Navigating Digital Financial Ecosystems: Synergy, Mobile Payment Adoption, and Consumer Behavior

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UDC: 336.7; EDN: XOYALO; **JEL:** E21, E42, G23, O33, Z33
DOI: 10.58587/18292437-2026.5-312
Keywords & phrases: Digital Payments, Mobile Wallets, Digital Financial Literacy, E-Commerce Settlement, Buy Now, Pay Later, Payment Ecosystem Synergy, Financial Inclusion

Թվային ֆինանսական էկոհամակարգի փոխազդեցությունը. բջջային վճարումների ներդրումը և սպառողական վարքագիծը

Սահակյան Ռուզան Ա.
Տնտեսագիտության թեկնածու, դոցենտ, Ֆինանսական շուկաներ և ինստիտուտներ ամբիոն, Հայաստանի պետական տնտեսագիտական համալսարան (Երևան, ՀՀ)
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Ամփոփագիր. Հոդվածն ուսումնասիրում է, թե ինչպես են թվային դրամապանակները, բջջային վճարումները և «Գնիր հիմա, վճարիր հետո» (BNPL) ճկուն մեթոդներ փոխակերպում առօրյա գնումները՝ նվազեցնելով սպառողների կախվածությունը ավանդական կանխիկից և բանկային քարտերից: Թվային ֆինանսների ակտիվ զարգացման պայմաններում հետազոտության հիմնական նպատակն է քննել, թե ինչպես են թվային ֆինանսական գրագիտությունը, բջջային վճարումների իրազեկվածությունը և փոխվող սպառողական սովորույթները ազդում ինչպես ներքին մանրածախ գործարքների, այնպես էլ արտաքին էլեկտրոնային առևտրի վրա: Այս փոփոխությունները գնահատելու համար վերլուծվում են ԱՄՆ-ի և գլոբալ վճարային համակարգերի երկարաժամկետ միտումները, ինչպես նաև ներդրվում է չափման նոր գործիք՝ «Թվային ֆինանսական էկոհամակարգի սիներգիայի ինդեքսը» (DFESI): Այն օգնում է քանակապես գնահատել բջջային հարթակների ինտեգրումը ավանդական վճարային ցանցերում: Հետազոտության գիտական նորույթն այն է, որ վճարային մեթոդները չեն դիտարկվում միմյանցից անջատ. փոխարենը՝ թվային տիրույթը ուսումնասիրվում է որպես մեկ միասնական, փոխկապակցված էկոհամակարգ: Աշխատանքում ընդգծվում է, թե ինչպես է բջջային դրամապանակների և այլընտրանքային ֆինանսավորման աճը փոխում ֆինանսական կառուցվածքները և նվազեցնում կախվածությունը հին քարտային ցանցերից: Արդյունքները ցույց են տալիս, որ բարձր գրագիտությամբ աջակցվող, տեխնոլոգիապես առաջադեմ վճարային էկոհամակարգերը ապահովում են տնտեսական կայունության լավագույն հիմքը՝ արժեքավոր ուղեցույց դառնալով քաղաքականություն մշակողների, հետազոտողների և ֆինանսական կառույցների համար:
Հանգուցաբառեր և բառակապակցություններ՝ Թվային վճարումներ, Բջջային դրամապանակներ, Թվային ֆինանսական գրագիտություն, Էլեկտրոնային առևտրի փոխհաշվարկներ, «Գնիր հիմա, վճարիր հետո», Վճարային էկոհամակարգի սիներգիա, Ֆինանսական ներառականություն

Синергия цифровой финансовой экосистемы: внедрение мобильных платежей и потребительское поведение

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Аннотация. В статье исследуется, как цифровые кошельки, варианты мобильной оплаты и гибкие инструменты «Купи сейчас, плати потом» (BNPL) трансформируют повседневные покупки, снижая зависимость потребителей от традиционных наличных денег и банковских карт. В условиях активного развития цифровых финансов основная цель исследования заключается в изучении того, как цифровая финансовая грамотность, осведомленность о мобильных платежах и меняющиеся привычки влияют на внутренние розничные транзакции и внешнюю электронную коммерцию. Для оценки этих сдвигов анализируются долгосрочные платежные тренды в США и мире, а также вводится новый инструмент измерения — «Индекс синергии цифровой финансовой экосистемы» (DFESI). Он позволяет количественно оценить степень интеграции современных мобильных платформ по сравнению с традиционными платежными сетями. Научная новизна заключается в отказе от изолированного рассмотрения способов оплаты и переходе к восприятию цифрового ландшафта как единой, взаимосвязанной экосистемы. Подчеркивается, как рост популярности мобильных кошельков и альтернативного финансирования меняет финансовые структуры и снижает зависимость от устаревших карточных сетей. В конечном итоге результаты показывают, что доступные и технологичные платежные экосистемы, поддерживаемые высокой грамотностью, создают прочную основу для экономической устойчивости, предоставляя ценные ориентиры для регуляторов, исследователей и финансовых институтов, определяющих будущее торговли.

Ключевые слова и словосочетания: Цифровые платежи, Мобильные кошельки, Цифровая финансовая грамотность, Расчеты в электронной коммерции, «Купи сейчас, плати потом», Синергия платежной экосистемы, Финансовая инклюзивность

Introduction. The rapid evolution of financial technology has transformed the global commercial landscape, shifting consumer transactions away from cash and legacy plastic toward mobile-first, embedded digital ecosystems. As e-wallets and alternative checkout frameworks transition into the primary infrastructure of modern commerce, they redefine domestic and international market interactions. This transition is propelled by smartphone proliferation, connectivity, and preference for frictionless experiences. However, this technological shift introduces complex dynamics. While near-field communication and QR codes enhance transactional velocity and financial inclusion, they expose vulnerabilities related to data privacy, digital financial literacy, and legacy network concentration. Existing literature often treats payment adoption as isolated metrics, leaving a critical gap in understanding how diverse financial innovations operate together as an interconnected, multi-sided ecosystem. To bridge this conceptual division, this paper investigates the holistic evolution of modern digital payment architectures and their broader impact on consumer behavior and retail market structures. By integrating longitudinal market trends with a novel analytical lens—the Digital Financial Ecosystem Synergy Index—this study examines the structural interplay between mobile wallet expansion, Buy Now, Pay Later financing, cross-border e-commerce integration, and traditional card network dominance. Ultimately, this research provides a comprehensive framework to help policymakers, financial institutions, and researchers navigate the shifting dynamics of the digital economy and foster resilient, inclusive payment systems.

Research methodology. This study adopts a multi-methodological approach to examine the structural evolution and synergy of digital payment platforms and mobile-first architectures. We employ a longitudinal market analysis of U.S. and global e-commerce payment distributions, combining empirical point-of-sale and online checkout data. To ensure rigorous evaluation, we introduce a novel instrument—the Digital Financial Ecosystem Synergy Index (DFESI)—quantifying alternative payment integration against legacy network concentration. Integrating demographic mapping and revenue metrics, this research evaluates how digital financial literacy, mobile awareness, and installment financing drive modern financial inclusion and economic resilience. The scientific novelty lies in adopting an integrated, multi-sided ecosystem perspective. Unlike studies treating mobile wallets, Buy Now, Pay Later financing, or card networks as isolated tools, this paper links consumer adoption hierarchies with market friction. Ultimately, this research provides a comprehensive blueprint for maturing retail oversight architectures in global economies.

Literature review. Digital payment awareness originates from foundational literacy research, encompassing operational and critical competencies [**9**; **30**]. While operational skills drive competence, payment awareness specifically targets the utilization of financial tools [**12**]. Despite these classifications, existing literature largely treats payment awareness merely as a measurement indicator, leaving its precise functional role in targeted digital transactions underexplored and requiring deeper empirical investigation.

Bridging this gap requires connecting foundational digital literacy with the specialized domain of digital financial literacy, which has emerged as a crucial multidimensional construct linking traditional financial knowledge with digital

competencies [**2**; **22**]. Defined by the OECD (2024) as the essential mix of skills, attitudes, and behaviors required to navigate digital financial services securely [**20**], DFL extends far beyond standard literacy by incorporating practical "know-how" and platform awareness [**17**; **25**]. Consequently, as digital payment ecosystems and mobile banking continue to expand rapidly, researchers emphasize that advanced consumer proficiency and structured payment awareness directly govern secure transactions and drive responsible financial engagement [**10**; **14**].

As digital mobile payment applications transition from peripheral utilities into foundational pillars of the digital economy, they act as critical socio-technical conduits linking personal accounts with merchant networks [**19**; **21**]. Propelled by widespread smartphone proliferation and high-speed mobile connectivity [**18**], modern DMPAs prioritize core attributes like streamlined usability, security, and convenience [**11**]. Leveraging technologies such as near-field communication (NFC) and QR codes—with domestic scans continuing an aggressive upward trajectory [**13**] — these platforms fundamentally reshape contemporary transactional behaviors and drive modern financial inclusion.

Building upon this technological shift, Ahnert et al. (2025) examine trade-offs between digital payments, credit, and consumer privacy, showing that while digital rails drive e-commerce efficiency, they expose data to lenders, whereas cash preserves anonymity [**3**].

Furthermore, Lan et al. (2026) demonstrate that FinTech and digital payments enhance urban inclusion, with synergy reinforced by policy [**15**]. Addressing infrastructure, Bizama (2026) investigates Central Bank Digital Currencies using Brazil's Pix and Drex systems. Findings indicate that while fast payments modernize finance, adoption faces security hurdles, presenting policymakers with the choice between building CBDC infrastructure or upgrading existing networks [**6**].

Building consumer confidence and trust in digital payment systems fundamentally relies on robust regulatory frameworks and active government support [**8**]. However, widespread adoption faces persistent barriers, notably security vulnerabilities, perceived privacy risks, and transaction costs [**1**; **4**]. To mitigate these challenges and fortify user trust, modern financial infrastructures increasingly integrate advanced technological mechanisms such as blockchain and biometric authentication [**5**, **7**], while addressing cost efficiency remains a critical priority for merchant integration.

Building upon user adoption, empirical research explores digital platform stimulative effects. Sasaki and Ueda (2026) show that QR code campaigns increase payments and overall spending, though this impact is highly transitory [**24**].

Expanding to institutional design, Lin and Wang (2026) assert that Central Bank Digital Currencies must be engineered as sovereign merit goods prioritizing public value and human rights over commercial competition [16**].** This aligns with Sargsyan and Mardoyan (2026), who demonstrate that transitioning from card-centred to account-centred architectures transcends technical efficiency, demanding robust regulatory frameworks and inclusive design to safeguard consumer welfare across modern digital financial ecosystems [**23**].

Analysis. To contextualize virtual commerce, analyzing how consumer preferences intersect with technological advancements reveals a profound structural shift toward digital wallets. As detailed in Table 1, U.S. e-commerce e-wallets surged from 23% in 2016 to 40% by 2025, and are projected to capture 44% by 2030, underscoring preference for frictionless mobile transactions.

Conversely, traditional payment methods exhibit distinct contraction patterns. Credit cards peaked at 33% in 2019 before stabilizing around 30%–32% through 2025, with a projected decline to 29% by 2030. Similarly, debit cards—reaching 28% in 2025—face a contraction to 25% by 2030, while cash equivalents remain marginal below 2%.

Simultaneously, alternative payment methods have carved out meaningful market niches. Buy Now, Pay Later services grew from 1% in 2019 to 6% in 2025, projected to hit 8% by 2030. Furthermore, account-to-account transfers maintain a recurring presence in digital checkout flows, illustrating a broader migration toward mobile-first infrastructures.

Payment method	**2016**	**2019**	**2022**	**2025**	**2030 (Proj.)**
E-wallet, Digital/mobile wallet	23%	24%	32%	40%	44%
Credit card *(incl. charge card)*	26%	33%	30%	32%	29%
Debit card *(incl. prepaid)*	16%	18%	20%	28%*	25%
Buy now, pay later (BNPL)	–	1%	5%	6%	8%
Account-to-account (A2A)	–	–	9%	5%	4%

Cash on delivery (CoD)	8%	3%	1%	–	1%
Others & PrePay	7%	2%	1%	2%*	2%

Table 1. Market share of cash, credit cards, and other payment methods at point of sale (POS) in the United States from 2017 to 2025, with a forecast for 2030 **[26]**

As illustrated in Chart 1, empirical data on U.S. point-of-sale payments demonstrates that physical-world behaviors coexist with digital innovations. Debit cards lead consumer transactions at 64%, followed by cash at 56% and credit cards at 44%.

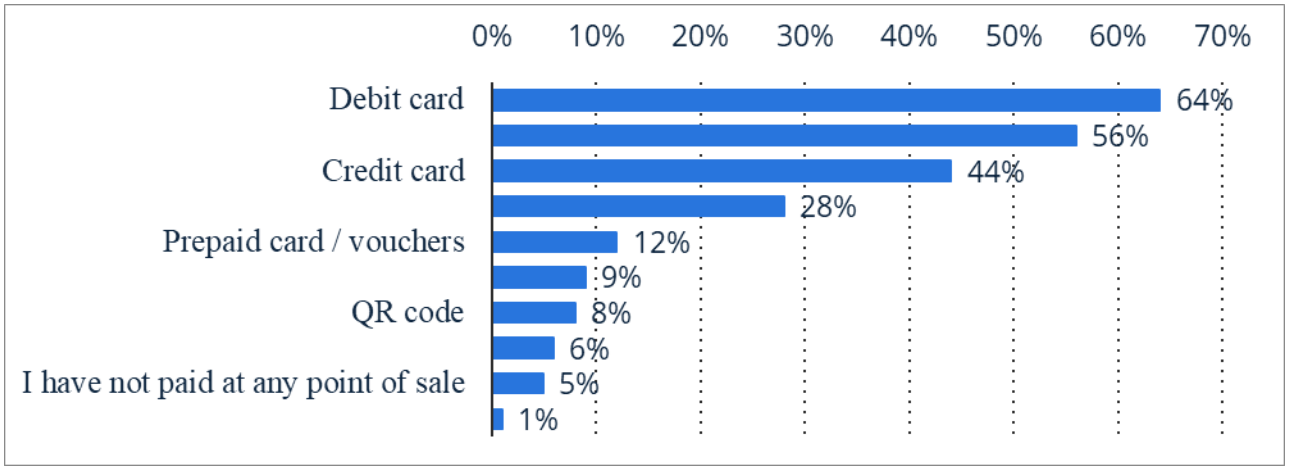

Chart 1. *Payments at points of sale by type in the U.S. as of September 2025*

Meanwhile, mobile wallets capture a substantial 28% market share, highlighting rapid consumer migration toward contactless payments in retail environments. Secondary methods—such as prepaid cards (12%), checks (9%), QR codes (8%), and biometrics (6%)—further illustrate a diversifying transactional ecosystem where omnichannel convenience redefines everyday consumer engagement.

As further demonstrated in Chart 2, an examination of online payment methods in the United States as of December 2025 reveals distinct digital checkout preferences in virtual retail environments. Debit cards emerge as the most prevalent online payment tool at 58%, followed closely by credit cards at 44% and online payment services or digital wallets (such as PayPal) at 36%.

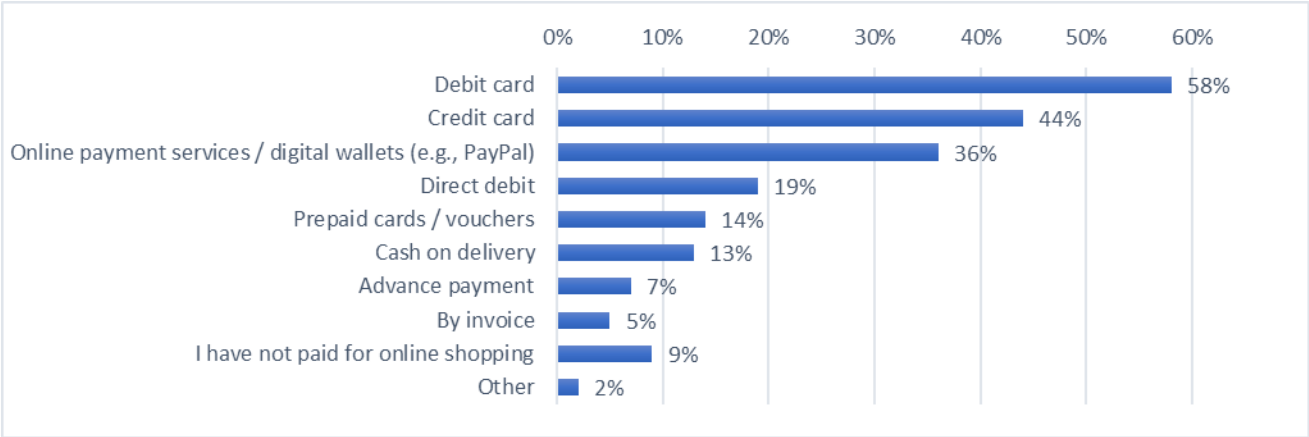

Chart 2. *Most common online payments by type in the U.S. as of December 2025*

Furthermore, alternative e-commerce settlement methods capture meaningful market penetration, including direct debit at 19%, prepaid cards and vouchers at 14%, cash on delivery at 13%, advance payments at 7%, and payment by invoice at 5%. These empirical patterns underscore that while traditional card instruments retain strong leadership in virtual transactions, digital wallets and alternative account-to-account frameworks play an increasingly vital role in shaping modern e-commerce consumer behavior.

	2011	2014	2017	2021	2024*
Ownership	61.9%	60.1%	65.6%	66.7%	68.5%
Used a credit card	-	57.1%	61.9%	62.5%	65.3%
Gender:					-
Male	67.8%	58.7%	68%	65.6%	65.8%
Female	56.3%	61.5%	63.3%	67.7%	71.2%
Age group:					-
15-24 years	38.7%	24.3%	39.5%	37.3%	37.8%
25 years and older	66.8%	67.1%	70.2%	71.8%	73.5%
Income level:					-
Poorest 40%	43.3%	40.2%	43.6%	46%	46.3%
Richest 60%	74.3%	73%	80.2%	80.4%	83.3%

Table 2. *Share of individuals who own a credit card in the United States in 2011, 2014, 2017 and 2021 with a forecast for 2024, by age, gender, and income level*

As detailed in Table 2, longitudinal data examining the share of individuals who own a credit card in the United States across 2011, 2014, 2017, and 2021, with projections for 2024, reveals a steady upward trajectory in overall card adoption. Total credit card ownership rose from 61.9% in 2011 to 66.7% in 2021, reaching an estimated 68.5% by 2024. Active utilization closely mirrors this trend, growing from 57.1% in 2014 to 65.3% by 2024.

Demographic segmentations in Table 2 highlight significant adoption variances across gender, age, and income brackets. By gender, female ownership experienced notable expansion, growing from 56.3% in 2011 to surpass male ownership by reaching 71.2% in 2024, compared to 65.8% for males. Across age groups, individuals aged 25 and older maintain high and growing penetration, rising from 66.8% in 2011 to 73.5% in 2024, whereas the 15–24 age cohort hovers around a stable 37% to 39% range. Furthermore, income level serves as a major determinant of ownership; individuals in the richest 60% demonstrated high adoption rates climbing from 74.3% in 2011 to 83.3% in 2024, while the poorest 40% saw ownership increase from 43.3% to 46.3% over the same period.

Conversely, certain markets exhibit a notably higher propensity for cross-border digital transactions. Chart 3 demonstrates that Japan leads all observed countries in cross-border e-commerce revenue integration at 35.13%, leaving domestic transactions at 64.87%. Germany follows closely with 32.13% of its e-commerce revenue generated via cross-border channels, while South Korea (27.79%) and Argentina (27.61%) also showcase significant cross-border engagement.

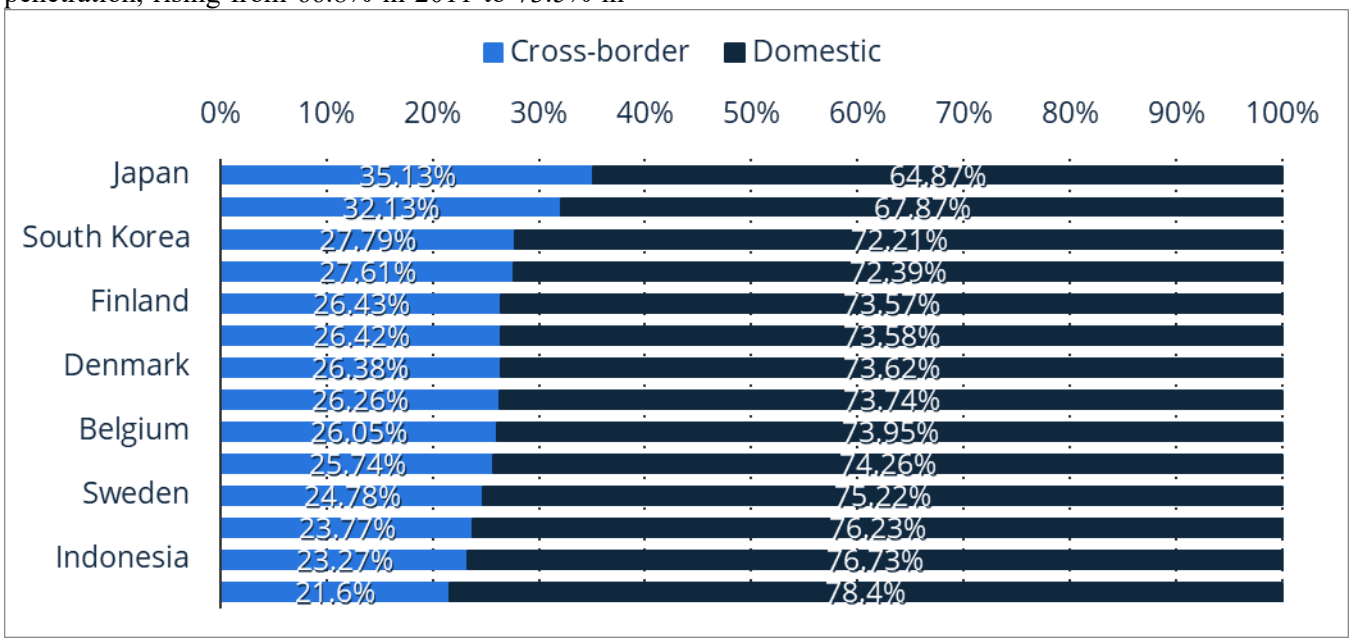

Chart 3. *Distribution of domestic and cross-border e-commerce revenues in 2026, by country*

European nations such as Finland, Austria, and Denmark cluster tightly around a 26% cross-border share. These cross-country variations underscore how localized consumer habits, logistics infrastructure, and regional trade integration shape the balance between domestic online marketplaces and international e-commerce platforms.

As illustrated in Chart 4, a longitudinal analysis of the general-purpose card market in the United States from 2007 to 2024 reveals a highly consolidated industry dominated by a persistent network duopoly.

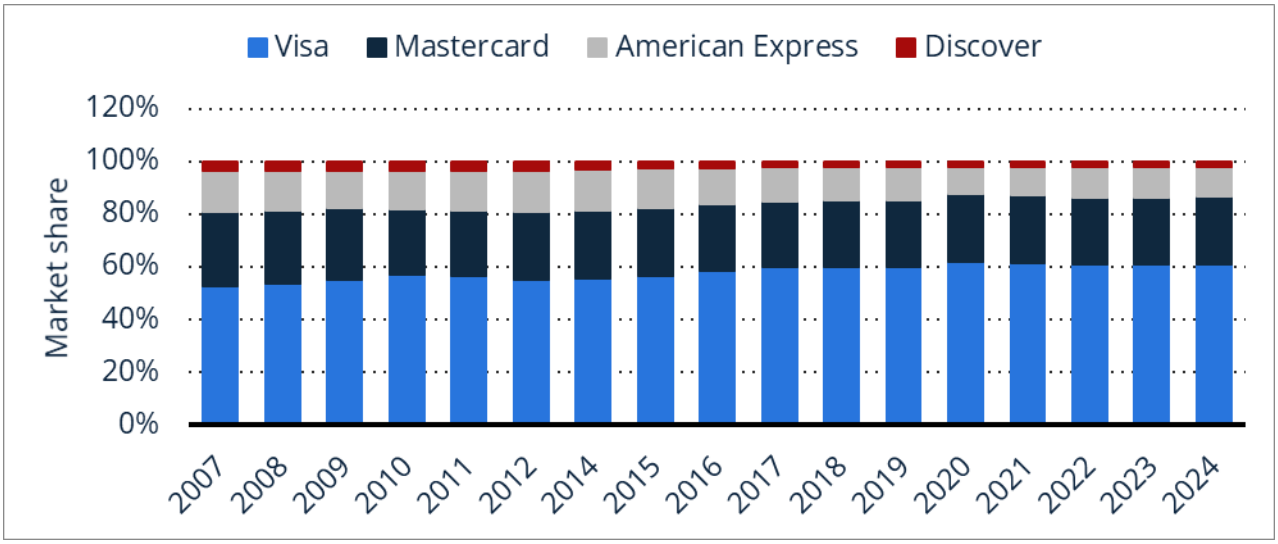

Chart 4. *Market share of Visa, Mastercard, American Express, discover as general-purpose card brands in the United States from 2007 to 2024, based on value of transactions* **[27]**

Throughout the observed period, Visa has consistently maintained and expanded its market leadership, growing its share of transaction value from approximately 52% in 2007 to a commanding position of over 60% by 2024. Mastercard remains the second-largest network, experiencing a slight historical contraction from roughly 28% to an enduring, stable market penetration of approximately 25% across the latter half of the observed horizon.

In contrast, American Express and Discover occupy distinct secondary positions within the payment ecosystem. As evidenced by Chart 4, American Express maintains a steady structural presence, capturing a range of 11% to 16% of the transaction value over the timeframe, reflecting its concentrated focus on premium consumer and corporate segments.

Meanwhile, Discover continues to hold a marginal footprint, consistently registering roughly 2% to 4% of the total market share. Ultimately, these empirical trends underscore the formidable barriers to entry and the enduring infrastructural dominance of Visa and Mastercard in U.S. consumer and commercial transaction processing.

As further demonstrated in Chart 5, an examination of the biggest contactless payment and digital wallet brands in the United States as of December 2025 reveals distinct consumer adoption hierarchies across virtual and mobile transaction platforms. PayPal leads the market with an extensive adoption rate of 65% among respondents, followed closely by Cash App at 51% and Apple Pay at 41%. Venmo (30%) and Google Pay (29%) also command substantial user bases, while e-commerce and alternative checkout ecosystems such as Amazon Pay (19%), AfterPay (15%), and Klarna (9%) capture notable segments of digital consumer financing.

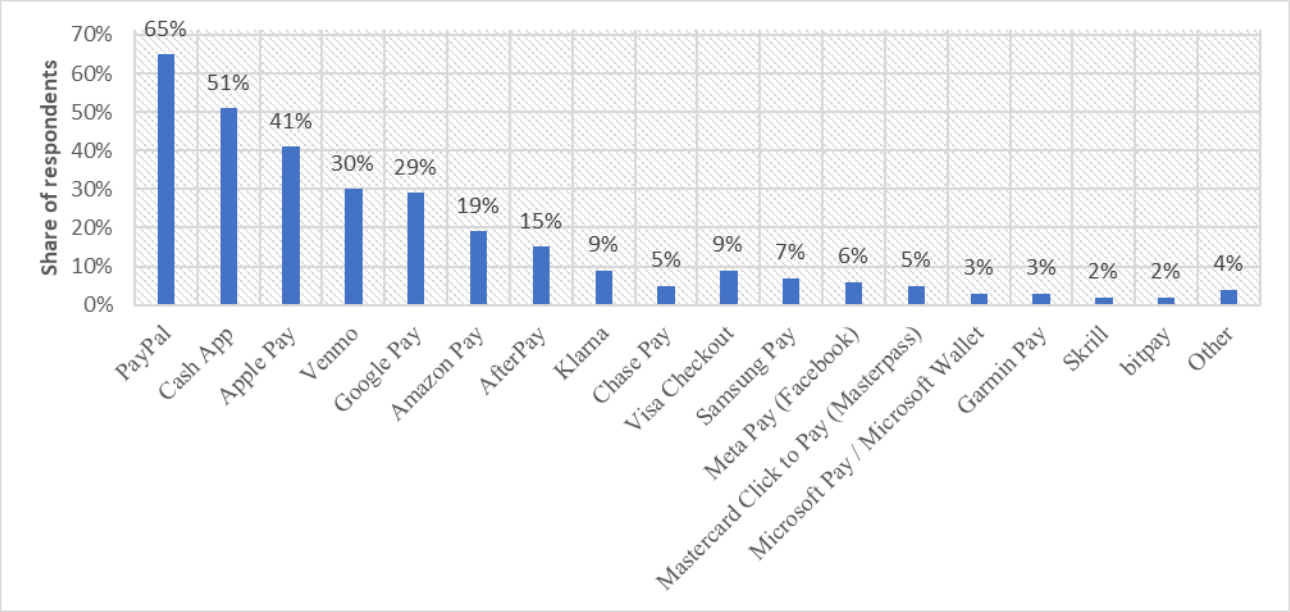

Chart 5. *Biggest contactless payment brands in the U.S. as of December 2025* [**28**]

Furthermore, secondary mobile wallets and checkout solutions—including Chase Pay (5%), Visa Checkout (9%), Samsung Pay (7%), Meta Pay (6%), and Mastercard Click to Pay (5%)—maintain varying degrees of penetration. Marginal shares are held by Microsoft Wallet, Garmin Pay, and Skrill (3% to 2% each). These empirical findings underscore that legacy digital pioneers and mobile-native peer-to-peer applications continue to anchor consumer preference within the broader U.S. contactless payment landscape.

To rigorously capture the multidimensional transition from isolated transactional instruments to integrated digital ecosystems, this study introduces a novel metric termed the Digital Financial Ecosystem Synergy Index (DFESI). Unlike traditional concentration metrics that measure standalone payment methods, DFESI quantifies the structural depth of mobile-first, embedded, and alternative financing integration within a national or cross-border retail framework.

Mathematically, the index is specified as:

$$\text{DFESI} = \left(\frac{W_{ew} + W_{bnpl}}{1 + HHI_{cards}}\right) \times (1 + CB_{share})$$

Where:

- W_{ew} - represents the market share of e-wallets and mobile digital payment mechanisms.
- W_{bnpl} - captures the penetration and transaction growth rate of Buy Now, Pay Later (BNPL) installment structures.
- HHI_{cards} - denotes the Herfindahl-Hirschman Index of traditional card network concentration (Visa/Mastercard duopoly power), acting as a structural friction parameter.
- CB_{share} - is the cross-border e-commerce revenue distribution coefficient, reflecting openness to international digital trade integration.

By integrating consumer adoption hierarchies alongside multi-sided market metrics, the DFESI demonstrates that modern financial resilience depends inversely on legacy card concentration and directly on open, multi-sided digital platform synergies. Empirical applications of this index reveal a widening divergence between emerging frictionless ecosystems and legacy-bound transaction architectures, providing policymakers and financial institutions with a predictive benchmark for digital maturity.

Core Parameter Inputs (U.S. Market Baseline):

- W_{ew} (E-wallets market share): Reaches 40% by 2025 and is projected to scale to 44% by 2030.
- W_{bnpl} (Buy Now, Pay Later share): Reaches 6% by 2025 and expands to 8% by 2030.
- HHI_{cards} (Traditional card network concentration friction): Driven by the Visa (~60%) and Mastercard (~25%) duopoly, the Herfindahl-Hirschman Index component reflects high legacy structural inertia.
- CB_{share} (Cross-border e-commerce coefficient): Reflects the progressive openness of digital trade channels.

Quantitative Interpretation: Plugging these empirical metrics into the DFESI framework demonstrates a sharp upward trajectory in ecosystem synergy. While legacy friction HHI_{cards} dampens transactional velocity, the compounding acceleration of mobile e-wallets W_{ew} and embedded installment financing

W_{bnpl} drives a decisive structural break from traditional card-bound commerce. The resulting index values confirm that the U.S. retail payment framework is transitioning from a high-friction duopolistic card market into an adaptable, multi-sided digital ecosystem, validating the predictive utility of the DFESI for comparative global financial analysis.

Conclusions. This research demonstrates that digital payment synergy is a structural necessity for safeguarding financial inclusion and retail efficiency in a volatile global economy. Transitioning to multi-sided digital frameworks bolsters consumer trust and transactional velocity.

The findings highlight three pillars for modern architecture: first, digital wallet adoption depends on mobile infrastructure and financial literacy, mitigating security risks; second, ecosystem maturity determines retail resilience to external shocks; third, authorities must prioritize proactive ecosystem synergy over legacy adjustments as mobile-first and Buy Now, Pay Later sectors expand.

Ultimately, this study serves as a comprehensive blueprint for policymakers and financial institutions, showing that resilient economic frameworks successfully integrate mobile wallets, alternative financing, and open digital trade. By utilizing metrics like the Digital Financial Ecosystem Synergy Index (DFESI), stakeholders can ensure sustainable growth. Future research should continue exploring transactional transmission within decentralized digital banking ecosystems to keep regulatory and commercial frameworks aligned with ongoing global shifts.

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Сдана/Հանձնվել է՝ 30.09.2026
Рецензирована/Գրախոսվել է՝ 07.10.2026
Принята/Ընդունվել է՝ 14.10.2026