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AI AS A TOOL FOR IMPROVING THE QUALITY OF DIGITAL PRODUCTS, USER ENGAGEMENT, AND RETENTION

The article explores the critical problem of optimizing digital product quality within a highly competitive global market. Merely launching a functionally sound application is insufficient; long-term commercial success depends on retaining users and cultivating consistent, habit-forming engagement. Utilizing the AARRR framework, the study illustrates how retention serves as the foundational pillar for sustainable business models, directly impacting customer acquisition cost (CAC) and customer lifetime value (LTV). Key influencers on these behavioral metrics–including the core value proposition, intuitive user experience (UX) design, and personalized communication strategies–are systematically analyzed.

Furthermore, the research demonstrates that integrating artificial intelligence (AI) fundamentally transforms traditional audience interaction. By shifting from static to dynamic designs, AI enables real-time adaptation. Specific applications, such as predictive churn modeling, intelligent recommendation systems, and adaptive interfaces, are examined as pivotal tools for proactively managing user lifecycles.

Theoretical findings are empirically validated through an analysis of two practical cases: a Mobility-as-a-Service application and an EdTech platform. Results confirm the profound effectiveness of deploying AI algorithms and smart onboarding processes. These interventions significantly reduce early user churn, enhance daily active usage, optimize operational costs, and shorten the time-to-value period, ultimately securing a loyal user base and driving long-term financial stability.

Keywords: *digital product quality, user engagement, user retention, artificial intelligence, user experience, UX design, predictive analysis, personalization.*

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ШТУЧНИЙ ІНТЕЛЕКТ ЯК ІНСТУМЕНТ ПОКРАЩЕННЯ ЯКОСТІ ЦИФРОВОГО ПРОДУКТУ, ЗАЛУЧЕНОСТІ ТА УТРИМАННЯ КОРИСТУВАЧІВ

У статті досліджено проблему оптимізації якості цифрових продуктів в умовах перенасичення ринку, де критичним показником успіху стає здатність утримувати користувачів та формувати їхню стабільну залученість. Проаналізовано ключові фактори впливу на ці метрики: пропозиційну цінність, користувацький досвід (UX) та комунікаційні стратегії. Доведено, що інтеграція штучного інтелекту (ШІ) трансформує підходи до взаємодії з аудиторією через предиктивне моделювання відтоку, персоналізацію контенту та адаптивні інтерфейси. На основі аналізу практичних кейсів (мобільний застосунок оренди авто та освітня платформа) продемонстровано ефективність застосування алгоритмів ШІ для зменшення раннього відтоку користувачів, підвищення щоденної активності та скорочення часу до усвідомлення цінності продукту (Time-to-Value).

Ключові слова: *якість цифрового продукту, залученість користувачів, утримання користувачів, штучний інтелект, користувацький досвід, UX-дизайн, предиктивний аналіз, персоналізація.*

Problem statement. In the context of rapid transformational changes in the global digital market and modern technological challenges, the role of user engagement and retention metrics as key indicators of digital product quality is constantly growing. Current trends toward hypercompetition for consumer attention, exponential growth in the number of mobile and web applications, and increased user demands for personalization and convenience require IT companies to take a systematic approach to software development that helps them gain sustainable competitive advantages.

Effective user retention mechanisms contribute to a significant reduction in customer acquisition costs, increased loyalty, and daily audience activity. They allow you to form long-term functional and emotional attachment to the digital ecosystem of the product, which is a particularly important factor in a saturated market.

From this perspective, user experience (UX) optimization is a strategic tool that directly affects customer lifetime value (LTV), brand reputation, and the stability of the business model as a whole.

Given the above, identifying the key components of digital product quality, especially those that shape user habits and minimize early audience churn, is an extremely important and relevant task. Traditional approaches to interface design often prove insufficient to ensure high retention rates, which highlights the need to find new methods, in particular, the deep integration of artificial intelligence technologies for predictive analysis and product adaptation to individual user needs.

Analysis of recent studies and publications. The issues of user engagement and retention are addressed in the works of many contemporary researchers and practitioners in the IT industry. In particular, the AARRR metrics framework described by Mae Rice [1] has become the standard for analyzing the user lifecycle, emphasizing that retention is a critical stage before monetization.

Dan Shewan's [2] research in the field of value proposition emphasizes that understanding user needs is the foundation of engagement. At the same time, UX design experts, such as Fora Soft specialists [3], emphasize the critical role of intuitive interfaces and onboarding. Recent publications, including Boonyawee Sirimaya [4], reveal the potential of artificial intelligence in content personalization, citing examples from giants such as Netflix.

More fundamental academic research in recent years has shown a clear focus on integrating intelligent systems into the structure of digital services. For example, a thorough study by Y. K. Dwivedi, L. Hughes, E. Ismagilova, G. Aarts, C. Coombs, and others [10] outlines the multidisciplinary perspectives and challenges of implementing artificial intelligence, emphasizing its ability to radically change consumer behavior patterns.

The practical aspect of using algorithms to retain customers is revealed in the work of M. A. Al-Shboul, A. M. Al-Zoubi, R. Al-Sayyed, and M. Al-Quraan [7], who proved the high effectiveness of machine learning in predictive modeling of user churn for digital services.

The role of user experience as a key driver of quality has also been rethought: research by G. Margetis, S. Ntoa, M. Antona, and C. Stephanidis [15] proves the need to move from static to human-centered and adaptive design. J. Lee and C. Park [12] empirically confirmed the direct link between deep user engagement and the long-term financial performance of digital platforms. As for direct personalization tools, Q. Zhang, J. Lu, and Y. Jin [14] systematized modern achievements in the field of AI-based recommendation systems, defining them as the main mechanism for generating continuous interest in content.

Most publications treat UX design, marketing, and artificial intelligence as separate disciplines. The synergy of integrating artificial intelligence as a dynamic component of UX to increase customer retention remains understudied and requires further research.

Purpose and objectives of the study. The purpose of the article is to provide theoretical and methodological justification and develop practical approaches to optimizing the quality of digital products by increasing user engagement and retention rates through the integration of AI technologies.

Presentation of the main research material. The concepts of user engagement and retention are central to assessing the viability and effectiveness of any information service. They directly correlate with the overall quality of the digital product offered to the end user.

For a comprehensive understanding of the place of these metrics in the life cycle of a digital product, it is advisable to refer to the AARRR framework (Acquisition, Activation, Retention, Referral, Revenue) [1]. Within this model, engagement and retention are critical stages (activation and retention) that turn a casual visitor into a loyal customer. Without effective retention, the product funnel collapses: investments in initial acquisition do not pay off because users do not reach the stages of revenue generation or product referral.

Engagement is defined as the intensity and depth of user interaction with a digital product, measured by the frequency and duration of sessions, depth of navigation, and number of target actions (e.g., reading content, making transactions, generating own content). A high level of engagement indicates that the product is of significant value to the user and is effectively integrated into their daily activities [1].

Retention, in turn, reflects the ability of an information service to retain its users for a certain period of time. This approach is important in terms of the following advantages:

– reduction of acquisition costs. The cost of acquiring a new user (CAC) usually significantly exceeds the cost of retaining an existing one;

– increased customer lifetime value (LTV). Long-term users generate more revenue throughout their entire interaction with the product;

– word-of-mouth effect. Loyal and satisfied users act as brand ambassadors, contributing to organic audience growth;

– business model stability. High retention rates ensure a stable user base and predictable financial flows [12].

To systematize the understanding of these indicators, a comparison of the characteristics of key digital product quality metrics is provided in Table 1.

Table 1

Comparative characteristics of key metrics for digital product quality

Category	Metric	Description and calculation method	Impact on quality strategy
Engagement	DAU / MAU (Stickiness)	The ratio of daily active users to monthly users.	This indicator reflects the degree of regular engagement and the level of integration of the product into the user's daily routine.
Engagement	Average session length	The average duration of a single user session.	Shows the depth of content consumption or the complexity of interaction.
Retention	Retention rate (RR)	Proportion of lost users over the period.	The main marker of long-term value and satisfaction with the product.
Economics	Churn rate	The churn rate (the percentage of those who stopped using the service).	Signals critical defects in UX or loss of relevance of the USP (Unique selling proposition).
Economics	LTV (Lifetime value)	The total revenue per user over the entire period.	Allows you to assess the limits of investment in interface optimization.

Source: compiled by the author.

Therefore, Table 1 shows that digital product quality metrics do not function in isolation, but as a single interconnected system where behavioral indicators are directly transformed into economic results. Taken together, the analysis of these markers allows us to form a quality strategy and determine the limits of return on investment in further optimization of the digital product.

Engagement and retention are influenced by many factors, which can be divided into several key groups: product value proposition, user experience, communication strategies, and personalization.

The product value proposition is the primary and most important factor. An information service must solve real user problems or provide tangible benefits. Without this basic quality, a digital product cannot be successful in the market. The product value proposition includes:

– unique selling proposition (USP) – differentiation from competitors;

– functional completeness – the availability of the necessary set of functions;

– reliability and stability – uninterrupted operation of the system.

For example, the value proposition of the Uber service is convenience. Uber skillfully highlights all the shortcomings of traditional taxis and demonstrates why their service is much more convenient. A simple but very effective text taken from Uber's home page perfectly conveys the simplicity and convenience that makes this service so attractive: “One tap and a car comes right to you. Your driver knows exactly where to go. Payment is completely cashless” [2].

Even the most functional product will not retain a user if its use is inconvenient or difficult. It is the user experience (UX) that is one of the most important components of the overall quality of a digital product [3, 15]. User experience includes:

– usability – ease and intuitiveness of interaction with the interface;

– interface design (UI) – aesthetics and clarity of visual elements [11];

– onboarding – the effectiveness of the process of adapting a new user to the product.

The role of communication strategies and personalization is that constant and relevant interaction with the user is critical to maintaining his interest, namely:

– personalized messages (push notifications, emails) that inform about new opportunities, product value or special offers;

– adaptation of information and offers to the individual needs and preferences of the user (content personalization).

– feedback mechanisms that provide users with the opportunity to express their opinions and take into account their wishes.

The integration of artificial intelligence transforms approaches to managing user engagement and retention, providing unprecedented opportunities to optimize interaction and significantly improve the quality of the digital product.

The process of interaction of artificial intelligence with the user is presented in Fig. 1.

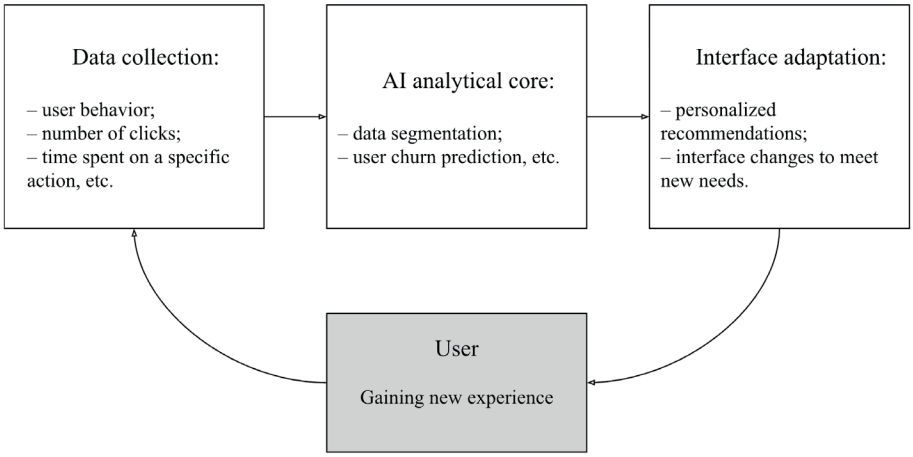

Figure 1. Conceptual diagram of AI integration into the digital product quality management system

Source: compiled by the author.

Advanced data analysis and predictive modeling. Artificial intelligence is able to process and analyze huge amounts of data on user behavior (big data), revealing hidden patterns, trends and predicting future actions with high accuracy [10]. This analysis is important for systematically improving the quality of a digital product and includes:

– automatic segmentation of users, which allows them to be grouped according to similar characteristics and behavior;

– predictive churn analysis allows artificial intelligence models to identify users with a high risk of churn and respond in a timely manner with proactive campaigns [7].

Personalizing the user experience is manifested in the fact that artificial intelligence allows creating a unique, tailored experience for each individual user and affects the perception of the quality and value of a digital product [6]. Personalization includes:

– recommendation systems – offering content, products or services that are most closely aligned with the user's individual preferences, significantly increasing engagement (e.g. Netflix, Spotify) [14];

– adaptive interfaces that dynamically change interface elements or interaction logic based on user behavior and help optimize the user experience (UX);

– onboarding optimization. Artificial intelligence can analyze new user interactions and automatically adjust the onboarding process, accelerating the moment of product value realization;

– chatbots and virtual assistants provide 24/7, instant support, automate responses to common queries and routing of complex issues, improving overall satisfaction [13].

For example, Netflix is a leader in personalization, and its AI-powered recommendation system saves companies up to $1 billion annually by reducing user churn. Overall, personalized communications can increase customer engagement by 50% and lead to a 10-15% increase in sales [4].

The theoretical principles of using AI and optimizing UX are confirmed in real scenarios of digital product development. Two application cases are offered that demonstrate how the combination of thoughtful onboarding, personalization, and predictive analysis affects key product metrics.

For example, a mobile car rental application: onboarding transformation and churn prediction. One of the common problems in rental services (Mobility-as-a-Service) is losing the user at the stage of first acquaintance. Onboarding in a car rental service often loses the user in the first minutes due to generic, uninformative screens and lack of obvious benefits.

To solve this problem, the emphasis was shifted to demonstrating a specific benefit during the user's first session. Immediately after logging in, the system selects several closest offers with relevant prices and conditions. It is important to note that this is not due to "black boxes", but due to the transparent comparison of location, recent views and the use of key filters when searching for offers. The first user experience is accompanied by a step-by-step review of the interface, and the test car booking scenario works on test data, so it allows you to trace the full user journey without risks and costs.

For users at high risk of early dropout, the system gently encourages them to return by selecting nearby areas or sending reminders. The formats of such messages were selected by a step-by-step algorithm. First, several options were tested, leaving the one that brings more people to the next step.

The results of the implementation were:

– 20% shorter time to the first tangible benefit (Time-to-Value);

– a higher share of users (by 15%) reaching the point of realizing the value of the product in the first session;

– a moderate increase in retention on the seventh day;

– the limits of personalization were fixed, the logic of recommendations was explained with simple messages in the interface.

The second example is an educational platform (EdTech), which demonstrates an increase in daily activity due to adaptability. In the EdTech field, a typical problem of educational services is a rapid decline in motivation during the first days of using the platform. Users often leave training due to a feeling of excessive workload or lack of rapid progress.

As part of the optimization, the first week was reformatted into a clear "15 minutes a day" mode, where each session ends with a small tangible result, such as a quiz. The key role here is played by an intelligent system that analyzes user behavior and suggests the "next most useful step." For example, it offers some users a vocabulary exercise, while others offer conversational practice. This balanced combination of rules and a trained AI model takes into account the user's previous actions and level of competence.

In addition, a conversational assistant based on a large AI language model (LLM) has been introduced. It answers queries based on course materials and reference books, and always provides links to primary sources. This reduces the waiting time for help and removes minor barriers during lessons [9].

A reactivation mechanism has also been implemented: if there has been no activity for 48–72 hours, the system offers a personalized "return to rhythm plan"–three short tasks totaling up to 15 minutes. Complex or controversial questions are automatically forwarded to the instructor.

The results of the implementation were:

– an increase in the proportion of completed onboarding;

– improved retention on the first and seventh days;

– reduced need to contact support (live operators), which optimizes the platform's operating costs.

Thus, the cases presented illustrate that a successful retention strategy is based on the synergy of thoughtful UX design and artificial intelligence capabilities. Instead of passively waiting for user actions, modern digital products must proactively shape the user experience: from personalized value demonstration during the first session to predictive response to churn risk and task complexity adaptation. This ensures high-quality digital service and allows companies to remain competitive in the market.

Conclusions. Thus, user engagement and retention are not just metrics of a digital product's success, but rather a comprehensive reflection of its quality and ability to effectively integrate into the user's life, providing them with lasting value and a positive experience.

An analysis of theoretical principles and practical cases suggests that the use of artificial intelligence allows us to move from mass communications to a personalized, proactive, and adaptive approach. This approach not only increases engagement rates but also builds long-term, loyal relationships with the audience. As demonstrated by the examples of a mobile car rental app and an educational platform, combining competent UX design with machine learning algorithms (predictive churn analysis, recommendation systems, intelligent assistants) is an effective tool for solving the problem of low user retention in a highly competitive market.

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