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Architecture of an Adaptive System for Strategic Management of Competitiveness of Service Enterprises on Platforms of Digital Service Ecosystems

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ABSTRACT

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The article is devoted to substantiating the architecture of an adaptive system for strategic management of competitiveness of hotel and restaurant service enterprises, capable of functioning in the environment of digital service ecosystems. The study aims to develop the theoretical and methodological foundations and an architectural model of such a system, which integrates the internal business processes of hospitality establishments with the mechanisms of external digital platforms based on continuous real-time feedback. In the course of the scientific research, general scientific methods were used: analysis and synthesis, systems approach, content analysis of scientific sources, comparative analysis of the functionality of leading platforms (Booking, Expedia, TripAdvisor, Glovo, Bolt Food), the method of architectural modelling based on the principles of service-oriented architecture, as well as the method of expert evaluation for verification of the proposed solutions. The results of the study show that the competitiveness of a hotel and restaurant enterprise in the ecosystem landscape has a relational and emergent nature, being formed simultaneously in the physical and digital contours of value creation. The proposed architecture comprises four integrated subsystems: sensory monitoring, predictive modelling and digital twins of competitive situations, dynamic formation of a strategic portfolio, and a "strategic reflex" subsystem for automated response to weak signals. The adaptation mechanism is implemented as a five-stage cycle of "monitoring – assessment of capability gaps – selection of strategic options – implementation through flexible service architectures – system learning," which transforms strategic management into a continuous self-learning loop. The main barriers to implementation have been identified: financial constraints, incompatibility of IT systems, shortage of digital competencies among staff, and managerial resistance to change. The obtained results create a basis for enhancing the resilience and adaptability of domestic hospitality enterprises in the conditions of the platform economy.



KEYWORDS

adaptive system, strategic management, competitiveness, hotel and restaurant service, digital service ecosystem, platform economy, digital twin.



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СОЦІАЛЬНИЙ РОЗВИТОК: економіко-правові проблеми

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Архітектура адаптивної системи стратегічного управління конкурентоспроможністю підприємств сфери послуг на платформах цифрових сервісних екосистем

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СТАТТЯ

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Стаття присвячена обґрунтуванню архітектури адаптивної системи стратегічного управління конкурентоспроможністю підприємств готельно-ресторанного сервісу, здатної функціонувати в середовищі цифрових сервісних екосистем. Мета дослідження – розроблення теоретико-методологічних засад та архітектури системи, яка поєднує внутрішні бізнес-процеси закладів гостинності з механізмами зовнішніх цифрових платформ на основі безперервного зворотного зв'язку в реальному часі. У ході наукового дослідження використовувалися загальнонаукові методи аналізу та синтезу, системний підхід, контент-аналіз наукових джерел, порівняльний аналіз функціональних можливостей провідних платформ (Booking, Expedia, TripAdvisor, Glovo, Bolt Food), метод архітектурного моделювання на принципах сервісно-орієнтованої архітектури, а також метод експертного оцінювання для верифікації запропонованих рішень. Результати дослідження показують, що конкурентоспроможність готельно-ресторанного підприємства в екосистемному ландшафті має реляційну та емерджентну природу, формуючись одночасно у фізичному й цифровому контурах створення цінності. Запропонована архітектура охоплює чотири інтегровані підсистеми: сенсорного моніторингу, предиктивного моделювання та цифрових двійників конкурентних ситуацій, динамічного формування стратегічного портфеля, а також підсистему «стратегічного рефлексу» для автоматизованого реагування на слабкі сигнали. Адаптаційний механізм реалізовано як п'ятиетапний цикл «моніторинг – оцінка розривів у спроможностях – вибір стратегічних опцій – імплементація через гнучкі сервісні архітектури – навчання системи», що перетворює стратегічне управління на безперервний самонавчальний контур. Виявлено основні бар'єри впровадження: фінансові обмеження, несумісність ІТ-систем, дефіцит цифрових компетенцій персоналу та управлінський опір змінам. Отримані результати створюють підґрунтя для підвищення стійкості й адаптивності вітчизняних підприємств гостинності в умовах платформеної економіки.



КЛЮЧОВІ СЛОВА

адаптивна система, стратегічне управління, конкурентоспроможність, готельно-ресторанний сервіс, цифрова сервісна екосистема, платформна економіка, цифровий двійник.

1. Introduction

The hospitality industry today operates in an environment where digital service ecosystems are becoming the main space for competition for customers. Hotels and restaurants, which historically built their competitiveness on physical comfort, location, or menu uniqueness, increasingly depend on the ability to integrate into global booking platforms, review aggregators, foodtech delivery ecosystems and local digital tourism hubs. The digitalization of hotel and restaurant services in Ukraine accelerated under the pressure of first pandemic restrictions, and then full-scale war: contactless services, cloud-based PMS systems, dynamic profitability management based on big data and mobile loyalty applications became not an option, but a condition for survival. At the same time, hospitality companies face a unique challenge: their product is both deeply personalized (inseparability from staff, heterogeneity) and critically dependent on external reputation mechanisms of digital platforms (ratings, instant feedback, ranking algorithms). In such a reality, the competitiveness of an establishment is determined not only by the quality of service in an offline environment, but also by the effectiveness of managing its digital presence within service ecosystems, which are constantly being restructured under the influence of technological innovations, changing consumer patterns, and regulatory shocks.

However, existing systems for strategic competitiveness management in the hospitality sector remain largely static and poorly integrated with the logic of digital platforms. Traditional strategic analysis tools designed for the industrial age cannot keep up with the speed of data from Booking.com, Google Maps, Tripadvisor, Bolt Food or Glovo, and therefore do not allow timely recognition of weak signals, critical gaps in service quality or new competitive threats. Hotels and restaurants often find themselves in the trap of “reactive management”: decisions are made post factum, when a reputational crisis has already unfolded or aggressive pricing policies of competitors on the platform have led to a loss of market share. The problem is exacerbated by the lack of architectural solutions capable of combining internal business processes of the enterprise with open interfaces of ecosystems into a single adaptive management loop. Without such an architecture, it is impossible to implement predictive response to demand fluctuations, automated adjustment of pricing strategy, or instant personalized guest retention, which translates competition on digital platforms into a plane of irreversible lag for those players who continue to rely on manual management and fragmented IT solutions. Thus, there is an obvious problem that requires analysis and solution: substantiation of such an architecture of an adaptive system of strategic management of the competitiveness of hotel and restaurant service enterprises, which would organically function in the environment of digital service ecosystems and ensure continuous adjustment of competitive behavior in accordance with turbulent market dynamics.

2. Literature Review

During the review of literary sources on the topic of the article, several scientific works were reviewed, which can be grouped into the following thematic areas: theoretical and methodological principles of strategic competitiveness management, features of digitalization of the hotel and restaurant business, ecosystem approach and adaptive management, customer orientation and quality of service. Thus, O. Krukovska [6] argues that the competitiveness of hotel and restaurant enterprises largely depends on the implementation of modern approaches to management, which allow for accurate assessment of market positions. At the same time, the author notes that management methods in many enterprises of the industry remain insufficiently innovative and flexible, which reduces their ability to adapt to rapid changes in market conditions. The research of E. Parkhuts [10] is devoted to theoretical and practical aspects of strategic management of industry competitiveness in the digital era, in which he emphasizes that the integration of digital technologies into strategic management allows enterprises to create flexible, adaptive business models that provide a prompt response to changes in the external environment, and develops a conceptual model of strategic management that includes the introduction of innovative technologies and the construction of digital ecosystems. In the article by V. Susidenk, T. Gushtan, L. Kaganets-Gavrylko and I. Vakula [13], a theoretical and analytical understanding of the digital transformation of the hotel and restaurant business in Ukraine is carried out, taking into account modern challenges and prospects for post-war recovery. The authors argue that information systems in the HoReCa sector act as a strategic factor in the adaptation, growth and competitiveness of the industry

in the digital economy, forming a new model of economic subjectivity built on managerial transparency and analytical management. T. Zakharova's study [16] showed that the introduction of digital technologies, such as CRM systems, hotel management systems (PMS), mobile applications, online booking platforms, contributes to the automation of business processes, cost reduction, improvement of service quality and increased customer loyalty. The analysis revealed that enterprises that actively implement digital solutions demonstrate revenue growth by 15–25% and cost reduction by 10–15%. M. Barna and I. Melnyk [1] considered the essence of the digitalization strategy of the hotel and restaurant business and identified its key aspects: digitized products and processes, smart integration, connected client, multilateral ecosystem. The authors have established the main elements of the digitalization strategy, which include automation of operations, digital marketing and online presence, personalization of service, mobile technologies and contactless services, implementation of analytics and artificial intelligence. Yu. Zemlina and A. Bukatov [17] emphasize that the implementation of modern IT solutions, such as automation of management processes, digital booking platforms, and integration of customer interaction management systems, is becoming a strategically important factor in the development of the hotel and restaurant business in Ukraine. G. Kish [4] insists that digitalization is a key factor in the formation of a new hospitality economy (digital hospitality economy), within which value creation is based on the use of data, technological innovations and personalized customer experience, and also systematizes three main areas of influence of digital transformation on the economic structure of the enterprise: automation of operational activities, increasing staff productivity and strengthening customer orientation.

The literature review demonstrates the growing interest of scientists in the issues of strategic competitiveness management in the hotel and restaurant business, especially in the context of digital transformation. At the same time, the analysis of sources revealed insufficient development of the issue of forming a holistic architecture of an adaptive management system that would organically combine the internal business processes of the enterprise with the mechanisms of external digital service ecosystems based on real-time feedback. It is this scientific gap that determines the relevance of this study.

3. Problem Statement

The purpose of the study is to develop theoretical and methodological principles and architecture of an adaptive system for strategic management of the competitiveness of hotel and restaurant service enterprises, capable of functioning in the environment of digital service ecosystems. The objectives of the study: to clarify the essence of adaptive strategic management of competitiveness in the conditions of a platform economy; to identify key components of digital service ecosystems that determine the competitive positions of hotel and restaurant enterprises; to substantiate the architecture of an adaptive strategic management system that combines internal business processes with external platforms based on real-time feedback; to reveal the mechanism of operation of the proposed system and its ability to ensure increased competitiveness of enterprises.

4. Methods and Materials

The methodological basis of the study is a systematic approach, which allows us to consider a hotel and restaurant service enterprise as an open socio-technical system that operates in a dynamic environment of digital service ecosystems. To achieve the goal, a set of general scientific and special methods was used: methods of theoretical generalization, analysis and synthesis – to clarify the conceptual apparatus and identify the prerequisites for integrating strategic competitiveness management into the platform environment; the method of content analysis of scientific publications – to systematize existing approaches to adaptive management and identify key components of digital service ecosystems that affect the competitiveness of hotel and restaurant enterprises. The comparative analysis method was used to compare the functional capabilities of leading digital platforms (Booking.com, Expedia, TripAdvisor, Glovo, Bolt Food) and identify typical architectural patterns of their interaction with hospitality establishments. The development of the architectural model of the adaptive system is based on the architectural modeling method, which is based on the principles of service-oriented architecture (SOA) and the concept of microservices, as well as the graphical modeling

method for visualizing the component structure and connections in the system. The research materials are peer-reviewed scientific articles, monographs and conference proceedings on the problems of strategic management, competitiveness, digital transformation of the hotel and restaurant business and platform economy, published mainly during 2020–2025. The information base was supplemented by analytical reports of international consulting companies (Deloitte, McKinsey) and specialized associations of the hotel and restaurant industry, which contain data on the pace of implementation of digital technologies, the dynamics of consumer behavior and indicators of the competitiveness of service enterprises. The empirical basis was formed by the results of a sample survey of the practice of using PMS systems, online distribution channels and reputation management tools by thirty hotel and restaurant chains in Ukraine (data was obtained from open sources and official websites of companies). The combination of these methods and materials ensured the validity and reliability of the obtained scientific results.

5. Results and Discussion

The formation of strategic management as a scientific discipline has gone through several qualitatively different stages, each of which was a response to the growing complexity and turbulence of the external environment. In the fundamental research of I. Ansoff, which laid the foundations of the theory of strategic management, four stages of this evolution were identified: the reactive (Chandler) model, long-term planning, strategic planning and, ultimately, strategic management itself. The key difference of the fourth stage was the shift in emphasis from formalized planning procedures to the creation of a system of continuous monitoring of changes and timely strategic response. In modern scientific literature, this logic has received further development; namely, S. Dovbnya and I. Papush, analyzing world experience, proposed to consider the current stage of the evolution of strategic management as innovative and adaptive, the characteristic features of which are digitalization, globalization, investment in human capital and continuous adaptation to unpredictable changes [3].

This evolution is largely due to the exhaustion of the heuristic potential of the classical schools of strategic management – planning, positioning and resource concept – in conditions when the competitive environment has lost signs of stability and predictability. The response to this crisis was the concept of dynamic change, which considers the ability of a firm to integrate, build and reconfigure internal and external competencies in accordance with rapid changes in the environment. Scientists note that the modern model of strategic management should reproduce the full cycle of change management, integrating the phases of signal detection, their interpretation, decision-making and systemic reconfiguration of resources. It is on this basis that the concept of adaptive strategic management is formed, which involves the transition from traditional linear approaches to integrated information and analytical systems based on business analytics tools and providing flexible maneuvering of resources in conditions of uncertainty [14]. O. Kushniruk and A. Shpotyuk also justify the feasibility of using adaptive models of strategic management with the involvement of modern digital tools (ERP systems, cloud technologies, AI), which allow coordinating operational and long-term goals, increasing the efficiency of resource use, and ensuring organizational flexibility [7].

Further development of the adaptive approach under the influence of digital transformation leads to the formation of a contour of cyber-physical systems of strategic management. In such systems, there is a convergence of physical service processes (direct service, operational activities) with digital analytical superstructures (predictive analytics, digital twins, automated decision-making systems), which form a single space of strategic response. M. Kovbatyuk emphasizes that adaptive strategic planning in such conditions becomes an effective tool that allows organizations to identify potential risks, develop plans for unforeseen situations and build resilience into the very architecture of management processes [5]. At the same time, successful strategic management in a digital environment requires not just technological modernization, but a profound transformation of managerial consciousness – a transition from hierarchical models of control to network models of cooperation, where adaptability becomes not an auxiliary characteristic, but an immanent property of the system. It is this conceptual shift that creates the prerequisites for the integration of strategic competitiveness management into the environment of digital service ecosystems.

The digital service ecosystem is emerging today not just as a technological phenomenon, but as a new institutional form of organizing economic activity, which fundamentally changes the nature of

competition and the mechanisms of value creation. Unlike traditional market structures, where enterprises compete within clearly defined industry boundaries, the ecosystem forms an environment of inter-industry interaction based on the joint use of digital platforms, data and complementary services. As noted by O. Levkovets, a change in the business paradigm is taking place: instead of competing alternative value propositions, there is a search for new ways of inter-industry interaction and joint solutions for value creation [8]. Digital platforms play the role of the integration core of the ecosystem, ensuring the reduction of entry barriers, simplification of cooperation between participants and the formation of network effects.

In modern scientific discourse, digital platforms are innovative solutions that change the business models of enterprises in the digital economy and form new formats of interaction between business and customers, combining interfaces, data, analytics and security tools. The integration of digital platforms enhances competitiveness and management flexibility through the transition to a strategic model using artificial intelligence, cloud technologies and microservice architecture. At the same time, a digital platform is not identical to an ecosystem: a platform acts as a technological basis, while an ecosystem covers a wider range of relationships – from a community of participants and a network of partnerships to a system of co-creation of value and collective learning. The key characteristics of a digital service ecosystem that define its role as a competitive environment are network effects, data-centricity, modularity and API-economy. Network effects are manifested in the fact that the value of the platform for each user increases with the increase in the total number of participants, which creates a natural barrier for competitors and at the same time strengthens the dependence of the competitiveness of an individual enterprise on its integration into the ecosystem. As O. Shevchenko and colleagues prove, the competitiveness of enterprises in the digital age is determined not simply by individual technological solutions, but by the synergy of network effects, API integrations, ecosystem connections and personalized customer experience [12]. The modularity of the ecosystem, in turn, allows enterprises to flexibly combine their own service modules with complementary offers of partners, creating unique value configurations for changing consumer demands. Data-centricity means that the main strategic asset within the ecosystem is not physical resources, but data on consumer behavior, algorithms for their processing and predictive models that allow you to predict changes in demand and personalize the service offer.

A characteristic feature of digital service ecosystems is also the blurring of industry boundaries and the formation of new markets around actual human needs, which has been called the E2H (Ecosystem-to-Human) model. The transition to this model is accompanied by a transformation of consumer behavior, when the client expects to seamlessly receive a comprehensive solution, rather than individual products or services. For hotel and restaurant service enterprises, this means that their competitiveness is increasingly determined not by internal operational excellence, but by the ability to integrate into the ecosystems of travel, gastronomic experiences and the local hospitality environment that are formed around digital platforms. Moreover, the architecture of these platforms involves the distribution of roles between participants: the orchestrator (platform owner), providers of basic services, complementors, and the competitive position of a particular hotel or restaurant depends on how successfully it chooses and implements its role in this structure. Thus, the digital service ecosystem forms a new economic logic of interaction, which determines the need for an adaptive and secure strategic management system capable of functioning in a decentralized, dynamic and multi-agent environment.

The functioning of service enterprises in the ecosystem landscape causes a profound transformation of the very content of the competitiveness category, which acquires new dimensions not inherent in traditional market competition. First of all, there is a shift in the sources of competitive advantages: from the possession of unique material assets (location, physical infrastructure, exclusive access to resources) to the ability to orchestrate value propositions based on customer experience and digital data. E. Parkhuts proves that the integration of digital strategies into the overall management system is a necessary condition for the formation of sustainable competitive advantages in modern conditions [10]. For the hotel and restaurant business, this thesis is of particular importance, because information systems in the HoReCa sector act as a strategic factor in adaptation, growth and competitiveness, forming a new model of economic subjectivity, built on managerial transparency and analytical management [13].

A fundamentally important characteristic of competitiveness in an ecosystem environment is its relational nature: the competitive position of an individual enterprise is increasingly determined not by its isolated characteristics, but by the quality and density of ties with other participants in the ecosystem. In the conditions of the digital economy, the latest trends have a multifactorial impact on the competitive position of the enterprise, and the activation of digitalization processes intensifies competition in the markets, opening access to them for new enterprises. Therefore, the competitiveness of a hotel or restaurant in the ecosystem landscape is not only its internal ability to provide quality services, but also the ability to be visible to booking platform algorithms, receive high ratings in review systems, and integrate with delivery services, logistics platforms, and local travel aggregators.

Another feature of competitiveness in digital service ecosystems is its dynamic and multi-level nature. Traditional indicators (market share, profitability, occupancy rate or average check) remain important, but they are increasingly complemented by digital metrics: platform rating, NPS loyalty index, response speed to reviews, level of digital visibility, conversion from page views to bookings. In addition, current economic trends mean that market leaders are determined not by a long-term history of success or the cost of real estate, but by the ability to quickly adapt the business model to changes in consumer expectations and technological capabilities. In this context, the competitiveness of a hotel and restaurant service enterprise acquires the characteristics of an emergent property that arises at the intersection of internal competencies, digital infrastructure and ecosystem connections, and is not reduced to a simple sum of the above components.

Finally, the specificity of the competitiveness of a service enterprise in the ecosystem landscape also lies in the need to simultaneously manage two value creation circuits: physical (direct service, quality of service, atmosphere of the institution) and digital (presence on platforms, reputation management, personalization of the offer based on data). Yu. Zemlina and A. Bukatov, studying information technologies as a factor of the competitiveness of a hotel and restaurant enterprise, show that IT has become a critical tool for adapting to modern challenges, and its implementation has become a strategically important factor of development [17, p. 210]. This confirms that in conditions when the consumer makes decisions based on the digital footprint of the institution (reviews, ratings, photos, online menu), competitiveness is formed simultaneously in both circuits, and the gap between them (for example, high physical service with a low digital rating) creates critical vulnerability. Therefore, the competitiveness of a hotel and restaurant service enterprise in digital service ecosystems is an integral ability to create and maintain unique value for the client through a combination of physical service quality with an effective digital presence, flexible adaptation to changes in the platform environment and active participation in network interactions within the ecosystem.

Building the architecture of an adaptive system for strategic management of the competitiveness of a hotel and restaurant service enterprise in a digital ecosystem environment requires the isolation of several functionally specialized, but closely integrated subsystems. The core of such an architecture is the sensor monitoring subsystem, which is responsible for the continuous collection, cleaning and aggregation of data from a variety of heterogeneous sources. As modern researchers justify, the introduction of digital technologies in the hotel and restaurant business today already allows you to automate operational processes and accumulate large amounts of data on consumer behavior, loading, competitor price dynamics and changes in consumer sentiment [2]. The sensory circuit encompasses both internal sources (PMS systems, cash registers, loyalty programs, physical space sensors) and external ones – APIs of key digital platforms (Booking.com, Expedia, TripAdvisor, Google Maps, food delivery platforms), social media and open statistical data. This combination of sources creates the prerequisites for the formation of a single data-driven space, where competitiveness ceases to be a static assessment and turns into a constantly updated flow of structured information.

The next critically important component is the predictive modeling and digital twins' subsystem of competitive situations. It uses accumulated data to build analytical models that can not only explain past dynamics, but also predict future changes in demand, price fluctuations, reputational risks, and competitor behavior on various digital platforms. As research results show, companies that actively implement analytics and AI tools demonstrate significant revenue growth and operating cost reduction [15]. Within the proposed architecture, the concept of a digital twin is of particular importance – a virtual model of a specific hotel or restaurant that reproduces its competitive position in digital ecosystems in real time, including pricing policy parameters, reputation metrics, guest satisfaction index, and level of operational efficiency. Such a twin allows you to simulate the consequences of various

strategic decisions before their implementation in real business, which ensures the transition from reactive to proactive competitiveness management.

The third component is formed by the subsystem of dynamic formation of a strategic portfolio. Its purpose is to automatically generate, evaluate and rank alternative strategic options based on the results of predictive analysis and assessment of available resources. For the hotel and restaurant sector, this may mean a choice between a price dumping strategy on booking platforms, investing in package offers with complementary services (SPA, gastronomic events, transfer), shifting the emphasis towards direct booking through its own website, or entering new aggregator platforms. This subsystem implements the principle that E. Parkhuts calls a flexible, adaptive business model, capable of promptly responding to changes in the external environment through constant adjustment of the composition of services, their distribution channels and price parameters [10].

The final link in the component structure is the subsystem of “strategic reflex” – automated response to weak signals. Weak signals in the environment of digital service ecosystems can be, for example, a sudden decrease in the rating by 0.2 points, an abnormal surge in negative reviews in a certain time window, the emergence of a new competitor on the platform with an aggressive pricing strategy, or a change in the ranking algorithm by the platform itself. The strategic reflex subsystem, using predefined triggers and machine learning models, initiates appropriate actions without the delays inherent in hierarchical management procedures: automatic price adjustment, launch of promotional campaigns, personalized appeals to guests with a request to leave a review, or prompt escalation of the problem to management. As A. Maksymenko emphasizes, it is this ability to instantly adaptively respond to micro- and macro-changes in consumer habits and market conditions that determines the sustainability of hospitality establishments in modern conditions [9]. Taken together, the four described subsystems form a holistic architecture that is capable of ensuring continuous adjustment of the competitive behavior of the enterprise.

The functioning of the proposed architecture is based on a cyclical adaptation mechanism that implements continuous feedback between the competitive environment and management decisions of the hotel and restaurant service enterprise. Unlike traditional linear models of strategic management, where environmental analysis precedes strategy formation and occurs with a certain periodicity (quarterly or annually), the adaptive mechanism involves constant data input and continuous adjustment of strategic parameters. As I. Porsyurova and M. Botin note, in the context of global digitalization, growing competition and transformation of consumer behavior, it is the ability to quickly restructure internal business processes that becomes a key factor in long-term viability and competitiveness [11]. In the proposed model, this mechanism is deployed as a five-stage cycle that combines monitoring, gap assessment, selection of strategic options, implementation through flexible service architectures and system training based on the results obtained.

The first stage of the cycle – “monitoring the competitive field” – provides the formation of a holistic picture of the external environment in a mode close to real time. The sensor monitoring subsystem records the current market configuration according to several parameters: pricing strategies of competitors on booking platforms, occupancy level, dynamics of ratings and reviews on TripAdvisor, Booking.com and Google Maps, the emergence of new players, changes in the ranking algorithms of digital platforms, as well as shifts in consumer sentiment that are manifested in social networks. In parallel, the internal data of the enterprise itself is collected – room occupancy, average check, conversion of views into bookings, repeat visit rates. As evidenced by the results of T. Zakharova’s research, the introduction of digital technologies, in particular PMS systems and online booking platforms, contributes to the automation of business processes and creates a technical basis for such comprehensive monitoring [16]. A feature of this stage is that the company monitors not only direct competitive signals (changes in prices or assortment), but also weak signals – subtle changes in the tone of reviews, a slight reduction in the time guests spend on the site, or the appearance of atypical queries in search queries, which may indicate the emergence of new consumer trends. The second stage – “capacity gap assessment” – involves an analytical comparison of the current state of the company with the desired competitive positioning. At this stage, the predictive modeling subsystem compares actual performance indicators with forecast values calculated by the digital twin of the company and identifies strategic gaps – deviations that require management intervention. Such gaps can be, for example, a decrease in the rating by 0.3–0.5 points on a key platform, which correlates with a drop in conversion by 7–10%, or a mismatch of the hotel’s price offer with the average market range in the selected

segment. It is important to note that this stage is not limited to identifying deviations, but includes diagnosing their causes: whether the gap is caused by internal operational shortcomings (for example, a decrease in the quality of cleaning), or external factors (the entry of a new competitor with a dumping strategy onto the platform), or algorithmic changes to the platform itself. Such in-depth diagnostics allows you to avoid incorrect strategic reactions and direct resources to those areas where competitive vulnerability is formed.

The third stage – “selection of strategic options” – is implemented through the strategic portfolio formation subsystem. Based on the results of the gap assessment, the system generates, models and ranks alternative options for strategic actions. For a hotel, this may be a choice between a short-term promotion on Booking.com to quickly increase occupancy, a price reduction in certain distribution channels, launching a “stay + dinner” package offer, investing in updating room photos or encouraging guests to write positive reviews through after-service communications. For a restaurant, options may include participating in special promotions on Glovo or Bolt Food, adjusting the menu based on an analysis of the most popular items from competitors or launching a targeted advertising campaign for an audience that has left positive reviews for neighboring establishments. Each option is evaluated according to the criteria of the expected impact on key competitiveness metrics, resource requirements, implementation time horizon and potential risks, which allows you to form a balanced portfolio of short-, medium- and long-term measures.

The fourth stage – “implementation through flexible service architectures” – involves the implementation of selected strategic solutions using digital tools that ensure speed and flexibility of execution. Unlike traditional implementation, which requires lengthy coordination procedures, preparation of internal regulations and staff training, in the proposed architecture a significant part of the actions is automated through integration with platforms: price changes are instantly reflected in all distribution channels through the channel manager, promotional offers are published simultaneously on all connected platforms, and personalized messages are sent to guests automatically based on triggers. According to A. Maksymenko, the use of an adaptive management model that combines demand forecasting, service personalization, dynamic resource management and algorithmic tariff regulation helps to increase operational efficiency, reduce costs and increase customer satisfaction [11]. At the same time, for decisions that require human intervention (such as changing the design of a service process or implementing a new service standard), the system generates appropriate tasks for staff with clear deadlines and performance quality criteria.

The final, fifth stage – “system training” – closes the adaptation cycle, turning each implemented strategic measure into a source of new knowledge for the management architecture. At this stage, a retrospective assessment of the effectiveness of the implemented solutions takes place: predicted and actual indicators are compared, the causes of deviations are analyzed, and patterns that were not taken into account in previous iterations of the cycle are identified. The data obtained are used to further train predictive models, refine the logic of triggering triggers in the strategic reflex subsystem, and calibrate the digital twin of the enterprise. It is thanks to this stage that the system acquires the properties of self-learning: with each new cycle, the accuracy of forecasting increases, the speed of recognizing weak signals increases, and strategic reactions become increasingly relevant to the actual market situation. As the researchers emphasize, adaptability depends not only on technological modernization, but also on a management philosophy focused on continuous development and openness to innovation, which turns organizational learning into a strategic resource of the enterprise [11]. An important feature of the proposed adaptation mechanism is the ability to function in conditions of partial uncertainty and information asymmetry, characteristic of digital service ecosystems. Since the enterprise does not have full access to data on competitors' activities or the internal logic of platform algorithms, the system uses indirect assessment and probabilistic modeling methods. For example, a change in the position of a hotel in the Booking.com search results can be a consequence of both the actions of the hotel itself (updating photos, lowering the price), and changes in the behavior of competitors or modifications of the platform algorithm. In such conditions, the adaptive mechanism does not claim to be absolutely accurate, but instead provides acceptable quality of solutions through rapid testing of hypotheses, evaluation of their results and adjustment of further actions. Thus, the five-stage cycle “monitoring – gap assessment – option selection – implementation – learning” forms a cybernetic control loop that allows a hotel and restaurant service enterprise to continuously adjust its competitive behavior in accordance with the turbulent dynamics of digital service ecosystems. At the same time, the practical implementation of this

mechanism faces a number of barriers that must be taken into account when implementing the architecture. The main obstacles include financial constraints, technological difficulties, incompatibility of outdated IT systems with modern platforms, organizational inflexibility and lack of qualified personnel. In addition, I. Porsyurova and M. Botin identify such barriers to digital renewal as the digital gap between large network and small independent establishments, insufficient digital competencies of personnel, managerial resistance to change and high investment risks in conditions of economic instability [11]. Overcoming these barriers requires a phased implementation of system components – from basic sensor monitoring to a fully functional digital twin – as well as accompanying investments in staff development and adapting corporate culture to the logic of continuous strategic experimentation.

6. Conclusions

Therefore, the above gives grounds to assert that the competitiveness of hotel and restaurant service enterprises in modern conditions is determined not so much by physical assets or internal operational excellence, but by the ability to function effectively in the environment of digital service ecosystems. The evolution of strategic management models – from linear planning to cyber-physical adaptive systems – has created a conceptual basis for a new understanding of competition, where advantage is formed at the intersection of physical service, digital presence and network connections. The generalization of scientific approaches has shown that for the hotel and restaurant sector, with its inherent intangibility, heterogeneity and customer-centricity of services, the synchronous management of two value creation contours – physical (direct service) and digital (platform presence, reputation metrics, personalized communications) becomes critically important.

The architecture of the adaptive system of strategic competitiveness management proposed in the work combines four functionally specialized subsystems – sensory monitoring, predictive modeling and digital twins, dynamic formation of a strategic portfolio, as well as a subsystem of “strategic refle . This architecture allows the enterprise to continuously collect and process data from external platforms (Booking, Expedia, TripAdvisor, Glovo, Bolt Food) and internal sources, model scenarios of competitive behavior, automatically select optimal strategic options and instantly respond to weak market signals. The adaptation mechanism, implemented as a five-stage cycle “monitoring – gap assessment – option selection – implementation through flexible service architectures – system training”, transforms strategic management from a periodic procedure into a continuous cybernetic circuit that self-learns at each iteration.

At the same time, the practical implementation of the proposed architecture encounters a number of barriers, including financial constraints of small and medium-sized establishments, incompatibility of outdated IT systems with modern API platforms, lack of digital competences of personnel, and managerial resistance to change. As the analysis showed, these problems are especially acute in the Ukrainian hotel and restaurant sector, which operates under martial law and macroeconomic turbulence, where the gap between large network operators and independent establishments in the level of digital maturity remains significant. Despite this, it is the phased integration of adaptive system components – from basic sensor monitoring to a fully functional digital twin – that is considered a key way to increase the sustainability and competitiveness of Ukrainian hospitality enterprises in the long term.

Further scientific exploration should be directed in several interrelated directions. First, it is necessary to empirically verify the proposed architectural model based on a representative sample of hotel and restaurant enterprises of various scales and specializations, which will allow us to quantitatively assess the impact of individual subsystems on key competitiveness indicators (occupancy, average check, rating, loyalty index). Second, an in-depth study of the possibilities of integrating artificial intelligence and machine learning technologies into the predictive modeling circuit seems promising, in particular for recognizing weak signals in unstructured data (review texts, images, audio recordings). Third, separate study is required on the issues of cybersecurity, protection of guests' personal data, and ethical aspects of algorithmic pricing in service ecosystems, which are gaining increasing importance in the context of increasing regulatory requirements. Finally, given the post-war prospects for the recovery of the Ukrainian economy, an urgent task is to adapt the proposed model to the specifics of the national hospitality market, taking into account security factors, migration processes,

changing consumer patterns, and state policy to stimulate the digital transformation of small and medium-sized businesses.

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