ECONOMIC MECHANISMS FOR INCREASING THE DURATION OF CUSTOMERS' USE OF ENTERPRISE SERVICES IN THE DIGITAL ECONOMY

Mirziyodova Gulnoxon Ayubxon qizi
Basic doctoral student
Institute for Advanced Training
and Statistical Research
https://doi.org/10.5281/zenodo.24054881

Abstract

The thesis examined economic mechanisms that extend the period during which customers keep using an enterprise's services in the digital economy. The analysis drew on the customer lifetime value (CLV) model and on geometric and shifted-beta-geometric models of retention and churn. Official indicators for Uzbekistan were reviewed: online sales reached 22.7 trillion soums in 2025 and the number of bank cards exceeded 68.27 million. A mechanism matrix covering switching costs, loyalty programmes, subscriptions, data-driven personalised offers and ecosystem bundling was built. An illustrative cohort example computed in Python showed that raising retention from 60% to 70% increased customer value by 30% and that a loyalty programme paid back in its second year. Retention indicators were proposed as part of enterprises' management reporting.

Keywords: customer lifetime value, customer retention, churn, loyalty programme, switching costs, digital ecosystem, digital economy.

Annotatsiya

Tezisda raqamli iqtisodiyot sharoitida mijozlarning korxona xizmatlaridan foydalanish davomiyligini oshirishning iqtisodiy mexanizmlari o‘rganildi. Mijozning umrboqiy qiymati (CLV) modeli, mijozlarni saqlab qolish va ketishini baholovchi geometrik hamda siljitilgan beta-geometrik modellar asos qilib olindi. O‘zbekistonda onlayn savdo hajmi 2025-yilda 22,7 trln so‘mga yetgani, bank kartalari soni 68,27 mln donadan oshgani kabi rasmiy ko‘rsatkichlar tahlil qilindi. O‘tish xarajatlari, sodiqlik dasturlari, obuna, ma’lumotlar tahliliga tayangan shaxsiy takliflar va ekotizim xizmatlari kesimida mexanizmlar matritsasi tuzildi. Python dasturida shartli kogorta misoli hisoblandi: mijozni saqlab qolish darajasi 60 foizdan 70 foizga ko‘tarilganda mijoz qiymati 30 foizga oshib, sodiqlik dasturi ikkinchi yilda o‘zini qoplagani ko‘rsatildi. Korxonalar uchun saqlab qolish ko‘rsatkichlarini boshqaruv hisobotiga kiritish taklif etildi.

Kalit so‘zlar: mijozning umrboqiy qiymati, mijozlarni saqlab qolish, mijozlar ketishi, sodiqlik dasturi, o‘tish xarajatlari, ekotizim, raqamli iqtisodiyot.

Аннотация

В тезисе были рассмотрены экономические механизмы увеличения продолжительности пользования клиентами услугами предприятия в условиях цифровой экономики. Основой исследования послужили модель пожизненной ценности клиента (CLV), а также геометрическая и смещенная бета-геометрическая модели удержания и оттока клиентов. Были проанализированы официальные показатели Узбекистана: объем онлайн-продаж в 2025 г. достиг 22,7 трлн сумов, число банковских карт превысило 68,27 млн. Была составлена матрица механизмов, включающая издержки переключения, программы лояльности, подписку, персональные предложения на основе анализа данных и экосистемные сервисы. На условном когортном примере в Python было показано, что рост удержания с 60 до 70% повысил ценность клиента на 30%, а программа лояльности окупилась на второй год. Было предложено включить показатели удержания в управленческую отчетность предприятий.

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

Ключевые слова: пожизненная ценность клиента, удержание клиентов, отток клиентов, программа лояльности, издержки переключения, экосистема, цифровая экономика.

INTRODUCTION

An enterprise that sells a service over a digital channel pays most of its acquisition cost before the first transaction, while the revenue arrives month after month for as long as the customer stays. The length of that relationship therefore decides whether a customer is profitable at all. Reichheld and Sasser showed more than three decades ago that small gains in retention translate into large gains in profit for service firms [1], and the logic has become sharper in digital markets, where a rival offer is one tap away and the cost of attracting a new user through paid advertising keeps rising.

Uzbekistan offers a clear setting for this question. According to the National Agency for Perspective Projects, online sales reached 22.7 trillion soums in 2025, 1.5 times the level of 2024, and their share in total retail trade rose from 3.7% to 4.6% [2]. The Central Bank reports that more than 68.27 million bank cards were in circulation on 1 January 2026, twice the 34.2 million recorded at the start
of 2023 [3]. Account ownership among adults grew from 44.1% in 2021 to 59.7% in 2024 [4]. These figures describe a market in which the number of digital customers grows fast, so the next source of value for enterprises is how long each customer stays and how much of their spending the enterprise keeps.

The thesis addresses two questions. RQ1: which economic mechanisms lengthen the customer relationship in a digital service business, and through which lever (retention probability or margin) does each act? RQ2: how large must a retention gain be for a retention investment to pay back, and how fast does it pay back? The contribution is a compact decision framework that links a mechanism matrix to the CLV formula and to a break-even retention rate that managers can compute from their own data.

LITERATURE REVIEW

Customer lifetime value turns the length of a relationship into money. Gupta, Lehmann and Stuart valued customers as a stream of margins weighted by the probability of survival and showed, for five listed internet and service firms, that a 1% improvement in retention raised customer value by about 5%, against about 1% for the same improvement in margin and far less for acquisition cost [5]. The later review by Gupta et al. set out the family of CLV models and stressed that retention is the parameter most sensitive to managerial action [6].

Duration research explains what keeps a customer. Bolton modelled the duration of relationships with a continuous service provider and found that cumulative satisfaction lengthens it, that losses from service failures weigh more than equal gains, and that experienced customers rely more on their accumulated satisfaction than on the latest episode [7]. Reinartz and Kumar linked profitable lifetime duration to purchase frequency, cross-buying and the use of several channels, which matters for omnichannel digital firms [8]. Fader and Hardie added a simple and robust tool: the shifted-beta-geometric (sBG) model, which assumes that each customer has a constant churn probability but that these probabilities differ across customers, so the observed retention rate of a cohort rises over time as the least loyal leave first [9].

A second stream studies barriers to leaving. Burnham, Frels and Mahajan separated procedural, financial and relational switching costs and showed that each raises the intention to stay independently of satisfaction [10]. Farrell and Klemperer explained how switching costs and network effects create lock-in, giving firms market power over existing customers while intensifying competition for new
ones [11]. Loyalty programmes sit between reward and barrier: Bolton, Kannan and Bramlett found that programme members discount negative service experiences [12], and Dorotic, Bijmolt and Verhoef concluded that programme effects are real but often smaller than expected once self-selection of already loyal customers is controlled for [13]. Ascarza showed that retention campaigns work best when targeted at customers whose behaviour responds to the campaign rather than at those with the highest

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

churn risk [14]. Ecosystem research adds a structural mechanism: complementary services bundled on one platform raise the value of staying and the cost of leaving at the same time [15].

These two lines, valuation and mechanisms, are rarely joined into one decision rule for enterprises in emerging digital markets, where research has focused on adoption rather than on keeping customers already acquired.

METHODOLOGY

The study combines a review of official statistics on Uzbekistan's digital economy [2]; [3]; [4]; [16] with an analytical model of customer value. Under a constant retention rate and a constant annual margin, the lifetime value of a newly acquired customer is [5]:

$$CLV=\frac{m\cdot r}{1+d-r} \qquad (1)$$

where CLV is customer lifetime value, m is the annual margin earned from an active customer, r is the annual retention rate (the share of customers who stay for the next year) and d is the annual discount rate. The expected length of the relationship is $E(T)=1/(1-r)$ years. In plain words, formula (1) adds up all the profit a customer is expected to bring in future years, with later years counted for less because money today is worth more than money later.

The sensitivity of value to retention follows from differentiating (1):

$$\frac{dCLV}{dr}=\frac{m(1+d)}{(1+d-r)^2} \qquad (2)$$

where the symbols are as in (1). Because the denominator shrinks as r grows, each additional point of retention is worth more when retention is already high. Put simply, keeping customers becomes more rewarding the better a firm already is at keeping them.

Real cohorts are mixed: some customers are loyal and some are about to leave. The sBG model captures this by letting the individual churn probability follow a beta distribution with parameters α and β [9]. The retention rate in period t and the share of the cohort surviving to period t are:

$$r_t=\frac{\beta+t-1}{\alpha+\beta+t-1} \qquad (3)$$

$$S(t)=\frac{B(\alpha,\beta+t)}{B(\alpha,\beta)} \qquad (4)$$

where r_t is the retention rate observed in year t, S(t) is the survival share and B is the beta function. A higher β relative to α means a more loyal customer base. In everyday terms, the model explains why a firm sees many customers leave in the first year and fewer later: the customers who remain are, on average, the more loyal ones.

A retention mechanism changes r, often changes m (rewards and discounts cost money) and carries a set-up cost F per enrolled customer. Its net value per customer over a horizon of H years is:

$$NV=\sum_{t=1}^{H}\frac{m_1 r_1^t-m_0 r_0^t}{(1+d)^t}-F \qquad (5)$$

where index 0 refers to the situation without the mechanism and index 1 to the situation with it. Setting the net value of the infinite-horizon version of (5) to zero gives the break-even retention rate:

$$r^*=\frac{(CLV_0+F)(1+d)}{m_1+CLV_0+F} \qquad (6)$$

where CLV_0 is customer value without the mechanism and m_1 is the margin after the cost of the mechanism. Plainly speaking, r^* is the minimum retention a programme must achieve to earn back what it costs. All calculations were performed in Python. Because enterprise-level retention data for Uzbekistan are not publicly available, the cohort parameters below are hypothetical and serve only to show how the method works; their empirical estimation from enterprise transaction records is the next research step.

ANALYSIS AND RESULTS

Digital customer base in Uzbekistan

Table 1

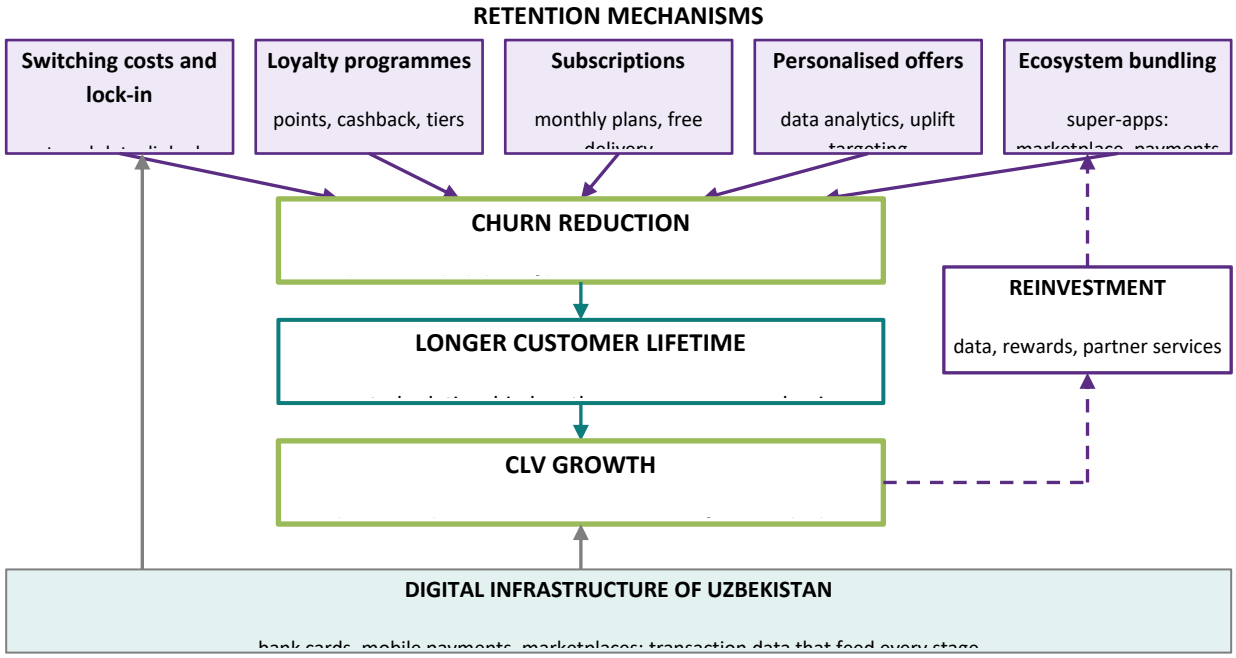
© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

Indicators of the digital customer base in Uzbekistan[1]

Indicator	Earlier value	Latest value
Online sales, trillion soums	≈15.2 (2024)	22.7 (2025)
Share of online sales in retail trade, %	3.7 (2024)	4.6 (2025)
Bank cards in circulation, million	34.2 (start of 2023)	68.27 (1 January 2026)
Payments through terminals, trillion soums	326.7 (2024)	460.25 (2025)
Account ownership, % of adults	44.1 (2021)	59.7 (2024)
Uzum ecosystem users, million	n/a	more than 20 (2025)

Table 1 shows that the base of digitally reachable customers has expanded quickly. Card numbers doubled in three years, terminal payments grew by about 41% in 2025, and online retail grew by half [2]; [3]. The ecosystem model has also taken root locally: Uzum reported more than 20 million users, more than 20,000 sellers and over half of its platform payments made through its own financial tools [16]. For enterprises, the growth path now runs through keeping this expanding pool of digital customers, not only through acquiring new ones.

Mechanism matrix



Dashed line: part of the value gained is reinvested, strengthening the mechanisms in the next cycle

Figure 1. Retention mechanisms, churn reduction and CLV growth loop[2]

Figure 1 presents the mechanisms as a self-reinforcing loop. Each mechanism lowers the probability of leaving, a longer relationship follows, and CLV rises. Part of the extra value is reinvested in data, rewards and partner services, which strengthens the mechanisms in the next cycle, while cards, mobile payments and marketplaces supply the transaction data on which the loop runs.

Table 2

[1] Source: Compiled by the author from [2]; [3]; [4]; [16]. The 2024 online sales value is the author's calculation (3.7% of retail trade of 410.07 trillion soums); growth rates are the author's calculation from the cited values. Uzum figures are company-reported and unaudited.

[2] Source: Developed by the author based on [5]; [9]; [10]; [15].

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

Matrix of economic mechanisms for extending customer lifetime[3]

Mechanism	Main lever	Main cost to the enterprise	Expected effect on retention	Condition for success
Switching costs and lock-in (stored data, linked cards, history)	Retention	Low; integration and data storage	Medium	Core service quality stays high
Loyalty programme (points, cashback, tiers)	Retention up, margin down	Rewards, programme operation	Medium	Rewards target responsive customers
Subscription (monthly plan, free delivery)	Retention	Revenue forgone on heavy users	Medium to high	Clear value for the fee
Personalised offers via data analytics	Retention up, margin down	Analytics staff, discounts	Low to medium	Uplift-based targeting
Ecosystem bundling (marketplace, payments, instalments)	Retention, cross-buying	Platform building or partner fees	High	Services truly complement each other

Table 2 orders five mechanisms by the lever they move. Switching costs and subscriptions act mainly on r at low running cost, but they work only when the core service is good; a customer kept by a barrier alone tends to leave as soon as a competitor removes it [10]; [11]. Loyalty programmes and personalised offers raise r while reducing m, so their payoff depends on targeting [13]; [14]. Ecosystem bundling has the strongest expected effect on both duration and cross-buying [8]; [15], and its cost is the highest, which suits large platforms or partnerships among smaller firms.

Illustrative cohort example

Table 3

Illustrative (hypothetical) cohort: effect of retention mechanisms on CLV[4]

Scenario	Retention rate	Annual margin	Expected lifetime, years	CLV	Net gain after set-up cost	Break-even retention	Payback year
Baseline	0.60	300	2.50	321.4	-	-	-
Loyalty programme (set-up cost 25)	0.70	275	3.33	418.5	72.0	0.647	2

[3] Source: Developed by the author based on [10]; [11]; [12]; [13]; [14]; [15]. Effect ratings are the author's qualitative assessment of the cited evidence, not measured values.

[4] Source: Author's calculation in Python using formulas (1), (2), (5) and (6). Hypothetical assumptions: cohort of 20,000 customers; baseline margin 300 thousand soums per active customer per year; discount rate 16%; retention rates, margins after mechanism costs and set-up costs as shown. Values are in thousand soums per customer unless stated.

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

Scenario	Retention rate	Annual margin	Expected lifetime, years	CLV	Net gain after set-up cost	Break-even retention	Payback year
Personalised offers (set-up cost 15)	0.66	292	2.94	385.4	49.0	0.621	2
Ecosystem bundle (set-up cost 40)	0.75	270	4.00	493.9	132.5	0.664	2

Table 3 applies formulas (1), (2), (5) and (6) to a hypothetical cohort. At a 60% baseline retention rate a customer is worth 321.4 thousand soums. A points-based loyalty programme that lifts retention to 70% raises CLV to 418.5 thousand soums, an increase of 30%, although each active customer now earns 25 thousand soums less per year. After the set-up cost, the net gain is 72.0 thousand soums per customer, or about 1.44 billion soums for a cohort of 20,000 customers. The programme would break even at a retention rate of 64.7%, so it needs a gain of at least 4.7 percentage points. Personalised offers need only 2.1 points because they cost less, while the ecosystem bundle needs 6.4 points but delivers the largest gain. In all three cases the cumulative discounted cash flow turns positive in the second year (author's calculation).

Formula (2) explains the ranking. At the baseline, one extra percentage point of retention adds about 11.1 thousand soums of CLV; in the ecosystem scenario, with 75% retention and a 270 thousand soum margin, it adds about 18.6 thousand soums. The sBG version of the same cohort gives a further insight. With $\alpha=2$ and $\beta=3$ the first-year retention is also 60%, but it rises to 71.4% in the third year and 77.8% in the fifth as less loyal customers leave. Customer value under this heterogeneous model is 420.1 thousand soums, 31% higher than the constant-retention estimate. A firm that applies one average retention rate to all years therefore undervalues its loyal core and may underinvest in keeping it [9].

CONCLUSION AND SUGGESTIONS

Answering RQ1, the duration of customers' use of enterprise services is extended through two levers: mechanisms that raise the retention probability (switching costs, subscriptions, ecosystem bundling) and mechanisms that raise it at the expense of margin (loyalty rewards and personalised discounts). Answering RQ2, a retention investment pays back when the achieved retention exceeds the break-even rate (6); in the illustrative cohort, gains of 2 to 6 percentage points were enough, and payback came in the second year.

Three recommendations follow for enterprises working in Uzbekistan's digital market. First, retention rate, expected lifetime and CLV by acquisition cohort should be reported alongside sales in management accounts, because the growing digital customer base shown in Table 1 makes these indicators measurable from transaction data. Second, before launching a loyalty programme, a firm should compute its break-even retention rate and test the programme on a randomly selected group, directing offers to customers whose behaviour responds to them. Third, small and medium-sized enterprises can obtain ecosystem effects through partnerships with marketplaces and payment platforms rather than by building their own.

The results rest on hypothetical parameters and illustrate the method rather than measure actual effects. Future research will estimate the sBG and hazard parameters from enterprise transaction records and test the mechanism effects with field experiments in Uzbek service companies.

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.

REFERENCES

1. Reichheld, F. F., & Sasser, W. E. (1990). Zero defections: Quality comes to services. Harvard Business Review, 68(5), 105-111. https://hbr.org/1990/09/zero-defections-quality-comes-to-services
2. UzDaily. (2026, February 21). Online sales in Uzbekistan reach 22.7 trillion soums in 2025 (based on data of the National Agency for Perspective Projects). https://www.uzdaily.uz/en/online-sales-in-uzbekistan-reach-227-trillion-soums-in-2025/
3. Kun.uz. (2026, February 9). Cashless transactions surge as bank card usage rises across Uzbekistan (based on Central Bank of Uzbekistan data). https://kun.uz/en/news/2026/02/09/cashless-transactions-surge-as-bank-card-usage-rises-across-uzbekistan
4. World Bank. (2025). The Global Findex Database 2025. Indicator account.t.d (Account, % age 15+), Uzbekistan. https://api.worldbank.org/v2/country/UZB/indicator/account.t.d?source=28&format=json
5. Gupta, S., Lehmann, D. R., & Stuart, J. A. (2004). Valuing customers. Journal of Marketing Research, 41(1), 7-18. https://doi.org/10.1509/jmkr.41.1.7.25084
6. Gupta, S., Hanssens, D., Hardie, B., Kahn, W., Kumar, V., Lin, N., Ravishanker, N., & Sriram, S. (2006). Modeling customer lifetime value. Journal of Service Research, 9(2), 139-155. https://doi.org/10.1177/1094670506293810
7. Bolton, R. N. (1998). A dynamic model of the duration of the customer's relationship with a continuous service provider: The role of satisfaction. Marketing Science, 17(1), 45-65. https://doi.org/10.1287/mksc.17.1.45
8. Reinartz, W. J., & Kumar, V. (2003). The impact of customer relationship characteristics on profitable lifetime duration. Journal of Marketing, 67(1), 77-99. https://doi.org/10.1509/jmkg.67.1.77.18589
9. Fader, P. S., & Hardie, B. G. S. (2007). How to project customer retention. Journal of Interactive Marketing, 21(1), 76-90. https://doi.org/10.1002/dir.20074
10. Burnham, T. A., Frels, J. K., & Mahajan, V. (2003). Consumer switching costs: A typology, antecedents, and consequences. Journal of the Academy of Marketing Science, 31(2), 109-126. https://doi.org/10.1177/0092070302250897
11. Farrell, J., & Klemperer, P. (2007). Coordination and lock-in: Competition with switching costs and network effects. In M. Armstrong & R. Porter (Eds.), Handbook of Industrial Organization (Vol. 3, pp. 1967-2072). Elsevier. https://doi.org/10.1016/S1573-448X(06)03031-7
12. Bolton, R. N., Kannan, P. K., & Bramlett, M. D. (2000). Implications of loyalty program membership and service experiences for customer retention and value. Journal of the Academy of Marketing Science, 28(1), 95-108. https://doi.org/10.1177/0092070300281009
13. Dorotic, M., Bijmolt, T. H. A., & Verhoef, P. C. (2012). Loyalty programmes: Current knowledge and research directions. International Journal of Management Reviews, 14(3), 217-237. https://doi.org/10.1111/j.1468-2370.2011.00314.x
14. Ascarza, E. (2018). Retention futility: Targeting high-risk customers might be ineffective. Journal of Marketing Research, 55(1), 80-98. https://doi.org/10.1509/jmr.16.0163
15. Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. Strategic Management Journal, 39(8), 2255-2276. https://doi.org/10.1002/smj.2904
16. UzDaily. (2026, February 13). Uzum surpasses 20 million users (company results for 2025). https://www.uzdaily.uz/en/uzum-surpasses-20-million-users/

© 2026 International Conference on Artificial Intelligence and Applications . All Rights Reserved.