

НАУЧНАЯ СТАТЬЯ

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## ОПЫТ ИЗУЧЕНИЯ ЯЗЫКОВ С ИСПОЛЬЗОВАНИЕМ ИИ И УДЕРЖАНИЕ ПОТРЕБИТЕЛЕЙ В ЭКОНОМИКЕ ЗНАНИЙ: ДАННЫЕ DUOLINGO ВО ВЬЕТНАМЕ

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**Ключевые слова:** экономика знаний, обучение с использованием ИИ, цифровые компетенции, геймификация, удержание потребителей, Duolingo

### Аннотация.

В условиях стремительного развития технологий искусственный интеллект (ИИ) стал ключевым фактором цифровой трансформации образования в экономике знаний. Платформы для изучения языков с поддержкой ИИ, такие как Duolingo, получили широкое распространение благодаря своей способности предоставлять персонализированный контент, обеспечивать автоматическую обратную связь и включать механизмы геймификации, что повышает мотивацию учащихся. Во Вьетнаме растущий спрос на изучение английского языка ускорил внедрение приложений на основе ИИ в качестве жизнеспособной альтернативы традиционным языковым центрам. В данном исследовании изучается влияние персонализации, геймификации и автоматической обратной связи с использованием ИИ на удержание пользователей и намерение повторной покупки. С использованием как качественных, так и количественных методов исследования на выборке из 155 пользователей Duolingo в Ханое результаты показывают, что погружение (впитывание), социальное взаимодействие и чувство достижения значительно усиливают вовлеченность в бренд. В свою очередь, вовлеченность в бренд способствует удовлетворенности пользователей, доверию и намерению продолжать использовать приложение. Эти результаты свидетельствуют о том, что персонализированный и увлекательный опыт обучения с использованием ИИ является критически важным фактором удержания пользователей.

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## AI-ENABLED LANGUAGE LEARNING EXPERIENCES AND USER RETENTION IN THE KNOWLEDGE ECONOMY: EVIDENCE FROM DUOLINGO IN VIETNAM

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### Abstract.

With rapid technological advancements, artificial intelligence (AI) has become a key driver of the digital transformation of education in the knowledge economy. AI-enabled language learning platforms like Duolingo have gained widespread adoption due to their ability to deliver personalized content, provide automated feedback, and

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incorporate gamification mechanisms, which enhance learner motivation. In Vietnam, the growing demand for English learning has accelerated the adoption of AI-powered apps as a viable alternative to traditional language centers. This study examines the impact of personalization, gamification, and AI-powered automated feedback on user retention and repurchase intention. Using both qualitative and quantitative research methods on a sample of 155 Duolingo users in Hanoi, the results show that immersion, social interaction, and a sense of achievement significantly enhance brand engagement. Brand engagement, in turn, contributes to user satisfaction, trust, and intention to continue using the app. These results indicate that personalized and engaging learning experiences using AI are critical factors in user retention

**Keywords:**

knowledge economy, AI-enabled learning, digital competences, gamification, repurchase intention, Duolingo

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**1 Introduction / Введение**

The digital transformation of the economy currently takes the form of a structural shift that radically alters the proportions of the use of production factors, including labor. A distinctive feature of this process is the formation of fundamentally new competencies in workers, radically changing the labor market.

In the knowledge economy – the main form of economic system of the 21st century – the development of competencies in students is carried out with the extensive use of digital technologies. Artificial intelligence (AI) is increasingly transforming the education sector by enhancing learning experiences and improving operational efficiency [1; 2]. In the field of educational technology (EdTech), AI-enabled applications such as Duolingo provide interactive and personalized language learning experiences through features such as content personalization, automatic feedback, and adaptive learning algorithms [1; 3]. This is especially relevant in Vietnam where the demand for foreign language learning is increasing while access to traditional learning centers is limited, making AI-based learning applications an effective solution [4]. This study addresses three main gaps. Firstly, previous research on AI-enabled features (e.g., personalization, gamification, automated feedback) and long-term learning lacks a common theoretical framework [5]. Secondly, in Vietnam, research is fragmented, failing to integrate popular theories such as SDT, TAM, and ECT to explain the retention of paid subscriptions. Finally, psychological factors such as satisfaction, trust, and brand attachment, which have a significant impact on long-term usage, are often overlooked in the context of AI-based learning [6]. This study aims to fill this gap by examining the impact of specific AI factors in the knowledge economy, namely content personalization, gamification, and auto-feedback, on repurchase intention on the Duolingo platform in Vietnam.

**2 Literature Review / Обзор литературы***Self-Determination Theory (SDT)*

Self-Determination Theory [7] explains that motivation is driven by the needs for autonomy, competence, and relatedness. When these needs are met, individuals experience stronger engagement, trust, and long-term commitment. In gamified platforms like Duolingo, features such as achievements, social interaction, and content choice fulfil these needs ([7]. This satisfaction enhances user trust, engagement, and brand attachment, leading to higher subscription retention [2]. Therefore, SDT provides the theoretical foundation for understanding how gamification affects user behaviour in this study.

*Technology Acceptance Model (TAM)*

According to Davis [8], the Technology Acceptance Model (TAM) suggests that users accept technology based on two factors: perceived usefulness and ease of use. In language learning applications, AI-assisted gamification features make the learning process more effective and accessible

[9; 10]. This creates a positive attitude, increasing satisfaction, trust, and intention to continue using. TAM thus helps explain the connection between technology factors, user psychological responses and behavior [11]. While SDT explains why users are motivated, TAM clarifies how technological features shape their perceptions, beliefs, and willingness to interact with the platform.

#### *Expectation-Confirmation Theory (ECT)*

Expectation Confirmation Theory (ECT) [12] explains that users compare their initial expectations with their actual experience. If the experience meets or exceeds expectations, they will be satisfied and continue using the app [13]. In an app like Duolingo, factors such as rewards, personalization, and an easy-to-use interface help to form positive expectations, which in turn lead to satisfaction, trust, and intention to continue subscribing [14].

### **3 Research Model and Hypotheses / Модель исследования и гипотеза**

#### *Conceptual framework*

This study is based on three core theories. First, Self-Determination Theory (SDT) explains how Absorption, Social Engagement, and Achievement satisfy learners' psychological needs for autonomy, competence, and relatedness [7], thereby promoting intrinsic motivation. Second, the Technology Acceptance Model (TAM) emphasizes how perceptions of usefulness and ease of use, often enhanced by AI-driven personalization, reinforce engagement, trust, and satisfaction [8]. Finally, Expectation Confirmation Theory (ECT) [12] explains how satisfaction and trust are reinforced when actual experiences meet or exceed expectations, promoting continued use and retention.

Thus, Absorption, Social Engagement, and Achievement function as independent variables; Brand Engagement, Satisfaction and Trust are the mediating factors; and Customer Retention is the dependent variable, forming a framework strongly supported by SDT, TAM and ECT.

#### *Absorption and Brand Engagement*

Absorption represents the extent to which learners are deeply engaged in learning content, described as a state of "flow" where time and effort are spared. Recent research highlights that personalizing learning paths, creating adaptive and immersive tasks, and enhancing users' focus and interest, thereby enhancing their emotional connection to digital platforms [15]. In Duolingo, immersion is fostered by self-paced lessons and audiovisual content that enhance users' cognitive and emotional connection, thereby strengthening their attachment to the brand [16].

Therefore, the hypothesis H1 of the study is There is the positively relationship of Absorption & Brand Engagement in case of using Duolingo

#### *Social Interaction and Brand Engagement*

Social interaction emphasizes the role of connection, support, and community building among learners through leaderboards, peer challenges, and online forums that encourage presence that sustains language learning motivation [17]. In Duolingo, social features such as leaderboards, challenges, and group games promote meaningful interactions that enhance user engagement with the brand [18].

Therefore, the hypothesis H2 of the study is There is the positively relationship of Social Interaction & Brand Engagement in case of using Duolingo

#### *Achievement and Brand engagement*

Achievements refer to rewards such as badges, achievement streaks, and performance points. These reward mechanisms stimulate intrinsic and extrinsic motivation, increase enjoyment, and build user commitment [2]. When users feel that their efforts are recognized, they tend to continue to maintain engagement behavior. From there, they will share and promote the brand in social relationships. Duolingo does this through progress bars, badges, and experience points [19].

Therefore, the hypothesis H3 of the study is There is the positively relationship of Achievement & Brand Engagement in case of using Duolingo

#### *Brand engagement and Satisfaction*

Brand engagement is characterized by active engagement, positive emotions, and long-term commitment to the brand [16]. This engagement strengthens the emotional connection, helping users feel recognized for their efforts through features such as streaks, badges, or congratulations after completing a lesson on Duolingo. This recognition and positive feedback increases satisfaction, as it transforms engagement experiences into positive emotions and satisfaction.

Therefore, the hypothesis H4 of the study is There is the positively relationship of Brand Engagement & Satisfaction in case of using Duolingo

#### *Brand engagement and Trust*

Trust represents the user's confidence in the reliability, fairness, and value that the platform provides [20]. In the context of gamification, trust is reinforced through reward systems or transparency in communication and consistency in experience [21]. Duolingo builds trust by providing a transparent, fair, and personalized experience; thus, clear progress tracking, tailored learning paths, and continuous reinforcement help users feel supported, safe, and maintain long-term engagement with the brand [21; 22].

Thus, the hypothesis H5 of the study is There is the positively relationship of Brand Engagement & Trust in case of using Duolingo.

#### *Satisfaction, Trust and Customer retention*

Customer retention is the ability of a business to retain current users by promoting repeat and long-term service usage behaviour [23]. Both satisfaction and trust are key predictors of customer retention, including continued use, reduced switching intentions. At Duolingo, satisfaction is built through personalized gamification, clear learning progression, and timely feedback, which keeps users motivated to return and strengthens their relationship with the brand [12; 18]. Meanwhile, trust, built on transparency, fairness, and consistent learning experiences, helps reduce perceived risk and strengthens long-term commitment [20]. Combined, these two factors increase the intention to continue using and recommend the platform to others.

Thus, the study proposes the Hypothesis 6 and 7 such as follows:

Hypothesis H6: There is the positively relationship of Satisfaction & Customer Retention in case of using Duolingo

Hypothesis H7: There is the positively relationship of Trust & Customer Retention in case of using Duolingo

#### **4 Research Methodology and Data Collection / Методология исследования и сбор данных**

##### *Research methodology*

*Research design:* In order to develop the research model and testing, the research was conducted by two-step methodology. The first step was primary research, which applied a desk research method and the second step was exploratory research, which applied a quantitative research method.

Desk research helps synthesizing theories and literatures relevant to research areas, having better understanding about real situation. Desk research is useful in gathering secondary data from various sources: internet, documents, domestic and foreign studies, statistic offices, etc. This facilitates the authors to develop research model and collect necessary data.

Quantitative method: Confirmation factor analysis (CFA) is applied to identify factors affecting brand engagement and retention toward Duolingo users in Hanoi. Data was gathered from groups of Duolingo users in Hanoi city through Google Forms.

##### *Measurement scales and Questionnaire design*

A structured questionnaire was designed using established and validated scales from prior studies. The respondents were asked whether they agreed or disagreed with the 29 statements or variables, which are divided into 7 factor groups. Their given answers were judgments on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

##### *Questionnaire design*

Based on the hypotheses, a questionnaire survey with the stated preferences was developed. The survey questionnaire is divided into 3 main parts: part 1 is project introduction; part 2 includes socio-demographic questions such as gender, age and educational level and interaction with gamified applications; and part 3 consists of psychological statements with an ordinal scale.

A structured questionnaire was designed using established and validated scales from prior studies. The respondents were asked whether they agreed or disagreed with the 29 statements or variables, which are divided into 7 factor groups. Their given answers were judgments on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). In particular, each construct was adapted to the context of AI-integrated language learning applications and translated into Vietnamese to ensure clarity and relevance for the target respondents.

#### **5 Results and Discussion / Результаты и обсуждение**

##### *Statistics of survey*

Structure surveyed by gender is shown in Fig. 1.

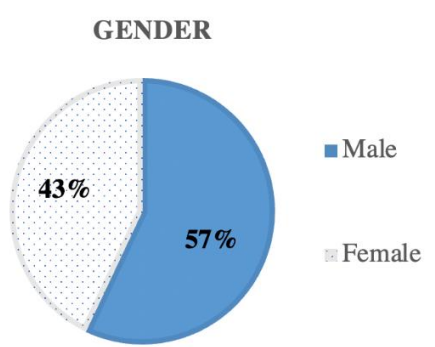


Fig. 1. Structure surveyed by gender (N=155) (drawn by the Authors based on the current research results)

Рис. 1. Структура, исследованная по гендерному признаку (N=155) (составлена авторами на основе результатов текущего исследования)

After distribution the survey questionnaire, the demographic breakdown of the 155 respondents offers valuable insight into the composition of Duolingo users and their usage behaviour. In terms of gender, female users made up the majority with 56.8% (n=88), while male users accounted for 43.2% (n=67). From there, this indicates a slight female predominance among surveyed users. Structure surveyed by age groups is shown in Fig. 2.

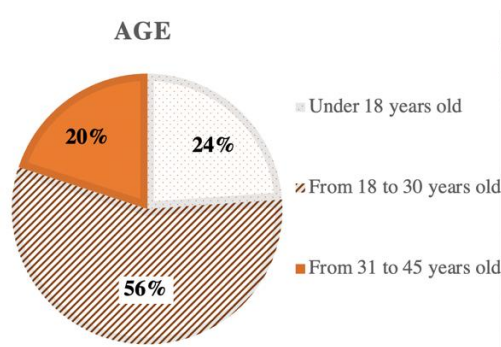


Fig. 2. Structure surveyed by age groups (N=155) (drawn by the Authors based on the current research results)

Рис. 2. Структура, исследованная по возрастным группам (N=155) (составлена авторами на основе результатов текущего исследования)

**EDUCATION BACKGROUND**

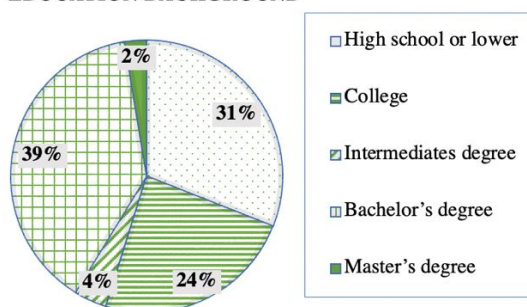


Fig. 3. Structure surveyed by education background (N=155) (drawn by the Authors based on the current research results)

Рис. 3. Структура, исследованная по уровню образования (N=155) (составлена авторами на основе результатов текущего исследования)

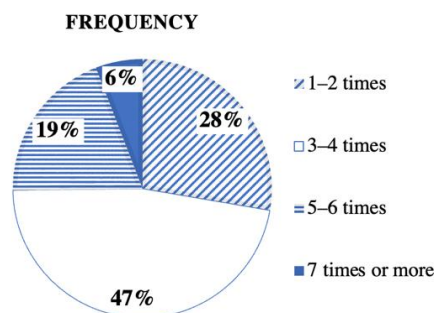


Fig. 4. Structure surveyed by frequency (N=155) (drawn by the Authors based on the current research results)

Рис. 4. Структура, исследованная по частоте (N = 155) (составлена авторами на основе текущих результатов исследования)

Moreover, the age distribution reveals that the platform is especially popular among younger demographics, with 56.1% of users aged 18 to 30 (n=87), followed by 23.9% under 18 (n=37), and 20.0% between 31 and 45 years old (n=31). Structure surveyed by education background is shown in Fig. 3.

Regarding educational background, the majority of respondents had completed at least a bachelor’s degree (38.7%), followed by high school or lower education (31.0%), and college-level education (23.9%). Structure surveyed by frequency is shown in Fig. 4.

Besides that, only a small fraction reported holding a master’s degree (2.6%) or an intermediate degree (3.9%). In terms of usage frequency, nearly half of the respondents (47.1%) used Duolingo 3–4 times per week, followed by 27.7% who used it 1–2 times, and 19.4% who used it 5–6 times. A smaller portion (5.8%) reported using it 7 times or more per week, indicating a highly engaged minority of frequent users. Scale reliability tests and validity assessment are shown in Table 1.

Table 1. The results of reliability and validity analysis

Таблица 1. Результаты анализа надежности и валидности

No.	Constructs and the scale items	Mean	Standard deviation	Factor Loading
<b>1. Absorption - A</b>				
<i>Cronbach's Alpha = 0.845</i>				
AB1	I become deeply immersed when using AI-integrated language learning apps.	0.286	0.036	0.815
AB2	I lose track of time while learning through AI-integrated apps.	0.277	0.031	0.804
AB3	I often continue using AI-integrated learning apps longer than I intended.	0.269	0.032	0.782
AB4	I feel fully focused and attentive when engaging with AI-driven language lessons.	0.275	0.033	0.793
AB5	I sometimes forget my surroundings while learning through AI-integrated apps.	0.159	0.043	0.724
<i>AVE = 0.856 Total variance = 61.5</i>				
<b>2. Social - S</b>				
<i>Cronbach's Alpha = 0.948</i>				
SO1	I feel a sense of belonging when interacting with other users on AI-integrated language learning apps.	0.224	0.015	0.889
SO2	I feel comfortable communicating with other learners through AI-driven platforms.	0.240	0.016	0.871
SO3	AI-integrated apps make it easy for me to engage in social interactions while learning.	0.211	0.015	0.901
SO4	Interacting with other learners motivates me to continue using AI-integrated apps.	0.214	0.012	0.915
SO5	Social features in AI-driven learning apps enhance my language learning experience.	0.211	0.009	0.973
<i>AVE = 0.949 Total variance = 82.9</i>				
<b>3. Achievement - AC</b>				

<i>Cronbach's Alpha = 0.829</i>				
AC1	I feel a sense of accomplishment when earning points or badges in AI-integrated learning apps.	0.275	0.046	0.797
AC2	Earning rewards (such as badges or points) motivates me to continue learning through AI-integrated apps.	0.247	0.044	0.726
AC3	Competing on leaderboards encourages me to engage more with AI-integrated learning apps.	0.244	0.040	0.732
AC4	Daily challenges and streaks help me build a consistent learning habit on AI-integrated apps.	0.322	0.038	0.838
AC5	Achieving milestones in AI-integrated learning apps increases my satisfaction with the learning process.	0.203	0.040	0.753
<i>AVE = 0.841 Total variance = 59.3</i>				
<b>4. Brand Engagement - BE</b>				
<i>Cronbach's Alpha = 0.881</i>				
BE1	I often think about the language learning app I use.	0.262	0.021	0.855
BE2	I feel very positive when I interact with the app.	0.287	0.023	0.824
BE3	Using the app makes me feel happy and satisfied.	0.306	0.022	0.850
BE4	I feel good and emotionally connected when using the app.	0.288	0.016	0.893
BE5	I put significant effort into engaging with the app's activities and features.	n/a	0.040	-
<i>AVE = 0.883 Total variance = 73.8</i>				
<b>5. Satisfaction - SA</b>				
<i>Cronbach's Alpha = 0.783</i>				
SA1	I am satisfied with my overall experience using this language learning app.	0.415	0.028	0.822
SA2	Using this app has been enjoyable and fulfilling.	0.375	0.024	0.854
SA3	I feel content with the features and learning activities provided by the app.	0.409	0.027	0.829
<i>AVE = 0.783 Total variance = 69.7</i>				
<b>6. Trust - T</b>				
<i>Cronbach's Alpha = 0.639</i>				
T1	I trust the language learning app to deliver a reliable learning experience.	0.330	0.096	0.679
T2	The app consistently meets my learning needs and expectations.	0.431	0.070	0.801
T3	I believe the app respects my data privacy and security.	0.512	0.077	0.830
<i>AVE = 0.651 Total variance = 73.4</i>				
<b>7. Customer Retention - CR</b>				
<i>Cronbach's Alpha = 0.665</i>				
R1	I intend to continue using this language learning app regularly.	0.464	0.028	0.859
R2	I am unlikely to switch to another app for language learning.	0.379	0.036	0.776
R3	I would recommend this app to others interested in learning a new language.	0.446	0.036	0.683
<i>AVE = 0.670 Total variance=60.1</i>				

Source: Authors

Cronbach's Alpha is performed to evaluate the reliability of the variables in the model [24]. Furthermore, the condition for Cronbach's Alpha to be at least 0.7 and "Corrected Item-Total Correlation"  $> 0.3$ . Thereby, the results of running the data showed that Cronbach's Alpha of 3 independent variables; 3 mediating variables and 1 dependent variable were respectively Absorption = 0.845; Social = 0.948; Achievement = 0.829; Brand Engagement = 0.881; Satisfaction = 0.783; Trust = 0.639; Retention = 0.665 after removing factor BE5 had observation  $< 0.3$ .

AVE of 3 independent variables were respectively Absorption = 0.856; Social = 0.949; Achievement = 0.841; AVE of Brand Engagement = 0.883; AVE of Satisfaction = 0.783; AVE of Trust = 0.651 and AVE of Retention = 0.670. From that, it can be seen that these AVE values all satisfy the conditions  $> 0.5$  and  $< 1$ . In addition, the total variance values  $> 50\%$ , which means they are suitable for the research model. Notably, the factor loadings of these observations are all at a good level when  $> 0.5$  (details in the table above).

Final model of the impact of Artificial Intelligence on user satisfaction and subscription intention is shown in Fig. 5.

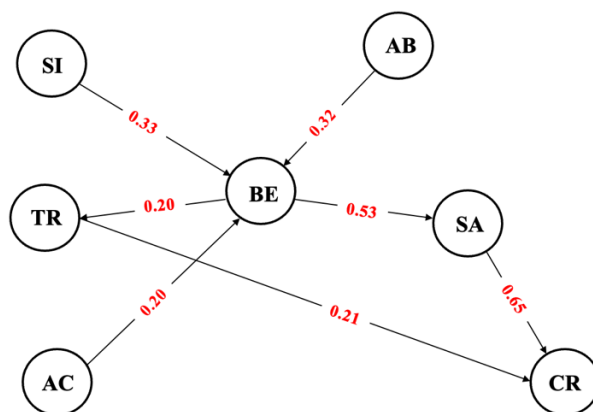


Fig. 5. Impact of Artificial Intelligence on User Satisfaction and Subscription Renewal Intention in Duolingo – Final model and coefficients (drawn by the Authors based on the current research results)  
Рис. 5. Влияние искусственного интеллекта на удовлетворенность пользователей и намерение продлить подписку на Duolingo – окончательная модель и коэффициенты (составлены авторами на основе результатов текущего исследования)

## 6 Conclusion / Заключение

This study aims to explore the impact of artificial intelligence (AI) on users' repurchase intention on the Duolingo application, with a particular emphasis on the mediating role of brand engagement, satisfaction, and trust in influencing customer retention. Using a PLS-SEM structural model, the study found that AI-enabled features such as personalized learning content contribute to increased satisfaction, enhanced engagement, and trust, which in turn increases the likelihood of users renewing their subscriptions. The results show that personalized AI features increase engagement, satisfaction, and trust, which in turn motivate users to renew their subscriptions. The three key psychological factors of absorption, social engagement, and achievement all positively impact brand engagement, with social engagement being the strongest. Satisfaction is the best predictor of continued usage. The study confirms that AI not only improves learning but also builds personalized experiences and increases user loyalty, which is an important strategy for EdTech businesses.

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Авторы заявляют об отсутствии конфликта интересов.

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#### **Conflicts of Interest**

The authors declare no conflict of interest.

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