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Gamified Voice AI Agents: Enhancing User Engagement and Interaction Through Playful Design

Wilawan Inchamnan
Wilawan.inn@dpu.ac.th
College of Creative Design & Entertainment Technology,
Dhurakij Pundit University, Bangkok, Thailand
Banyapon Poolsawas
Banyapon.poo@dpu.ac.th
College of Creative Design & Entertainment Technology,
Dhurakij Pundit University, Bangkok, Thailand

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ABSTRACT

This research examines the design of a Voice AI agent enhanced with gamification elements such as points, rewards, challenges, storytelling, and personalization to increase user engagement and satisfaction. Two hypotheses guided the study: (H1) users of gamified Voice AI systems demonstrate higher engagement and motivation than those using non-gamified systems; (H2) demographic factors, particularly age and prior experience, influence preferences for gamification features. Experimental testing and user feedback showed that the most frequent interactions involved game-based activities, childlike conversations, and psychology-related queries, with consistently high satisfaction and predominantly positive or curious sentiments. These findings support both hypotheses, highlighting the motivational benefits of gamification and the moderating role of user characteristics. Future work should investigate how gamification shapes long-term engagement, how demographics moderate playful feature effectiveness across contexts, and which combinations of rewards, personalization, and social presence deliver sustainable improvements in satisfaction and retention.

KEY WORDS **AI Agents, Gamification, User Engagement, Personalization, Playful Design**

1. Introduction

This research focuses on designing a Voice AI agent integrated with gamification elements, such as points, rewards, and challenges, to enhance user engagement. It aims to evaluate the effectiveness of these gamified features in improving user interaction, retention, and satisfaction through experimental testing and user feedback. Furthermore, the study seeks to identify the most impactful gamification features that foster meaningful and enjoyable interactions. The research will culminate in the development of a mobile application that embodies the concept of a gamified Voice AI agent.

2. BACKGROUND

The rapid progression of artificial intelligence (AI) and natural language processing (NLP) has driven the widespread adoption of Voice AI agents across diverse sectors such as customer service, education, and healthcare. Embedding gamification elements—such as points, rewards, and challenges—within these agents has been shown to enhance user engagement and motivation, offering a promising approach to improving the quality and sustainability of human–AI interaction.

2.1 What Are AI Agents?

Voice AI agents, such as chatbots, play a pivotal role in shaping user motivation, engagement, and behaviors by incorporating gamification elements. Studies comparing gamification approaches reveal that game-of-chance mechanisms, such as spin-the-wheel games, outperform knowledge-sharing games

in delivering positive outcomes. These findings underscore the importance of aligning gamification strategies with user motivations to maximize engagement and impact [1]. Beyond consumer engagement, autonomous AI systems, or digital researchers, are transforming research workflows through gamified interactions. By incorporating features like reward systems, progress tracking, and interactive challenges, these AI agents enhance engagement while breaking down complex research questions, analyzing diverse data sources, and building predictive models. Gamification not only improves efficiency but also introduces an interactive, adaptive dimension to research processes, enabling workflows to evolve dynamically. Advanced AI frameworks combined with gamified designs offer unparalleled scalability, efficiency, and innovation, revolutionizing industrial R&D, academic research, and business intelligence, and heralding a new era of motivation-driven and interactive AI applications [2]. In educational contexts, integrating motivational features in AI-driven mobile applications significantly enhances reading comprehension. Using Self-Determination Theory (SDT) as a foundation, research highlights the value of features like personalization, progress tracking, social interaction, and gamification in supporting autonomy, competence, and relatedness. Findings suggest that intrinsic motivation is preferred, and features that promote engagement and self-regulated learning are critical for effective application design [3]. Gamification in Voice AI agents enhances user engagement by aligning with intrinsic motivations, creating interactive, rewarding experiences that sustain interest and drive active participation.

2.2 User Engagement

Key factors influencing user engagement and retention in interactions with role-playing AI models include the length of each turn the AI takes during conversations. Research highlights that longer and more substantial AI responses significantly contribute to retaining users, providing valuable insights for designing conversational AI systems that are both engaging and user-friendly [4]. Similarly, Conversational Task Assistants (CTAs) can enhance user engagement by incorporating relevant and interesting facts into interactions. Researchers trained a classifier to automatically identify intriguing facts, creating a cooking-specific annotated dataset and developing a dialogue policy to integrate these facts seamlessly into conversations. Live testing on a leading multi-modal voice assistant demonstrated that 66% of the presented facts were well-received, resulting in a 40% increase in user satisfaction and a 37% increase in conversation length. These findings emphasize that embedding interesting facts strategically within CTA interactions can effectively boost user participation and engagement during guided tasks [5]. User satisfaction in games is driven by the quality of interaction, usability, and engagement. Ensuring a positive user experience (UX) requires intuitive design, usability testing, and a balance between technical and social aspects. Playability, which includes factors like learnability, efficiency, and memorability, plays a crucial role in enhancing satisfaction. Emerging trends, such as Virtual Reality (VR), introduce new challenges in maintaining usability while providing immersive experiences. Ultimately, involving users in the design process through participatory methods helps create games that meet their expectations and enhance overall enjoyment [6]. AI can enhance user satisfaction in games by personalizing experiences, optimizing usability, and improving immersion through adaptive systems, machine learning, and intelligent interactions.

2.3 Playful Design

Artificial Agency's article, "Playful Intelligence: Bringing Generative Behavior to Games," explores the evolving role of artificial intelligence (AI) in gaming, emphasizing a transition from developing superhuman opponents to creating adaptive AI agents that enhance player engagement through dynamic and context-aware behaviors. The study highlights the potential of generative AI in designing game characters and systems capable of comprehending their narrative roles, thereby contributing to more immersive and human-centric gaming experiences. To support this development, Artificial Agency introduces an AI-powered behavior engine that integrates real-time decision-making into various aspects of gameplay, enabling virtual environments to become more responsive and interactive [7]. Additionally, Artificial Agency's AI-powered behavior engine advances user engagement and interaction by embedding playful design elements into real-time adaptive systems. Through the use of machine learning, procedural content generation, and predictive analytics, the system dynamically personalizes gameplay experiences, fostering deep immersion and sustained player interaction. This approach aligns with contemporary advancements in AI-driven interactive storytelling and adaptive digital environments, including applications beyond gaming, such as e-commerce and virtual assistants. Ultimately, the integration of playful AI within interactive systems has significant implications for enhancing digital experiences, making them more intuitive, engaging, and personalized [8].

2.4 Gamified Voice AI Agents

Gamified AI voice assistants enhance user engagement by integrating playfulness, interactivity, and challenge-based mechanics into voice-based interactions. This suggests that even without visual components, voice agents can meaningfully leverage game mechanics like rewards, progress cues, and competition to create immersive and playful learning experiences [9]. Research suggests that users are motivated to adopt AI voice assistants (AIVA) due to functionality, emotional achievement, social value-seeking, and individual traits. Gamification elements such as humor, competition, and cooperative gameplay significantly enhance user satisfaction and retention by fostering immersive experiences. Additionally, anthropomorphism and social presence contribute to a heightened sense of realism, encouraging deeper interaction with AI systems. These findings suggest that incorporating gamification strategies into AI voice assistants can create engaging and personalized user experiences, making them more effective for applications in entertainment, education, and customer service [10]. Further supporting the role of gamification, research on speaker comparison tasks examined the impact of different interface designs on user performance. In this study, three interface variations were tested: a traditional non-gamified version, a gamified version with feedback and customizable features, and a gamified version with an additional constraint of limited 'lives' for incorrect answers. A total of 150 participants, recruited through Amazon Mechanical Turk, were equally distributed among the three conditions. Findings indicate that gamification improves listener performance, particularly in balancing detection errors, demonstrating that game-like elements enhance engagement and task effectiveness in voice-based AI interactions [11]. Gamification uses game mechanics to make non-game activities more engaging and motivating. With AI, this experience becomes even smarter. AI personalizes challenges, adapts rewards, and fine-tunes interactions based on each user's behavior and preferences [12]. It can predict when engagement drops, offer real-time feedback, and even generate new content dynamically. By analyzing user data, AI ensures that every experience is tailored, rewarding, and continuously improving. Whether it's learning, productivity, or customer engagement, AI-driven gamification makes interactions more immersive and effective.

2.5 Demographic Influences on Gamification

Demographic characteristics have been shown to significantly shape user preferences and experiences with gamification. Age is a central factor: younger users tend to value competition, challenges, and fast-paced feedback, while older adults often prefer clarity, supportive features, and simpler mechanics [13,14]. Prior experience with games or gamified systems also influences effectiveness, with experienced users responding more positively to elements such as badges, leaderboards, and storytelling, whereas less experienced users lean toward personalization and cooperative modes [15]. Gender and social orientation may further moderate outcomes, as some studies find women report higher social benefits from gamification, while men emphasize competition [15]. More recent research underscores the importance of adaptive design that adjusts rewards, challenges, and complexity to user attributes, thereby enhancing engagement across age groups and experience levels [16,17].

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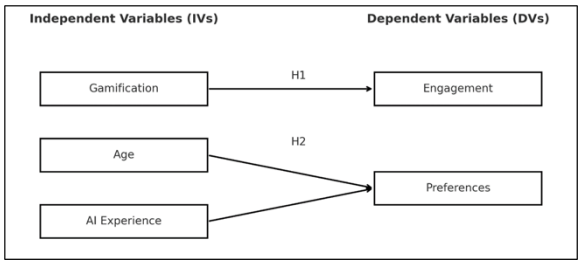

Fig.1. Hypotheses Framework

3. HYPOTHESES

Based on the research objectives and prior literature on user engagement and gamification, the study proposes the following hypotheses:

H1: Users who interact with Voice AI systems that incorporate gamification elements will demonstrate significantly higher levels of engagement and motivation than users who interact with non-gamified Voice AI systems. Independent Variable (IV): Presence of gamification elements (e.g., rewards, storytelling, personalization). Dependent Variable (DV): User engagement and motivation.

H2: Demographic characteristics, particularly age and prior experience with Voice AI, will significantly influence user preferences for specific gamification features. Independent Variables (IVs): Age, prior experience with Voice AI. Dependent Variable (DV):

User preferences for gamification features (e.g., challenges, competition, personalization, rewards).

4. METHODOLOGY

4.1 User-Centered Interaction

This study was conducted in two phases: the first phase involved an experiment in which design students identified key gamification factors for a Voice AI agent, and the second phase demonstrated the outcomes produced by the gamified AI agent using those factors. A total of 238 participants were recruited through a research exhibition event to take part in the study examining sentiment interactions with the AI agent. Each participant engaged with the system through structured tasks designed to capture emotional responses, preferences, and overall user experience. The collected data provide valuable insights into how users express positive, negative, or neutral sentiments during real-time interactions with the AI, highlighting patterns of engagement and emotional alignment. This participant base offers a robust sample for analyzing the effectiveness of sentiment detection, user satisfaction, and the potential of AI agents to adapt communication strategies based on emotional cues. This study adopts a mixed-methods experimental design to investigate the impact of gamified Voice AI agents on user engagement, retention, and satisfaction. A prototype mobile application incorporating gamification elements: points, rewards, challenges, and interactive storytelling will be developed and evaluated. Participants will be randomly assigned to one of three experimental conditions:

1. Non-gamified baseline model
2. Partially gamified model
3. Fully gamified model featuring real-time adaptive mechanics

Data collection will combine both quantitative and qualitative approaches. Quantitative metrics will include interaction length, user retention rates, task completion efficiency, and engagement levels. Qualitative data will be gathered through user satisfaction surveys, usability assessments, and sentiment analysis of user interactions. Statistical analyses, including ANOVA and regression modelling, will be conducted to determine the impact of gamification elements on engagement and interaction quality.

Through this systematic evaluation, the study seeks to generate empirical insights into the role of playful design in AI-driven systems, contributing to best practices for designing adaptive, engaging, and user-centered AI interfaces. The findings will inform future applications in entertainment, education, and customer service. In terms of satisfaction, responsiveness plays a critical role: users expect immediate feedback when interacting with buttons, menus, or forms, which enhances the perception of fluidity and reward [18]. A user's interaction with an application encompasses usability, accessibility, and overall satisfaction, representing a holistic design approach that prioritizes seamless, efficient, and enjoyable experiences [19].

The anticipated results will encompass four domains: demographic and usage patterns, perceptions of gamification, engagement and motivation, and qualitative insights. Demographic analysis will reveal the distribution of respondents by age, gender, education, and occupation, alongside their frequency and purposes of voice AI use, with cross-tabulations highlighting group differences. Perceptions of gamification will capture levels of awareness, prior interaction, and preferences for elements such as rewards, storytelling, challenges, or personalization, supported by statistical tests to assess demographic effects on adoption tendencies. Engagement and motivation will be examined through mean ratings of interactivity importance, correlations between interest in gamification features and intention to increase usage, and identification of the most effective reward structures, including badges, tangible incentives, and personalization options. Finally, qualitative insights from open-ended responses will highlight unmet needs, perceived limitations, and user-driven design recommendations. Collectively, these findings are expected to demonstrate that gamification elements particularly rewards, personalization, and interactive storytelling enhance user motivation and foster sustained engagement with voice AI systems, thereby offering empirical evidence for the design of next-generation conversational agents that integrate functionality with playful, user-centered interaction.

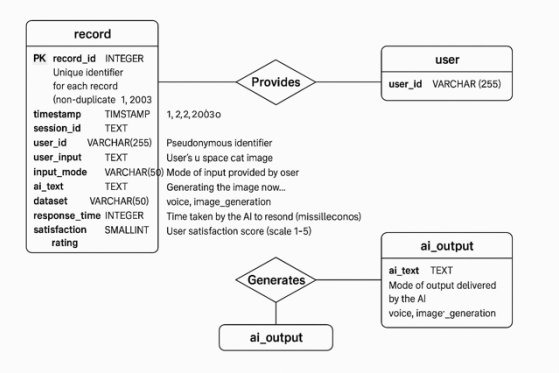

Table 1: Database Diagram

4.2 Enhancing User Engagement

This study employed a survey-based experimental design to investigate how gamification influences engagement with Voice AI agents and to identify

appropriate gamification elements for AI agent design. The survey was administered using a Google Sheets form, allowing participants to provide structured responses efficiently. The research focused on two hypotheses: (H1) gamification increases user engagement and motivation, and (H2) demographic characteristics, particularly age and prior experience, influence preferences for gamification features. A total of 14 participants, all design students, completed the survey. All respondents were young adults aged 18–24 with undergraduate-level education. The sample consisted of 8 females, 5 males, and 1 participant who did not disclose gender. Using a Google Sheets–based survey with 14 design students. Although the results align with the study's hypotheses at a descriptive level, they cannot be regarded as confirmatory due to methodological constraints, including the small, homogeneous sample and the absence of statistical analysis. Nevertheless, the findings contribute initial empirical grounding for incorporating gamification in Voice AI design and highlight potential pathways for improving user experience and retention. Future research should expand the participant pool, employ controlled experimental methods, and integrate behavioral usage data to more robustly evaluate how gamification shapes long-term engagement with AI agents across diverse populations.

Data were collected through an online questionnaire distributed via academic networks. The survey included sections on demographics, prior Voice AI usage, and interaction frequency, followed by questions on awareness and perceptions of gamification in Voice AI systems. Participants were asked to identify features they found most engaging (e.g., personalization, challenges, rewards) and to rate their likelihood of increased use if gamification were incorporated. Additionally, participants evaluated the importance of adaptive features, such as emotion-sensitive responses and personalization. The collected responses were analyzed descriptively to identify patterns in preferences and usage behaviors. To complement the survey data, user interaction logs from a prototype Voice AI agent were examined, including sentiment analysis of conversation transcripts. This procedure enabled triangulation between self-reported data and observed interaction patterns, strengthening the validity of the findings.

5. CONCEPTION MODEL

AI has significantly transformed UX design, necessitating an understanding of how machine learning (ML) can be integrated into the design process. The key challenges UX designers face when incorporating ML, highlighting difficulties in understanding ML concepts and applying them effectively. Their study outlines various tools, algorithms, and techniques to address these challenges, offering practical insights for designers adapting to AI-driven workflows. This research provides a complementary perspective on the obstacles and solutions in UX design with ML integration [20].

5.1 AI Applying Gamification to Voice AI Agents Processes

This ensures that game mechanics such as points, badges, and leaderboards are aligned with users' authentic motivations. The conceptual framework of AI agents using Gemma in combination with Retrieval-Augmented Generation (RAG) demonstrates a layered architecture consisting of user interaction, an agent controller, knowledge integration, and output delivery. In this model, Gemma functions as the lightweight large language model (LLM) responsible for reasoning and generation, while RAG provides contextual augmentation through retrieval
from domain-specific knowledge bases, thereby reducing hallucinations and improving factual accuracy.

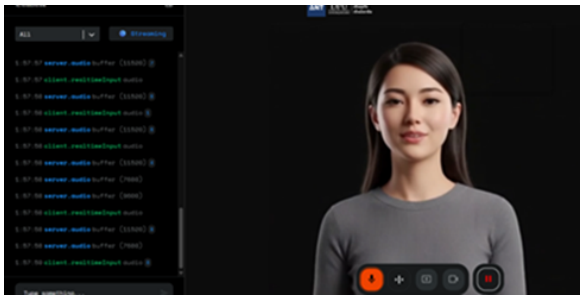

Fig.2. UI Design

The agent controller orchestrates decision-making between internal reasoning and external retrieval, ensuring adaptability and efficiency. Outputs are further enhanced with transparency features such as citations, supported by a feedback loop where user evaluations refine subsequent performance. This approach reflects recent advances in open LLMs [21] and aligns with prior research highlighting the efficacy of RAG in enhancing factual consistency and domain adaptability of AI systems [22,23].

5.2 Conceptual Framework of AI Agents Using Gemma + RAG

The conceptual framework (Fig.3) illustrates the layered design of AI agents that integrate Gemma, a lightweight open-source LLM, with Retrieval-Augmented Generation (RAG). The model is organized into four layers, each representing a functional component of the agent architecture. The framework depicts a gamified Voice AI architecture that integrates playfulness into user interactions.

Queries pass through an agent controller that blends reasoning (Gemma LLM) with retrieval (RAG) to generate accurate yet engaging outputs, enriched by rewards, humor, or challenges. A feedback loop with user ratings ensures adaptive and enjoyable experiences.

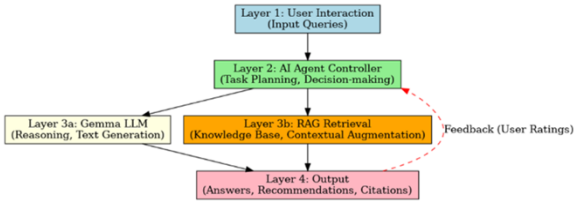

Fig.3. Conceptual Framework of AI Agents Using Gemma + RAG

6. RESULTS

The first study showed that all participants identified their occupation as students, reflecting a digitally literate population. This exploratory phase examined how gamification influences engagement with Voice AI agents and identified preferred gamification elements that could inform future AI agent design. The study revealed positive attitudes toward playful interaction features and a general openness to gamified conversational experiences.

Key Insights: The top three use cases (Fig.4) were game interactions (e.g., guessing images or people), childlike conversations (playful, casual dialogue), and psychology-related queries (mental health or depression discussions), which together accounted for over 84% of usage. User satisfaction was exceptionally high, with more than 94% rating their experience at level 4 or 5, indicating that the AI effectively addressed diverse and complex topics. The majority of conversations reflected positive or curious sentiments, underscoring a friendly atmosphere that fostered learning and entertainment. The bar chart illustrates the distribution of user conversation intents with the AI. The most frequent intent is Game Interaction with 19 occurrences (36.5%), followed by Childlike Conversation at 13 occurrences (25.0%) and Psychology Query with 12 occurrences (23.1%). Less frequent intents include Acknowledgement with 2 occurrences (3.8%), and both Singing Request and Storytelling Request, each appearing once (1.9%).

The fig.5 presents the overall sentiment analysis of user conversations. The pie chart shows the distribution of sentiments identified by the AI: Positive with 26 occurrences (50.0%), Curious with 16 occurrences (30.8%), Negative with 4 occurrences (7.7%), and Neutral with 2 occurrences (3.8%).

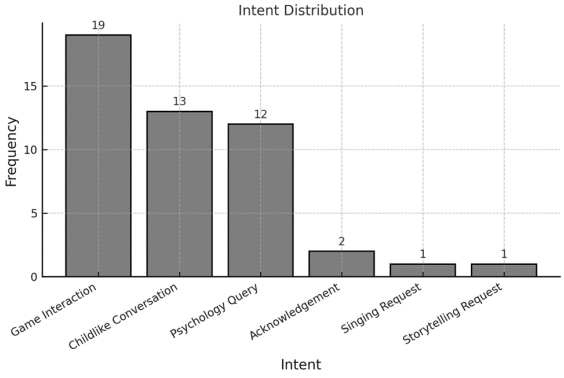

Fig.4. Game Interactions

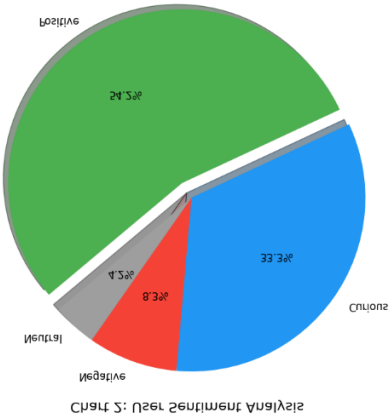

Fig.5. sentiment analysis of user conversations

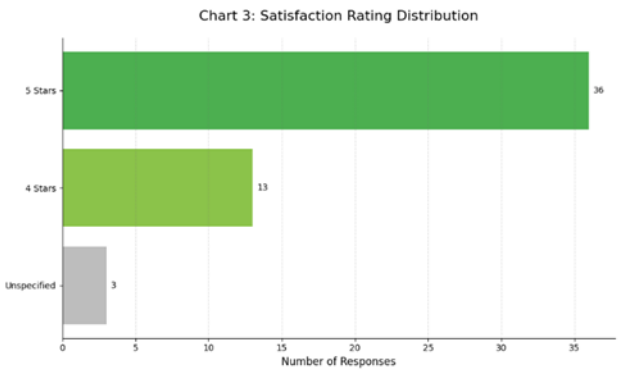

Fig.6. Satisfaction Rating

The third chart illustrates the distribution of user satisfaction ratings on a scale of 1 to 5. The majority of users gave the highest rating, with 36 responses (69.2%) at level 5, followed by 13 responses (25.0%) at level 4. No users rated at levels 3, 2, or 1. Additionally, 3 responses (5.8%) were unspecified, assumed to indicate no rating was provided.

Table 2: Mapping of Research Hypotheses

Hypothesis	Survey Evidence	Interpretation
H1: Gamification increases engagement and motivation	Users reported moderate likelihood of increased Voice AI use when gamification features (e.g., rewards, personalization, emotion-adaptive design) were included.	Supports H1: gamification elements are perceived to enhance engagement and motivation compared to non-gamified systems.
H2: Age and prior experience influence gamification preferences	Participants were mostly 18–24-year-old undergraduates with varied usage frequency. Younger and less experienced users favoured personalization, special content, and natural conversation improvements.	Supports H2: demographic factors shape gamification preferences, with younger users valuing customization while low-frequency users stress functionality before playful features.

The survey results indicate that incorporating gamification elements such as rewards, personalization, and emotion-adaptive features can enhance engagement and motivation in Voice AI systems. Demographic characteristics, particularly age and prior experience, were found to shape user preferences, with younger and less experienced users favoring playful customization and natural interaction, while low-frequency users prioritized functional reliability. These findings highlight the moderating role of user characteristics in determining the effectiveness of gamified Voice AI.

SUMMARY and DISCUSSION

The empirical findings indicate that the predominant Voice AI interactions comprised game-based activities, childlike conversational exchanges, and psychology-related queries, collectively accounting for the majority of system usage. Levels of user satisfaction were consistently high, with nearly all participants providing favorable evaluations of their experiences. Sentiment analysis further demonstrated that user interactions were largely characterized by positive and inquisitive tones, thereby lending support to the hypotheses that the incorporation of gamification mechanisms enhances user engagement and motivation (H1), and that demographic factors such as age and prior experience serve as moderating variables in shaping user preferences (H2).

This study is situated within the broader objective of designing a Voice AI agent enriched with gamification features—including points, rewards, and challenges—with the intent of augmenting user engagement. The research design emphasizes the empirical evaluation of these gamified elements in fostering interaction quality, promoting retention, and improving user satisfaction, drawing upon both experimental testing and user feedback. In addition, the investigation seeks to determine which gamification features exert the most pronounced influence on creating meaningful and enjoyable interactions. The project is expected to culminate in the development of a prototype mobile application that operationalizes the conceptual framework of a gamified Voice AI agent. The Voice AI interactions centered on game-based activities, childlike conversations, and psychology related queries, resulting in very high user satisfaction and predominantly positive and inquisitive sentiment. The objective of this research was to design a Voice AI agent using gamification elements to improve interaction quality and user retention.

For this research, the findings provide preliminary insights into how gamification elements may enhance long-term engagement with AI voice agents, how demographic factors might influence the effectiveness of playful features, and which combinations of rewards, personalization, and social presence contribute most to user satisfaction. To build on these insights, future studies should include a clear experimental comparison between a non-gamified baseline, a partially gamified version, and a fully gamified model to determine the incremental impact of each gamification level and establish more robust design guidelines.

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