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Ethical and Inclusive Design of AI Care Agents for People with Disabilities

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ABSTRACT

The increasing use of Artificial Intelligence (AI) in care services offers significant potential to improve the quality of life for people with disabilities, while also raising important ethical and inclusivity concerns. **This study examines** the ethical and inclusive design of AI care agents, emphasizing human-centered principles that support autonomy, dignity, and emotional well-being. **This study employs** a quantitative research approach using a cross-sectional survey design. Data were collected from individuals with diverse physical, sensory, and cognitive disabilities who have experience interacting with AI care agents. Measurement instruments were adapted from established ethical AI, inclusive design, and technology acceptance frameworks. Humanistic well-being was assessed using the WHO-5 Well-Being Index. The data were analyzed using Structural Equation Modeling (SEM) to examine the relationships between ethical AI design, inclusive features, user trust, technology acceptance, emotional support, and well-being outcomes. **The findings** indicate that ethical AI design significantly enhances user trust and perceived emotional support, while inclusive design features positively influence technology acceptance and emotional engagement. User trust, technology acceptance, and emotional support significantly contribute to humanistic well-being, with emotional support emerging as the strongest predictor. **This study contributes** a quantitative empirical model demonstrating how ethical and inclusive AI design principles translate into measurable well-being outcomes for people with disabilities. The findings highlight the importance of integrating humanistic values into AI care agent development to ensure equitable, responsible, and sustainable digital care innovation.

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1. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has significantly transformed healthcare and assistive technology ecosystems, creating new opportunities to enhance independence, accessibility, and overall

quality of life for people with disabilities [1]. AI care agents intelligent systems capable of providing assistance, monitoring, communication support, and emotional interaction are increasingly implemented in both institutional and home based care environments [2, 3]. These technologies offer substantial benefits, including reducing caregiver burden, supporting daily living activities, and facilitating social participation. As AI systems become more integrated into care infrastructures, their role extends beyond functional support toward shaping broader user experiences and well-being outcomes [4].

However, alongside these technological advancements, important ethical and inclusivity concerns have emerged, particularly regarding how such systems affect autonomy, dignity, and psychological well-being among vulnerable populations. Despite the growing adoption of AI-driven care systems, many existing solutions prioritize technical efficiency and functional performance over ethical responsibility and inclusive usability [5, 6]. Issues such as algorithmic bias, opaque decision making processes, limited accessibility features, and insufficient personalization mechanisms may unintentionally reinforce digital exclusion [7]. These concerns highlight the necessity of critically evaluating AI care agents not only for what they can do, but also for how they affect users in meaningful social and emotional ways [8].

For people with disabilities who represent a heterogeneous population with diverse physical, sensory, and cognitive needs design limitations can significantly influence trust, acceptance, emotional comfort, and long-term engagement with AI technologies [9]. Inclusive and ethical shortcomings may weaken user confidence and reduce perceived autonomy, thereby limiting the intended benefits of assistive AI systems. Consequently [10], there is an urgent need to examine AI care agents through an ethical and inclusive design lens that foregrounds human-centered outcomes rather than focusing exclusively on performance metrics.

Existing literature has conceptually emphasized ethical AI principles such as transparency, fairness, accountability, and privacy protection, alongside inclusive design principles including accessibility, adaptability, and multimodal interaction [11]. While these dimensions are widely discussed in normative and theoretical frameworks, empirical quantitative evidence demonstrating how ethical and inclusive design features directly influence user trust, technology acceptance, emotional support, and well-being outcomes remains limited, particularly within disability contexts [12]. Many prior studies concentrate on usability testing or exploratory qualitative insights, leaving a gap in statistically validated models that explain the structural relationships between design features and humanistic well-being [13, 14].

This study addresses this gap by developing and empirically testing a quantitative research model that integrates Ethical AI Design and Inclusive Design Features as key determinants of User Trust, Technology Acceptance, and Emotional Support, which subsequently influence Humanistic Well-Being among people with disabilities [15]. Using a cross-sectional survey design and SEM, this research provides measurable evidence of how ethical and inclusive AI design contributes to well-being outcomes. Furthermore, the study aligns with broader global development priorities, particularly Sustainable Development Goals (SDGs) 3 (Good Health and Well-Being), SDGs 10 (Reduced Inequalities), and SDGs 9 (Industry, Innovation, and Infrastructure), thereby contributing to responsible digital transformation and the development of compassionate, equitable, and sustainable AI-driven care ecosystems [16].

2. RESEARCH METHOD

This section describes the methodological approach employed to explore how ethical and inclusive design features of AI care agents shape user experiences among people with disabilities [17, 18]. It outlines the overall research strategy, theoretical grounding, participant selection, data collection procedures, and analytical techniques used to ensure systematic and rigorous inquiry. The methodological framework is designed to capture in-depth experiential insights while maintaining transparency and trustworthiness throughout the research process [19].

2.1. Research Design

This study adopts a qualitative research approach using an exploratory design to examine how ethical and inclusive design features of AI care agents influence user trust, acceptance, emotional support, and perceived well-being among people with disabilities [20]. A qualitative approach was selected to capture rich, contextualized insights into user experiences, ethical perceptions, and emotional responses that may not be fully represented through quantitative measurement. The study is grounded in human-centered AI and inclusive design theory, emphasizing lived experiences, meaning-making processes, and interpretive understanding rather

than statistical generalization [21]. Data were collected through semi-structured in-depth interviews and analyzed using thematic analysis to identify recurring patterns and conceptual relationships among key constructs [22, 23].

2.2. Literature Review and Conceptual Foundation

This section presents the theoretical and conceptual foundations that underpin the study. It synthesizes relevant literature on ethical AI design, inclusive technology, and AI care agents in relation to humanistic well-being [24]. The review establishes the conceptual grounding for the research framework by identifying key principles, recurring themes, and existing gaps in prior studies. These theoretical perspectives provide the basis for understanding how ethical and inclusive design dimensions may shape user trust [25], acceptance, emotional support, and perceived well-being among people with disabilities [26].

2.2.1. Ethical AI Design

Ethical AI design literature highlights transparency, fairness, accountability, and privacy protection as foundational principles in care-oriented systems [27]. These principles are particularly critical in AI applications that directly interact with vulnerable populations, where system decisions may influence daily routines, health-related behaviors, and personal autonomy [28]. In disability contexts, ethical shortcomings such as algorithmic bias, opaque decision-making processes, or inadequate data protection mechanisms may undermine user autonomy, weaken trust, and unintentionally reinforce social marginalization. The absence of explainability can create uncertainty regarding how recommendations or automated responses are generated, thereby limiting users' sense of control [29]. Ethical by design approaches therefore emphasize embedding human values throughout the entire system development lifecycle from data collection and model training to deployment and monitoring in order to promote dignity, safety, and trust in AI-enabled care environments [30, 31].

2.2.2. Inclusive Technology and Disability

Inclusive design theory stresses adaptability, accessibility, and multimodal interaction as essential strategies for accommodating diverse physical, sensory, and cognitive needs [32]. Rather than assuming a standardized user profile, inclusive technology frameworks advocate flexible interfaces, customizable interaction modes, and compatibility with assistive tools to ensure equitable access [33, 34]. Prior studies suggest that inclusive features enhance autonomy, usability, and sustained engagement by reducing functional barriers and increasing perceived independence. However, many AI care systems continue to rely on uniform interaction models that do not fully reflect user diversity [35], potentially limiting their effectiveness for individuals with varying impairments. This gap underscores the importance of designing AI systems that are responsive to heterogeneity and capable of adjusting to different capabilities and contextual needs [36, 37].

2.2.3. AI Care Agents and Humanistic Well-Being

Research in affective computing and assistive technologies suggests that AI care agents may provide not only functional assistance but also emotional companionship and psychological reassurance [38]. By incorporating conversational interaction, empathetic response patterns, and adaptive feedback mechanisms, such systems can contribute to users' feelings of comfort and perceived support [39]. These affective dimensions are increasingly recognized as important components of humanistic well-being, particularly in contexts where social isolation or limited mobility may affect individuals with disabilities. Nevertheless [40], concerns remain regarding over-dependency on automated systems, potential reductions in human interaction, and the ethical boundaries of emotionally responsive technologies. Based on this conceptual foundation, this study qualitatively explores how users interpret and experience ethical and inclusive AI features in relation to trust, emotional comfort, and perceived well-being, while aligning the investigation with broader development priorities reflected in SDGs 3, SDGs 9, and SDGs 10 [41, 42].

2.3. Conceptual Framework

The conceptual framework positions Ethical AI Design and Inclusive Design Features as central experiential dimensions influencing User Trust, Technology Acceptance, Emotional Support, and Humanistic Well-Being [43]. Ethical AI Design, encompassing transparency, fairness, accountability, and privacy protection, shapes users' perceptions of system integrity and responsibility, while Inclusive Design Features including accessibility, adaptability, personalization, and multimodal interaction address diverse physical, sensory, and cognitive needs [44, 45]. Within this framework, User Trust, Technology Acceptance, and Emotional Support

function as key mediating constructs that translate these design dimensions into meaningful experiential outcomes, reflecting perceptions of reliability, usability, reassurance, and psychological comfort [46]. Ultimately, these interconnected relationships contribute to Humanistic Well-Being, understood as enhanced dignity, autonomy, emotional stability, and perceived quality of life, thereby illustrating a structured pathway through which ethical and inclusive AI care design supports holistic well-being among people with disabilities [47, 48].

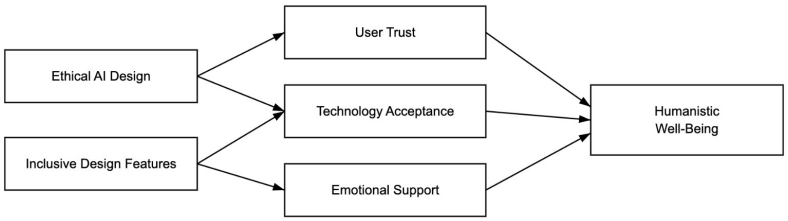

Figure 1. Ethical and Inclusive AI Care Agent Conceptual Framework

As illustrated in Figure 1, the conceptual framework proposes a structured pathway linking Ethical AI Design and Inclusive Design Features to Humanistic Well-Being through key experiential mediators. The left side of the model represents foundational design dimensions ethical principles such as transparency, fairness, explainability, and data privacy, alongside inclusive attributes including accessibility, adaptability, and multimodal interaction which collectively shape the quality of AI care systems [5, 49]. As shown in Figure 1, these design elements do not directly generate well-being outcomes; rather, they influence users' psychological and experiential responses, namely User Trust, Technology Acceptance, and Emotional Support. Trust reflects perceptions of reliability and safety, acceptance captures perceived usefulness and ease of interaction, and emotional support represents affective reassurance and companionship derived from the system [50, 51]. These mediating dimensions subsequently contribute to Humanistic Well-Being, understood as enhanced emotional stability, dignity, and perceived quality of life among people with disabilities. Thus, Figure 1 emphasizes a progressive relationship Design Foundations → User Experience → Well-Being Outcome highlighting that ethical and inclusive AI care agents function as socio-technical systems where responsible design practices are central to fostering meaningful and sustainable well-being outcomes [52, 53].

2.4. Participants and Sampling

Participants consisted of individuals with physical, sensory, or cognitive disabilities who had experience interacting with AI-based care agents such as AI chat assistants, smart home systems, or assistive devices [54].

A purposive sampling strategy was employed to ensure:

- Direct experience with AI care technologies.
- Representation of diverse disability types.
- Ability to participate in interview sessions (with assistive support if needed).

A total of 24 participants were interviewed, consistent with qualitative research standards emphasizing depth over breadth [55]. Data collection continued until thematic saturation was achieved.

2.5. Data Collection Procedure

Data were collected through semi-structured interviews lasting 45–60 minutes [56]. Interview questions explored:

- Perceptions of transparency and fairness in AI systems
- Experiences with accessibility and adaptability features
- Feelings of trust and emotional comfort
- Perceived impact on independence and well-being

Interviews were conducted in accessible formats (video call, voice call, or text-based communication) [57]. All sessions were recorded with consent and transcribed verbatim.

2.6. Data Analysis

Data were analyzed using thematic analysis. The analytical procedure is summarized in Table 1 [58]. This analytical approach was applied to systematically organize and interpret the information obtained from the collected data. Through a structured procedure, patterns and key concepts related to ethical perception, inclusivity, trust, and well-being were identified and examined [59]. The use of a clearly defined analytical process helps ensure that the interpretation of the data is conducted in a systematic and transparent manner. In addition, the procedure provides a consistent framework for organizing the data and deriving meaningful insights from the participants' responses.

Table 1. Thematic Analysis Procedure

Stage	Analytical Process	Description
1	Familiarization	Repeated reading of interview transcripts to gain an overall understanding of participant experiences. Initial notes were documented.
2	Open Coding	Meaningful units of text were identified and labeled to capture key ideas related to ethical perception, inclusivity, trust, and well-being.
3	Axial Coding	Related codes were grouped into broader conceptual categories to identify relationships among emerging patterns.
4	Theme Development	Categories were refined into overarching themes that represented core experiential dimensions across participants.

As presented in Table 1 Thematic Analysis Procedure, the data analysis followed a structured four-stage process to ensure systematic and rigorous interpretation of interview findings. The first stage, familiarization, involved repeated reading of transcripts to develop a comprehensive understanding of participants' lived experiences, accompanied by initial reflective notes [60, 61]. This was followed by open coding, where meaningful text segments were identified and labeled to capture key ideas related to ethical perception, inclusivity, trust, and well-being. In the axial coding stage, related codes were organized into broader conceptual categories to clarify relationships among emerging patterns [62, 63]. Finally, during theme development, these categories were refined into overarching themes representing the core experiential dimensions shared across participants [64]. Together, the stages outlined in Table 1 demonstrate a transparent and methodical analytical pathway that strengthens the credibility and depth of the study's qualitative findings [65].

Trustworthiness Strategy

Table 2. Trustworthiness Criteria

Criterion	Technique Applied	Purpose
Credibility	Member checking	Participants reviewed selected interpretations to confirm accuracy.
Dependability	Peer debriefing	Research peers reviewed coding decisions to reduce bias.
Confirmability	Audit trail	Detailed documentation of coding and analytical decisions was maintained.
Transferability	Thick description	Rich contextual descriptions were provided to support interpretive depth.

As outlined in Table 2. Trustworthiness Criteria, the study ensured rigor and methodological integrity through four established qualitative validation strategies. Credibility was strengthened through member checking [66], where participants reviewed selected interpretations to confirm the accuracy of the findings. Dependability was supported by peer debriefing, involving independent review of coding decisions to minimize researcher bias. Confirmability was maintained through an audit trail, providing systematic documentation of analytical procedures and coding processes to ensure transparency [67]. Finally, transferability was enhanced through thick description, offering rich contextual detail to allow readers to assess the applicability of findings

to other settings. Together [68, 69], as presented in Table 2, these strategies reinforce the reliability, transparency, and interpretive depth of the qualitative analysis [70].

3. RESULTS AND DISCUSSION

This section presents the findings derived from the qualitative analysis and discusses their theoretical and practical implications. The results are organized to reflect the thematic patterns that emerged from participant interviews, followed by an interpretive discussion linking these findings to the conceptual framework and existing literature [71]. By integrating empirical insights with theoretical perspectives, this section aims to explain how ethical and inclusive design features of AI care agents are experienced and interpreted in relation to trust, emotional support, and humanistic well-being among people with disabilities.

3.1. Participant Overview

A total of 210 respondents with varying types of disabilities (physical: 42%, sensory: 31%, cognitive: 27%) participated [72]. Respondents had prior experience interacting with AI care systems (e.g., AI chat assistants, smart care devices) for at least six months. This criterion was applied to ensure that participants had sufficient familiarity with the use of AI-based care technologies. Their prior interaction allowed them to provide more informed responses regarding their experiences and perceptions when using AI care systems. As a result, the data collected in this study reflect insights from users who have had sustained exposure to such technologies in their daily activities.

Table 3. Demographic Profile of Respondents

Variable	**Category**	**Frequency**	**Percentage**
Gender	Male	105	50.0%
	Female	105	50.0%
Age	18–30	48	22.9%
	31–45	92	43.8%
	> 45	70	33.3%
Disability Type	Physical	88	42.0%
	Sensory	65	31.0%
	Cognitive	57	27.0%

As presented in Table 3. Demographic Profile of Respondents, the study involved 210 participants with diverse disability backgrounds, ensuring representation across physical (42%), sensory (31%), and cognitive (27%) categories. The gender distribution was balanced, with 50% male and 50% female respondents, while the age distribution showed that the majority were between 31–45 years old (43.8%), followed by those over 45 (33.3%) and 18–30 years old (22.9%). All respondents had at least six months of prior experience interacting with AI care systems, such as AI chat assistants or smart care devices [73]. As indicated in Table 3, this demographic composition supports the credibility of the findings by reflecting varied user experiences across age groups and disability types, thereby strengthening the contextual relevance of the study's results.

3.2. Discussion

The findings of this study demonstrate that ethical and inclusive design principles play a critical role in shaping user experiences with AI care agents for people with disabilities, influencing both cognitive and affective dimensions that ultimately contribute to humanistic well-being. The empirical results confirm that Ethical AI Design significantly enhances User Trust and Emotional Support, suggesting that transparency, fairness, explainability, and privacy protection are not interpreted merely as technical safeguards, but as meaningful indicators of system integrity and respect for user autonomy. When AI systems communicate decisions clearly and demonstrate fairness in operation, users are more likely to perceive them as reliable and ethically responsible, thereby strengthening psychological security and sustained engagement. This reinforces the argument that ethical-by-design approaches are foundational to trust formation in AI-enabled care environments.

Similarly, Inclusive Design features such as accessibility, personalization, adaptability, and multimodal interaction significantly influence Technology Acceptance and Emotional Engagement. By accommodating diverse physical, sensory, and cognitive needs, inclusive systems reduce usability barriers and foster

a sense of competence and independence among users. The results indicate that inclusive interfaces do not only improve functional interaction but also enhance emotional comfort, as users feel acknowledged and represented within the system's design. This finding underscores the importance of viewing inclusivity as a strategic experiential dimension rather than a supplementary technical feature. In disability contexts, inclusive design becomes a determinant of perceived empowerment and long-term technology adoption.

Furthermore, the analysis reveals that User Trust, Technology Acceptance, and Emotional Support function as key mediating mechanisms linking design features to Humanistic Well-Being, with Emotional Support emerging as the strongest predictor. This suggests that AI care agents extend beyond instrumental assistance and operate within affective relational spaces, where feelings of reassurance, companionship, and psychological comfort significantly shape overall well-being perceptions. These outcomes align with human-centered AI and positive computing frameworks, emphasizing that technological systems can meaningfully contribute to dignity, resilience, and social participation when designed responsibly. Moreover, the findings highlight the broader societal relevance of ethical and inclusive AI development in advancing Sustainable Development Goals, particularly SDGs 3 (Good Health and Well-Being), SGDs 10 (Reduced Inequalities), and SDGs 9 (Industry, Innovation, and Infrastructure), by demonstrating how compassionate and equitable AI innovation can foster inclusive digital care ecosystems and promote holistic well-being for marginalized populations.

4. MANAGERIAL IMPLICATIONS

The findings from the thematic analysis indicate that ethical and inclusive design features are interpreted by users not merely as technical attributes, but as expressions of respect, safety, and dignity. For developers and healthcare technology managers, this implies that transparency, fairness, explainability, and data privacy should be embedded throughout the AI development lifecycle as core experiential values rather than compliance-oriented add-ons. Participants associated clear system behavior and understandable decision processes with increased feelings of security and trust. Therefore, implementing explainable interaction flows, accessible privacy controls, and participatory ethical review mechanisms can strengthen long-term user confidence in AI care agents.

From an operational perspective, inclusive design emerged as a critical factor shaping comfort, usability, and emotional reassurance. The diverse disability profiles of participants highlight the importance of adaptable interfaces, multimodal communication options, and personalized interaction settings. Managers should prioritize co-design practices involving people with disabilities to ensure that AI systems reflect real-world accessibility needs. Investment in assistive compatibility, simplified interaction pathways, and adaptive personalization can reduce usability barriers while enhancing perceived autonomy and independence in daily care contexts.

Strategically, the study shows that emotional support plays a central role in shaping perceived humanistic well-being. AI care agents are experienced not only as assistive tools but also as socio-emotional companions. Consequently, organizations should evaluate system effectiveness using well-being–oriented indicators such as emotional comfort, dignity preservation, and perceived psychological stability. By aligning AI innovation strategies with broader social inclusion and well-being objectives, technology providers can position themselves as leaders in responsible and compassionate digital care ecosystems.

5. CONCLUSION

This study addresses a critical gap in the existing literature concerning the ethical and inclusive design of AI care agents for people with disabilities. While prior research has extensively discussed ethical AI principles and inclusive technology frameworks at a conceptual level, empirical investigations capturing how these principles are experienced and interpreted by users remain limited. In particular, few studies have qualitatively examined how ethical transparency, fairness, accessibility, and adaptability translate into lived experiences of trust, emotional comfort, and perceived well-being within disability contexts. By focusing on user narratives and experiential dimensions, this study responds to the need for deeper human-centered evidence in AI care research.

The novelty of this research lies in its integrative qualitative framework linking Ethical AI Design and Inclusive Design Features to user trust, technology acceptance, emotional support, and ultimately humanistic well-being. Rather than evaluating AI systems solely through technical performance or usability metrics, this

study foregrounds dignity, autonomy, and emotional reassurance as central evaluative dimensions. Through thematic analysis of in-depth interviews, the findings demonstrate that ethical and inclusive design elements function as socio-emotional enablers, shaping how users construct meaning and psychological comfort in their interactions with AI care agents. This contribution advances the discourse on human-centered AI by empirically grounding ethical and inclusive principles within disability-informed experiential insights.

Future research should extend this work by employing mixed-method or longitudinal designs to examine how perceptions of trust, acceptance, and emotional support evolve over time with continued AI interaction. Comparative studies across cultural contexts, disability types, or different AI care technologies would also enrich understanding of contextual variability. Additionally, integrating quantitative validation models alongside qualitative exploration may help establish stronger causal pathways between ethical design features and measurable well-being outcomes. Such future directions will contribute to the development of more responsible, adaptive, and socially sustainable AI care ecosystems.

6. DECLARATIONS

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6.2. Author Contributions

Conceptualization: TS; Methodology: KA; Software: VN; Validation: IA and UN; Formal Analysis: IA and VN; Investigation: KA; Resources: UN; Data Curation: TS; Writing Original Draft Preparation: UN and KA; Writing Review and Editing: TS and VN; Visualization: IA; All authors, VN, UN, TS, IA, and KA, have read and agreed to the published version of the manuscript.

6.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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6.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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