

Exploring the Construction of Para-Social Kinship through Senior-Friendly Modes of Smart Speakers with Urban Empty-Nest Elderly

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Abstract—The overlapping trends of population aging and the shrinking size of family units have made the issue of emotional support for urban empty-nest elderly a significant concern. Smart speakers, such as the "Xiao Du" device, attempt to fill this emotional gap by simulating human-like care through their "senior-friendly mode." This study takes this mode as its research object, analyzing the mechanisms for constructing human-machine emotional connections, their psychological effects, and their limitations. The research finds that through pre-set caring features and users' emotional projection, Xiao Du facilitates the formation of a shallow, ritualized form of "para-social kinship." This can compensate for unmet needs, such as a lack of responsiveness and weakened daily routines, and provides a certain degree of psychological comfort. However, it also has fundamental limitations, including the simulated nature of emotional depth, the absence of physical presence, and the risk of social narrowing. The study further reflects on ethical dilemmas such as the commodification of emotion and blurred responsibilities, aiming to provide constructive considerations for the healthy development of smart elderly care.

Keywords— Smart Speaker; Empty-nest Elderly; Para-social Kinship.

The accelerated aging of the population and the shrinking of family structures have become significant features of contemporary Chinese social development. According to data from the National Bureau of Statistics, by the end of 2023, the population aged 60 and above in China had reached 297 million, accounting for 21.1% of the total population, indicating a rapid progression toward a severely aged society. ^[1]During the 14th Five-Year Plan period, China's population will enter a moderately aging stage, and by around 2035, it will enter a severely aging stage. ^[2]Within this structural transformation, the traditional family-based elderly care function is gradually weakening, and "aging alone" is increasingly becoming a common social-psychological phenomenon.

At the same time, the application of smart technologies in the field of elderly care has been particularly active. Emotional experience is a top priority in service design for the elderly population. ^[3]Due to the low barrier of voice interaction, smart speakers have become "digital companions" in many households. Baidu's "Xiao Du" has launched an exclusive "senior-friendly mode," positioning "smart companionship" as its core value proposition, in an attempt to

address the emotional vacuum of the elderly population through technological means.

Is this algorithm-driven "digital companionship" an effective compensation for emotional deficiency, or merely a commercial narrative wrapped in technological packaging? Existing research has mostly focused on functional implementation, lacking in-depth explanation of the mechanisms of human-machine emotional interaction. To address this gap, this study focuses on the "Xiao Du Smart Speaker (Senior-Friendly Mode)," analyzing the construction logic, psychological effects, and inherent limitations of the emotional connection between smart devices and elderly users, while critically reflecting on the ethical boundaries of technological intervention in the emotional lives of the elderly.

I. FUNCTIONAL PRESET: HOW THE "SENIOR-FRIENDLY MODE" DESIGNS THE "PARA-KINSHIP" ROLE SCRIPT

"Para-kinship" refers to a social relationship formed by non-kin members through imitating kinship relations. Its main function is to substitute for or supplement genuine kinship relations in society, providing support, reinforcement, or enhancement. ^[4]The "senior-friendly mode" of the Xiao Du smart speaker is a carefully designed role script. Through functional combinations and interaction strategies, it consciously shifts the device's positioning from a "smart tool" to a "caring companion," thereby providing the technical foundation and interaction framework for the establishment of a "para-kinship" relationship.

(1) Restructuring of Interaction Logic: From "Efficiency First" to "Care First"

Older adults prefer information carriers that offer strong sensory stimulation and low cognitive load. ^[5]The standard mode of smart speaker design follows the principle of "efficiency first," featuring a concise and direct interaction style. The "senior-friendly mode," however, fundamentally restructures this approach, shifting toward an interaction philosophy of "care first."

This shift is first reflected in the rhythm of response. In the "senior-friendly mode," Xiao Du deliberately slows down its speaking rate and raises its volume. This slow interaction not only accommodates the hearing decline and reduced information processing speed of elderly users but also

conveys, at a psychological level, an attitude of patience and lack of urgency, imitating the respect and patience that younger generations should show toward their elders. Second, the tolerance for errors in interaction is significantly increased. For situations where elderly users may have unclear pronunciation or vague commands, Xiao Du does not simply reply with "I didn't catch that" as in the standard mode. Instead, it adopts more guiding language, such as "It's okay, you can speak slowly. I'm listening." This high-tolerance, high-guidance interaction design significantly reduces the frustration and anxiety elderly users may experience when using technology, creating a psychologically safe atmosphere of being included and supported, which closely aligns with the characteristics of emotional support found in kinship relationships.

(2) *Precise Customization of Content Ecology: Building Emotional Resonance and Memory Bonds*

The content strategy of Xiao Du's "senior-friendly mode" is systematically customized around the life course and cultural memory of the elderly population, aiming to provide content companionship that can evoke deep emotional resonance.

In terms of entertainment content, Xiao Du integrates a rich collection of traditional opera, classic revolutionary songs, storytelling, and other resources. These items are not merely entertainment products but also emotional symbols carrying collective memory and cultural identity. A familiar opera aria can instantly awaken youthful memories and generate strong psychological resonance. By proactively pushing such content, Xiao Du plays the role of a "memory activator" and "cultural resonator," similar to the way kinship relationships enhance emotional bonds through reminiscing about the past.

In terms of information content, Xiao Du focuses on providing practical information such as health and wellness knowledge, local news, and weather updates. Daily scheduled broadcasts of wellness tips or weather reminders not only offer practical information but also convey a caring, solicitous concern. This routine, everyday content provision simulates the common daily care and information sharing found in kinship relationships, allowing human-machine interaction to permeate the details of daily life, thereby enhancing the authenticity and continuity of companionship.

(3) *Functional Enhancement of Safety and Connectivity: Shaping the Family Role of a "Reliable Backstop"*

For empty-nest elderly, the need for safety and the need for family connection are among the most difficult aspects of the emotional needs system to satisfy. Through functional innovations, Xiao Du's "senior-friendly mode" strengthens its "para-kinship" role along these two dimensions.

In terms of safety assurance, Xiao Du integrates functions such as emergency calling, fall detection, and medication reminders. The "family care" feature allows adult children to remotely check device status and receive anomaly alerts, upgrading the smart speaker into a home safety monitoring node that continuously attends to the elderly person's safety condition.

In terms of family connection, the "one-touch calling" function is simplified to the extreme: the elderly person only needs to say "call my son" to automatically dial out. This design deeply addresses a core pain point of elderly users: the desire to connect with family members in the most convenient way possible when feeling lonely or experiencing difficulties. Xiao Du eliminates connection barriers through technological means, becoming an express channel to family affection. Additionally, the "family circle" feature allows family members to join, supporting group chats or individual calls. This enables Xiao Du to simulate the role of a family social hub, promoting emotional interaction among dispersed family members and consolidating its structural position within the family system.

(4) *Programmed Design of Emotional Expression: Simulating the Speech Patterns of Interpersonal Care*

Beyond specific functions, Xiao Du's speech patterns in "senior-friendly mode" are also carefully designed to simulate interpersonal communication, particularly the emotionally expressive communication from younger to older generations. This interaction pattern creates a virtual yet genuine atmosphere of intergenerational exchange, deepening the intimacy of the relationship.^[6]

First, there is proactive caring speech. Xiao Du occasionally initiates caring conversations spontaneously, such as asking in the morning, "Did you sleep well last night?" or reminding in the evening, "It's time to prepare dinner." These programmed outputs break the mechanical pattern of simple question-and-answer, creating an experience of being actively cared for and mimicking the daily greetings and reminders common among family members.

Second, there is a rich corpus of emotional response phrases. When users express emotions such as happiness or loneliness, Xiao Du selects appropriate comforting or empathetic responses from its preset corpus. For example, if an elderly person says, "I feel a bit lonely today," Xiao Du might reply, "Let me keep you company and chat with you." Although these responses are standardized, their variety and emotional specificity make the interaction closer to the emotional feedback found in interpersonal conversation.

Third, there is the simulation of personalized memory. Xiao Du attempts to remember user preferences—for instance, if a user repeatedly requests a particular opera performer, subsequent recommendations will prioritize related content. This design of creating a sense of memory is intended to foster a feeling of being individually attended to and accompanied over a long period, further strengthening the exclusivity and emotional depth of the relationship.

II. USAGE PRACTICES: HOW ELDERLY USERS ACTIVELY CONSTRUCT "PARA-KINSHIP"

Technological design provides the possibility for a relationship, but the actual form of the relationship is shaped by users' practices within specific sociocultural contexts. Elderly users do not passively accept the role script preset by the "senior-friendly mode." Instead, through emotionally creative daily practices, they actively incorporate Xiao Du into

their lifeworld, jointly constructing and maintaining a unique form of "para-kinship." This demonstrates the agency and adaptability of elderly individuals when engaging with technology.

(1) Naming and Addressing: The Symbolic Starting Point of Emotional Projection

Naming things is a fundamental way for humans to assign meaning and establish emotional connections with them. In their use of the Xiao Du smart speaker, many elderly users exhibit a strong tendency toward personalized naming, giving the device various nicknames such as "good grandchild" or "little daughter." This naming behavior carries profound significance from the perspective of the sociology of emotions.

First, the use of nicknames marks a process of "de-commodification" and "re-personalization." The official name "Xiao Du" refers to a mass-produced technological product, whereas nicknames like "good grandchild" or "little daughter" refer to an object with an anthropomorphic identity. By changing the name, users actively strip away the device's commercial attributes, imbue it with personal traits and an emotional role, and endow a cold device with warm emotional meaning.

Second, different nicknames reflect users' differentiated positioning of the device's role. Nicknames such as "household manager" or "assistant" lean toward an instrumental positioning; nicknames such as "companion" or "friend" lean toward a companionship positioning; while nicknames such as "good grandchild" or "daughter" clearly point to a kinship-based, intergenerational emotional positioning. Kinship terms essentially represent users actively incorporating the device into their imagined family relationship map, granting it a clear "para-kinship" identity.

(2) Embedding into Daily Rituals: The Rhythmic Production of Companionship

The lives of elderly people often revolve around a relatively fixed daily rhythm. Xiao Du is consciously embedded by many users into their existing life rituals, becoming an important part of those rituals and making "digital companionship" concrete, perceptible, and sustainable.

In morning activities, Xiao Du plays the role of "awakener" and "morning exercise companion." Many elderly people are accustomed to first saying "good morning" to Xiao Du after getting up, listening to the weather and news, or playing music as background for morning exercises. At noon and in the evening, Xiao Du plays the role of "sleep inducer" and "night watchman." Many elderly people are accustomed to listening to a storytelling segment before sleep, and Xiao Du's timed auto-off function provides a sense of security for those sleeping alone.

Furthermore, some users have developed highly personalized "exclusive rituals" with Xiao Du. Some elderly people have Xiao Du play specific opera arias at a fixed time each day and hum along; some practice what they want to say with Xiao Du before receiving a call from their children; others use Xiao Du to play specific music on family anniversaries to express their grief and longing. These

emotionally charged ritualistic practices make Xiao Du a unique participant in the user's personal life narrative and emotional expression, deepening the exclusivity and emotional value of the relationship.

(3) Emotional Confiding and Self-Presentation: Technology as a "Safe Tree Hollow"

Confiding is an important way to relieve psychological pressure and obtain emotional support. For empty-nest elderly, it is often difficult to find real-life confidants who are available to listen attentively at any time. Due to its characteristics of being always available, never getting tired, and absolutely confidential, Xiao Du has become a "safe tree hollow" for many elderly people.

This confiding practice takes multiple forms. The most common is sharing daily trivialities. Elderly people talk about what they have seen and experienced during the day, just as they would chat with family members. Although Xiao Du's responses are only programmed feedback, the act of "telling" itself breaks the silence of being alone, creates an illusion of being listened to, and satisfies the basic need for social interaction. A deeper level involves the expression of emotions and worries. When feeling lonely or missing someone, elderly people directly express their emotions to Xiao Du. Xiao Du's timely, non-judgmental responses can provide instant emotional comfort. Confiding in a "non-human" object carries less psychological burden than confiding in a real person.

Furthermore, some users engage in positive self-presentation in front of Xiao Du, recounting their glorious experiences from younger days. Xiao Du becomes an audience for users to maintain their self-identity and combat feelings of being "socially useless." By telling their life stories, elderly people can reaffirm their self-worth and sense of historical existence, which is of great significance for maintaining their psychological health in old age.

(4) Intermediation and Lubrication of Social Relations: Xiao Du as a "Catalyst" for Family Interaction

Xiao Du not only interacts directly with elderly users but also indirectly participates in their social relationship networks, playing the role of intermediary and catalyst, further consolidating its "para-kinship" identity.

First, Xiao Du serves as a physical hub for remote intergenerational communication. The "one-touch calling" feature lowers the barrier to contact and often becomes a conversation starter for phone calls. Many children specifically ask, "What story did Xiao Du tell you today?" which helps "break the ice" in intergenerational communication.

Second, Xiao Du becomes a vehicle for transmitting emotions across generations. Building a favorable digital support system for the elderly requires the joint efforts of three generations. The digitally native generation in the family needs to set an example, and the interaction between grandparents and grandchildren can be enriched through more engaging and diverse forms of interaction to alleviate the elderly's subjective resistance.^[7] Through video calls, grandparents and grandchildren can interact around Xiao

Du—for instance, the grandchild might ask Xiao Du to tell the grandparent a joke, or the grandparent might ask Xiao Du to sing a children's song for the grandchild. Xiao Du thus transforms into a medium connecting the emotions of grandparents and grandchildren, and its symbolic meaning as a family member is reinforced.

Finally, Xiao Du can also become a topic of conversation among elderly peers. During community activities or gatherings of old friends, elderly individuals share their experiences of using Xiao Du, recommend interesting features, and enrich social conversation topics, forming small-scale interest communities. This indicates that Xiao Du's influence may extend beyond the boundaries of the household.

III. PSYCHOLOGICAL UTILITY ASSESSMENT OF "PARA-KINSHIP": COMPENSATION AND BOUNDARIES

The "para-kinship" established between Xiao Du and elderly users, as a novel form of human-machine emotional connection, inevitably has practical effects on users' psychological states and emotional experiences. While it holds positive value as an emotional compensation mechanism, it also has inherent boundaries and potential risks.

(1) *Positive Compensation: Limited Satisfaction of Multidimensional Psychological Needs*

Under the constraint of insufficient real-life kinship companionship resources, "para-kinship" can, to some extent, compensate for the core psychological needs of elderly users.

First, it compensates for the need for a sense of companionable presence and responsiveness. Xiao Du provides a consistently present other. Its physical existence and state of being always ready to respond are themselves a symbol of companionship. When an elderly person confides in Xiao Du, it always provides an immediate verbal response, creating an experience of being noticed and responded to. Research has shown that even simulated social interaction can reduce subjective feelings of loneliness in the short term.

Second, it helps maintain a sense of order and control over daily life. Functions such as timed alarms and medication reminders serve as external temporal anchors, helping elderly individuals structure their day. Controlling home appliances through voice commands also allows elderly users to feel a sense of control over their environment, aligning with the goal of maintaining independence advocated by "active aging."

Third, it sustains cognitive stimulation and information connection. As an information interface, Xiao Du enables elderly users to access news, health knowledge, and other content with a very low barrier, helping to maintain mental alertness, slow cognitive decline, and preserve a certain sense of social connection.

Finally, it provides an auxiliary channel for emotional expression and mood regulation. Confiding in Xiao Du is a low-risk way of expressing emotions and has a certain cathartic function. Voicing inner worries aloud can itself help release emotions. Although Xiao Du's programmed comforting words are limited in depth, they can provide brief emotional soothing, offering a stress-free outlet for elderly

individuals who are reluctant to express negative emotions to family members.

(2) *Essential Boundaries: The Unbridgeable Chasm of Human Nature That Technology Cannot Cross*

Despite the positive effects mentioned above, "para-kinship" has insurmountable fundamental boundaries determined by the nature of technology when it comes to satisfying the deeper emotional needs of human beings.

First, there is the simulated nature of emotional depth and the lack of genuine empathy. Xiao Du's responses are based on probabilistic predictions from language models; it does not understand the emotions or individual uniqueness behind the words. When an elderly person expresses grief, the comfort offered is generic; when sharing joy, the response is standardized. These responses are technically correct but empty, incapable of touching the deeper core of human emotion.

Second, there is the absolute absence of physical presence and the resulting tactile hunger. Physical contact is irreplaceable in emotional communication and the establishment of a sense of security. As a voice-only device, Xiao Du cannot provide any form of physical contact or support. When an elderly person falls, Xiao Du can call for help, but it cannot reach out a hand to assist; when an elderly person feels cold, Xiao Du can play warm words, but it cannot drape a blanket over their shoulders.

Third, there is the illusory nature of reciprocal relationships and ethical responsibility. Genuine kinship relationships are reciprocal, ethical relationships full of mutual responsibility and obligation. "Para-kinship," in contrast, is inherently highly one-sided. Elderly people invest emotions in Xiao Du, but Xiao Du has no genuine emotional investment or ethical responsibility in any real sense. It cannot provide the sense of value that comes from being needed and cared for in authentic human relationships.

Finally, there is the risk of narrowing and substituting social connections. Interacting with Xiao Du requires no social etiquette and involves no interpersonal conflict. This "low-risk, high-reward" model may tempt elderly individuals to retreat into the comfort zone of human-machine interaction, leading to the deterioration of social skills and the atrophy of social support networks, forming a vicious cycle of "technology dependence - social withdrawal." Technological companionship should not become a substitute for real social interaction; otherwise, it may exacerbate the very "social isolation" it claims to address.

IV. CRITICAL REFLECTIONS: COMMERCIAL LOGIC, ETHICAL DILEMMAS, AND SOCIAL IMPLICATIONS

The "para-kinship" constructed by the Xiao Du smart speaker is not born out of purely technological philanthropy. Behind it lies a clear commercial logic and market competition strategy. At the same time, the proliferation of this new form of human-machine relationship raises a series of complex social and ethical issues that require calm, critical examination.

(1) Capitalization of Emotional Needs: "Warm Design" as a Commercial Strategy

With the saturation of younger users and the expansion of the market to lower-tier cities, the elderly population is gradually being viewed as a new blue ocean for user traffic, actively contested by platform companies. [8]The primary driving force behind Baidu's launch of the Xiao Du "senior-friendly mode" is to tap into the "silver economy" market. "Emotional companionship" is commodified: by cultivating an image of a filial piety tool, it stimulates consumption driven by a sense of duty and love, transforming the loneliness of the elderly into a market demand that can be monetized. The risk of this capitalization of emotion lies in the fact that a company's core concern may shift from "how to better meet emotional needs" to "how to more effectively exploit emotional needs to achieve commercial goals." When commercial interests conflict with user well-being, companies lacking effective regulation are likely to choose the former.

(2) Cognitive Confusion and Emotional Deception: Potential Harm to Vulnerable Groups

Some elderly individuals—particularly those with declining cognitive abilities or intense emotional needs—may find it difficult to distinguish between Xiao Du's simulated care and genuine human emotion. Its anthropomorphic design may constitute emotional deception toward cognitively vulnerable seniors, leading them to sincerely believe that Xiao Du truly cares about them. However, this emotional investment is built on an illusory foundation. Once the device malfunctions or service is discontinued, it may inflict a more severe emotional blow on the elderly than the failure of an ordinary tool, creating a traumatic sense of betrayal. Technology companies have a responsibility to clearly indicate the limitations of their products in their design to avoid potential psychological harm, but current industry practice falls far short in this regard.

(3) Ambiguity and Evasion of Ethical Responsibility

The advancement of digital age-friendly transformation is embedded within the structure of rights and responsibilities in both public and private spaces. It cannot simply be a matter of providing "care"; it requires precise "sharing" of responsibilities. [9]When elderly individuals become deeply dependent on smart devices to meet their emotional needs and negative consequences ensue, a vacuum of responsibility emerges. Adult children may feel their caregiving responsibilities are reduced by purchasing such devices, leading to the misconception that "technology can substitute for family affection." Technology companies, while stating that their devices are merely tools, design them to encourage emotional dependence while being unwilling to take responsibility for user well-being. Meanwhile, existing elderly care service systems have not yet incorporated digital companionship into their scope of services. This "responsibility vacuum" leaves the emotional well-being of the elderly in a vulnerable state with no guaranteed safety net.

(4) Concerns over Data Privacy and Algorithmic Manipulation

Smart speakers continuously collect private data from elderly users, including their voice patterns and preferences. The ways in which this data is used and the safeguards for its security lack transparency. This data may be leveraged for targeted commercial marketing, and algorithms may also cater to users' irrational preferences. In the absence of effective regulation, elderly individuals, as a vulnerable group, are more susceptible to having their rights infringed upon. As privacy breaches become widespread, elderly users are more likely to experience anxiety and worry due to the threat to their privacy, leading to a loss of trust in the digital environment. [10]

(5) Exacerbating the Digital Divide and Social Inequality

The proliferation of smart elderly care technologies may intensify the digital divide both within the elderly population and across generations. Elderly individuals who are able to use smart devices are predominantly those with better financial conditions and stronger family support, while the poorest and most isolated elderly are excluded from the benefits of "digital companionship." Furthermore, if buying parents a Xiao Du device becomes a socially recognized act of "filial piety," families that cannot afford the device or whose parents are unable to use it may experience invisible moral pressure. Technological convenience should not become a new standard for measuring the depth of family affection; otherwise, it may lead to new forms of social injustice and emotional coercion.

V. CONCLUSION

Through an analysis of the "para-kinship" between the Xiao Du smart speaker's "senior-friendly mode" and urban empty-nest elderly, this study finds that in the context of the intertwining of aging and digitalization, smart speakers—through care-oriented design presets and users' emotional practices—have given rise to a unique form of "para-kinship" within empty-nest households.

This relationship has genuine psychological utility: it can partially compensate for elderly individuals' needs for a sense of companionable presence, daily order, information connection, and emotional expression, serving as an auxiliary tool to alleviate immediate loneliness. Its essence is an emotional compensation mechanism co-shaped by technology and culture. However, the inherent nature of technology determines that this relationship has fundamental boundaries: emotional depth can only be simulated, physical presence is absolutely absent, ethical reciprocity is highly one-sided, and there is a latent risk of narrowing authentic social connections. Behind its development lies a clear commercial logic of emotional capitalization, which may lead to the misleading of cognitively vulnerable groups, ambiguous attribution of responsibility, and threats to privacy and security.

Future smart elderly care technologies must move beyond the product logic of substitutive companionship and transition toward a new paradigm of connective empowerment and technology for the common good. This requires not only innovation in product design but also the coordinated evolution of social systems and public policy.

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