AGORA International Journal of Economical Sciences, http://univagora.ro/jour/index.php/aijes
ISSN 2067-3310, E-ISSN 2067-7669
Vol. 19, No. 1 (2025), pp. 46-55

SCENARIO FORECASTING REVENUE MANAGEMENT STRATEGY FOR UKRAINIAN HOTELS

M. BOIKO, M. BOSOVSKA, M. KULYK, N. VEDMID

Margaryta Boiko[1], Myroslava Bosovska[2], Mariia Kulyk[3], Nadiia Vedmid[4]
State University of Trade and Economics, Kyiv, Ukraine
[1] https://orcid.org/0000-0003-0249-1432 E-mail: m.boyko@knute.edu.ua
[2] https://orcid.org/0000-0002-6021-5228 E-mail: m.bosovskaya@knute.edu.ua
[3] https://orcid.org/0000-0001-8732-7441 E-mail: m.kulyk@knute.edu.ua
[4] https://orcid.org/0000-0002-5010-6394 E-mail: n.vedmid@knute.edu.ua

Abstract: *An organizational mechanism for revenue management implementing is proposed: monitoring and analytics of metrics for efficient adaptation; dynamic pricing and market segmentation; partnerships and staff motivation. Pessimistic, realistic, and optimistic scenarios have been developed to ensure the long-term effectiveness of revenue management. The pessimistic scenario as a preventive indicator of a crisis situation is proposed to prevent cost dissipation in the face of rate changes, ensuring the preservation of resource potential and maintaining consumer interest in the hotel product. The realistic scenario which reflects situationally possible deviations in revenue dynamics and likely fluctuations in demand focuses on strategizing preventive marketing measures to influence demand depending on external conditions and resource potential. The optimistic scenario, representing a favorable forecast involves the use of a portfolio of strategies, the variability of which provides conditions for maximizing income and helps to determine the priority areas of investment in the revenue management subsystems.*

Keywords: *Revenue management, scenario, strategy, hotels, dynamic pricing, digitalization.*

INTRODUCTION

The significant impact of a turbulent external environment and fluctuating market conditions has led to a decrease in the potential for implementing revenue management by hotel companies, especially small and independent facilities, due to limited economic and investment opportunities, deteriorating competitiveness and revenue shortfalls. The adaptation of Ukrainian hotels to the challenges associated with the war has demonstrated the importance of flexibility and the ability of businesses to respond quickly to external challenges, including those related to improving revenue management (Mazaraki et al, 2024). Therefore, attention should be paid to research related to the generalization of the evolutionary prerequisites and features of the implementation of the revenue management of various types of hotel enterprises and the identification of proposals on this basis for the formation of their strategic priorities in the context of the transformation of challenges and threats.

Therefore, the modern model of revenue management of hotel industry enterprises should be aimed at forming a balanced strategy with appropriate constraints and development vectors. Accordingly, this strategy involves not only the most efficient use of the available resource potential and ensuring sustainable growth of performance metrics that characterize the synchronization of growth opportunities, but also the establishment of partnerships to prevent cost dissipation. In other words, sustainable development and a collaborative model of the economy should be important principles in the new paradigm.

Strategic priorities for the implementation of the revenue management of hotel enterprises are aimed at achieving a balance of tactical and strategic goals, which will allow to reasonably allocate resource potential, determine descriptors of increasing revenues and adapting business processes to unfavorable external conditions (Kulyk et al, 2024).

In the context of setting strategic priorities, the following should be considered. The difference in the use of revenue management (RM) tools between hotels of different categories determines the choice of performance indicators and becomes a key element in the choice of a strategic priority, which serves as the basis for choosing a strategy. Given the diversity of tools used in hotels for revenue management, let's consider all possible variations.

1. Big Data, risk analysis, controlling. Big Data tests large amounts of analytics used to justify decisions, analyze consumer behavior and adapt pricing strategies, which ensures the flexibility of operational business processes and optimization of the value chain, leading to revenue maximization using a decision-making algorithmization model that structures the stages of management decision-making and automates business processes using integrated digital platforms, Google Analytics tools and global data analysis platforms. This toolkit covers the following performance indicators: key performance indicators (KPIs), Occupancy Rate, average daily rate (ADR), revenue per available room (RevPAR), average length of stay (ALOS), cost revenue per available room (CPAR).

2. Benchmarking. The process of analyzing the performance of competing hotel companies in order to improve business efficiency, optimize the current state of affairs and implement the positive experience of competitors. Benchmarking is an effective method of strategic and crisis management, which is a mechanism for comparative analysis of performance indicators and technologies of companies to identify and implement best practices. This toolkit covers the following performance indicators: revenue generation index (RGI), average rate index (ARI), market penetration index (MPI), net promoter score (NPS), life time value (LTV).

3. Business modeling. Some businesses use demand forecasting models and technologies based on historical booking data, which allows hotels to adjust their strategies using a technology platform that improves operational efficiency and customer service through real-time booking and management systems. This toolkit covers the following performance indicators: ADR, RevPAR, CPAR.

Thus, the definition of strategic priorities is based on the tools used and is the quintessence of the performance indicators monitored by the hotel. The basis for the formation of the external core of the effectiveness of the revenue management is the strategic guidelines that determine the meaningful idea and serve as a theoretical basis for determining the directions that ensure the effectiveness of the choice of strategies for practical application,

revenue management focuses on optimizing revenues through the implementation of environmental principles, which allows attracting investors focused on sustainable development. Implementation of digital tools in RM is a determinant of long-term efficiency of RM.

Theoretical Background

The multivariable characteristics of factors influencing the choice of strategic priorities of revenue management of a hotel enterprise, in particular in a turbulent environment, creates the basis for determining how to achieve a balance of tactical goals of the internal core of the revenue management efficiency as a key goal. The choice of strategic priorities and the combination of interests of stakeholders is determined by determining the cause-and-effect relationships between threats and opportunities and expected results in the system of evaluating tactics and further strategizing of the revenue management.

Scenario forecasting of the revenue management strategy as an alternative to single-variant forecasts is aimed at considering many factors. Modeling of possible scenarios depending on changes in internal and external factors is the result of scenario forecasting, which involves the analysis of possible development alternatives under the same initial conditions and allows to formulate optimal revenue management strategies adapted to market conditions (Chiang et al, 2007; Möller et al, 2004; Petropoulos et al, 2022).

In the context of choosing revenue management strategies, scenarios are forecasting of hypothetical development options based on the method of multiple regression using an artificial intelligence system, based on fuzzy sets and methods of fuzzy logical inference, presented in the form of an action plan.

The main advantage of scenario forecasting is the identification of factors that influence risk-based decision-making and determine priorities in the use of development opportunities (Homem-de-Mello & Bayraksan, 2014; Rahimian & Mehrotra, 2022; Strauss et al, 2018).

The heterogeneity of initial conditions in terms of seasonal fluctuations, the level of income of hotel enterprises and market factors of individual destinations causes a contradiction in determining the role and accuracy of the forecasted indicators in the revenue management. Explaining the essence of this thesis, especially in times of crisis, it is appropriate to note that the fundamental content of scenario forecasting is budget planning and strategic management, but is associated with significant challenges from the market business environment, and at the level of the hotel industry enterprise - the availability of resource potential and the balance of subsystems of revenue management as functionalities of its organizational mechanism.

However, it is worth noting that the accuracy and relevance of forecasts depends on large amounts of data, as well as analytical skills and the ability to analyze the results obtained, which necessitates the use of machine learning and artificial intelligence technologies, which, in turn, leads to the expansion of data collection and accumulation capabilities, the introduction of new methods in the process of their analysis and processing.

The problem lies in the fact that the resource capabilities of hotel enterprises for the implementation of revenue management are different in relation to the available potential, even if the enterprises belong to the same category, are located in the same climatic conditions, and are focused on a similar target consumer segment. The variability of the initial conditions of

hotel enterprises determines not only heterogeneous requirements for the development of strategies, but also affects the possibility of their implementation, which depends on the correlation of factors influencing the effectiveness of revenue management.

By the combination of external and internal environment factors in determining the potential of a hotel enterprise in terms of the effectiveness of revenue management, we understand the technology for assessing the level of occupancy rate (demand for hotel services) and the level of revenue per available room (RevPar). The methodology of scenario forecasting includes the analysis of historical data, identification of key drivers of influence, construction of alternative scenarios and assessment of their probability.

The mechanisms of scenario forecasting are described in detail by determining the correlation dependence of various parameters, among which the most common are indicators that characterize the relationship between two random variables (paired indicators): correlation moment, correlation coefficient.

In addition, other statistical indicators can be mentioned: mathematical expectation value, variance, and mean-square estimate. Thus, pairwise regression analysis involves the consideration of one independent variable and allows us to define a pairwise linear regression as a causal model of a statistical linear relationship between two quantitative variables (Klein et al, 2020)

The scenario of variability of substrategies of revenue management in the hotel business may include several key aspects that help to adapt to changing market conditions and increase the effectiveness of revenue management. It is the multivariate development of events and the turbulence of the external environment that determines the use of the scenario method in order to predict possible strategic priorities and select the optimal substrategies of revenue management. This method is used to evaluate and analyze alternative development options for hotel enterprises operating in the same market conditions. In the context of choosing revenue management substrategies depending on the trends in demand fluctuations and revenue growth rates, the scenarios are predictive development alternatives presented in the form of tactical goals and objectives. The main elements of the scenario method are the analysis of market conditions, in particular market data, including competitors, demand for services, seasonality and economic conditions and trend identification, which is to identify current and future trends in consumer behavior, such as changes in preferences for the type of accommodation or services. Having identified the areas of scenario forecasting, the management of the hotel management company has established the main directions of development and the consequences of the planned changes: flexibility in pricing using algorithms to automatically adjust prices depending on supply and demand; development of promotions and discounts for different customer segments, such as families, business travelers or groups; market segmentation based on demographic, psychographic and behavioral characteristics of consumers; development of personalized service offers.

METHOD

I.1. Sample and population

The survey was conducted from April to July 2023 and focused on the period from February 24 to the end of 2022 in hotels in Poland and Ukraine using the CAWI method

(computer-assisted web interview). Hotel managers from Ukraine and Poland (top managers and/or heads of structural units - sales, marketing, and reservation departments) were invited to participate in the survey.

I.2. Data Collection Process and Methods

The final mailing list included 306 hotels in Poland and 312 hotels in Ukraine, of which 100 hotels in Poland and 98 hotels in Ukraine responded to the survey. It should be noted that some of the hotels participating in the survey were reluctant to provide information, so some responses were found to be missing, incomplete, which reduced the number of questionnaires from Poland by six (N1 = 94) and from Ukraine by five (N2 = 93). In accordance with the entire population of certified hotels in Ukraine and Poland, the sample can be considered representative of the hotel market in Ukraine and Poland. Hotels from every voivodeship in Poland and every region of Ukraine, except for the temporarily occupied ones, took part in the survey. Most often, the survey involved two- and three-star hotels with an average capacity of 45 rooms in Poland and 49 in Ukraine. The quantitative empirical study was conducted in late 2022 and early 2023, i.e., during the period of martial law in Ukraine. The questionnaire was developed in accordance with the specifics of hotel operations under martial law, considering the peculiarities of different categories of hotels and the use of the revenue management system to improve performance.

I.3. Methodology

For the mathematical identification of scenarios of variability of revenue management (Si) substrategies, three strategic structural components (areas of choice) are defined: S1 - analysis of historical data; S2 - identification of key drivers of influence; S3 - assessment of the probability of the scenario's realization.

The methodology for identifying scenarios of variability of substrategies can be represented in the form of a matrix:

$$Si = (S1; S2; S3). \quad (1)$$

Strategic priorities are identified by C, such as: C1 - anti-crisis; C2 - supporting; C3 - cluster. The types of actions aimed at continuous transformation of the scenario selection processes are presented in the form of a column matrix:

$$Cj = \begin{pmatrix} C_1 \\ C_2 \\ C_3 \end{pmatrix} \quad (2)$$

Multiplying the selected matrices results in a rectangular matrix:

$$P_{ij} = S_i C_j, \quad (3)$$

where the elements of the matrix Pij are goals that determine the qualitative improvement of scenarios of variability of revenue management substrategies, i.e. strategic goals. The resulting matrices can reflect the scenario, Pij:

$$P_{ij} = \begin{pmatrix} S_1C_1 & S_2C_1 & S_3C_1 \\ S_1C_2 & S_2C_2 & S_3C_2 \\ S_1C_3 & S_2C_3 & S_3C_3 \end{pmatrix} = \begin{pmatrix} P_{11} & P_{12} & P_{13} \\ P_{21} & P_{22} & P_{23} \\ P_{31} & P_{32} & P_{33} \end{pmatrix} \quad (4)$$

The obtained forecasts have a high degree of approximation accuracy and can be used in the system of tactics evaluation and further revenue management strategy (Kimes, 2003; Lentz et al, 2021; Lin & Huang, 2015; Matsuoka, 2022).

RESULTS

Considering the directions of development and the consequences of the planned changes, we have developed scenarios for the variability of revenue management substrategies in the hotel business, which provide for constant market monitoring, flexibility in pricing, personalization of services and the use of modern technologies.

In practice, the use of scenario forecasting of the revenue management strategy makes it possible to make an informed choice among the relevant fluctuations in the market conditions of the substrategy/s to achieve the tactical and strategic goals of the revenue management.

In the crisis and post-crisis (post-war) period, for example, investing in the hotel business can be a profitable source for business diversification and as the main source of income (Bosovska et al, 2023).

Given the impact of certain environmental factors (level of demand), strategic priorities, and revenue potential (internal environment), we propose specific scenarios for the development of strategic behavioral models and the creation of competitive advantages for hotel enterprises. Such modeling of scenarios will allow to identify potential opportunities for the development of hotel enterprises (Table 1).

Table 1: ***Matrix for implementing revenue management substrategies***

	Scenario of variability of substrategies (V)		
	anti-crisis (C_1)	*supporting (C2)*	*cluster (C3)*
Analysis of historical data (S1)	adaptability	related diversification	cooperation
Identification of key drivers of influence (S2)	Product diversification	Development of new products and markets	Product modification
Assessment of the probability of scenario realization(S3)	Simulation strategy	Traditional strategy	Innovative strategy

Source: (Bakker et al, 2020; Gibbs et al, 2018; Pereira & Cerqueira, 2022; Xiao et al, 2024).

The matrix of implementation of the revenue management substrategies shown in the table contains a horizontal combination of elements that determine the competitiveness and efficiency of choosing the directions of modeling revenue management scenarios. It should be noted that the optimistic scenario provides a starting point for the level of efficiency of the revenue management for the hotel industry enterprise, with a high coefficient of synchronization in statics and dynamics. In turn, the baseline scenarios involve the use of a limited range of strategies that require investment. The pessimistic scenario assumes the use of

limited functionality of the revenue management, when only the dynamic pricing strategy can be used. The proposed scenarios are focused on the choice of revenue management substrategies, when it is important to determine the determinants of revenue management efficiency, risks, features of resource potential, as well as costs of the hotel enterprise (Dana, 2008; Demirciftci et al, 2020; Sundaram et al, 2020; Talluri & Van Ryzin, 2004; Webb, 2016; Yang et al, 2014).

Based on the modeling results, scenarios have been identified that make it possible to choose the revenue management substrategy(s) depending on the trends in demand fluctuations and revenue growth rates. The pessimistic scenario is a preventive indicator of a crisis situation in an unfavorable market environment. To stabilize revenue, the article proposes a dynamic pricing substrategy that prevents cost dissipation in the situation of tariff changes, ensuring the preservation of resource potential and maintaining consumer interest in the hotel product.

The optimistic scenario, representing a favorable forecast of market conditions, involves the use of a portfolio of substrategies, the variability of which provides conditions for maximizing revenues and efficient use of resource potential, and helps to determine the priority areas of investment in the subsystems of the revenue management.

DISCUSSIONS/CONCLUSIONS

In practice, the use of scenario forecasting of the revenue management strategy makes it possible to make an informed choice among the relevant fluctuations in the market situation of the substrategy/s to achieve the tactical and strategic goals of the management.

In times of crisis, it is important to use a scenario approach, since, taking into account the factors of internal and external influence, it is the miscalculation of possible scenarios that is an indicator of trends in the hotel services market. In times of market turbulence, an important process is to monitor the financial, resource, human resources, marketing, environmental and digital capabilities of a hotel company for timely adaptation to new consumer needs. The proposed scenarios take into account the level of efficiency of the management of hotel industry enterprises, which is determined by the synchronization coefficient. In order to ensure the reliability of data analysis, the following areas of scenario selection have been identified: analysis of historical data; identification of key drivers of influence; assessment of the probability of scenario implementation. A systematic approach was used to evaluate the strategic priority of the hotel industry enterprise, which allows to effectively analyze the factors of influence for making management decisions.

The strategic priorities for revenue management implementing are aimed at achieving a balance of tactical and strategic goals in the frame of the external core of revenue management efficiency. The use of the instrumentarium proposed in the article allowed to allocate three basic strategic priorities for the implementation of revenue management: anti-crisis (outsourcing strategy), supporting (segmental), cluster (consolidated), the choice of which depends on the assessment of the performance indicators of operating activities (Chiang et al, 2007).

The economic effect is calculated and the risks of implementing strategies within the framework of strategic priorities are identified. Implementation of the outsourcing strategy for delegation of non-core and supplementary business functions of the operating activities

reduced the burden on internal resources and influenced the annual revenue growth in the range of 0.5--2.7%. The segment strategy focused on differentiating distribution channels to increase consumer demand, maintaining loyalty, and promptly adjusting the tariff policy has helped to identify sources of profitability that lead to an annual increase in operating income of 3 to 5% (Mazaraki et al, 2024). It has been proved that the strategic priority in the format of the consolidated strategy is aimed at ensuring long-term revenue growth with an annual increase of (up to 10%).

Scenario forecasting of the variability of the revenue management strategies is aimed at achieving a balance of tactical goals of the internal core of revenue management efficiency. A correlation analysis was carried out to assess how changes in demand can affect the level of income. Based on the results obtained, two types of correlations were identified: positive and negative (Petropoulos et al, 2022).

. These results made it possible to accurately determine the relationship between demand and income, which is the basis for creating adaptive scenarios for choosing revenue management strategies. In particular, they helped to develop substrategies to optimize pricing policy, distribution channels, and to introduce new technologies and tools for revenue management.

Based on the results of the scenario forecasting, four scenarios were modeled to determine the likely strategy of revenue management. For the pessimistic scenario, as a preventive indicator of a crisis situation, the dynamic pricing substrategy is likely to be used; for the basic ones, the distribution, differentiation of the hotel product, and personalization substrategies are defined; for the optimistic scenario, a portfolio of substrategies is proposed, the variability of which ensures the conditions for maximizing revenues. It is proved that the choice of a probable revenue management strategy allows to respond proactively to potential external threats and to substantiate adaptive measures depending on future changes in the external environment.

REFERENCES

1. Bakker, H., Dunke, F., & Nickel, S. (2020). A structuring review on multi-stage optimization under uncertainty: Aligning concepts from theory and practice. *Omega*, *96*, 102080. https://doi.org/10.1016/j.omega.2019.06.006
2. Bosovska, M., Boiko, M., Bovsh, L., Okhrimenko, A., & Vedmid, N. (2023). Foresight (prevision) of development of the tourist system in Ukraine. *Problems and Perspectives in Management*, *21*(4), 696–712. https://doi.org/10.21511/ppm.21(4).2023.52
3. Chiang, W. C., Chen, J. C. H., & Xu, X. (2007). An overview of research on revenue management: Current issues and future research. International Journal of Revenue Management, 1(1), 97. https://doi.org/10.1504/ijrm.2007.011196
4. Dana, J. D. (2008). New directions in revenue management research. *Production and Operations Management*, *17*(4), 399–401. https://doi.org/10.3401/poms.1080.0040
5. Demirciftci, T., Chen, C., & Erdem, M. (2020). A tabulation of information technology and consumer behavior in hospitality revenue management

research. *Journal of Hospitality and Tourism Technology*, *11*(3), 575–587. https://doi.org/10.1108/jhtt-02-2019-0018

6. Gibbs, C., Guttentag, D., Gretzel, U., Yao, L., & Morton, J. (2018). Use of dynamic pricing strategies by Airbnb hosts. *International Journal of Contemporary Hospitality Management*, *30*(1), 2–20. https://doi.org/10.1108/ijchm-09-2016-0540
7. Homem-de-Mello, T., & Bayraksan, G. (2014). Monte Carlo sampling-based methods for stochastic optimization. *Surveys in Operations Research and Management Science*, 19(1), 56–85. https://doi.org/10.1016/j.sorms.2014.05.001
8. Kimes, S. E. (2003). Revenue management: A retrospective. *Cornell hotel and restaurant administration quarterly*, 44(5-6), 131-138.
9. Klein, R., Koch, S., Steinhardt, C., & Strauss, A. K. (2020). A review of revenue management: Recent generalizations and advances in industry applications. *European Journal of Operational Research*, *284*(2), 397–412. https://doi.org/10.1016/j.ejor.2019.06.034
10. Kulyk, M., Boiko, M., Bosovska, M., & Okhrimenko, A. (2023). Strategy of sales and communication of hotel services during the war. *Agora International Journal of Economical Sciences*, 17(1), 48–55. https://doi.org/10.15837/aijes.v17i1.5762
11. Lentz, M., Berezan, O., & Raab, C. (2021). Uncovering the relationship between revenue management and hotel loyalty programs. Journal of Revenue and Pricing Management. https://doi.org/10.1057/s41272-021-00331-0
12. Lin, Y. H., & Huang, K. (2014). Customer loyalty under the influence of revenue management: The case of taiwanese hotel customers. *Asia Pacific Journal of Tourism Research*, *20*(12), 1374–1388. https://doi.org/10.1080/10941665.2014.981556
13. Matsuoka, K. (2022). Effects of revenue management on perceived value, customer satisfaction, and customer loyalty. *Journal of Business Research*, *148*, 131–148. https://doi.org/10.1016/j.jbusres.2022.04.052
14. Mazaraki, A., Kulyk, M., Boiko, M., Bosovska, M., & Vedmid, N. (2024). Implementation of hotel revenue management strategies during a martial law. *Agora International Journal of Economical Sciences*, 18(1), 124–131. https://doi.org/10.15837/aijes.v18i1.6716
15. Möller, A., Römisch, W., & Weber, K. (2004). A new approach to O&D revenue management based on scenario trees. *Journal of Revenue and Pricing Management*, *3*(3), 265–276. https://doi.org/10.1057/palgrave.rpm.5170113
16. Pereira, L. N., & Cerqueira, V. (2021). Forecasting hotel demand for revenue management using machine learning regression methods. *Current Issues in Tourism*, 1–18. https://doi.org/10.1080/13683500.2021.1999397
17. Petropoulos, F., Apiletti, D., Assimakopoulos, V., Babai, M. Z., Barrow, D. K., Taieb, S. B., & Ziel, F. (2022). Forecasting: theory and practice. *International Journal of forecasting*, 38(3), 705-871.
18. Rahimian, H., & Mehrotra, S. (2022). Frameworks and results in distributionally robust optimization. *Open Journal of Mathematical Optimization*, *3*, 1–85. https://doi.org/10.5802/ojmo.15

19. Strauss, A. K., Klein, R., & Steinhardt, C. (2018). A review of choice-based revenue management: Theory and methods. *European Journal of Operational Research*, *271*(2), 375–387. https://doi.org/10.1016/j.ejor.2018.01.011
20. Sundaram, R., Sharma, D. R., & Shakya, D. A. (2020). Digital transformation of business models: A systematic review of impact on revenue and supply chain. *International Journal of Management*, 11(5). https://ssrn.com/abstract=3628963
21. Talluri, K., & Van Ryzin, G. (2004). Revenue management under a general discrete choice model of consumer behavior. Management Science, 50(1), 15-33. https://doi.org/10.1287/mnsc.1030.0147
22. Webb, T. (2016). From travel agents to OTAs: How the evolution of consumer booking behavior has affected revenue management. *Journal of Revenue and Pricing Management*, *15*(3-4), 276–282. https://doi.org/10.1057/rpm.2016.16
23. Xiao, W., Zhang, S., Huang, Z., & Yu, Y. (2024, May). Multi-Scenario Pricing for Hotel Revenue Management. In Proceedings of the ACM Web Conference 2024(WWW '24). Association for Computing Machinery, New York, NY, USA, 3986–3994. https://doi.org/10.1145/3589334.3645350
24. Yang, Y., Pan, B., & Song, H. (2013). Predicting hotel demand using destination marketing organization's web traffic data. Journal of Travel Research, 53(4), 433–447. https://doi.org/10.1177/0047287513500391