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PLATFORM MIDDLEWARE-MANAGEMENT: FROM RESOURCE CONTROL TO INTERACTION COORDINATION IN DIGITAL SERVICE ECOSYSTEMS

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Abstract. The article examines the patterns of transformation of the theoretical and methodological approaches of strategic management in the transition from traditional linear value-added chains to multi-sided digital platform ecosystems operating in the service sector. It substantiates the proposition that in the modern digital economy the object of strategic management shifts from the direct control of an organization's tangible and intangible resources to the formation and development of a coordination layer ensuring the effective interaction of independent ecosystem participants. Based on an analysis of the functioning of service platforms in the Republic of Uzbekistan, including the payment systems CLICK and Payme, the digital ecosystem Uzum, and innovative companies resident in IT Park, a typology of platform ecosystems is developed and the author's concept of platform Middleware-management is proposed. Theoretical propositions are formulated establishing the relationship between the aggregate transaction costs of managing the ecosystem and three key controllable parameters: the level of algorithmization of business processes, the speed of verification of interacting participants, and the intensity of network communications. These factors are considered as objects of subsequent quantitative and empirical assessment at further stages of the research. The results form a conceptual and methodological basis for improving the mechanisms of strategic management of digital service ecosystems and for developing effective instruments of their sustainable development in the context of the digital transformation of the economy.

Keywords: strategic management, digital platform ecosystems, service sector, network effects, transaction costs, platform Middleware-management.

Аннотация. В статье исследуются закономерности трансформации теоретико-методологических подходов стратегического менеджмента при переходе от традиционных линейных цепочек создания стоимости к многосторонним цифровым платформенным экосистемам, функционирующим в сфере услуг. Обосновывается положение о том, что в современной цифровой экономике объект стратегического менеджмента смещается от прямого контроля материальных и нематериальных ресурсов организации к формированию и развитию координационного слоя, обеспечивающего эффективное взаимодействие независимых участников экосистемы. На основе анализа функционирования сервисных платформ Республики Узбекистан, включая платёжные системы CLICK и Payme, цифровую экосистему Uzum и инновационные компании — резиденты IT-Park, разработана типология платформенных экосистем и предложена авторская концепция платформенного Middleware-менеджмента. Сформулированы теоретические положения, устанавливающие связь между совокупными транзакционными издержками управления экосистемой и тремя ключевыми управляемыми параметрами: уровнем алгоритмизации бизнес-процессов, скоростью верификации взаимодействующих участников и интенсивностью сетевых коммуникаций. Результаты формируют концептуально-методологическую основу для совершенствования механизмов стратегического менеджмента цифровых сервисных экосистем в условиях цифровой трансформации экономики.

Ключевые слова: стратегический менеджмент, цифровые платформенные экосистемы, сфера услуг, сетевые эффекты, транзакционные издержки, платформенный Middleware-менеджмент.

Annotatsiya. Maqolada strategik menejmentning nazariy-metodologik yondashuvlari an'anaviy chiziqli qiymat yaratish zanjirlaridan xizmat ko'rsatish sohasida faoliyat yurituvchi ko'p tomonlama raqamli platforma ekotizimlariga o'tish jarayonidagi o'zgarish qonuniyatlari tadqiq etiladi. Zamonaviy raqamli iqtisodiyotda strategik menejment obyektini tashkilotning moddiy va nomoddiy resurslarini bevosita nazorat qilishdan ekotizimning mustaqil ishtirokchilari o'rtasidagi samarali o'zaro ta'sirni ta'minlovchi koordinatsion qatlamni shakllantirishga siljishi asoslanadi. O'zbekiston Respublikasidagi xizmat platformalari, jumladan CLICK va Payme to'lov tizimlari, Uzum raqamli ekotizimi hamda IT-Park rezidenti bo'lgan innovatsion kompaniyalar faoliyati tahlili asosida platforma ekotizimlari tipologiyasi ishlab chiqilgan va muallifning platforma Middleware-menejmenti konsepsiyasi taklif etilgan. Ekotizimni boshqarishning umumiy tranzaksiya xarajatlari bilan uchta asosiy boshqariladigan

parametr — biznes-jarayonlarni algoritmlashtirish darajasi, ishtirokchilarni tekshirish tezligi va tarmoq aloqalarining jadalligi o'rtasidagi bog'liqlikni belgilovchi nazariy qoidalar shakllantirilgan. Natijalar raqamli xizmat ekotizimlarini strategik boshqarish mexanizmlarini takomillashtirishning konseptual-metodologik asosini tashkil etadi.

Kalit so'zlar: strategik menejment, raqamli platforma ekotizimlari, xizmat ko'rsatish sohasi, tarmoq effektlari, tranzaksion xarajatlar, platforma Middleware-menejmenti.

INTRODUCTION

For a deep understanding of the transformation of strategic management it is necessary to fix the key conceptual apparatus that has formed in economic science over the past half-century.

Strategic management is a system of management decisions that determines the long-term direction of an organization's development, its competitive advantages, and the allocation of resources to achieve goals in a changing external environment. The term took root in academia in the 1970s thanks to the work of Ansoff [3].

A linear value chain is a model describing the sequence of business processes (from the procurement of raw materials to after-sales service) through which a product acquires value for the end consumer. The concept was introduced by Porter [19].

A value network is a decentralized system of interconnected agents (companies, suppliers, partners) that jointly create and distribute value not sequentially but in a parallel, networked manner. The term and concept were developed by Stabell and Fjeldstad [21] as an alternative to Porter's chain for the service and IT sectors.

A multi-sided platform is a business model acting as an intermediary that facilitates direct interaction and transactions between two or more independent groups of users. The theoretical basis was laid by Rochet and Tirole [20] within the theory of two-sided markets.

A digital business ecosystem is a dynamic, evolving community of independent economic agents (producers, consumers, developers) interacting on the basis of a single digital platform to create complex value propositions. The concept of business ecosystems was first proposed by Moore [17], and it acquired its digital content in the work of Iansiti and Levien [13].

The development of strategic thought at the global level passed through three key macro-stages, each corresponding to the technological and economic order of its time.

The era of industrial dominance (1980-1990). During this period the Porter paradigm prevailed, based on rigid industry boundaries and the optimization of internal processes. Strategy was understood as positioning the enterprise in a defensive stance against competitors. Value was created linearly and strictly sequentially: each link added a margin to the product, and competition was over the redistribution of that margin. The main assets were tangible (factories, logistics parks). An example is the automotive giants Ford and General Motors of the twentieth century, from purchasing steel from regular contractors to assembly on the conveyor and distribution through dealer networks.

The era of network integration and co-opetition (the 2000s). With the spread of the internet, linear ties began to break down, giving way to flexible outsourcing and strategic alliances. Value networks emerged: economic agents realized that competing alone was inefficient, and the phenomenon of co-opetition formed, after Brandenburger and Nalebuff [5], where companies cooperate in creating a market but compete over its division. The focus shifted to intangible assets (intellectual property, branding). An example is Nike, which gave up ownership of factories and focused on design, marketing, and the orchestration of a network of independent contract manufacturers.

The era of multi-sided digital ecosystems (the 2010s to the present). The deep penetration of high-speed internet, cloud technologies, and smartphones led to the triumph of the platform economy. The business model is built around a digital core (the platform) connecting independent participants, and value scales through network effects: the more sellers on the platform, the more valuable it is to buyers, and vice versa. The boundaries between industries are erased. An example is Apple with its bundle of the App Store (developers), device users, payment (Apple Pay) and content services: the platform itself does not produce the overwhelming majority of applications but orchestrates this entire market.

The evolution of strategic management concepts in Uzbekistan has its own specificity, conditioned by the transition from a planned economy to a market one and then by a forced leap into the digital age. Three periods can be distinguished here.

1. The local-linear period (1991-2016). Strategic management was at a nascent stage and was predominantly directive and production-oriented in character. Rigid linear supply chains with a high share of state participation prevailed; corporate strategies were built around import substitution and the localization of production. The digitalization of business processes was at a basic level. Examples are the establishment of the automotive industry (UzAuto Motors) as a classic closed linear chain with tightly controlled suppliers, as well as large state-owned mining and metallurgical combines (NMMC, AMMC).

2. The infrastructure-network period (2017-2021). The start of large-scale market reforms, the liberalization of the currency market, and the opening of the economy to foreign investment gave impetus to network integration. The adoption of comprehensive state programs (including the Digital Uzbekistan-2030 Strategy) laid the foundation for platform solutions. Business began to move from linear sales to partner networks and omnichannel trade. Examples are the growth of commercial banks (Kapitalbank), the development of fintech services (Payme, CLICK), the launch of delivery and passenger-transport services (Yandex Go in Tashkent), and the appearance of marketplaces (Olx.uz).

3. The period of the ecosystem boom (2022 to the present). The domestic market reached maturity for the deployment of full-fledged multi-sided digital ecosystems. Cross-industry convergence is observed: fintech companies build their own marketplaces, and retail operators create payment systems. The strategic management of leading domestic companies has reoriented toward retaining the customer within the perimeter of their own digital products.

Characteristic examples of the formation of multi-sided digital ecosystems in the Republic of Uzbekistan are the fintech ecosystem Uzum, uniting the marketplace Uzum Market, the digital Uzum Bank, the installment service Uzum Nasiya, and the logistics platform Uzum Tezkor, as well as the platform initiatives of leading telecommunications-market operators, Ucell and Beeline Uzbekistan, which are consistently expanding their own digital services toward integrated ecosystem solutions.

The digital transformation of the service sector of the Republic of Uzbekistan, which has taken place over the past decade, has brought about a qualitative change in the structure of socio-economic relations and in the mechanisms of value creation. According to the National Statistics Committee of the Republic of Uzbekistan, the share of the service sector in gross domestic product reached 47.4 percent in 2024, with information and communication among the fastest-growing segments of the economy. Within the service sector the platform economy has expanded rapidly: electronic commerce has grown to several percent of retail turnover, the share of cashless payments has approached two fifths of all payments, and the number of transactions processed through national payment systems has grown many times over since 2020. These trends correspond to the strategic priorities enshrined in the Uzbekistan-2030 Strategy [9], according to which the accelerated development of digital services is regarded as one of the key factors for ensuring sustainable economic growth and increasing the country's international competitiveness. Under current conditions, the payment systems CLICK and Payme, the digital ecosystem Uzum, and innovative companies resident in IT Park have formed a fundamentally new model of organizing economic activity, in which the main source of competitive advantage is not the concentration of tangible assets but the ability to effectively coordinate the interaction of independent participants in the digital ecosystem, ensuring sustainable network effects, the scalability of digital services, and the continuous exchange of data.

At the same time, traditional management oriented toward administering discrete physical assets proves insufficient for governing distributed network ecosystems, which makes a re-examination of the theoretical foundations of strategic management for the platform environment timely.

The object of the research is the socio-economic systems of digital platform ecosystems in the service sector of the Republic of Uzbekistan. The subject of the research is the methods, principles, and functions of strategic management that arise in governing these ecosystems. The aim of the work is to provide a theoretical justification for relocating the object of strategic management to the ecosystem's coordination layer and to formulate the concept of platform Middleware-management.

LITERATURE REVIEW

For much of the twentieth century, management thinking leaned on Porter's picture of the firm as a connected sequence of activities, where advantage springs from tying those activities together more deftly than rivals do [19]. Yet that picture quietly assumes value forms inside the firm's walls, and the assumption breaks down once value arises in the space between participants rather than within a single enterprise. Barney's reasoning, which traces advantage to resources that are scarce and hard to copy [4], meets the same wall in an ecosystem: the decisive assets are scattered across independent players and are not the operator's to own.

In the transaction-cost tradition running from Coase to Williamson, the firm's boundary is read as the outcome of weighing the cost of organizing exchange inside the enterprise against the cost of doing so through the market [7, 24]. The platform, however, refuses the firm-or-market binary and settles into an in-between, hybrid mode of governance. Rochet and Tirole's [20] account of two-sided markets pins down network effects and the simultaneous pricing of several user groups with precision, but leaves in shadow the very managerial layer through which that coordination is carried out.

The modern platform view assembles from several strands: Eisenmann et al. [10] on the strategy of two-sided platforms, Gawer and Cusumano [11] on leadership understood as the capacity to set partner innovation

in motion, and Parker et al. [18] on industries rebuilt around the management of interactions. Alongside these sit a theory of ecosystems resting on the complementarity of participants [14], a reading of strategy as the alignment of partners around an architecture of value [2], the architecture-governance-evolution triad [23], an analysis of platform rivalry [6], and a stocktaking of unresolved questions where networks, platforms, and strategy meet [16]. One limitation binds them together: all grew out of mature markets, and importing their categories into a late-developing, largely state-guided digitalization calls for careful adaptation.

The split between transaction-type and innovation-type platforms is drawn most consistently by Cusumano et al. [8]. In Uzbek scholarship, questions of digital management are pursued by Gulyamov [12] and Makhmudov [15], yet how the coordination layer of service-sector platform ecosystems is actually built and tuned in Uzbekistan still sits at the margin of analysis. From this follows the task of the present work: to join the classical apparatus of strategic management to the practice of multi-sided digital ecosystems.

Research methodology

A two-level conceptual representation of the platform ecosystem is proposed: a structural level (a typology of platforms) and a functional level (the coordination layer). The structural level records the type to which a platform belongs and its key management task; the functional level describes the elements of the coordination layer through which the operator exercises management.

Structural level. Drawing on the distinction between transaction and innovation platforms [8], the national service-sector ecosystem is classified as shown in Table 1.

Table 1. Typology of platform ecosystems in Uzbekistan's service sector

Platform type	Core function	Examples in Uzbekistan's services	Key management task
Transaction	Matching and facilitating exchange	CLICK, Payme	Speed, trust, and cost of clearing
Transaction with logistics	Exchange with physical movement	Marketplaces, express delivery, ride-hailing	Verification and logistical coordination
Innovation	Technological foundation for third parties	Few so far; potential among IT-Park residents	Cultivating complementors, open APIs
Hybrid (layered)	Bundling several platforms	Uzum (marketplace + fintech + bank)	Managing the shared identity, payment, and data layer

Functional level. The most consequential management loop of a platform runs not through the activities it owns but through the digital coordination layer (middleware) that connects independent participants. Its main elements and management functions are presented in Table 2.

Table 2. Elements of the coordination layer and the operator's management functions

Coordination-layer element	Management function	Effect when well designed
Ranking and recommendation algorithms	Distributing demand and attention	Relevance, reduced asymmetry for SMEs
Verification and trust systems	Admitting participants to transact	Lower risk and friction without higher cost
Interfaces (APIs)	Connecting businesses and partners	Scalability, faster time-to-market
Rules on data and value flow	Ecosystem governance	Transparency, neutrality, protection of rights

On the basis of this representation the following propositions are advanced:

- the object of strategic management in a platform ecosystem is not the set of resources the operator owns but the coordination layer through which independent participants interact;
- the competitiveness of a service platform is determined by the quality of the coordination layer's design, its ranking algorithms, verification systems, interfaces, and rules on data flow, rather than by the volume of assets it controls;
- the integration of heterogeneous platforms into hybrid, layered ecosystems of the Uzum type shifts the center of strategic management toward the shared identity, payment, and data layer.

As a working hypothesis for the subsequent empirical stage, the aggregate transaction costs of managing the ecosystem are treated as a function (y) of three controllable factors, $y = f(x_1, x_2, x_3)$, where x_1 is the level of algorithmization of management procedures, x_2 is the speed of counterparty verification, and x_3 is the density of network interaction. The quantitative estimation of the elasticities of these factors lies beyond the scope of this article and is the subject of a separate study using correlation and regression analysis.

ANALYSIS AND RESULTS

Comparative analysis of global and Uzbek practices. For a visual comparison of the trajectories of strategic-management development, the key parameters of global trends and the current state of the Uzbek market are summarized in Table 3.

Table 3. Comparison of global and Uzbek concepts of strategic management

Comparison criterion	Global concepts	Current concepts in Uzbekistan
Dominant model	Transnational multi-sided ecosystems, AI orchestrators	Regional and national hybrid ecosystems (fintech + marketplace)
Driver of competition	Global network effects, ownership of end-to-end technologies	Speed of penetration into regions, depth of logistics (last mile), financial inclusion
Market maturity	Platform saturation; focus on antimonopoly regulation and data protection	Stage of active extensive and intensive growth; formation of basic habits
Nature of integration	Open ecosystems with free use of APIs	Predominantly closed or semi-closed ecosystems
Key barrier	Strict data regulation, retention of AI talent	Shortage of IT personnel and ecosystem architects, partial digital shadow economy

The transition from linear chains to digital ecosystems changes the operational and financial efficiency of business. Table 4 presents qualitative benchmarks of the relative efficiency of different types of strategic configurations (the direction of differences rather than precise values; specific quantitative indicators are subject to assessment on the author's own data at the empirical stage).

Table 4. Qualitative benchmarks of the relative efficiency of strategic configurations

Efficiency metric	Linear model	Network model	Digital ecosystem
Return on invested capital	Low	Moderate	High
Customer acquisition cost	High (direct advertising)	Medium (referral networks)	Low/organic (cross-side effects)
Customer retention rate	Low	Medium	High
Cost of scaling the business	High (capital-intensive)	Medium (operational)	Near zero (low marginal costs)

The application of the developed typology of digital platforms to the conditions of the Republic of Uzbekistan indicates the dominance of transactional platform models, oriented predominantly toward providing electronic payments, marketplaces, and intermediary services, with a comparatively low representation of innovation platforms that create conditions for the development of new digital products and services. Such a structure limits the development of the institution of complementors, independent software developers, startups, and technology companies, including IT Park residents, since it reduces the possibilities for integrating external innovations into existing digital ecosystems. Under these conditions, the management task of forming open programming interfaces, ensuring interaction among various participants in the digital economy and promoting the expansion of innovation activity, acquires particular significance.

The practical experience of the development of the Uzum ecosystem demonstrates the natural evolution of digital platforms from specialized services to integrated multi-sided ecosystems. As trade, financial, logistics, and payment services are combined, the key object of strategic management becomes a unified infrastructure layer of data, user identification, and payment mechanisms. It is precisely this coordination loop that ensures the formation of network effects, the increase of user loyalty, and the growth of the aggregate value of the ecosystem for all groups of participants.

The concept of platform Middleware-management makes it possible to consider the totality of a digital platform's management processes as a single system for allocating the operator's limited coordination resources. Within this approach, the tasks of pricing, attracting new participants, managing user experience, controlling service quality, and countering fraudulent operations act not as independent areas of activity but as interconnected elements of a single mechanism for tuning the coordination layer of the platform architecture. Accordingly, the strategic efficiency of a digital ecosystem is determined not so much by the volume of available resources as by the quality of the algorithms for managing interactions among platform participants.

For the leading operators of the digital market of the Republic of Uzbekistan, such as Uzum, CLICK, and Payme, this means the need to shift the strategic focus from scaling individual services to improving the algorithmic mechanisms of coordination, data management, and user interfaces. For state regulators, such an approach makes pressing the need to assess the platform coordination layer from the standpoint of ensuring

competitive neutrality, the non-discriminatory access of small-business entities to digital infrastructure, and the prevention of abuses of market power by platform operators.

The specificity of the development of digital ecosystems in the Republic of Uzbekistan is determined by a combination of three interrelated factors: the high intensity of the digital transformation of the economy, the substantial participation of the state as a regulator and institutional customer of digital solutions, and the dominant role of small and medium enterprises in the structure of national business. These features significantly limit the applicability of a number of foreign theoretical models formed predominantly on the material of developed economies and necessitate the formation of an independent conceptual apparatus oriented toward the service ecosystems of developing states.

Looking ahead, the further evolution of the strategic management of multi-sided digital ecosystems will be closely linked to the integration of next-generation artificial-intelligence technologies. Whereas traditional platforms performed predominantly the function of an information intermediary between seller and buyer, modern intelligent ecosystems are gradually transforming into autonomous decision-making systems capable of forecasting user needs, personalizing offers, and optimizing the interaction of participants in real time. As a result, there is a transition from a reactive management model based on the analysis of events that have already occurred to a predictive model of the strategic orchestration of user demand.

No less significant a direction of development is the gradual transition from closed centralized platforms to architectures of distributed digital ecosystems based on the principles of Web3, decentralized governance, and open data exchange. The strengthening of antimonopoly regulation, the growth of digital-sovereignty requirements, and the need to ensure fair competition objectively stimulate the opening of infrastructure interfaces for small and medium business. As a result, long-term competitive advantages will be formed not through the creation of rigidly closed digital conglomerates but through the development of flexible platform consortia ensuring the seamless interaction of independent market participants.

For the Republic of Uzbekistan, a strategically important direction of medium-term development is the transformation of national digital ecosystems into regional platform structures of Central Asia. The limited nature of the domestic market and the achievement of a certain level of saturation of national demand objectively stimulate the largest operators of fintech, e-commerce, and digital services to expand their activities into the markets of neighboring states. The success of this expansion will be determined by the level of adaptation of logistics infrastructure, the integration of cross-border payment mechanisms, and the ability of platforms to ensure uniform standards of digital interaction within the macro-regional space.

The digitalization of the economy shows a steady positive dynamic in digital infrastructure and electronic services: the user base of digital payment systems and the volume of cashless operations have both expanded markedly, and the audience of marketplaces and mobile applications continues to grow. This points to the formation of sustainable network effects and a gradual transition from individual digital services to full-functional ecosystem models of interaction.

An additional analysis shows that, according to the Statistics Agency under the President of the Republic of Uzbekistan, small and medium enterprises form more than 80 percent of the total number of economic entities in the country [22] and act as the main group of potential participants in platform ecosystems. At the same time, even a modest reduction in transaction costs, owing to the introduction of open APIs, digital identification, and integrated payment services, is capable of ensuring a substantial increase in business activity, a growth in the volume of e-commerce, and an acceleration of the processes of digital transformation of the national economy. Consequently, the further development of platform ecosystems should be regarded not only as a technological task but also as a most important instrument for increasing the competitiveness of the Republic of Uzbekistan under conditions of the formation of a regional digital market.

CONCLUSIONS AND RECOMMENDATIONS

1. A key result of the evolution of strategic management over the past five decades has been a fundamental transformation of the nature of competitive leadership. Whereas in the industrial economy sustainable advantages were ensured predominantly through the concentration of tangible resources, vertical integration, and control of production-and-distribution chains, in the digital economy a dominant position is achieved through the ability to form and coordinate complex network interactions among numerous independent market participants. The greatest efficiency is demonstrated by organizations that create high-tech digital platforms ensuring maximum value, scalability, and speed of data exchange among users, suppliers, developers, and other ecosystem entities.

This is reflected in the fact that many of the world's largest companies by market capitalization are platform-based technology firms. Owing to network effects, an increase in the number of participants of a digital platform raises its economic value more than proportionally, intensifying digital transactions across the ecosystem.

2. The prospective development of strategic management is associated with a transition to predictive autonomous decision-making systems based on technologies of artificial intelligence, machine learning, and the comprehensive processing of big data. Under conditions of the increasing dynamics of the external environment, the competitiveness of organizations is determined not only by the ability to analyze accumulated data but also by the capacity to forecast changes in market conditions, automatically adapt business processes, and optimize resource allocation in real time. In this connection, the formation of intelligent digital ecosystems becomes a necessary condition for preserving strategic sustainability, while companies that do not carry out the digital transformation of their platforms risk losing their leadership positions to AI-oriented ecosystem operators.

The introduction of artificial-intelligence technologies makes it possible to materially increase the accuracy of management forecasts, to reduce operating costs, and to shorten the time required for strategic decisions, which substantially increases the adaptability of organizations to changes in the digital economy.

3. For the Republic of Uzbekistan, the current stage of the development of digital ecosystems is characterized by a gradual approach to the limits of extensive internal growth, conditioned by the scale of the national market, demographic parameters, and the capacity of domestic demand. Under these conditions, the priority direction of strategic development becomes the transition from local digital platforms to the formation of integrated cross-border ecosystems of Central Asia, ensuring the expansion of markets, the growth of the volume of digital services, and the strengthening of the technological independence of the state. The implementation of such a strategy will make it possible to preserve digital sovereignty, increase the regional competitiveness of national platforms, and create conditions for the integration of the Republic of Uzbekistan into international digital value chains.

Realizing this potential will depend less on the size of any single national market than on the ability of platform operators to standardize cross-border payment, logistics, and data-exchange mechanisms across the region, which is itself a strategic-management problem of coordinating a wider and more heterogeneous set of participants.

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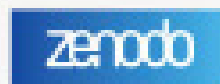
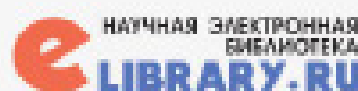
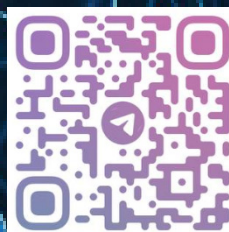
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