychological constructs such as Perceived Anthropomorphism, Social Presence, and Perceived Intelligence. For example, an empathetic Emotion display primarily enhances UX by first increasing the user's sense of social presence and engagement[40], [55].



The review identifies several key mediators that explain how design factors affect outcomes. Perceived Anthropomorphism—the attribution of human-like qualities—mediates the effect of both visual avatars and conversational tone on user trust [13]. Social Presence, or the feeling that one is interacting with a social entity, mediates the relationship between interactivity and user satisfaction, particularly in relational contexts like healthcare and education [65], [68]. Furthermore, Perceived Intelligence serves as a critical mediator between interactivity (e.g., adaptive responses) and trust, especially in task-oriented domains like banking [50], [101]. A significant contribution of this framework is its accommodation of domain-specific variations. The strength and direction of the proposed relationships are moderated by the chatbot's application domain. In e-commerce and customer service, the path from Avatar (anthropomorphic cues) to Trust is strongest, as visual human-likeness reduces uncertainty in transactions [7], [86]. Conversely, in the healthcare domain, the Emotion → Satisfaction pathway dominates, where empathetic responses are paramount for patient comfort and perceived support [44], [59]. For educational chatbots, Interactivity shows the most direct and powerful connection to overall UX, as active dialogue is essential for learning effectiveness [3], [65].

Theoretically, this framework consolidates fragmented findings from Computer-Mediated Communication (CMC), Anthropomorphism, and Affective Computing literature into a unified, testable model. It offers clear, hypothesized pathways for future experimental validation. Practically, it serves as a decision-support tool for designers. By identifying which design factor most strongly influences a target outcome (e.g., emphasizing Emotion for satisfaction in healthcare or Avatar for trust in retail), teams can prioritize design resources effectively. Furthermore, the framework provides a foundation for developing standardized evaluation metrics, moving beyond anecdotal assessments to evidence-based design iteration.

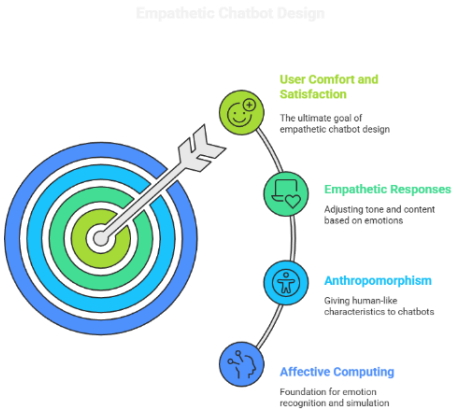
G. *Annual Factor Trends*

Research on emotional empathy, initially minimal, has transformed into a significant focus with a consistent surge in interest. The topic peaked in popularity among academics and remains a dominant topic, despite a slight decline in recent years. A nearly identical pattern is seen in the study of anthropomorphism. Attention to this aspect grew substantially and steadily over time, becoming a major research focus. Although enthusiasm for it waned slightly

Gambar.3 Trajectory of Key Research Interests.

towards the end of the observation period, the topic remains considered crucial. In contrast, user experience (UX) satisfaction has had a unique development trajectory. After experiencing a drastic decline in interest, the topic has re-emerged as an important issue, with steady growth until it peaked, before gradually declining again.

H. *The Most Influential Factors in Chatbot Design*



Gambar 4. Essential Elements and Goals of Empathetic Chatbot Design.

The foundation of empathetic chatbots lies in the field of affective computing, the study and development of systems that can recognize, interpret, process, and simulate human affection or emotion. In the context of chatbots, this means equipping them with the ability to perform sentiment analysis on user input. By detecting emotional cues in text—such as word choice, punctuation, or even the use of emojis—the chatbot can adjust the tone and content of its responses. This empathetic response shifts the dynamic of the interaction from transactional to relational. Users no longer feel like they are being "ordered" by a machine, but rather "heard." This capability is crucial in domains like customer service, mental health, and education, where emotional validation is a key component of successful interactions. While affective computing provides the "engine" for empathy, anthropomorphism provides its "face," or form. Anthropomorphism is the attribution of human characteristics, emotions, and intentions to non-human entities. In chatbot design, this is realized in several ways:

a. Persona and Name: Providing a human-sounding name (e.g., "Maya" or "Budi") and a consistent backstory or personality.

b. Language Style: Uses everyday language, humor, personal greetings ("you," "bro"), and natural pauses ("Hmm, let me check...").

c. Visual Avatar: Displays an avatar or image with facial expressions, even if it's cartoon or abstract.

The combination of empathetic responses and anthropomorphic design creates a powerful synergy. Users feel more comfortable and satisfied because they are interacting with an entity that not only "understands" their problems but also has a "personality" that makes the interaction feel more natural and enjoyable. This experience aligns with the initial description, where users feel as if they are interacting with a human using a non-human avatar. Based on the analysis above, the emotional and empathetic factors, manifested through anthropomorphic design, are the most crucial elements in the evolution of modern chatbot design. Shifting from stiff and mechanical interactions to warm and humanized conversations is key to overcoming user reluctance and boredom.

I. *Most factors in each domain*

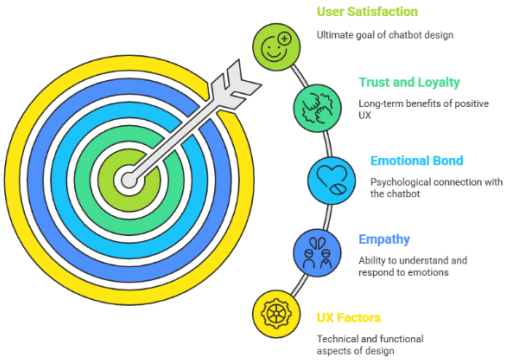
Gambar 5. Key Focus Areas for Chatbot Implementation by Industry Sector

Analysis of the results shows that each research domain tends to have a different design focus according to the needs and characteristics of its users. In the e-commerce and customer service sectors, anthropomorphism, social presence, and trust are the most dominant factors. This pattern illustrates that the success of chatbots in business contexts depends on their ability to mimic human behavior and build interpersonal relationships that can increase customer trust and loyalty to the service.

In the healthcare sector, empathy, emotion, and interactivity are more prominent. These findings indicate that chatbots in healthcare serve not only as information providers but also as emotional companions that can provide affective support to users. Meanwhile, in education, interactivity, UX, and satisfaction are top priorities. This demonstrates that chatbots used in learning contexts must be able to encourage active engagement, two-way communication, and provide a fun and effective learning experience.

In the entertainment and design domains, the research focus tends to be balanced between interactivity, social presence, and UX, indicating that user experience aspects are prioritized to create emotional engagement and satisfaction. On the other hand, gender ambiguity factors rarely emerged across domains, indicating that the issue of chatbot identity representation is still not a major concern in current design research. Overall, these results demonstrate that the focus of chatbot design is always adapting to the context of its use—where emotional, social, and user experience factors play a crucial role in determining the effectiveness of human-chatbot interactions.

J. *Correlation of UX and Empathy in Chatbot Design*



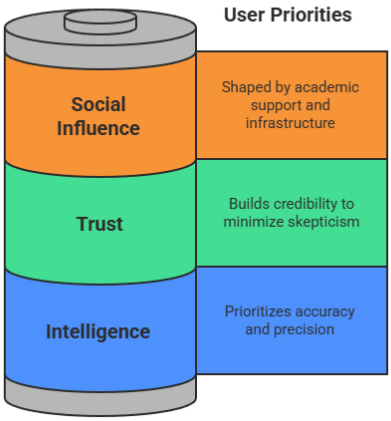
Gambar 6. The Role of Empathy and Trust in Achieving User Satisfaction.

The relationship between empathy and user experience (UX) factors demonstrates a strong correlation in determining the overall quality of chatbot design. The analysis reveals that these two factors emerged with the highest frequency among all identified themes, indicating that a positive user experience is highly dependent on the chatbot's ability to understand and adapt to the user's emotional state. Empathy acts as a bridge connecting functional interactions with emotional experiences, so chatbots that demonstrate empathy through language, tone, or visual expressions tend to create more natural and enjoyable interactions.

This correlation also reinforces the notion that UX success depends not only on technical aspects such as response speed or ease of navigation, but also on the affective dimension that forms a psychological bond between the user and the system. When a chatbot displays responses perceived as caring, warm, or adaptive to the emotional context, users experience a more meaningful and personalized experience. This ultimately increases satisfaction, trust, and long-term loyalty to the chatbot. Theoretically, the relationship between empathy and UX aligns with the principles of affective computing and human-centered design approaches, where systems that recognize and respond to emotions are considered more effective in meeting user needs. Thus, the integration of empathy elements in UX design is not merely a complement

to the aesthetics of communication, but is a key strategy for creating interactions oriented towards emotional experiences and building sustainable social relationships between humans and chatbots.

K. *Variability of Priorities in Specific and Local Contexts*

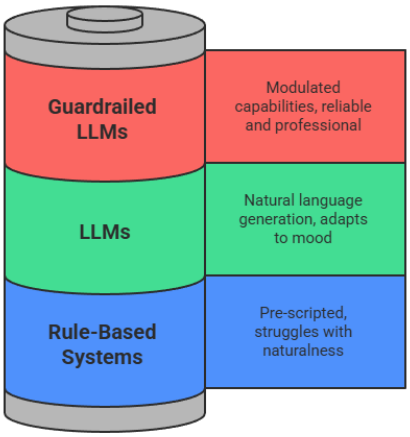


Gambar 7. Three Key Layers of User Priorities in Chatbot Adoption.

While global trends tend to highlight the dominance of emotional factors and anthropomorphism, empirical evidence suggests this is not a universally applicable rule. Counterbalancing this global perspective, a recent study from an affiliate of the Veteran National Development University in East Java provides crucial insights that user priorities can shift dynamically depending on task context and local culture. These findings highlight three important aspects. First, system intelligence dominates anthropomorphism in the banking sector. In contrast to e-commerce trends that rely on human personas to build relationships, research in Indonesia's digital banking sector reveals that Perceived Intelligence has a significantly greater influence on interaction quality than Perceived Anthropomorphism [108]. Findings confirm that AI efficiency and intelligence significantly increase satisfaction and user intentions, but anthropomorphic aspects are perceived as less relevant in Indonesia. In the context of high-risk financial services, users prioritize system accuracy and intelligence over the "human" nature of chatbots, confirming that in domains demanding high precision, functional design remains a primary preference for local users.

Second, trust plays a key role in Generative AI (AIGC). In the context of creative design tools, [109]study found that neither functional nor emotional risks had a significant direct influence on trust or behavioral intentions. Users were more influenced by the utility and usability of the tool than by their concerns or discomfort. This suggests a practical implication: in creative productivity tools, UX design should focus on enhancing trust through ease of use and peer influence, which are considered more effective than simply mitigating perceived risk. Third, social influence in educational chatbot adoption. Complementing the findings in the education domain, analysis using the UTAUT model by [110] showed that student acceptance of ChatGPT was relatively high, with social influence emerging as the most dominant factor influencing adoption intentions, followed by effort expectancy and performance expectancy. This reinforces previous findings that, in addition to interactivity, facilitating conditions—such as system support and accessibility—significantly shape actual behavior in a sustainable AI-based learning ecosystem.

L. *The Design Shift : Managing LLM Fluidity*



Gambar.8 Tone and Emotion LLM

The transition from rule-based systems to Large Language Models (LLMs) marks a fundamental paradigm shift in how "tone" and "emotion" are engineered. Unlike traditional chatbots that relied on rigid, pre-scripted responses and struggled to bridge the "Uncanny Valley," LLMs possess an intrinsic capability for natural, context-aware personification. This technological leap renders the previous design goal of merely "humanizing" the interface obsolete; natural language generation is now a baseline capability, allowing agents to dynamically adapt their emotional tone to the user's mood without the need for complex, manual scripting. Consequently, the primary User Experience (UX) challenge has evolved from *creating* a human-like persona to *controlling* it. The inherent fluidity of LLMs introduces new risks, such as the potential for the agent to become overly casual, intimately emotional, or inconsistent with a brand's professional identity. Therefore, modern design frameworks must prioritize "guardrailing" and precise prompt engineering to constrain this behavior. The focus is no longer on making the machine sound human, but on modulating its sophisticated capabilities to ensure it remains a reliable, professional tool rather than an unpredictable conversational partner.

M. *Ethical Implications of Artificial Empathy and Data Security Challenges*

Gambar 9. Ethics Implication

While the integration of anthropomorphism and empathy has been proven to enhance user satisfaction, the implementation of these elements presents significant ethical challenges. The literature [10] indicates a fine line between design that is "emotionally engaging" and design that is potentially "manipulative." When chatbots are designed with excessively high levels of anthropomorphism, there is a risk that users may attribute emotional capabilities and consciousness to the system that it does not possess—a phenomenon that can be construed as a form of subtle deception.

In the healthcare context, particularly mental health, the deployment of artificial empathy requires extreme caution. Recent studies [88] highlight the necessity for a symmetric and ethical therapeutic framework to prevent user psychological dependency on machines. This dependency often stems from the continuous positive reinforcement provided by chatbots, where users receive constant validation or affirmation for their prompts. If a chatbot delivers responses that are overly "human-like" without adequate transparency, mentally vulnerable patients may perceive a genuine emotional connection. This creates a risk of profound disappointment or exacerbated depression should the chatbot fail to handle a crisis appropriately. Therefore, transparency regarding the bot's identity—clarifying that the user is conversing with an AI, not a human—is a prerequisite for maintaining long-term trust.

Similar implications are observed in the banking and financial services sector. High levels of trust built through friendly avatars and empathetic responses can trigger the "Privacy Paradox," where users feel overly comfortable and subsequently lower their guard regarding personal data security. However, research in Indonesia [108] indicates that in the banking context, users actually prioritize perceived intelligence over anthropomorphic aspects. This underscores that in high-risk sectors, artificial empathy must not obscure functionality and security; chatbots should not employ emotional manipulation to drive impulsive financial decisions, thereby mitigating risks to the user's long-term financial stability. Consequently, developers face the moral responsibility of balancing a chatbot's "Emotional Intelligence" (EQ) with ethical boundaries. The ideal design is empathetic yet honest—capable of validating user emotions without feigning biological sentience, while proactively protecting user data from exploitation that may arise from excessive trust.

IV. Conclusion

Based on the conclusions, this study highlights that the evolution of chatbot development is increasingly prioritizing humanization, shifting focus from purely technical functionality to emotional empathy and anthropomorphism. The findings emphasize the necessity of synergizing affective computing with human-like personas and the importance of adapting design approaches to specific domain contexts—such as prioritizing trust in e-commerce versus empathy in healthcare—ultimately identifying empathy as the primary driver of modern User Experience (UX). Building upon these insights, future research should investigate the long-term sustainability of artificial empathy to assess potential user fatigue, explore the ethical implications of emotional manipulation in vulnerable sectors, examine cross-cultural variations in perceiving anthropomorphism, and develop objective quantitative metrics to accurately evaluate the quality of machine empathy.

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