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Quantitative modeling of the operational efficiency of men's grooming industry chain enterprises

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Abstract. The **purpose of the study** is to develop an integrated economic and mathematical model to quantitatively assess the operational efficiency of network enterprises in the men's grooming industry by combining financial, production, client, and digital parameters into a single calculation system. **Methods**. The research is based on a synthesis of economic and mathematical modeling, systems analysis, indicator standardization, nonlinear aggregation, and multicriteria evaluation methods. The information framework comprises twenty primary financial, operational, customer, and digital indicators, which are transformed into five functional modules. The computational algorithm incorporates six interconnected mathematical functions describing network operational potential, inter-branch synchronization, structural harmony, and the final integrated operational efficiency index. **Results**. The developed model combines a multilevel structure of primary data with an adaptive mechanism for integrated performance assessment. Unlike conventional approaches, the comparative evaluation of enterprises is based not only on financial outcomes but also on resource efficiency, operational productivity, customer performance, digital synchronization, and the overall balance of business processes. The findings indicate that enterprises with similar financial performance may differ considerably in their integrated operational efficiency due to variations in network synchronization and process imbalances. The practical applicability of the model depends on establishing a unified primary information base across all structural units of the network. **Conclusions**. The proposed approach forms a holistic system for quantitative assessment of the operational efficiency of network enterprises. The theoretical significance of the obtained results lies in the development of economic and mathematical tools for assessing operational efficiency by combining adaptive weighting, nonlinear aggregation, assessment of inter-salon synchronization and structural balance within a single integrated model. The obtained results can be used by network managers, business analysts and developers of corporate information systems for ranking structural units, identifying process imbalances, determining management priorities and monitoring operational processes.

Keywords: operational efficiency, network enterprises, men's grooming, integrated model, economic and mathematical modeling, functional modules.

Кількісне моделювання операційної ефективності мережевих підприємств індустрії чоловічого грумінгу

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Анотація. Мета дослідження - розроблення інтегральної економіко-математичної моделі кількісного оцінювання операційної ефективності мережевих підприємств індустрії чоловічого грумінгу шляхом синергетичного поєднання фінансових, виробничих, клієнтських і цифрових параметрів у межах єдиної розрахункової системи. **Методи.** Дослідження спирається на синтез методів економіко-математичного моделювання, системного аналізу, стандартизації показників, нелінійного агрегування та багатокритеріального оцінювання. Інформаційне підґрунтя сформовано на основі двадцяти первинних фінансових, виробничих, клієнтських і цифрових показників, які трансформуються у п'ять функціональних модулів. Розрахунковий алгоритм охоплює шість взаємопов'язаних математичних функцій, які описують мережевий операційний потенціал, міжсалонну синхронізацію, структурну гармонійність і підсумковий інтегральний індекс операційної ефективності. **Результати.** Розроблена модель поєднує багаторівневу структуру первинних даних із адаптивним механізмом інтегрального оцінювання. На відміну від традиційних концепцій, порівняльний аналіз підприємств здійснюється не лише за фінансовими результатами, а й з урахуванням рівня ресурсної ефективності, операційної продуктивності, клієнтської результативності, цифрової синхронізації та загальної збалансованості бізнес-процесів. Установлено, що суб'єкти господарювання із близькими фінансовими показниками можуть суттєво різнитися за інтегральною оцінкою внаслідок відмінностей у рівнях мережевої синхронізації та процесних дисбалансів. Коректність практичного застосування моделі може бути забезпечена за умови формування уніфікованої первинної інформаційної бази для всіх структурних підрозділів. **Висновки.** Запропонований підхід формує цілісну систему кількісного оцінювання операційної ефективності мережевих підприємств. Теоретичне значення одержаних результатів полягає в розвитку економіко-математичного інструментарію оцінювання операційної ефективності шляхом поєднання адаптивного зважування, нелінійного агрегування, оцінювання міжсалонної синхронізації та структурної збалансованості в межах єдиної інтегральної моделі. Отримані результати можуть бути використані керівниками мереж, бізнес-аналітиками та розробниками корпоративних інформаційних систем для ранжування структурних підрозділів, виявлення процесних дисбалансів, визначення управлінських пріоритетів і моніторингу операційних процесів.

Ключові слова: операційна ефективність, мережеві підприємства, чоловічий грумінг, інтегральна модель, економіко-математичне моделювання, функціональні модулі.

Problem statement. The development of network structures in the men's grooming industry is accompanied by a significant complication of their operating systems, where results are formed not only by the financial indicators of an individual salon but, first of all, by the consistency of the network as a whole. The expansion of digital channels of interaction with customers, the gradual standardization of service procedures, as well as the centralization of resource management significantly increase the requirements for tools for quantitative analysis of operational efficiency. The use of traditional performance indicators, as well as autonomous assessment systems, is increasingly proving insufficient to ensure the necessary accuracy in comparing enterprises that differ in resource structure and scale of activity. The problem lies primarily in the lack of a holistic quantitative model capable of combining financial, production, customer and digital parameters in a single integral assessment indicator.

Analysis of recent research and publications. The issue of digitalization of personalized services related to the formation of an external image was considered by Ye. Matsapura [1], who established that digital modeling increases the accuracy, detail and artistic expressiveness of visual compositions, allows taking into account anatomical features and individual aesthetic needs of the client and also optimizes the preparatory stage of image creation.

The possibilities of using generative artificial intelligence technologies in the training of barbers were studied by S. Nersisian [2]. The methodological approach proposed by the author involves the use of generative models to structure appearance parameters, stylistic preferences and professional requirements, predict optimal options for a male image and form personalized educational trajectories. It was established that the use of such technologies contributes to the development of professional competencies and critical and creative thinking in future barbers, and the developed models can be used not only in the educational process but also in professional salons to improve the quality of service.

The psychological consequences of changing the external image are highlighted in the work of O. Pasulia [3]. The author substantiates that stylistic transformations of the face and hair can positively affect the self-esteem, self-confidence and body perception of the client, provided that they are consistent with his individual characteristics and personal expectations.

The multi-model approach to assessing the operational efficiency of small and medium-sized businesses, highlighted in the work of H. Guo et al. [4], convincingly demonstrates the advantages of combining several performance measurement methods. However, the researchers have not paid attention to the aspects of adapting this concept to the specifics of network service enterprises. Instead, in the work of M. Li et al. [5], an innovative model for assessing the efficiency of service systems is proposed, which demonstrates high potential for a comprehensive analysis of production processes. The main limitation of the mentioned development is the lack of developed mechanisms for integrating financial, client and digital parameters within a single quantitative structure. The wide potential of the fuzzy logic toolkit for multi-factor assessment of management processes during the analysis of the readiness of enterprises to implement innovative strategies was substantiated by V. Makedon et al. [6]. Despite the importance of the results obtained, the issue of building integrated models of operational efficiency directly for service networks still requires further development.

The issue of quantitative assessment of the impact of digital transformation on the performance of service organizations is the subject of a study by A. Nath et al. [7]. The relationship established by scientists between the implementation of digital

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technologies and work efficiency is a significant achievement; however, the proposed approach ignores inter-salon synchronization and the structural imbalance of network objects. Other scientists also considered certain methodological aspects of the assessment. In particular, S. M. Shahzadeh Safavi et al. [8] formulated a model for quantitative assessment of financial resources, while S. Yang and co-authors [9] substantiated ways to increase operational efficiency through financial sharing mechanisms. Applied solutions for assessing the performance of service systems were proposed by V. Zakirov [10], and I. Meghrajani and N. Multani [11] highlighted the directions of transformation of consumer preferences in the men's grooming segment under the influence of digital communications.

Identification of previously unresolved parts of the general problem. Despite a significant amount of theoretical and practical work, the problem of creating a specialized quantitative model for assessing the operational efficiency of networks in the field of men's grooming remains fragmentarily developed. In particular, the existing studies have not sufficiently studied the simultaneous consideration of financial, production, client and digital indicators, as well as the level of synchronization of structural units within a single network. This gap justifies the need for this study.

Formulation of the article objectives (statement of tasks). The purpose of the article is to develop an integral economic and mathematical model for quantitatively assessing the operational efficiency of network enterprises in the field of men's grooming.

Research objectives:

– to form the primary information base of the model and substantiate the system of functional modules of the operational efficiency of men's grooming salons;

– to develop an integral economic and mathematical model for assessing the operational efficiency of network enterprises in the men's grooming industry.

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The research methodology is based on the synthesis of economic and mathematical modeling, quantitative analysis of operations and a systems approach. The methodological scheme covers the full cycle of building an integrated model, from the formation of an information base to the calculation of the final index of operational efficiency. The information base consists of twenty initial indicators of financial, production, customer and digital direction. Data accumulation occurs using Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Business Intelligence (BI) systems, as well as electronic booking platforms. After verification, standardization and normalization, the primary variables are converted into local coefficients. They are then aggregated into five functional modules, namely the resource efficiency module, the operational productivity module, the customer performance module, the digital synchronization module and the financial stability module. The network operational potential was determined using the modified Constant Elasticity of Substitution function (CES-function). The final integral index of operational efficiency was formed using penalty multipliers that allow taking into account spatial dispersion, digital instability and process imbalance. The model parameters were calibrated iteratively. For this, actual network data was used, which ensured the minimization of deviations between calculated values and empirical results.

Presentation of the main research material. The operational efficiency of network structures in the men's grooming industry is characterized by a multi-level structure, in which the result of the activities of an individual salon is formed not in isolation, but under the influence of network coordination of resources, standardization of service processes, digital management of client flows and spatial distribution of production workload. Traditional Key Performance Indicators (KPI) systems are mainly focused on an autonomous enterprise. In contrast, network business functions as an integrated organizational system, where the local results of a separate point continuously affect the efficiency of the entire network. A comparison of literature data demonstrates [12; 13], that quantitative assessment of operational activities is most often based on Data Envelopment Analysis (DEA) models, structural analysis of productivity, digital indicators of inventory management or systems of strategic indicators. In parallel, research on the men's grooming market focuses mainly on consumer behavior, marketing communications and demand dynamics. As a result, a methodological gap is formed, manifested not in the absence of individual indicators, but in the absence of an integrated system capable of simultaneously assessing the production, financial, client and digital performance of network enterprises in men's grooming. The problem also lies in the fact that absolute financial indicators do not provide a correct comparison of salons of different scales. One institution can generate more revenue only due to a larger area or number of personnel. Another may demonstrate lower income but use production resources much more intensively.

The proposed approach uses twenty basic variables that characterize all stages of creating an operational result: the formation of resource potential, the execution of service procedures, interaction with customers, digital coordination of business processes, and financial return on activity [8]. First, each variable undergoes a standardization procedure, after which a system of local calculation coefficients is formed. The latter perform an auxiliary function and are used only to build five functional modules M_1–M_5 (M_1 – resource efficiency; M_2 – operational productivity; M_3 – client performance; M_4 – digital manageability and network synchronization; M_5 – financial stability). The information base includes only indicators that are regularly accumulated by corporate information systems and can be automatically updated after each operational cycle. As a result, the mathematical model can be integrated into a corporate ERP, CRM or BI platform without changing the calculation algorithm (Table 1).

Table 1

Structuring primary indicators for the formation of functional modules of the integrated model of operational efficiency of a chain of male grooming enterprises

Group of primary indicators	Basic variables	Designation	Unit of measurement	Module
Financial results	Operating revenue; operating profit; operating expenses	R, OP, CR, OP, CR, OP, C	UAH	M_5
Labor resources	Working time fund; actual time worked	T_f, T_u	Hours	M_1
Production capacity	Number of barbers; number of jobs	E, W	Units	M_1
Service process	Number of procedures; average duration of the procedure	N_s, t_p	Units; min.	M_2
Client flow	Number of clients; repeat visits; average check	N_c, N_r, A	Persons; UAH	M_3
Digital interaction	Online booking; digital transactions	B_o, D_t	Units	M_4
Operational stability	Canceled entries; customer no-shows	B_c, B_n	Units	M_4
Material resources	Cost of materials used; average inventory balance	M_c, Is	UAH	M_1
Additional monetization	Sales of related products; inter-salon personnel movement	S_p, P_m	UAH; units	M_3, M_4
Operational quality	Number of complaints	Q_r	Units	M_2

Source: author's development

The information base given in Table 1 forms only the initial level of the calculation model. The next stage consists of transforming the primary variables into local normalized coefficients, their nonlinear aggregation within the functional modules M_1–M_5 and constructing an integral index of operational efficiency [14, p. 1320]. The function of the network operational potential will be determined through the modified CES-construction:

$$P_i = \left[\sum_{k=\bullet}^{K} \alpha_k \left(M_{ik} \cdot U_{ik}^{\eta_k} \right)^{\rho} \right]^{\frac{\bullet}{\rho}} \cdot \left(\bullet + \sum_{\substack{k \bullet l = \bullet \\ k<l}}^{K} \gamma_{kl} \sqrt{M_{ik} M_{il}} \right) \quad (1)$$

where P_i – the network operational potential of the i-th point (salon); M_{ik} – the normalized estimate of the k-th functional module; U_i – the coefficient of actual

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capacity utilization of the corresponding module; α_k – the basic weight of the functional module; η_k – the elasticity of the potential by the level of capacity utilization; ρ – the parameter of interchangeability of functional modules; γ_{kl} – the coefficient of pairwise operational complementarity; K – the number of functional modules.

The first part of formula (1) reproduces the salon's ability to transform resource, customer, digital and financial parameters into a stable operational result. The second part captures the synergistic effect. The parameter ρ determines the rigidity of the mutual substitution of modules. For $\rho \rightarrow 1$, the model approaches an additive design. For $\rho \rightarrow 0$, it passes to a geometric type. Negative values of ρ increase the sensitivity to weak subsystems, which, in our opinion, better corresponds to the operational nature of the service network [15; 16]. An individual salon cannot be evaluated outside the network configuration. Its effectiveness depends on the consistency of service standards, schedules, personnel utilization and digital service processes. The inter-salon synchronization coefficient (S_i) is proposed to be calculated as follows:

$$S_i = \bullet\bullet\bullet\left[-\frac{\bullet}{K}\sum_{k=\bullet}^{K}\omega_k \left|\frac{M_{ik}-\tilde{M}_k}{\bullet\;\bullet\;\bullet_k+\varepsilon}\right|\right]\cdot\left[\frac{\bullet}{n\bullet n-\bullet\bullet}\sum_{\substack{r\bullet s=\bullet \\ r<s}}^{n}\bullet\bullet\bullet\bullet(\bullet\,\mathbf{M}_r\bullet\bullet\,\mathbf{M}_s)_+\right] \quad (2)$$

where $\widetilde{M}_k$- the median value of the k-th module in the network; MAD_k – the median absolute deviation of the corresponding module; Ω_k – the weight parameter of network consistency; E – a small stabilization constant; ΔMr – the vector of temporal changes in the modules of the r-th salon; n – the number of network points; $corr(\cdot)+$ – the integral of the pairwise correlation.

The median deviation is chosen instead of the standard deviation, since networks often contain new, reorganized, or abnormally loaded points. The final integral index of operational efficiency (IOE_i) for male grooming salons can be calculated by the formula:

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$$IOE_i = P_i^{\beta_\bullet} G_i^{\beta_\bullet} S_i^{\beta_\bullet} \bullet\bullet\bullet \left[-\lambda_\bullet D_i^{sp} - \lambda_\bullet D_i^{dig} - \lambda_\bullet B_i^{proc} \right]^\bullet \qquad \sum_{q=\bullet}^{\bullet} \beta_q = \bullet \tag{3}$$

where D_i^{sp} – the spatial dispersion of the operational result; D_i^{dig} – the digital instability of records, transactions, and schedules; B_i^{proc} – the imbalance between functional modules; $\beta_1, \beta_2, \beta_3$ – the structural significance parameters; $\lambda_1, \lambda_2, \lambda_3$ – the penalty sensitivity coefficients.

Spatial dispersion reflects the dependence of the result on the territorial location of an individual salon in the network, local demand and distance from the management center. Digital instability records discrepancies between planned and completed operations. Process imbalance characterizes the uneven development of functional modules. As a result, a high index is not received by the salon with the maximum single indicator, but by a point with a stable, synchronized and balanced operational profile [17]. For network enterprises in the men's grooming industry, this practice does not provide an adequate description of operational processes, since the contribution of individual functional modules changes along with the structure of client flows, the level of digital interaction between salons and the nature of the use of production resources [18, p. 78].

After determining the adaptive weights, a network balance coefficient is formed. Its purpose is to assess the evenness of the development of all functional modules. For this purpose, a modified structural harmony index (H_i) was used, which is described by the formula:

$$H_i = \frac{\left(\prod_{k=\bullet}^{K} M_{ik}^{\alpha_k} \right)}{\sum_{k=\bullet}^{K} \alpha_k M_{ik}} \cdot \bullet\bullet\bullet\bullet - CV_i \bullet \tag{4}$$

where M_{ik} – the integral estimate of the functional module; α_k – the adaptive weight of the module; CV_i – coefficient of variation of the module estimates.

After the completion of the parameterization procedure, all functional modules acquire a single mathematical interpretation. The next stage of the research focused on forming a matrix of adaptive weighting coefficients that determines the contribution of each functional module to the construction of an integral index of operational efficiency of network male grooming enterprises (Table 2).

Table 2

Adaptive weight coefficients of functional modules of the integral model for assessing the operational efficiency of network enterprises in the male grooming industry

Functional module	Basic information weight, α_k	Structural interaction coefficient, C_k	Adaptation limits	Correcting parameter	Adjusted weight, α_k^*
Resource intensity, M_1	0.214	1.08	0.18–0.26	δ_{12}, δ_{15}	0.223
Operational productivity, M_2	0.231	1.12	0.20–0.28	δ_{21}, δ_{24}	0.247
Customer conversion, M_3	0.184	1.05	0.15–0.23	δ_{31}, δ_{35}	0.193
Digital synchronization, M_4	0.167	1.19	0.14–0.24	δ_{42}, δ_{45}	0.189
Financial return, M_5	0.204	1.11	0.17–0.26	δ_{51}, δ_{54}	0.216
Spatial stability, D_{sp}	–	–	0–1	λ_1	Penalty multiplier
Digital instability, D_{dig}	–	–	0–1	λ_2	Penalty multiplier
Process imbalance, B_{proc}	–	–	0–1	λ_3	Penalty multiplier
Harmony coefficient, H_i	–	–	0–1	Formula (4)	Resulting multiplier
Integral index, IOE_i	1.000	–	0–1	Formula (5)	Final indicator

Source: author's development based on data [19]

Two enterprises can obtain similar IOE_i values, but one salon is characterized by high internal balance, and the other supports the result exclusively due to a separate strong functional module. In the second case, even a slight change in the external environment leads to a sharp deterioration in operational performance. For this reason, the scale for interpreting the integral index was built not on the principle of statistical interval division, but on the logic of the network's operational modes (Table 3).

Table 3

Interpretation scale of the integral index of operational efficiency and management modes of operation of network enterprises of men's grooming

Interval IOE_i	**Operating mode**	**Harmony coefficient**	**Management priority**	**Reassessment period**	**Expected change in operational efficiency**
0.90–1.00	Optimally synchronized	≥0.95	Maintaining model parameters	1 quarter	Stable
0.80–0.89	Highly efficient	0.90–0.95	Punctual tuning of individual modules	1 quarter	Positive
0.70–0.79	Stable	0.84–0.89	Optimization of digital coordination	2 months	Moderate growth
0.60–0.69	Functionally unstable	0.78–0.83	Redistribution of production resources	1 month	Average need for changes
0.50–0.59	Critically unbalanced	0.70–0.77	Restructuring of business processes	1 month	High need for changes
0.40–0.49	Deficit of operational synchronization	0.60–0.69	Restructuring of digital architecture	2 weeks	High need for changes
0.30–0.39	Destabilized	0.50–0.59	Comprehensive operational audit	2 weeks	Very high need for change
0.20–0.29	Pre-crisis	0.40–0.49	Network management reorganization	1 week	Maximum need for change
0.00–0.19	Crisis	<0.40	Complete redesign of the operating system	Immediate	Radical transformation

Source: author's development

The interpretation scale is not used in isolation, but as the final link in the network enterprise ranking algorithm. This means that the enterprise's final ranking is determined not only by the value of IOE_i, but also by the level of harmony among functional modules and the degree of network synchronization. Grooming salons are ordered in descending order of IOE_i. If the difference between two neighboring salons does not exceed the established threshold of statistical sensitivity, the enterprise with the higher coefficient Hi is given priority. If both indicators are equal,

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the network synchronization coefficient Si is used as the second ranking criterion. Therefore, each update of the corporate database automatically starts a repeated calculation cycle, changes the structure of adaptive weights, clarifies the integral index and adjusts the position of the enterprise in the network rating.

The results obtained are consistent with the conceptual provisions of H. Guo et al. [4] regarding the feasibility of using multicomponent models when assessing the operational efficiency of enterprises. The toolkit we have proposed develops the above-mentioned approach by hierarchically transforming primary financial, production, customer and digital indicators into the corresponding functional modules, ensuring a mathematically consistent transition to the calculation of the integral index.

The methodological provisions formed partially overlap with the results of M. Li et al. [5] regarding the assessment of the efficiency of service systems. At the same time, the developed model expands the analytical potential of existing solutions by additionally considering the coefficient of inter-salon synchronization, the structural harmony of functional modules and penalty parameters that characterize spatial dispersion, digital instability and process imbalance. A significant clarification has also been made regarding the scientific achievements of A. Nath et al. [7]. Unlike these researchers, who associate the growth of operational efficiency mainly with digitalization, the proposed approach integrates the digital circuit into a single system of interconnected operational components. In addition, the results obtained detail the conceptual principles highlighted in the work of S. M. Shahzadeh Safavi et al. [8], since financial metrics are considered not as an isolated vector, but as one of the equal modules of the integral model. The approach proposed in the paper aligns with modern studies of digital marketing ecosystems, which emphasize the need to comprehensively consider digital parameters, personalization and the adaptability of information processes when assessing performance [20]. It has been established that business entities with similar financial indicators can differ significantly in overall assessment due to differences in network synchronization and process imbalances. Modern approaches to forecasting financial risks also confirm the need to combine traditional indicators with digital signals and nonlinear dependencies, as using structured digital information increases the timeliness and accuracy of analytical assessments [21]. The study shows that the correctness of the practical application of the business model can be ensured if a unified primary information base is formed. This is consistent with modern digital profiling research, which identifies fragmentation of heterogeneous data as a key limitation of complex analytical models and considers integration a prerequisite for increasing the validity of management decisions [22].

The scientific novelty of the study lies in expanding the existing economic and mathematical apparatus by developing a model specifically adapted to the specifics of network entities in the field of men's grooming. The key difference of the developed algorithm is the original combination of adaptive weighting tools, nonlinear aggregation and the assessment of inter-salon synchronization and structural balance.

The identified limitations of the model application are associated with the need to use unified corporate data and conduct preliminary calibration of parameters based on the actual indicators of a specific business network. Changing organizational conditions or selecting entities with a different business model will require a repeated procedure for identifying parameters.

Conclusions. The proposed economic and mathematical model is based on twenty primary financial, production, customer and digital indicators. After the standardization procedure, the specified metrics are aggregated into five functional modules M1-M5, which form an integral index of operational efficiency. The specified architecture provides a consistent transition from the initial information array to a comprehensive assessment while preserving the economic content of each variable. The practical implementation of this approach assumes the presence of a unified data collection system for all network entities, since the lack of such unity significantly reduces the level of comparability of the results obtained. The integral index is formed taking into account not only the operational potential, but also the coefficient of inter-salon synchronization, structural harmony of functional modules, as well as penalty multipliers that reflect spatial dispersion, digital instability and process imbalance of the business model. Therefore, the proposed economic and mathematical model is aimed at assessing the overall balance of the functioning of the entire network, and not at fixing the maximum values of individual metrics. The correctness of the interpretation of the final results directly depends on the preliminary calibration of weight parameters based on the actual indicators of a specific network of enterprises.

The integral index can be used to rank structural units, identify weak functional modules, determine the level of inter-salon consistency and select the appropriate management mode. The practical application of the model involves its integration into corporate ERP, CRM and BI systems, which will ensure automatic updating of estimates after the receipt of new operational data and create an information basis for the redistribution of resources, adjustment of business processes and monitoring of the operational efficiency of the network.

The theoretical significance of the results lies in the development of economic and mathematical tools for assessing network service enterprises by taking into account the interdependence of their structural units. The limitations of the model are related to the need for a unified data collection system and preliminary calibration of parameters for a specific network.

Promising areas of further development are empirical testing of the constructed model on an array of network enterprises of various scales, comparison of the obtained results with indicators of modern multi-criteria evaluation methods, as well as the use of machine learning algorithms for automated adjustment of adaptive weighting coefficients and forecasting the dynamics of operational efficiency.

References

1. Matsapura Ye. Digital modeling of tattoo compositions as a field of visual design. *Humanities Science Current Issues*. 2025. Vol. 2, № 93. P. 47–53. DOI: https://doi.org/10.24919/2308-4863/93-2-8.

2. Nersisian S. Generative AI for developing personalized male image strategies in barber education. *Педагогічна Академія: наукові записки*. 2026. № 26. DOI: https://doi.org/10.5281/zenodo.18301248.

3. Pasulia O. The impact of stylistic transformations of the face and hair on client self-esteem and body perception. *Наукові перспективи*. 2026. № 12(66). DOI: https://doi.org/10.52058/ DOI 2708-7530-2025-12(66)-2090-2103.

4. Guo H., Liu Y., Hu L., Zhang X. A multi-model based approach for measuring operational efficiency in SMEs: theory construction and empirical analysis. *International Journal of Finance and Investment*. 2024. Vol. 1, № 1. P. 47–49. DOI: https://doi.org/10.54097/hpjz6h74.

5. Li M., Lin L.-Y., Chen K.-S., Hsu T.-H. Novel service efficiency evaluation and management model. *Applied Sciences*. 2021. Vol. 11, № 20. Art. 9395. DOI: https://doi.org/10.3390/app11209395.

6. Makedon V., Myachin V., Aloshyna T., Cherniavska I., Karavan N. Improving the readiness of enterprises to develop sustainable innovation strategies through fuzzy logic models. *Economic Studies*. 2025. Vol. 34, № 5. P. 165–179. URL: https://archive.econ-studies.iki.bas.bg/2025/2025_05/2025_05_09.pdf (access date: 05.03.2026).

7. Nath A., Onib S. A. A. S., Barsa N. J., Anika A. A quantitative assessment of the role of digital transformation on operational efficiency in service-based organizations. *Corporate Sustainable Management Journal*. 2024. Vol. 2, № 1. P. 65–72. DOI: https://doi.org/10.26480/csmj.01.2024.65.72.

8. Shahzadeh Safavi S. M., Bikzadeh Abbasi F., Shahverdini S., Raad A. Quantitative modeling of financial resources in knowledge-based small and medium-

sized enterprises. *Journal of Resource Management and Decision Engineering*. 2025. Vol. 4, № 4. P. 1–16. DOI: https://doi.org/10.61838/kman.jrmde.143.

9. Yang S., Zang J., Wu Y., Kong D. Enhancing operational efficiency in resource-intensive enterprises through financial sharing model. *International Journal of e-Collaboration*. 2025. Vol. 21, № 1. P. 1–18. DOI: https://doi.org/10.4018/IJeC.367277.

10. Zakirov V. Assessment of service efficiency using public service models. *Business and Innovative Systems Engineering*. 2025. Vol. 2. DOI: https://doi.org/10.31603/biseeng.343.

11. Meghrajani I., Multani N. Breaking barriers: social media influencers and the evolution of men’s grooming preferences. *International Journal of Integrated Science and Technology*. 2025. Vol. 3, № 5. P. 2005–2014. DOI: https://doi.org/10.59890/ijist.v3i5.51.

12. Mokogwu C., Achumie G. O., Adeleke A. G., Ewim P.-M. A conceptual model for enhancing operational efficiency in technology startups: integrating strategy and innovation. *International Journal of Engineering Research and*. 2024. Vol. 20, № 11. P. 302–316.

13. Hamshaw R. J. T., Gavin J. Men’s perspectives on their grooming practices and appearance concerns: a mixed methods study. *American Journal of Men's Health*. 2022. Vol. 16, № 2. DOI: https://doi.org/10.1177/10608265211052068.

14. Abdullah M. S., Abas N. M., Aziz A., Kadir M. S. A. Purchase intention on grooming products among metrosexual men: whether brand awareness, brand loyalty and self concept give significant relationship? *International Journal of Academic Research in Business and Social Sciences*. 2023. Vol. 13, № 4. P. 1046–1059. DOI: https://doi.org/10.6007/IJARBSS/v13-i4/16653.

15. Wijaya A., Chandra E., Julyanthry, Candra V., Simarmata S. M. Purchase intention of grooming products: The value-attitude-behaviour (VAB) model. *International Journal of Entrepreneurship and Sustainability Studies*. 2021. Vol. 1, № 2. P. 10–18. URL:

https://pdfs.semanticscholar.org/20b7/8e85de3f6ac93b8dc6ba521c9126a5955b99.pdf (access date: 05.03.2026).

16. Ota R., Ray S. S., Jena S. A study on the growing interest of male towards grooming industry. *International Journal of Research Publication and Reviews*. 2023. Vol. 4, № 3. P. 2386–2397. DOI: https://doi.org/10.55248/gengpi.2023.4.33293.

17. Global men's grooming and cosmetics market research report 2026 (Report No. 5679940). *QYResearch*. URL: https://www.qyresearch.com/reports/5679940/men-s-grooming-and-cosmetics (access date: 05.03.2026).

18. Makedon V., Myachin V., Sokol P., Hordiichuk S. Synchronization of marketing strategies with company restructuring. *Eastern-European Journal of Enterprise Technologies*. 2025. Vol. 2, № 13(134). P. 71–81. DOI: https://doi.org/10.15587/1729-4061.2025.326377.

19. Amrina U., Hidayatno A., Zagloel T. Y. M. A model-based strategy for developing sustainable cosmetics small and medium industries with system dynamics. *Journal of Open Innovation: Technology, Market, and Complexity*. 2021. Vol. 7, № 4. Art. 225. DOI: https://doi.org/10.3390/joitmc7040225.

20. Hneletska P. Minimization of algorithmic bias in recommender systems as a factor in enhancing inclusivity and effectiveness of marketing communications. *Актуальні питання економічних наук*. 2026. № 21. DOI: https://doi.org/10.5281/zenodo.18980707.

21. Samodina D. Neural network forecasting of systemic financial risk based on blockchain market signals. *Актуальні питання економічних наук*. 2024. № 3-4. DOI: https://doi.org/10.5281/zenodo.18982753.

22. Pankulych I. Methodologies for digital profiling of foreign partners to assess their reliability and solvency. *Академічні візії*, 2026. № 51. URL: https://www.academy-vision.org/index.php/av/article/view/2754 (access date: 05.03.2026).