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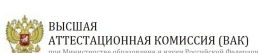of Theory and Practice of Management.
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Agent-Based Model for Forecasting the Impact of the Population Life Quality on Migration Movement in the Context of the Russian Federation Federal Districts

M.M. Nizamutdinov, Z.A. Davletova
Institute for Socio-Economic Research UFRC RAS,
Ufa, Russia

ABSTRACT

The Russian Federation is characterized by an extremely uneven distribution of the population across the country, which contributes to the asymmetry of economic and socio-demographic development of the regions, a shortage of qualified specialists for the development of the resources of Siberia and the Far East, and an increase in global risks in general. In this regard, the use of modern management technologies, in particular, multi-agent simulation modeling, to support decision-making on managing migration processes becomes relevant. Since the main incentive for active citizens to change their place of residence is investing in the development of the region and providing the necessary conditions for a comfortable life, the purpose of the study is to develop an agent-based model for forecasting the impact of the population life quality on migration flows between the federal districts of the Russian Federation. One of the tasks solved using the model is to track the direction of migrant movement relative to the Republic of Bashkortostan when changing the controlled parameters. The simulation model was designed using modern CASE tools; UML diagrams and a mnemonic diagram of the decision-making support process for managing the demographic development of the region were built in the course of the work. Scenario experiments were conducted to predict changes in the population size in the study areas. Within the framework of the research, the authors applied the object-oriented methodology of simulation model design, agent-based approach for its implementation, as well as an agent-oriented approach for its implementation and statistical analysis methods when setting up experiments. The toolkit developed as a result of the study can be used by the representatives of executive authorities and government officials to develop a balanced resettlement policy, assess the possibility and conditions for developing regions of the Russian Federation with low population density.

Keywords: population forecasting; migration; agent-based model; federal districts of the Russian Federation; population life quality; resettlement; Far East; Republic of Bashkortostan

INTRODUCTION

Russia is the world-largest country in terms of territory. It possesses significant natural resources, which offer unlimited opportunities for successful development and prosperity in the conditions of a well-maintained State policy. The Russian Federation has eight federal districts, which differ greatly in terms of socio-economic development and in natural and climatic conditions. For example, nearly 65 per cent of the country's territory is a permafrost-soil area, most of which is located in the Siberian Federal District (SFD) and the Far Eastern Federal District (FEFD). At the same time, Russia is specific by an extremely uneven density of population. For example, as of 1 January 2024, the Moscow's density was 5134.64 inhabitants per square kilometer and only 0.07 inhabitants per square kilometer in the Chukotka Autonomous Area. The main reasons for this are the harsh climatic conditions and the lack or poor development of infrastructure in the northern and far eastern parts of the country.

A significant gap in the indicators of population density in different regions of Russia leads to their differentiation in terms of socio-economic situation, since the main driver of the development of the territory and the development of its natural potential is the availability of a sufficient number of suitably qualified personnel. The problem of uneven distribution of population is one of the most serious obstacles to the successful development of the state, which requires the development of an effective policy of settlement of citizens in the territories of the federal districts [1]. In this regard, the objectives to generate instruments for developing balanced territorial settlement schemes become urgent. Currently, the application of multi-agent simulation modelling methods are still more in demand, since they can be successfully used to formulate strategic plans for the development of territories [2]. Many scientists are involved in working out agent-based models. In particular, the models are used to forecast demographic indicators and employment of the population in the regions of the country [3], which makes it possible to model public management processes by means of the change of a number of exogenous variables, to generate scenarios of experiments and to select optimal management decisions. The study [4] presents an agent-based model of population forecasting in the AnyLogic simulation environment. Experiments with the use of agent-based model contribute to the formation of the forecast of population change for the perspective up to 10 years in large and small cities of the Republic of Bashkortostan.

The authors of the article [5] propose an agent-based model of interaction between two categories of population: migrants and native inhabitants, which can be used to manage the human resource potential of enterprises based on the forecast values of demographic and migration indicators. Dutch researchers presented an agent-based model of internal migration under the conditions of the increasing risk of coastal flooding in France [6]. The agent parameters were determined using national statistics, and the model was calibrated on the basis of a household survey on the adaptation degree. An international team of researchers proposed an agent-based model of labour migration and farmland abandonment in China based on a very high resolution satellite visual footage, Global Positioning System, household surveys and census data [7]. The book [8] presents an agent-based labour market model to follow the life cycle of an individual from birth to retirement.

The problem of uneven distribution of human settlements is not only manifested in the context of federal districts, but also at the regional level. For example, the Republic of Bashkortostan (RB) has a tendency of concentration of inhabitants in large urban agglomerations and depopulation in the rural areas [9].

Besides, the migration outflow of population from Bashkortostan is another negative trend for

the development of the republic's economy. This mainly deals with young age groups: high school graduates leave the region to study in the leading universities of Russia, or young specialists who graduated from educational institutions in Bashkortostan and search for employment opportunities with a higher salary [10].

The federal cities — Moscow and St. Petersburg — are popular destinations for the residents of Bashkortostan. They are attracted by higher living standards, developed infrastructure, career opportunities and a whole variety of educational institutions. Bashkortostan trains personnel for the oil industry, therefore, such specialists move to the northern regions, where salaries are much higher, mainly to the Tyumen region. Bashkortostan's neighbouring Samara and Chelyabinsk areas, as well as Tatarstan Republic, are all attractive to would-be students from districts bordering of these constituent entities of the Russian Federation. After studying there, youngsters find jobs, start families and settle to live there permanently [11].

As mentioned above, regions in federal districts and in the subjects of the Russian Federation with a high quality of life are attractive for migration. It should be noted that this indicator is integral and includes such factors as accessibility of good education and qualified medical care, sufficient infrastructure development, income level, state of communications, economy, ecology. Besides, both geographical location and climate may be important for the choice of a place of residence [12].

Foreign researchers point out a close relationship between demographic or migration processes and the population life quality. To explore the latter, scientists in Norway studied environmental aspects, transport mobility, city development planning (location of stores, kindergartens, schools, universities, park areas) for the indigenous population and immigrants [13]. Indian scientists found out, that the education level is of the paramount importance for

the quality of life among the adult population in rural areas of the Punjab province [14]. In Finland, the quality of life-style of citizens was analysed by means of the QoL Bref scale developed by the World Health Organization (WHO) and this article reflects the results of this work [15]. The researchers prioritised the health status of the population as the most important indicator, utilised the WHO four-dimensional model for assessment of physical, psychological, social and environmental aspects of life quality.

Moreover, physical health parameters encompass medication dependence, mobility, sleep and performance. The psychological dimension includes assessments of life-style satisfaction, the degree of meaningfulness of life, the individual's appearance, self-esteem and lack of negative feelings. The social factor is related to satisfaction with social relationships, social support, etc. The environmental dimension involves the feeling of personal and economic security, quality of the living environment, access to necessary information and satisfaction with the provision of health services, transport and leisure activities. Vietnamese experts used the same WHO model for their research to report [16] factors affecting the population life quality in Vietnamese coastal communities affected by natural disasters (floods and storms).

The study was aimed to develop an agent-based model by means of the AnyLogic tool environment for forecasting the impact of population life quality on migration processes, which is applied to solve two problems. The first problem pertains to track down the migration outflow from and inflow to the Republic of Bashkortostan within the framework of the federal districts of the Russian Federation. The second problem deals with the forecasting of demographic development in federal districts in accordance with the authorities' decisions to comprehensively develop specific territories via the implementation of investment programmes aimed at enhancing the quality of life of the population.

RESEARCH METHODS

Designing a simulation model on the basis of object-oriented approach

Agent-based modelling is a newly-developing approach to describe complicated socio-economic processes, including migration and population reproduction. There are many systems to use it for developing models. Platform Any-Logic takes the top position in the list of software product for general purpose simulation modelling [17]. This agent-based modelling software has a few indisputable advantages: the professional tool integrated with GIS maps has extensive animation and visualisation capabilities, and it is able to handle large volumes of input Big data. The simulation model was designed using the CASE tool Enterprise Architect with an object-oriented approach. Its UML diagrams describe the functionality and the structure of the stored data memory for developing support system of solutions.

MS Visio was used to create a mnemonic scheme of the business process of decision-support system to control the demographic development of territories (*Fig. 1*).

A certain number of state entities deal with national migration policy. The key role is played by the Ministry of the Interior and its structural subdivision, the Main Directorate for Migration Issues. The Presidential Administration, the Ministry of Labour and Social Protection of the Russian Federation and the Federal Security Service are the leading federal executive bodies in charge of national migration policy. A supporting function is entrusted to the ministries, services and agencies, such as the Ministry of Science and Higher Education of the Russian Federation, the Ministry of Development of the Far East and the Arctic of the Russian Federation, the Federal Labour and Employment Service, the Federal Tax Service, the Federal State Statistics Service. [18]

The Enterprise Architect case-tool was used to create a diagram of decision-making support activities for managing the demographic development of territories (*Fig. 2*).

The agent-based model (which operates as a decision support tool) contains a database of both initial statistical indicators for analysis and modelling results, as well as an add-ons system of represented by exogenous variables which could be specified by the user. The core is a simulation model of demographic and migration processes. It also contains a system to visually evaluate the simulation results.

Government policy is modelled by changing the exogenous parameters, which can be specified in the system. The model in question forecasts the development of the demographic and socio-economic potential of the territory and ensures the possibility of scenario evaluation of management decision-making process. The system verifies target and planned values of socio-economic development indicators in order to determine the effectiveness of the State policy. In case of deviations revealed, it is possible to develop a whole set of corrective measures.

A class diagram constructed below describes the structure of the database (*Fig. 3*).

The input parameters of the model are the following: the area of the Federal district (or constituent entity of the Russian Federation), population size and density, an integral indicator of the quality of life that takes into account many factors that represent both the development of the region and the opportunities for education and employment, as well as the comfort of life on the given territory.

The agent-based model makes it possible to set up a variety of scenarios for experiments by changing three indicators: the inhabitants' quality of life, the volume of investment in the development of the economy and infrastructure of the region, as well as the average wage. It also makes it possible to estimate the forecast of changes in the results in relation to migration processes. Regarding the purpose of the study, the median or modal wage values can be used
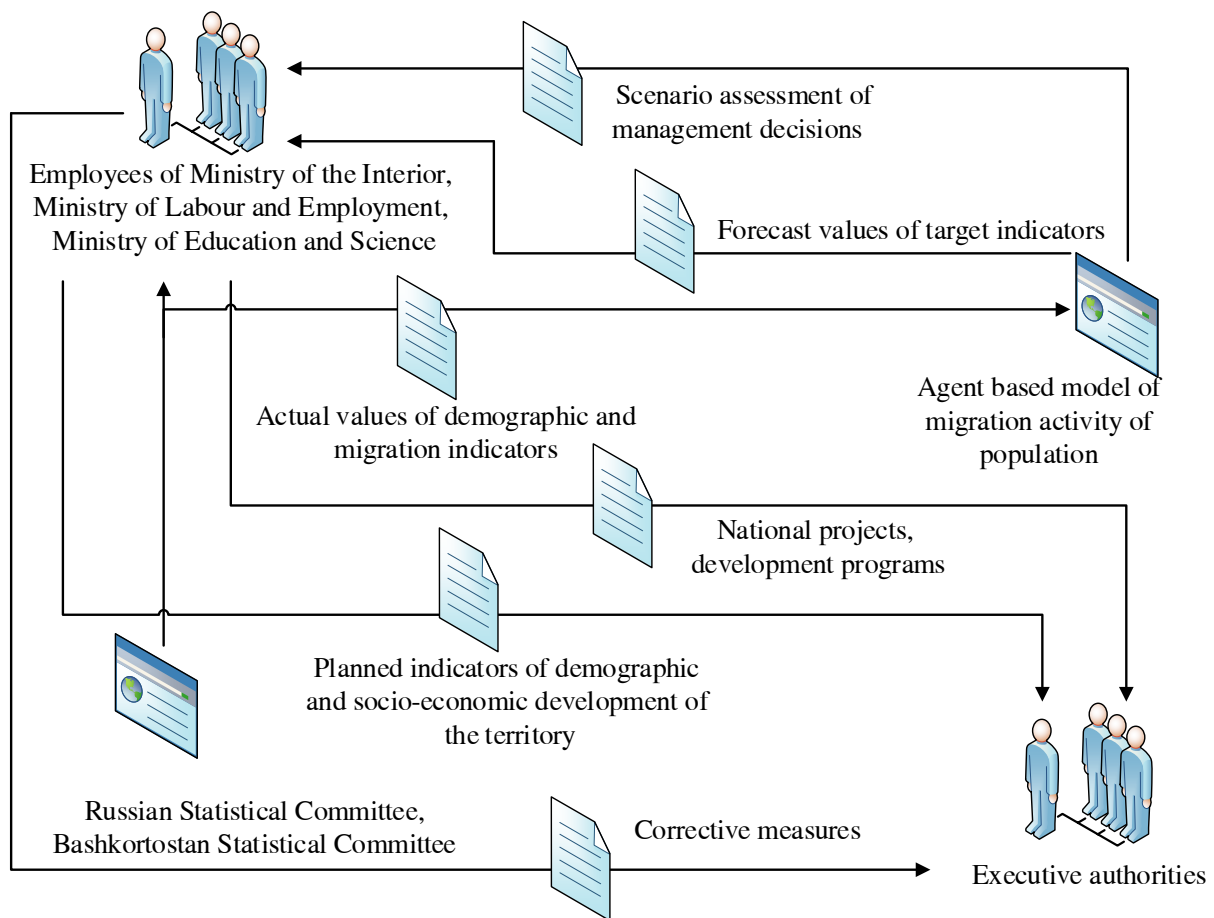
Fig. 1. **Mnemonic diagram of the decision-making support process for managing the demographic development of the territories**

Source: compiled by the authors.

in the model to ensure a more reliable assessment of the level of attractiveness of jobs in a constituent entity (or Federal district) of the Russian Federation. The median wage value is not affected by extremely high or low incomes, meanwhile the modal wage value is suitable for determining the most common level of earnings among workers and employees. At the same time, the model itself, as a flexible tool, allows to use a whole variety of options for measuring wages. This ensures a vast degree of reliability of experimental calculations for various problem statements. In the meanwhile, a number of measuring instruments could be used altogether, as controlled parameters of the model, for example,

to solve the problems of predicting the degree of migration intensity.

Implementation of a simulation model based on an agent-based approach

An agent based model has been developed to forecast migration dynamics in the framework of Federal districts as a function of changes in the population life quality and its main components, including average wages and investment in regional infrastructure. If compared to the econometric model, it is more advanced for analysis of complex socio-economic processes: the compilation of econometric dependencies requires much more volume of statistical data,

Input and output information	Activity	Role
Actual values of demographic and migration indicators	The start → **Collection of necessary statistical data**	Russian Statistical Committee, Bashkortostan Statistical Committee
Forecast values of target indicators	**Forecasting the population number in view of the migration component**	
Scenario assessment of management decisions	**Analysis of results**	Employees of Ministry of the Interior, Ministry of Labor and Social Protection
Target indicators of demographic development	**Identification of target indicators of demographic development**	
National projects and development programs	**Drawing up development programs for national projects**	
The list of corrective measures	**Development of the list of corrective measures** → The end	Executive authorities

Fig. 2. **Activity diagram of decision-making support for territorial development management**

Source: compiled by the authors.

Scenarios
- Scenario ID: int
- ID for Federal area/Subject: int
- Population life quality: int
- Investment volumes: int
- Average salary: int

Federal Districts
- ID for Federal area/Subject: int
- Name of Federal area/Subject: char
- Territory area: int

Forecasts
- Forecast ID: int
- Scenario ID: int
- ID for Federal area / Subject: int
- Date of the forecast: int
- Number of arrivals: int
- Number of departures: int

Collecting initial statistics
- ID of operation: int
- ID of indicator: int
- ID for Federal Area/Subject: int
- Date: int
- Actual Value: int

Indicators
- ID of indicators: int
- Name of indicator: char
- Units of measurement: char
- Target values: int

Fig. 3. **Class diagram of decision-making support for migration management**

Source: compiled by the authors.

which are not always possible to collect. Besides, the econometric approach only offers adequate results if the region's economy indicates the stability of development, without drastic ups and downs. However, in reality, the need to calculate forecast assessments of the evaluated indicators often occurs in case of emergency, like war, pandemics, or global economic crises. In case of sharp changes in the economic situation related to military conflicts, international situation, fluctuations in the prices of raw materials, introduction of technological innovations in production, it is necessary to forecast the dynamics of migration with preliminary justification of the plan of the corresponding scenario experiment, adjustment of the controlled parameters to take into account the most critical factors within the framework of the solved problem: for example, such as unemployment rate, accumulated inflation, cost of oil on the world market, etc.

The agent based model contains such agents, as residents, enterprises, educational institutions and regions.

Two main states of mind are characteristic for the agent entitled "Resident" (*Fig. 4*): if he/she is satisfied or dissatisfied with the life quality in the region, and the main factor in his/her assessment of the level of wages.

Transitions are triggered by the factor of dissatisfaction with the living standards, employment termination and loss of income, in case of decreasing or, conversely, increasing level of income.

The quality of life of the region's population is impacted by the level of economic development, which is expressed in the growing gross regional product to ensure the functioning of local enterprises.

Fig. 5 displays the level of conditions (growing, stable, unstable) for the agent "Enterprise". The activity of enterprises leads to either an increase or a decrease in the level of profit, which is graphically presented in the state diagram.

In the first case, it requires to hire additional employees. In the second case, enterprises start to lay off employees and search for ways to reduce costs, for example, moving to regions with cheaper labour force, material resources and rental prices.

Fig. 6 displays a simulation model generated in the AnyLogic environment on the map of the Russian Federation with eight Federal districts and one of the subjects: the Republic of Bashkortostan.

On the map, agents which represent the indigenous population are shown as blue dots and migrant agents as red dots. The pop-down menu opens the indicators of size and density population, average wages, investment volume and the number of enterprises by Federal district. To set the control parameters, one should select the Federal district, or region of interest and set the value of the change for investment volume, average wages and the integral indicator of the life quality. The simulation can generate diagrams displaying the intensity of migration flows and the ratio between the number of indigenous inhabitants and the number of migrants who have arrived in the region.

Separately, "the Statistics" method helps to forecast the number of people moving into and out of the region, and, consequently, the migration increase/decrease of the population.

RESULTS

Analysis of statistics on migration and life quality in the Republic of Bashkortostan and the Russian Federation

The Agency for Strategic Initiatives has developed a regional social standard that determines to set up a Quality of Life Council[1] in each region of the country, because improving this indicator is a priority for the Government of the Russian Federation. Such entity was es-

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[1] Regional Social Standard. Official website of the Agency for Strategic Initiatives. URL: https://files-ice.asi.ru/iblock/946/946d0385e1f6780979bcdbb98fff7b95/Regionalnyy-sotsialnyy-standart.pdf (accessed on 15.08.2024).
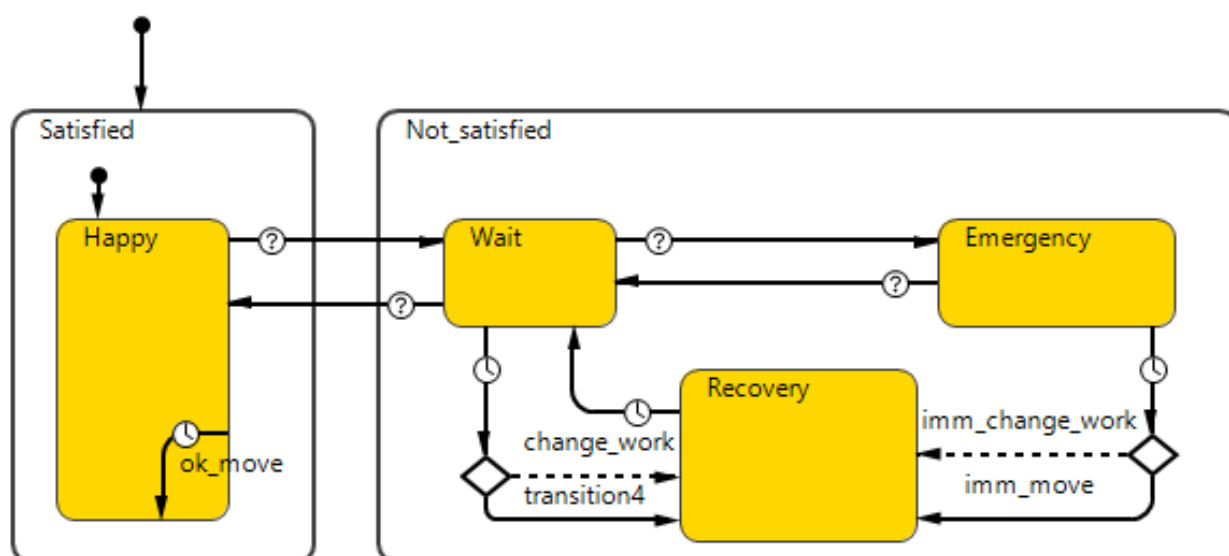
Fig. 4. **Diagram of the condition of agent "Resident" built in AnyLogic**

Source: compiled by the authors.
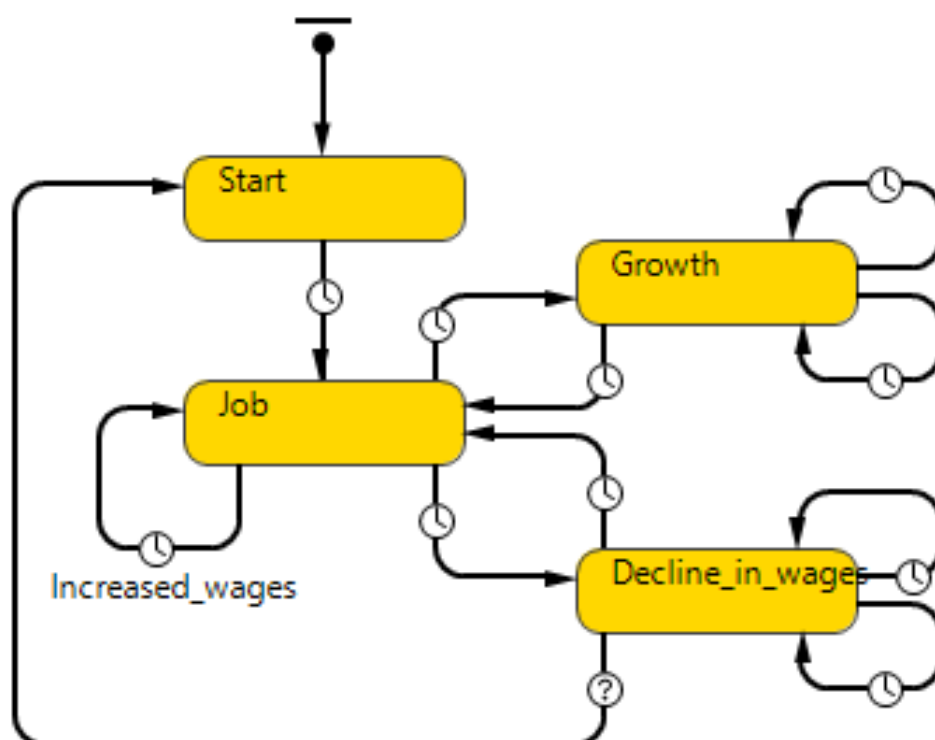
Fig. 5. **State chart of the agent "Enterprise" built in AnyLogic**

Source: compiled by the authors.

tablished in the Republic of Bashkortostan in 2023. The standard provides for the introduction of a human-centric approach in the at-titude culture of public administration. The topics of the document include such areas as health care, social services, education, culture,
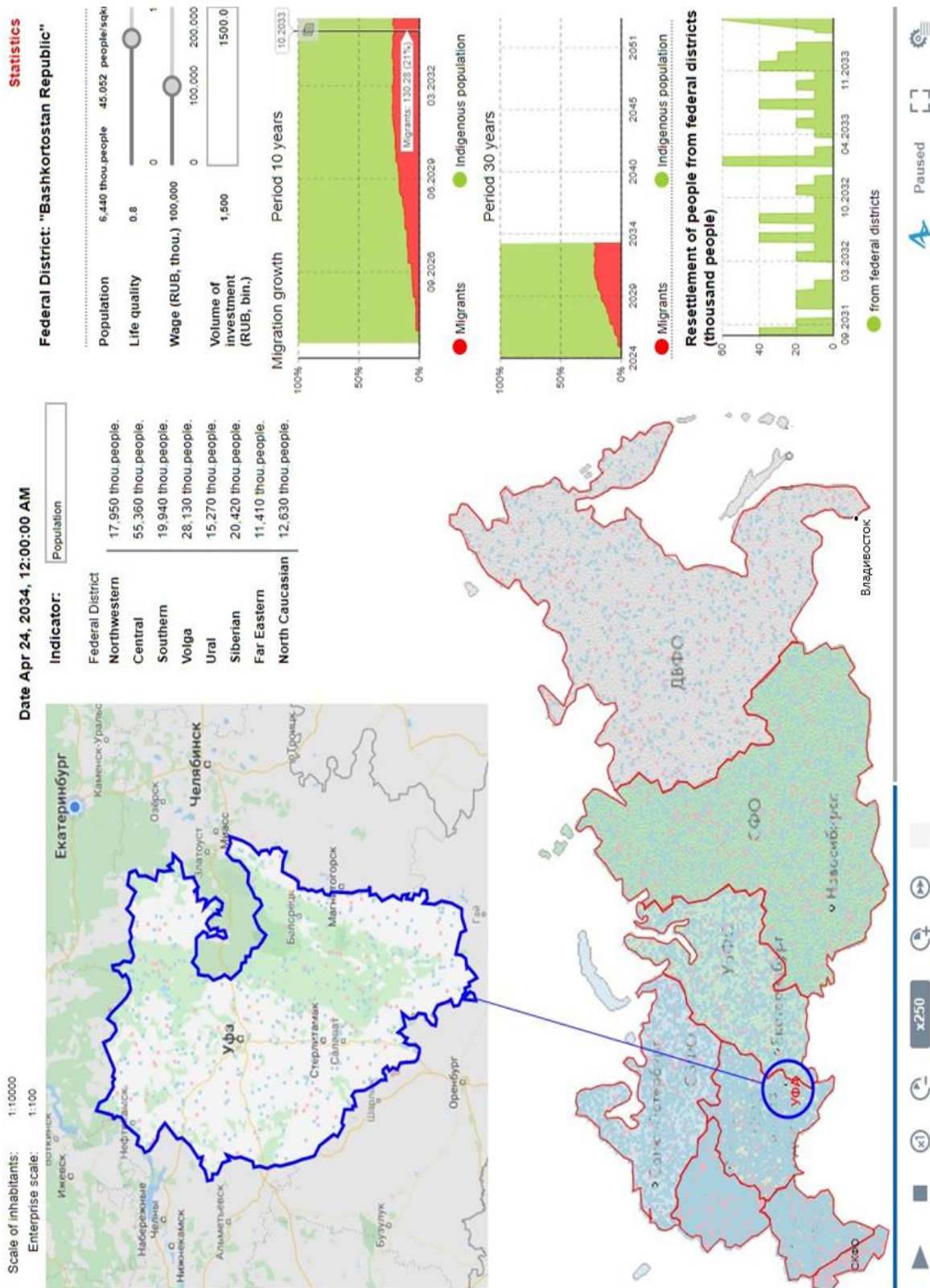
Fig. 6. **Agent-based model for forecasting the impact of life quality on migration processes by Federal districts**

Source: compiled by the authors.

development and improvement of the urban environment.

Data on the population life quality published by the RIA Rating Centre for Economic Research are aimed to conduct scenario experiments. In contrast to Rosstat estimates, which focus primarily on analysing income, expenditure, purchasing power of citizens, housing affordability, etc., the method proposed by RIA Rating for calculating the integral indicator of the population life quality uses the information from both Rosstat and the Ministry of Health of Russia, the Ministry of Finance of Russia, the Bank of Russia and other open sources.

The rating is based on 66 indicators which are grouped into 11 sections with the 100-point scale rating score. At the same time, this methodology takes into account, in addition to the listed criteria, environmental and climatic conditions, safety of residence, public health and education levels, provision of social infrastructure facilities, development of the territory and public convenience of transport infrastructure, etc. Hence, the most complete and accurate set of data is collected for assessing the life quality and the level of attractiveness of territories for migration, which is necessary for the research work provided.

RIA Rating annually prepares life quality ranking-lists of regions. Over the past five years, Moscow, St. Petersburg and the Moscow region have been traditionally in the top list. In 2023, the Republic of Bashkortostan held the 19th position, which, was a progress, compared to the last five years: in 2020, the Republic of Bashkortostan was ranked 29th.

Table 1 presents the results of the calculation of the rating of some regions of the Russian Federation over the last five years — in addition to the indicators of the leading regions, it includes

Table 1

Indicators of the population life quality

Region	Rating scores of the life quality					Average salary for the year of 2024 (in Rubles)	Investments in fixed capital in 2022 (in Rubles)
	Year						
	2019	2020	2021	2022	2023		
Moscow	79.2	82.1	81.3	82.9	83.6	152 859	5 917 986
St-Petersburg	77.3	80.6	80.2	82.3	82.3	101 892	997 478
Moscow region	74.5	76.1	75.8	78.2	79.9	91 809	1 329 379
Republic of Sakha (Yakutia)	37.9	39.1	39.2	42	44.3	119 338	616 285
Krasnoyarsk region	46.7	45.3	48	52.2	54	89 627	747 818
Republic of Bashkortostan	50.4	50	53.6	58.2	61.5	62 957	512 388

Source: compiled by the authors based on the Rosstat data. URL: https://rosstat.gov.ru/folder/210/document/13238 (accessed on 12.08.2024), URL: https://rosstat.gov.ru/labor_market_employment_salaries# (accessed on 12.08.2024); RIA Novosti. URL: https://ria.ru/20240212/kachestvo_zhizni-1926120093.html (accessed on 12.08.2024).

data for comparison from Krasnoyarsk Krai and the Sakha Republic (Yakutia). These are the two largest territory subjects of the Siberian and Far Eastern Federal Districts with the lowest population density in the country.

Table 1 also displays the figures of average monthly nominal wages of workers in the selected regions for the time frame period from January to May 2024. At the same time, the average wage in the Far Eastern Federal District as a whole for the same period was 91.970 Rubles, and in the Siberian Federal District — 72.574 Rubles. Thus, one can come to the conclusion, that this financial indicator is important, but not a decisive criterion for the integral indicator of the population life quality, since in such largest subjects of these federal districts the rating of the life quality turned out to be quite low, despite the relatively high level of income. The reason is insufficient infrastructure and the harsh climatic conditions in these regions.

Table 1 also provides information on the volume of investment in fixed assets [18]. This indicator is 2.512.408 million Rubles for the Far Eastern Federal District, 2.823.190 million Rubles for the Siberian Federal District, and 9.367.418 million Rubles for the Central Federal District. The gap in funding for the Central Federal District Rubles, in particular for Moscow, in comparison with other federal districts is extremely large, which indicates the uneven development of infrastructure in the urban centre and in the periphery. This is, of course, the reason for the migration of the population to the centre.

The indicators of migration growth/loss in the Republic of Bashkortostan lead to the conclusion, that the native population leave the Republic and migrants from Central Asia, Armenia, Vietnam and Turkey coming to the Republic to find the job. The situation turned out to be quite different only in 2021, when the pandemic restrictions measure were adopted (*Table 2*).

Official statistics on migration throughout federal districts of the Russian Federation show that the Central, Southern and Northwestern Federal Districts are the most attractive for migrants (*Table 3*). As to the Far Eastern Federal District is concerned, the situation here is alarming due to an out-migration of the local inhabitants. Besides, labour migrants from other countries are not enthused to settle in this region, which requires management decisions to change the current state of affairs.

Scenario experiments to forecast migration in the Republic of Bashkortostan

To forecast the migration situation in the Republic of Bashkortostan within the framework of changes in the life quality, investment volume and average wages, experiments were held using a simulation model according to the scenario parameters specified in *Table 4*.

The developed agent-based model helps to make long-term forecasts. In scenario No. 2, one can see an increase in the share of the population by 20 per cent over 10 years. If the current situation for the selected indicators does not

Table 2

Migration increase/decrease in the Republic of Bashkortostan

Types of migration	January-May 2024	2023	2022	2021
Interregional (the number of persons)	-995	-2451	-1860	5855
International (the number of persons)	2295	1531	381	9024

Source: developed by the authors based on the data from territorial body of the Federal state statistics service for the Republic of Bashkortostan URL: https://02.rosstat.gov.ru/folder/25491?ysclid=m0p3q9k7h6318966351 (accessed on 15.08.2024).

Table 3

Migration growth / loss by the federal districts for 2023

Federal Districts	In-migration increase, total, arrived per 10 thousand people of population	Out of it due to movements:			
		Within the territory of Russia due to movements, arrived per 10 thousand people of population	International total arrivals per 10 thousand people of population	Including:	
				the CIS countries, total arrivals per 10 thousand people of population	with other foreign countries, total arrivals per 10 thousand people of population
Central	122 406	76 869	45 537	42 485	3 052
North-Western	35 691	30 339	5 352	4 534	818
Southern	53 024	46 106	6 918	5 023	1 895
North-Caucasian	−10 401	−10 104	−297	−252	−45
Volga	−723	−16 738	16 015	14 859	1 156
Ural	27 514	1 020	26 494	26 655	−161
Siberian	−9 704	−20 116	10 412	10 012	400
Far Eastern	−14 178	−13 699	−479	−3 277	2 798

Source: developed by the authors based on the data of Rosstat. URL: https://rosstat.gov.ru/compendium/document/13283 (accessed on 15.08.2024).

Table 4

Scenario modeling parameters for the Republic of Bashkortostan

Scenario parameter	Scenario No. 1	Scenario No. 2	Scenario No. 3	Scenario No. 4
Volume of investment in fixed assets (in billions of Rubles)	500	1000	3000	1000
Wages (in Rubles)	63 000	80 000	80 000	100 000
Life qualitya	0.6	0.8	0.8	0.8

Source: compiled by the authors.

Note: **a −** life quality has no units of measurement (dimensionless value), that is, an integral indicator is from 0 to 1.

change, for example, in view of scenario No. 1, the flow of migrants will not stop, but will decrease to 11 per cent. Scenario No. 3 implies a significant increase in investment in the region: six times as much as today, while maintaining the same level of wages. Intensive infrastructure development can increase migration growth by 29 per cent. The scenario No. 4 indicates the
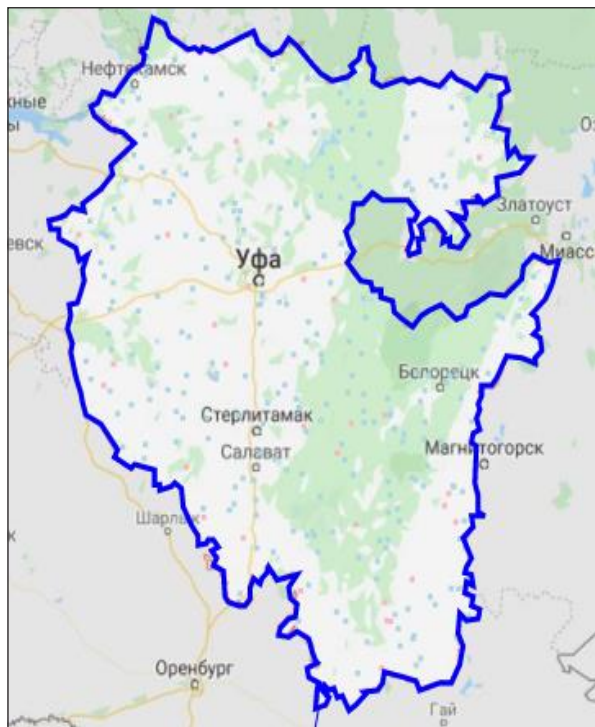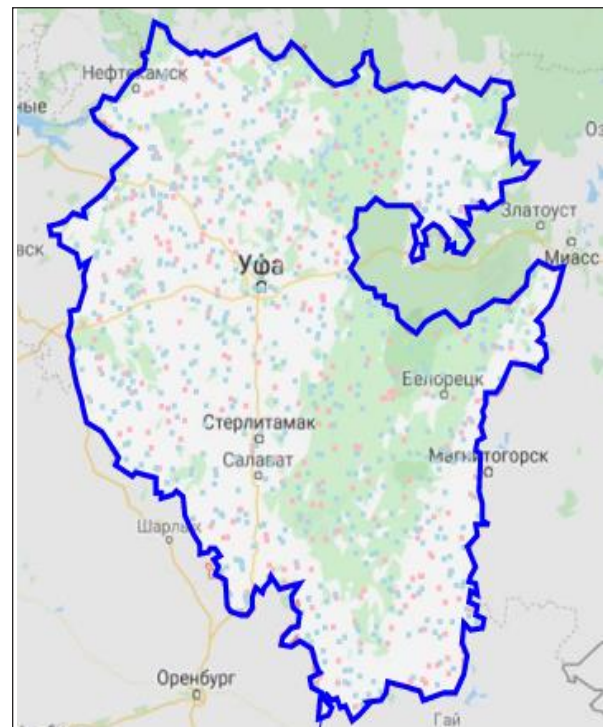
Scenario 1   Scenario 4

Fig. 7. **Distribution of migrant agents across the territory of the Republic of Bashkortostan under different scenario conditions**

Source: compiled by the authors.

twofold increase of the volume of investment in the development of the republic, then the average salary will grow to 100 thousand Rubles, and the inflow of migrants will reach 19 per cent. Thus, we can conclude that investment in the development of the region's infrastructure plays a significant role in increasing attractiveness for migrants. *Fig. 7* shows the distribution of migrant agents (marked as red dots) and local agents (marked as blue dots).

The density of colour spots on the maps allows us to assess the attractiveness of Bashkortostan for migrant labour force.

Scenario experiments for forecasting migration in the Far Eastern Federal District

To forecast migration in the Far Eastern Federal District, a number of experiments were conducted, the parameters of which are specified in *Table 5*.

The implementation of scenario No. 1 indicates a migration outflow from the Far Eastern Federal District: the population decreases by another 20 per cent in 10 years.

The scenario No. 2 implements the forecasted volume of investments to be increased twofold and the average salary raised by 30 per cent, the integral indicator of the life quality will grow by 30 per cent, so that the migration situation will improve by 12 per cent. Never the less, such influx of labour force will not be sufficient for the vast Far Eastern territory.

Scenario No. 3 assumes a threefold increase in investment in the Far Eastern Federal District and the payment of an average monthly salary similar to that in Moscow. In this case, the number of migrants will increase by 25 per cent.

Scenario No. 4 simulates all regulated indicators will be equal to the level of Moscow, including the volume of investment in infrastructure and in

Table 5

Scenario modeling parameters for the Far Eastern Federal District

Scenario parameter	Scenario No. 1	Scenario No. 2	Scenario No. 3	Scenario No. 4
Investment volume, in billion Rubles	2500	5000	7000	9000
Wages in Rubles	92 000	120 000	150 000	150 000
Life qualitya	0.45	0.6	0.8	0.8

Source: compiled by the authors.

Note: **a —** life quality has no units of measurement (dimensionless value), that is, an integral indicator is from 0 to 1.

Scenario 1   Scenario 4
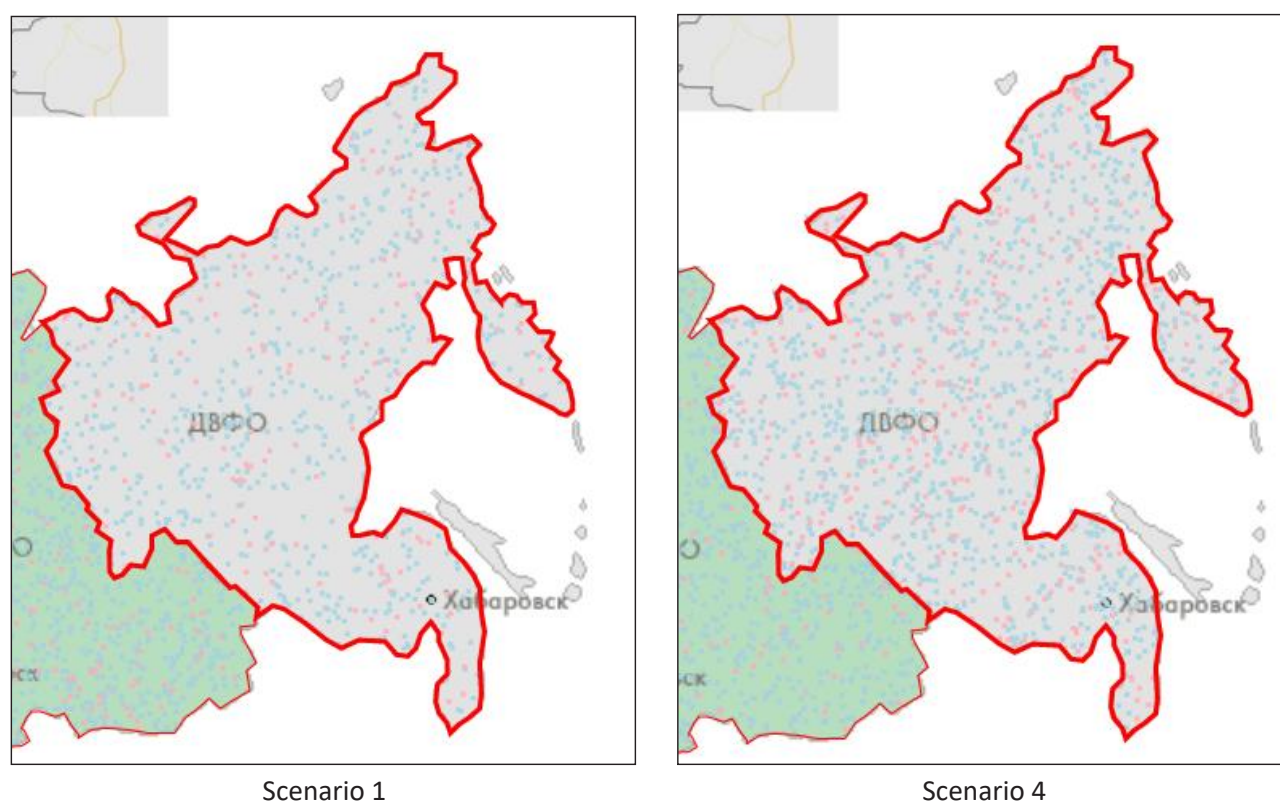
Fig. 8. **Distribution of migrant agents on the territory of the Far Eastern
Federal District under various scenario options**

Source: compiled by the authors.

this case 45per cent increase in local population could be predicted.

Fig. 8 shows the comparative results of the implementation of scenarios No. 1 and 4 under the condition of minimum and maximum values of the controlled parameters. Scenario No. 4 shows the attraction of a larger number of migrant agents and also demonstrates that an increase in the life quality contributes to the growth of the indigenous population.

Due to rather a harsh climatic conditions, peculiarities of food production and delivery, the price of the consumer goods basket in the Far Eastern Federal District is higher than the average one in Russia. Thus, the growth of the life quality depends much on the growth of people's incomes. Low quality of medical and educational services, as well as insufficient transportation links, have a strong impact on the out-migration of the population. Investment in the region's infrastructure will help to curb the out-migration of the local inhabitants and attract qualified specialists to develop and explore the region.

CONCLUSION

The abovementioned developed agent-based model is designed to build prognosis of internal labour force and educational migration (migrants are assumed as citizens of the Russian Federation). The analysis of the legislative framework measures has revealed that the legal regulation regarding foreign citizens entering the country is developing and becomes more upgraded, meanwhile the issues of internal migration control are not given due attention. The proposed agent-oriented model should become a reliable instrument to make effective management decisions to coordinate the re-location of the population throughout the territory of the Russian Federation.

Such phenomena as demographic ageing of population, emigration of young people and the drop of birth rate are common for the Republic of Bashkortostan as a whole. All this has a negative impact on the development of sectors of the economy related to consumption, such as construction, trade, housing and utilities. Economy would not grow in the environment of dramatic drop of domestic consumption and a lack of skilled labour force.

In the Republic of Bashkortostan, the number of students has notably decreased due to a reduction in university admissions. This has led to a mass migration of young people who needed to obtain a proper education. Correspondingly, the number of teachers in educational institutions has decreased as well due to the emigration of highly qualified personnel. The solution for this problem would be a new system of innovative scientific and educational projects able to provide professional skills with competitive advantages in the labour market.

To stop the migration outflow, it is necessary to set priorities for the territorial development measures of the Republic, aimed at provision of a comfortable living environment for the population and opportunities for human self-actualisation, under the strict conditions that socially significant services are available in the places of residence.

The research work [19] point out, that internal education-oriented migration contributes to the depopulation throughout the Siberia and the Far East: the most talented young people leave to Moscow and St-Petersburg for better education and, eventually, they never return to their native land. This creates a "domino effect": their parents, close relatives and friends abandon the region to follow their children. This situation poses a terminal security threat to the eastern part of the country. To solve this problem of education-oriented migration of the Far East, it is highly advisable to open there branches of leading universities of Moscow and St. Petersburg and to conduct student exchanges between these universities and their distant brunches.

In order to increase the birth rate, benefits and subsidies grants should be facilitated to purchase housing, to obtain special conditions for mortgages and the reduction in the interest rate depending on the number of children born in the family. It is also of great importance the prophylaxis of reproductive health among young people and the expansion of range of genetic screening tests for young families.

More new jobs with decent wages would attract more skilled workers and encourage labour force mobility. Rising wages would serve as an

incentive for inhabitants of the Far East to go in for self-education and development of their sustainable households. Nowadays, the income-to-expenditure ratio is inadequate for the majority of the population. An effective measure to improve the demographics of the region could be to exempt workers and employees with a certain period of job from paying income tax. Definitely, significant financial allocations are mandatory for all infrastructure and social programmes. At the same time, statistically, a huge gap exists between the volume of investment in the central regions of the country and in the periphery. Correction of such imbalances could successfully contribute to establishing a balanced territorial settlement policy.

ACKNOWLEDGEMENTS

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ABOUT THE AUTHORS

Marsel M. Nizamutdinov — Cand. Sci. (Tech.), Assoc. Prof., Head of the Sector of Economic and Mathematical Modeling, Institute for Socio-Economic Research, Ufa Federal Research Centre of the Russian Academy of Sciences, Ufa, Russia
https://orcid.org/0000-0001-5643-1393
marsel_n@mail.ru

Zulfiya A. Davletova — Cand. Sci. (Tech.), Senior Researcher, Sector of Economic and Mathematical Modeling, Institute for Socio-Economic Research, Ufa Federal Research Centre of the Russian Academy of Sciences, Ufa, Russia
https://orcid.org/0009-0008-4389-2113
Corresponding author:
davletova11@mail.ru

The Role and Place of Federal State Unitary Enterprises in the Sphere of State Property Management

E.V. Gavrilin

Federal State Unitary Enterprise "Directorate for Investment Activities", Moscow, Russia

ABSTRACT

The article is devoted to the problem of the organization of professional management of objects of the treasury of the Russian Federation in the light of the goals and objectives defined by the State Program "Federal Property Management" approved by the Government of the Russian Federation, in terms of securing property on the right of economic management for federal state unitary enterprises (FSUE) under the jurisdiction of the Federal Agency for State Property Management (Rosimushchestvo), in order to maintain the objects in proper condition technical condition, commercial use, reduction of facilities, not involved in economic turnover, replenishment of the federal budget. The purpose of the work is to propose ways to organize a management mechanism at the federal level aimed at using extra-budgetary mechanisms for maintaining federally owned facilities or properties and involving them in economic turnover with the involvement of commercial organisations — FGUP. The proposed ways and methods of management may allow using a more flexible mechanism for the extra-budgetary maintenance of federally owned real estate objects, their commercial use, involvement in economic turnover, with the transfer of part of the income received to the federal budget or their use for the purchase of both real estate objects for state needs based on a decision of the Government of the Russian Federation and movable property with subsequent transfer to the Treasury of the Russian Federation.

Keywords: property of the state treasury of the Russian Federation; federal state unitary enterprises; real estate objects in federal ownership; involvement of real estate objects in economic turnover

THE PLACE OF FEDERAL STATE UNITARY ENTERPRISES OF THE FEDERAL AGENCY FOR STATE PROPERTY MANAGEMENT (ROSIMUSHCHESTVO) IN THE MANAGEMENT OF FEDERAL PROPERTY

The Federal Agency for State Property Management (Rosimushchestvo), in accordance with the functions assigned to it, is the subject of management in relation to the object of management, which is the federally owned property of the State Treasury of the Russian Federation. The objects of management are the federal property of the Russian Federation, including immovable and movable property not assigned under the right of economic management to Federal State Unitary Enterprises (FSUE) and not assigned under the right of operational management to federal subordinate authorities and their treasury enterprises [1].

An important role in the management of federal property is performed by Federal State Unitary Enterprises [2–11] established under the authority of the Federal Property Management Agency on the ground determined by the Federal Law No. 161-FZ dated November 14, 2002.[1]

Federal State Unitary Enterprises are assigned real estate objects under the right of economic management, which are leased and the proceeds of which are used to replenish the revenue part of the federal budget of the Russian Federation, which is used for repairs, restoration of the assigned real estate objects and other purposes determined by the owner.

BASIC LEGISLATIVE AND REGULATORY DOCUMENTS GOVERNING FSUE ACTIVITIES

In order to maintain the state property in good condition, the legislative and regulatory framework establishes restrictions on the activities of unitary enterprises without the consent of the owner of the property, which are also aimed to ensure the efficient use of property for implementation of goals and objectives determined by the federal authority [12–14].

In accordance with Article 113 of the Civil Code[2] of the Russian Federation (hereinafter referred to as CC-RF), a unified enterprise is a commercial organisation that does not have the right of ownership of the property transferred to it by the owner. The Federal Law No. 161-FZ stipulates that the owner of the property sets up the charter fund of the enterprise, determines goals, main types of activity, main indicators of financial and economic activity and economic efficiency, controls the activity and safety of the property complex, as well as performs other activities of the founder of a unitary enterprise. Any activity with the property of the enterprise, which is not coordinated with the founder, any large transactions, or loans are banned by the law [4, 8, 15].

The Resolution of the Russian Federation dated 03.12.2004 No. 739[3] establishes that the powers of the owner of the property of unitary enterprises are exercised by the federal executive authorities under whose jurisdiction they are subject. The powers of the owner are specified to establish a certified fund, appoint an auditor of the enterprise, or approve transactions with property, etc.

The Resolution No. 228[4] of April, 10 2002 by the Government of the Russian Federation

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[1] Federal Law No. 161-FZ dated November 14, 2002 "On State and Municipal Unitary Enterprises". URL: https://www.consultant.ru/document/cons_doc_LAW_39768/

[2] The Civil Code of the Russian Federation (part 1) of Nov. 30, 1999 No. 51-FZ (Edition of March 11, 2024), p. 113. URL: https://www.consultant.ru/document/cons_doc_LAW_5142/

[3] Resolution of the Russian Federation dated 03.12.2004 No. 739 "On the Powers of Federal Executive Authorities to Exercise the Rights of the Owner of the Property of a Federal State Unitary Enterprise". URL: https://base.garant.ru/187622/

[4] Resolution No. 228 of April, 10 2002 by the Government of the Russian Federation "'On the Measures to Improve the Efficiency of the Use of Federal Property Assigned in the Economic Management of Federal State Unitary Enterprises". URL: https://base.garant.ru/12126413/

formally established the framework for the development and approval of Activity Programmes, as well as the allocation of profits to the federal budget. The resolution stipulates that Federal Executive Authorities (FEA) are responsible for approving the development of strategies for unitary enterprises in the framework of their jurisdiction, within a timeframe of 3 to 5 years. The share of profit is determined by the decision of the relevant federal executive authority to be transferred to the federal budget by no later than the 1st of May. The abovementioned amount is of no less than 50 per cent of the profit remaining at the disposal of the enterprise after taxes and other mandatory payments [3, 4, 12–15].

In the event of stable profitable work by the enterprise and the need to increase revenues to the federal budget, a share of profit exceeding 50 per cent may be transferred. In a similar way, it is possible to withdraw and transfer to the budget any additional profit derived from highly liquid property.

The joint order of the Ministry of Economic Development of the Russian Federation and the Ministry of Finance of the Russian Federation No. 96/30n[5] dated March 10, 2011 was issued to approve the procedure for submission of documents by Federal State Unitary Enterprises, Federal State Enterprises and Federal Sate Institutions in regards of coordinated decisions on writing off a federal property transferred to them under the right of economic or operational management. This was another step to ban and guarantee unjustified sale of federal property.

In accordance with the Federal Law No. 223-FZ[6] as of July 18, 2011, state unitary enterprises are allowed to make purchases and the federal executive authorities exercise control over the purchases.

Thus, legislative and regulatory acts to ensure the ability of controlling over the performance of only those activities that are determined by a federal body and are carried out strictly in the interest of the state.

According to Federal Law No. 161-FZ, the General Director is in charge of the entity and responsible for management of the unitary enterprise. The appointment is based on the results of a competition held in accordance with the Order on Conducting a Competition for the Position of Head of a Federal State Unitary Enterprise, approved by the Government of the Russian Federation dated 16.03.2000 No. 234,[7] by the order of the head of relevant federal executive body. The General Director is subject to certification.[8]

General Director of a unitary enterprise reports on the enterprise's activities in accordance with the procedure approved by Resolution No. 1116[9] of the Government of the Russian Federation as of October 10, 1999.

Thus, the regulatory documents establish the procedure by which the federal executive authority of a subordinate unitary enterprise appoints, certifies and controls the work of a General Director under the current situation.

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[5] Joint Order of the Ministry of Economic Development of Russia and the Ministry of Finance of Russia as of 10.03.2011 No. 96/30n. "On Approval of the Procedure for the Submission by Federal State Unitary Enterprises, Federal Treasury Enterprises and Federal State Institutions of Documents for the Approval of Decision to Write Off Federal Property Assigned to Them by the Right of Economic Management or Operational Management". URL: https://base.garant.ru/12183798/

[6] Federal Law No. 223-FZ "On the Procurement of Goods, Work and Services by Certain Types of Legal Entities". URL: https://www.consultant.ru/document/cons_doc_LAW_116964/

[7] Resolution of the Government of the Russian Federation No. 234 as of 16.03.2000 "On the Procedure for Concluding Labour Contracts andCertification of Managers of Federal State Unitary Enterprises". URL: https://base.garant.ru/181844/

[8] Ibid.

[9] Resolution of the Government of the Russian Federation of 4.10.1999 No. 1116 "On Approval of the Reporting Procedure for the Heads of Federal State Unitary Enterprises and Representatives of the Interests of the Russian Federation in the Management Bodies of Joint Stock Companies". URL: https://base.garant.ru/181015/

The Government of the Russian Federation has approved the Regulation on the conditions of remuneration for labour of enterprises' managers[10] (Resolution of the Government of the Russian Federation No. 2 of January 2, 2015). This establishes the maximum level of the ratio between the average monthly salary of the heads, deputy heads, chief accountants of enterprises and the average monthly salary of rank-and-file employees of the enterprise. This ratio in proportion of 1:8 is determined by a regulatory act of a federal executive body.

The Resolution of the Government of the Russian Federation No. 234 dated April 3, 2008[11] establishes prohibitions for federal executive authorities to approve transactions related to the disposal of federally owned land plots, to hold auctions to attract investments in land plots and real estate objects located on them. The Resolution defined the exception list of plots and real estate objects to which these prohibitions do not apply. In other words, such transactions involving immovable property and land plots are prohibited.

As can be seen from the above, an entire regulatory framework has been created, which is designed to ensure the effective management by unitary enterprises of federal property and the safety of property [16–20].

MAIN FUNCTIONS OF THE FEDERAL STATE UNITARY ENTERPRISE FOR STATE PROPERTY MANAGEMENT

One of the unitary enterprises of Rosimushchestvo is the Federal State Unitary Enterprise "Directorate for Investment Activities". In accordance with the Charter, the unitary enterprise is in charge of the following functions:

• conducting the inventory of property to be recorded in the Register of Federal Property [21];

• the operation and maintenance of buildings, structures, premises and other facilities assigned to the enterprise under the right of economic management;

• investment activities, capital investments, repair and construction works, acting as a contractor, or customer and developer in construction and reconstruction, major and current repairs;

• restoration and involvement in economic turnover of unused, used inefficiently or not for the intended purpose federal objects [22];

• leasing of real estate objects;

• preparation of justifications and proposals for the sale of objects assigned to the enterprise by the right of economic management in accordance with the established procedure;

• provision of administrative, consulting, organisational and economic services aimed at improving the efficiency of real estate use;

• implementation of all types of transactions in the real estate market, execution of transactions with real estate objects which require a green-light from Roscomimuschestvo etc.;

The following section will examine its main functions in more detail.

Conducting inventory of property listed in the Register of Federal Property. A Federal State Unitary Enterprise has more flexibility, including in terms of entering into agreements and payment for services in searching for objects that belong to federal property in order to put them on cadastral registration and entry in the Register of Federal Property. The reason for this is that the

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[10] Resolution of the Government of the Russian Federation No. 2 dated 02.01.2015 "On the Conditions of Remuneration of Labour of the Heads of Federal State Unitary Enterprises" (as amended and supplemented). URL: https://base.garant.ru/70836142/

[11] Resolution of the Government of the Russian Federation No. 234 of April 3, 2008 "On Ensuring Housing and Other Construction on Federally Owned Land Plots" (as amended).

receipt of funds from the federal budget for these purposes deals with their availability and with significant time-frame terms of their possible receipt. In the absence of a guaranteed positive result from it, the expenditure of federal budget funds is not possible [21].

Operation and maintenance of buildings, structures and other facilities assigned to the enterprise under the right of economic management. The Federal Agency for State Property Management assigns real estate objects to Federal State Unitary Enterprises under the right of economic management. The land plots under these objects are leased out.

The following categories of immovable property are assigned: firstly, objects that were part of the property complex of corporatised enterprises but were not subject to privatisation (as a rule, social, cultural and those of defence and mobilization purpose, or those of especially dangerous character). Secondly, immovable property that is not leased out by the territorial bodies of the Federal Property Management Agency and not included in the Forecast Plan or programme of privatisation and in the list of immovable property subject to privatisation approved by the Ministry of Finance of Russia. Thirdly, objects which require repair or to be written off, and this subsequently leads to high costs and expenses [23].

The State Programme of the Russian Federation "State Property Management"[12] calls for an annual increase in the ratio of treasury objects involved in economic turnover to their total number as a target indicator, which is possible, among other things, through the assignment of federal unitary enterprises under the rights of economic management.

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[12] Resolution of the Government of the Russian Federation of 15.04.2014 No. 327 "On Approval of the State Programme of the Russian Federation "State Property Management" (as amended on 10.02.2017). URL: https://www.law.ru/npd/doc/docid/420396566/modid/99

At this point, the following question arises: why not entrust to Federal State Unitary Enterprises the responsibility to implement the State Programme allocation of all real estate property in the Treasury that is not claimed by federal bodies and organisations? This would led Federal State Unitary Enterprises to carry out work on ownership with leasing, repair and renovation, write-off, privatisation, transfer to another larger scale, for example, to the regions of the Russian Federation etc.

In fact, the Treasury holds a great number of low-liquidity or illiquid property, which is not needed by federal bodies and organisations, as well as by regions, territorial bodies and private entities. Unitary enterprises, being commercial organisations, bear financial costs not only for maintenance and renovation (including utility payments and fees for capital repairs), but also pay annual real estate tax and a fee for the lease of the land plot under the real estate objects. This is why a company, which owns a significant amount of illiquid properties, could potentially end up with decline in financial and economic activity, which could eventually result in the enterprise becoming insolvent. This, in turn, would only aggravate the issue of illiquid real estate for the Treasury of the Russian Federation [1,7,23,24].

Investment activities, capital investments, repair and construction works, fulfilment of functions of the customer-developer in construction and reconstruction, capital and current repairs; restoration and involvement in economic turnover of federal property unused, used inefficiently or not for their intended purpose [22, 25, 26].

Federal State Unitary Enterprises have much more capacity and efficiency for carrying out repair and construction works at assigned facilities when compared to budgetary bodies and organisations, because the latter

need to go through several stages to obtain funds for such activities.

At the first stage, it is necessary to justify the need to spend budget funds for the development of the project and then receive these funds. After creating the project and its feasibility study, it is necessary to pass an expert examination in the Main State Expert Department (Glavgosexpertiza), where its experts professionally evaluate the project, the technologies, materials and the final cost of the works. If any comments, or necessary changes arise for the prepared project, all this needs to do over again. Then Glavgosekspertiza finally gives a greenlight, the Ministry of Finance of Russia should be contacted again to obtain the necessary budgetary funding for the project. The whole process of obtaining budget funds may take several months or even years, and there's no guarantee, that the required funds will be allocated [22,27].

The income received as a result of commercial activities may also be used for the construction of real estate for own needs, for subsequent transfer to the treasury of the Russian Federation and for assignment to federal executive bodies or their organisations that require additional space to accommodate their employees. In addition, funding for the accommodation of federal bodies and organisations may be provided by the Government of the Russian Federation, which at its discretion, allocate funds from its own extra-budgetary reserves for the purpose of purchasing real estate objects.

Leasing of real estate. Real estate under the economic management of unitary enterprises is leased out for commercial purposes in accordance with the procedure established by law. An independent assessment of the rental value of each real estate object is carried out [27]. On the basis of results of electronic tenders, estate objects are leased usually to the bidder who offered the highest price for rent, which is reviewed annually and adjusted either on the basis of a new valuation report prepared by an independent expert, or on the basis of the annual inflation rate.

Preparing justifications and proposals for the sale of federal property transferred to the company under the right of economic management in accordance with the established procedure. Like any commercial enterprise, real estate objects transferred to the right of economic management should be profitable. Objects that are not in commercial demand, and not rented out, therefore generate losses for the enterprise in the form of property taxes, rental payoff for the land under them, or generate income below the cost of their maintenance. If so, they should be subject to privatisation.

At the same time, as mentioned above, Resolution of the Government of the Russian Federation dated April 3, 2008 No. 234[13] prohibits the Federal State Unitary Enterprise from approving transactions on alienation of real estate objects.

In these conditions, the following options are available for privatisation of real estate transferred under the right of economic management: sending a waiver of the right of economic management of the generating-losses real estate objects to the Federal Property Management Agency and transferring this property to the Treasury of the Russian Federation.

Subsequently, privatisation of the objects is carried out in accordance with the mechanism provided for by the legislation in force: either by including them in the forecast privatisation plan (programme) approved by the Government of the Russian Federation, or by including them in the object's lists subject to privatisation and

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[13] Resolution of the Government of the Russian Federation as of 03.04.2008 No. 234 "On Ensuring Housing and Other Construction on Federally Owned Land Plots" (as amended and supplemented). URL: https://base.garant.ru/12159666/

approved by the Ministry of Finance of the Russian Federation.

It is also provided that a Federal State Unitary Enterprise in coordination with The Federal Agency for State Property Management Rosimushchestvo, submits these objects in the application list for consideration by the Government Commission for the Development of Housing Construction. On the basis of its decision, the objects are sold by the joint stock company DOM.RF. The Federal State Unitary Enterprise receives the bulk of the proceeds.

In accordance with the Order of Rosimushchestvo, movable property is allocated to federal state enterprises, including physically dilapidated vehicles (previously allocated to federal executive bodies and their organisations that have reached the end of their normal service life, for the purpose of further sale or disposal. After allocation, the objects run through an independent evaluation procedure and are sold by auction. Movable property that has no prospects of being sold for further use is subject to scrappage.

DEVELOPMENT OF ACTIVITIES OF FEDERAL STATE ENTERPRISES

Involvement of real estate objects in economic turnover. Analysing the properties proposed as collateral leads to the conclusion that, probably, they are not fit for the economic turnover through rental, as they are mostly unattractive from a commercial point of view.

Real estate objects that are not leased out due to lack of demand can be brought into economic turnover by selling them by means stipulated by the current legislation. They require maintenance costs and generate losses for the enterprise. If it is utterly impossible to lease them out after using all additional opportunities of the unitary enterprise, one may get them involved in economic turnover by means of renunciation of the right of economic management. Subsequently, the objects are transferred to the Treasury of

the Russian Federation for further inclusion in the Forecast Plan (programme) of privatisation and sale with involvement of all sales options provided for by the current legislation, namely: auction, public offer, and, in case of no demand, just sale without announcement of price, or, via some other above mentioned ways [2].

Expansion of sale and scrappaging of movable property. At present, the Federal State Unitary Enterprise is working on the auto sales of movable property assigned under the right of economic management. These are mainly motor vehicles that have reached the end of their normal service life (for which the rights of operational management were terminated at the request of the former owners — ministries, administrative departments, State institutions) and assigned to the Federal State Unitary Enterprise under the right of economic management.

Sales of movable property objects may generate income manifold, if a large number of assigned movable property will be available for sale. For this purpose, it is required to inform federal executive bodies more widely about plans to scrappage dilapidated movable property. Thus, it will expand the flow of movable property that has outlived its normative term and is subject for scrappage.

Leasing property, the alienation of which from federal property is inexpedient, to small and medium-size businesses. In accordance with Federal Law No. 159-FZ[14] of July 22, 2008, small and medium-sized businesses that lease an immovable property owned by the federal government may apply for its privatisation as a matter of priority. Such standard norm does not apply to immovable property fixed under the right of economic management.

Objects that have been transferred, or planned to be transferred to small and medium-sized enterprises, but alienation from federal

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[14] Federal Law No. 159-FZ dated 22.07.2008 "Regarding Specifics of Alienation of Immovable Property". URL: http://www.kremlin.ru/acts/bank/27817

property is not feasible, may be assigned under the right of economic management to a unitary enterprise or leased for a certain period of time until the need arises to use them for federal needs.

Disposal of written-off "frozen" construction objects. Pursuant to the Instruction of the Government of the Russian Federation No. MX-P13–4983 dated May 15, 2020, work is being carried out to reduce the number of "frozen" or construction-in-progress objects that are in federal ownership and accounted for in the register of federal property [1, 22, 28, 29, 30, 31, 32].

In vast majority, such objects are just metal frames. Their utilisation may be of commercial interest if the cost of the work is less than the cost of metal frames and other materials sold.

Such work not only will help the State to solve problem of cleaning up the territory formerly occupied by "frozen" or construction-in-progress objects, but also to generate income from the sale of construction materials

Streamlining organisation and strengthening control over existing business activities. The increase in the number of leased properties requires the introduction and development of digital technologies that enable prompt monitoring of overdue payments for federal property by tenants and timely reassessment of lease payments. This would significantly improve the discipline of payment and, consequently, lead to an increase in payments collected. In case of delayed payments for the deadline exceeding the period stipulated in the lease agreement, it is necessary to send a pre-action letter immediately to demand repay debts, accumulated fines and penalties within a month. Next, upon expiry of this deadline and failure to pay, a statement of claim to the court should be sent. Such pre-trial measures at the preliminary stage would become already an effective method to improve payment discipline.

Transfer of functions for the sale of real estate included in the Forecast Privatisation Plan (Programme) and commercial real estate. At present, the Federal Agency for State Property Management Rosimushchestvo as a federal body that, among other things, carries out commercial activities, such as leasing state property. Besides, starting from 2008, upon liquidation of Russian Federal Property Fund. a specialised State institution, Rosimushchestvo has been running auctions of property included in the Forecast Privatisation Plan (Programme) or included in the list of property for sale approved by the Ministry of Finance of the Russian Federation [2].

In our opinion, the functions of federal property management should be performed by the federal executive authority, and commercial functions may be delegated to a federal commercial organisation, in this case — to a Federal State Unitary Enterprise (FSUE). This is quite possible in current situation, since there is a decent system of control over the financial and economic activities of the FSUE.

Also, in our opinion, the Unitary State Enterprise under the Rosimushchestvo can manage the functions of leasing all commercial real estate owned by the Federal Government, provided that a Federal State Unitary Enterprise is entrusted to implement the plan for revenues to the federal budget from real estate leasing and privatisation.

In general, Federal State Unitary Enterprises, involved in the process of managing federal immovable and movable property, perform an integral part of this management and play a significant role in improving its efficiency, ensuring, among other things, increasing revenues in the federal budget.

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ABOUT THE AUTHOR

Evgeny V. Gavrilin — Dr. Sci. (Econ.), Director for Development, Federal State Unitary Enterprise "Directorate for Investment Activities", Moscow, Russia
https://orcid.org/0000-0002-7621-2785
evgavrilin@mail.ru

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ORIGINAL PAPER

The Integrating Role of Digital Staff Maturity in a Balanced Digital Transformation Model

I.M. Stepnov[a], M.Yu. Telegina[b,c]
[a] Financial University, Moscow, Russia;
[b] First Training Group LLC, Moscow, Russia;
[c] MGIMO University, Moscow, Russia

ABSTRACT

The article is devoted to the theoretical and methodological substantiation of the integrating role of digital maturity of personnel in the processes of modern transformations of industrial enterprises. The subject of the study was the assessment of the role of company employees within the framework of the proposed balanced digital transformation (DT) model, and its purpose is to establish the relationship between the digital maturity (DM) of employees and methods of its formation, taking into account the priorities of a balanced DT. The methodological basis was the materials of works from the field of organizational institutionalism, applicable to solving the problems of managing digital transformations in industry. The results of the research, carried out using the methods of scientific analysis and synthesis, as well as processing the results of the survey and questionnaires, consist in the formation of new ideas about the model of digital transformation. The article reflects its features such as cyclical nature, the sequence of mandatory stages (formation of corporate digital culture, motivation of staff, practice-oriented mentoring, technology, data analysis and customer influence). As differences from existing approaches, the inclusion of the integrating role of digital maturity of personnel in the digital transformation (DT) processes and consideration of technologies and customer needs only after assessing the readiness of personnel in the formed digital environment is noted. The authors have formed recommendations for the practical implementation of the presented model of balanced digital transformation and the conduct of appropriate survey procedures that may be of interest to specialists in this field.

Keywords: digital economy; digital transformation; digital strategy; digital maturity; personnel; industrial enterprise

INTRODUCTION

Before the COVID-19 pandemic, digital transformation (DT) in business was considered an advantage that enhanced functionality but was not a mandatory choice. However, in light of the severe changes brought about by the pandemic —including significant damage to the socio-economic development of many countries, disruptions in labor market mechanisms, shifts in traditional employment models, and other profound socio-economic transformations — DT has become a cornerstone of survival for many sectors of the economy [1]. Given that most consulting firms in Russia and abroad emphasize the necessity of DT tools in the post-pandemic world, real businesses are likely to significantly increase their investments in artificial intelligence (AI), augmented and virtual reality (AR and VR), the Internet of Things (IoT), and other emerging technologies in the coming years.

A direct confirmation of this trend is the significant increase in the market capitalization of Nvidia, a company specializing in AI-powered "superchips," which has become the world's most valuable company. In 2023, Nvidia's market capitalization exceeded $ 1 trillion; by March 2024, it reached $ 2.6 trillion, and by October 2024, it had surged to $ 3.4 trillion. This example illustrates growing investor interest in tech companies that can capitalize on AI[1] advancements. Compared to its financial results from January 2023, Nvidia's revenue in January 2024 increased 3.7 times, while its net profit rose 8.7 times (see *Fig. 1*).

Thus, the exponential growth of these indicators over the analyzed period, along with the corresponding increase in market capitalization, not only highlights the success of Nvidia's strategy in implementing the latest digital transformation (DT) technologies and its ability to adapt to a changing market but also proves the demand for similar solutions among other market participants. The Nvidia example underscores that investors recognize significant growth potential in AI-driven companies. This recognition drives further investment and intensifies competition in the sector, ultimately fostering new developments and broader technological progress.

Alongside this trend, there is also a noticeable rise in the number of startups[2] operating in the VR and AR sectors. This is evidenced not only by increased funding requests from these startups but also by the growing number of office spaces occupied by such companies (see *Fig. 2*).

Speculations about AI's impact — whether it will lead to increased unemployment and reduced opportunities for professional and personal development [2], create new jobs [3], improve disease diagnostics and drug discovery [4], expand learning and creative expression [5], or even serve as our conversational partner [6] — continuously attract the attention of not only the academic community but also the business sector and are widely discussed. However, according to anthropologist David Graeber [7], despite potential and expected contradictions, modern technologies are increasingly being used to encourage greater workforce participation rather than reducing labor demands. Many organizations are already working in this direction, actively engaging employees in digital business transformations, which fundamentally reshape both productivity and job responsibilities.

From this perspective, a crucial role in modern companies is assigned to digital transformation leaders — so-called Chief Digital Officers (CDOs) — as they are responsible for digital strategy and implementation. These executives play a key role in managing the integration of new technologies and digital innovations within enterprises. Effective leadership in digital transformation supports strategic thinking and adaptability in rapidly changing environments [8].

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[1] Nvidia hits $ 1tn market cap as chipmaker rides AI wave. Financial Times. URL: https://www.ft.com/content/fd317e1b-0440–4840-bc0a-0aa35c776ffd (accessed on 01.11.2024).

[2] DATA + AI PREDICTIONS. Snowflake. 2024. URL: https://www.snowflake.com/data-ai-predictions/ (accessed on 01.11.2024).
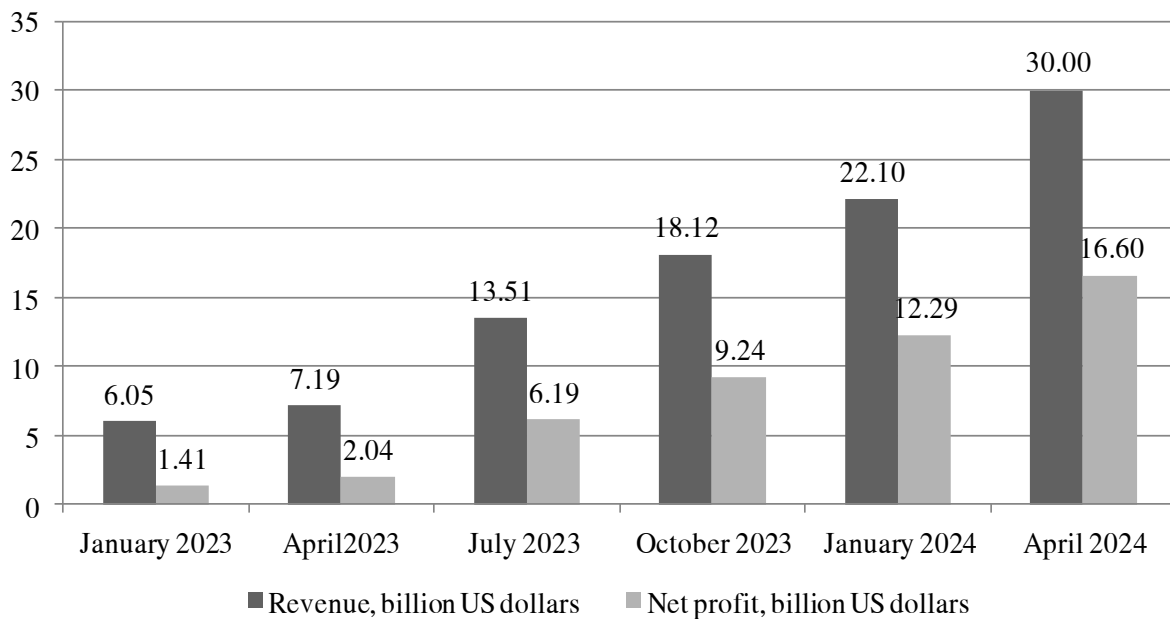
Fig. 1. **Nvidia's financial results from January 2023 to April, 2024**

Source: compiled by the authors based on Nvidia hits $ 1tn market cap as chipmaker rides AI wave. Financial Times. URL: https://www.ft.com/content/fd317e1b-0440 – 4840-bc0a-0aa35c776ffd (accessed on 01.11.2024).
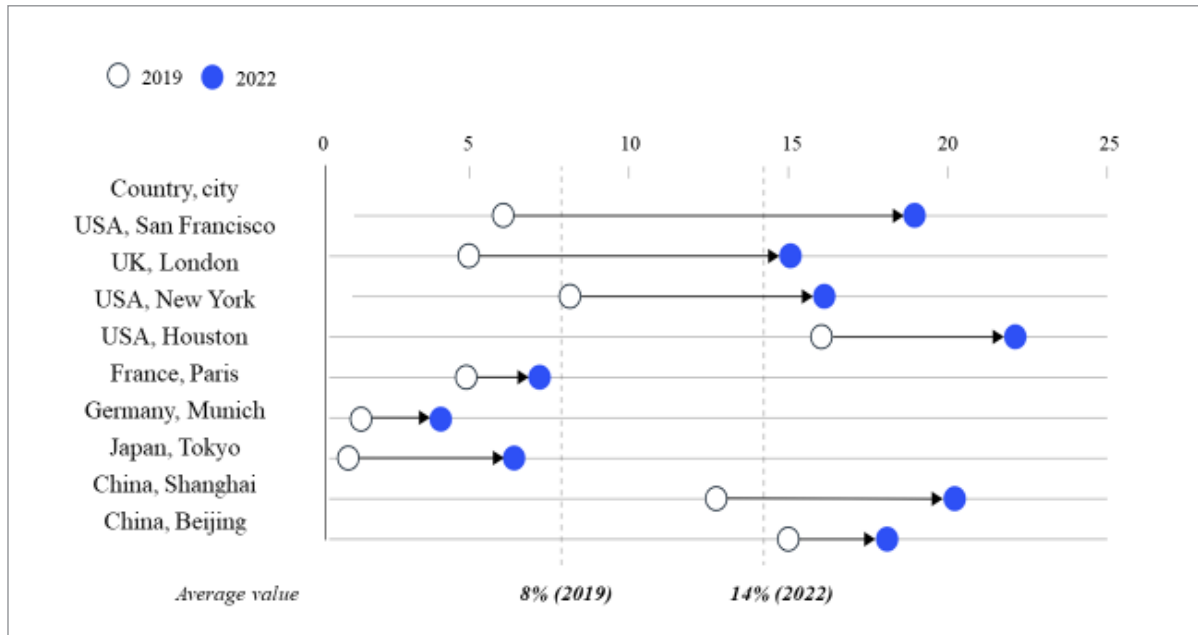
Fig. 2. **The share of office space remaining vacant in the post-pandemic period,%**

Source: compiled by the authors based on McKinsey Global Institute Report "Empty spaces and hybrid places: The pandemic's lasting impact on real estate"/ 13.07.2023/ URL: https://www.mckinsey.com/mgi/our-research/empty-spaces-and-hybrid-places utm_source=Franchising.com&utm_medium=referral&utm_campaign=Francising.com-Article#/ (accessed on 01.11.2024).

Today, leading Russian companies such as Russian Railways[3] (RZD), Sberbank,[4] Yandex,[5] Severstal,[6] and others have already appointed CDOs. Their primary task is to ensure the successful use of digital technologies to enhance business process efficiency, improve customer experience, and achieve strategic objectives.

However, although the role of Chief Digital Officers (CDOs) is extremely important, the success of their efforts depends on many factors [9]. Some companies achieve success by hiring qualified specialists who effectively implement innovative solutions and reform business processes, while others face challenges [10]. Negative consequences may arise when implementing digital strategies if employees are unprepared for change or resistant to innovation [11].

While not all CDOs manage to fulfill their objectives and successfully lead the digital transformation of their organizations — ensuring market leadership and sustained success — a more advanced digital culture within companies is a crucial aspect of balanced business development, both today and in the future. Built through employee training in new skills and encouraging staff to adopt digital innovations, digital culture will become a top priority for organizations in the coming decade to adapt to rapidly changing market conditions and maintain competitiveness. Analyzing a company's digital culture begins with assessing the digital maturity (DM) of its workforce, which, in turn, cannot be achieved in isolation from the chosen digital transformation model. This research question is the central focus of this article.

The need to implement an assessment of personnel digital maturity in domestic conditions is also driven by the necessity for the development of Russian society, as emphasized in the Decree of the President of the Russian Federation No. 309 "On the National Development Goals of the Russian Federation for the Period up to 2030 and the Prospects until 2036" dated 07.05.2024.[7] This decree includes the objective of "achieving by 2030 the digital maturity of state and municipal administration, key sectors of the economy, and the social sphere — including healthcare and education, which entails the automation of most transactions within unified industry-specific digital platforms and the adoption of a data-driven management model, taking into account the accelerated implementation of technologies for processing large volumes of data, machine learning, and artificial intelligence".[8]

RESEARCH METHODOLOGY

The choice of research methodology is based on the authors' perspective regarding the role of digital maturity of personnel within a balanced digital transformation (DT). This approach considers three key premises:

• *achieving and maintaining a high level of digital literacy among employees*, as such skills are becoming an integral part of the work environment and determine an employee's ability to effectively use digital technologies for professional tasks.

• *flexibility in adopting technological innovations*, which is essential in the context of digital transformation. This requires employees not only to be open to change but also to adapt to new technologies and processes.

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[3] Russian Railways Digital. Digital transformation of railway transport. URL: https://rzddigital.ru/ (accessed on 02.11.2024).
[4] Digital corporate bank. URL: https://developers.sber.ru/kak-v-sbere/teams/dcb?ysclid=m2edop68zt852546402 (accessed on 02.11.2024).
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[7] Decree of the President of the Russian Federation No. 309 "On the national development goals of the Russian Federation for the period until 2030 and for the future until 2036" from 07.05.2024 http://pravo.gov.ru/proxy/ips/?docbody=&firstDoc=1&lastDoc=1&nd=606911096
[8] Ibid., paragraph 8, paragraph a

• *integration of digital processes across all areas of business through trained personnel*, enabling enterprises to become more efficient and competitive. This is achieved through a DT strategy that outlines concrete steps for integrating digital technologies into all aspects of operations. The use of integrated platforms, including "digital labor platforms" [12], within a unified digital space helps organizations achieve their transformation goals.

It should be noted that employees will not be able to adopt the mechanisms and tools of digital transformation (DT) without possessing digital literacy —therefore, digital literacy is the foundation for forming digital culture and digital maturity (DM) as a whole. To understand how to develop a digital strategy, it is necessary to assess the professional level of employees, as well as their interests and needs.

The methodological foundations of such a strategy are based on the application of new applied concepts of organizational institutionalism, which allow for the identification of the relationship between digital mentoring (transformational leadership) and organizational flexibility, influencing DT in general and the digital strategy in particular, acting as a catalyst for digital transformations. These interdisciplinary concepts are most notably reflected in two theories of English scholars — organizational institutionalism [13] and new organizational institutionalism [14], which have sparked significant discussions among Russian authors [15–17] concerning the application of tools such as "organizational field" [18] and "institutional complexity" [19].

Organizational institutionalism represents a complex of political, normative, and technological changes (which most organizations face) with an emphasis on radical organizational transformations and adaptation to central research issues. In addition, proponents of this approach study the processes through which individual companies preserve, adopt, or reject patterns based on the institutionalized nature of organizational changes.

According to our approach, digital transformation is a significant organizational change.

In turn, new organizational institutionalism is typically used to understand organizational changes associated with the implementation of advanced technologies, by studying the influence of external factors on the practice and culture of the organization (with an emphasis on its sociocultural aspects) through two approaches:

• through the relationship between stagnation and change, continuity and homogeneity, as well as change and heterogeneity among organizations.

• by perceiving stagnation and change as the results of planning, structuring, operational activities, and specific actions at multiple levels of analysis, including the social, field, organizational, and individual levels.

• the establishment of multiple levels of complexity and the concept of "field" provides a more structured understanding of the category of "unified information space" [20], particularly in relation to organizational culture (including digital culture), which, in our opinion, is becoming a modern institution, despite criticism from some researchers regarding the separation of this institution [15].

At the same time, many business leaders, ignoring the principles of organizational institutionalism theory, are currently rushing to invest in large-scale technological digital transformation (DT) in hopes of breakthrough results. This leads to costly failures, executive resignations, staff reductions, and a strategy of returning to basics, where digital efforts are relegated to a secondary priority, remaining at the pilot project stage. Business structures that attempt to engage in the DT process without ready plans and digital strategies, and without accounting for the need to improve the digital literacy of their personnel, face difficulties in adapting to technological changes [21, 22]. The reason for this is the growing gap between theory and reality, accompanied by even larger contradictions between strategy and

its implementation. In most cases, companies fail in their DT efforts if they begin with technological changes without creating comprehensive plans and developing a series of sequential steps. To avoid such situations, digital leaders must ensure that their enterprises develop the digital mindset and flexibility needed to respond to challenges related to digital innovations. To do so, they need to: study the relationship between organizational flexibility within their companies and mentorship in the context of DT (including the impact of this relationship on digital transformation); prepare a workforce-oriented digital strategy and determine its impact on organizational flexibility and the success of digitalization within the chosen DT model.

CONCEPTUAL REPRESENTATION OF A BALANCED DIGITAL TRANSFORMATION MODEL

In our view, the success of digital transformation (DT) can be achieved through the use of two tools: regular employee and management surveys to identify current DT issues and employee needs, as well as adherence to the sequential stages within our proposed balanced DT model for a seamless transition to digital maturity. It should be noted that the components of the model are integrated into a cohesive whole through the regular assessment of digital maturity (DM).

By digital maturity, we mean the organization's ability to successfully integrate digital technologies and processes across all aspects of its operations to leverage advanced digital tools and systems, a deep understanding of the needs and requirements of employees, as well as the potential of both existing and new technologies for their optimal application to improve productivity, reduce costs, and enhance product quality and customer service. Therefore, an industrial enterprise with high digital maturity is characterized by:

• successful integration of digital technologies such as IoT, data analytics, AI, and process automation.

• a sustainable digital culture, characterized by the widespread dissemination of digital skills among employees, active use and promotion of digital tools and approaches by staff, and encouragement of a continuous learning and development mindset;

• flexibility in decision-making and openness to innovation, where the company is able to respond promptly to changes in the digital environment, is ready for rapid business adaptation, and actively explores new technologies and approaches to maintain its competitiveness;

• a safe and modern production system, whose efficiency is regularly improved; full employee engagement and loyalty; Improved product quality and customer service, as well as increased competitiveness in the market.

To address the complex issues of digital transformation (DT) in industrial companies, a conceptual model is proposed that ensures the balance of digital transformation through the sequential (cyclical) formulation of goals and determination of corresponding priorities. Within this model, priority attention is given to aspects of organizational development such as corporate culture, motivated personnel, practice-oriented mentorship, relevant data, modern technologies, and loyal customers (*Fig. 3*).

Unlike traditional models [23, 24], which often focus on technologies or economic indicators, the model we propose includes corporate culture, including employee motivation, recognition of their involvement in transformation processes, and their impact on productivity (which required the use of the organizational institutionalism theories mentioned above).

This model is qualitative and serves as the subject of narrative analysis in economics [25]. Its core solution is not only the choice of corporate culture as the starting point but also the integration of practice-oriented mentorship and relevant data. This creates conditions for continuous learning and adaptation to change. The distinctive feature of the proposed model lies in its comprehensive approach

to developing its structure — every element is cyclically interconnected and influences the overall outcome. Thus, by using this model, companies can achieve more harmonious and sustainable digital leadership, approaching transformation with consideration for the human factor and long-term goals.

Let's highlight the basic terms used in the proposed model:

• Digital Transformation (DT) Strategy — a long-term plan defining how the enterprise will use technologies to improve its business processes, create new products and services, enhance customer service quality, and increase competitiveness.

• DT Mentorship — the ability of the organization's leadership to effectively manage digital transformation, which involves understanding technological trends and their potential for improving business processes, as well as being open to change and innovation. A key component of DT mentorship is promoting a culture that encourages the use of technologies and supports employees working with them.

• DT Mentor — a new type of top manager responsible for developing and implementing the company's DT strategy, possessing not only technical knowledge but also strategic vision, the ability to manage change and teams, as well as the capability to adapt to rapidly changing market conditions.

The DT Mentor plays a key role in this model. He serves as both a catalyst and organizer of digital transformation. First and foremost, he must not only understand current technological trends but also anticipate how these trends should be integrated into the organization's existing business processes to improve efficiency. These skills allow him to develop and adapt the DT strategy, paving the way to a digital future that aligns with the company's unique needs and goals. Secondly, the DT Mentor must be capable of effectively managing DT processes, creating both a technical vision and a culture that supports innovation and openness to change. In this way, the DT Mentor helps create an environment where staff feel supported and motivated to work with new technologies.

Given the characteristics of industrial companies, the DT Mentor must quickly adapt to demands and challenges, consider the specifics of the regional market and business environment, and integrate aspects important for a particular location into the DT strategy. He can also actively work on fostering a culture of innovation and digital thinking within the organization.

FEATURES OF THE COMPONENTS OF THE CONCEPTUAL MODEL OF BALANCED DIGITAL TRANSFORMATION

Let us turn to the features of each component of the balanced DT model (*Fig. 3*).

Corporate Culture

The role of corporate culture in achieving digital leadership within a company is studied by scholars such as E. Schein [26], P. Senge [27], J. Katzenbach, and others [28]. It is quite likely that the existing culture and structure of many companies are not suitable for implementing digital transformation. Therefore, when developing a DT strategy, the following aspects play an important role in achieving digital leadership:

• analyzing the current culture and structure of the organization. This needs to be conducted to understand how ready employees are for change and the degree of support from management. This can be done through surveys and interviews, as well as by studying company data, such as employee satisfaction levels, the number of support requests, and so on.

• helping employees gain the necessary knowledge and skills. These skills will be essential not only in theory but also in practice. To achieve this, it is necessary to analyze the existing competencies of employees and determine what knowledge and skills they need for the successful implementation of DT. After this, individual training and development plans can be created for team members to prepare them for the expected future changes.
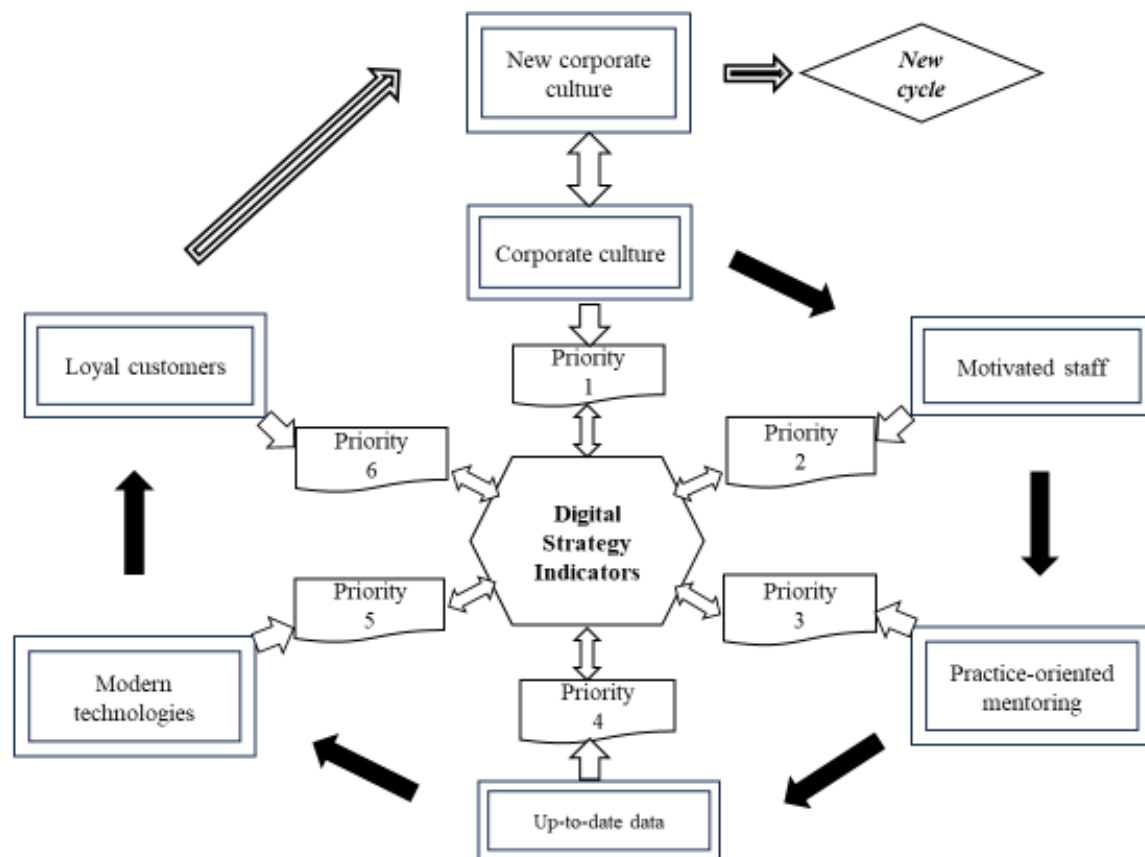
Fig. 3. **A conceptual model for ensuring the balance of digital transformation**

• improving communication within groups. To ensure more effective collaboration both within individual teams and across the entire company, it is necessary to identify which communication tools will be most effective for each specific group and create a plan to ensure regular interaction between employees.

It is worth noting that if it is found that the existing culture and structure of the organization are not suitable for the implementation of digital transformation, appropriate actions should be developed and implemented to adjust the business model, revise processes and roles, provide individual training for employees based on specific business tasks, and so on.

Motivated Personnel

Researchers E. Brynjolfsson and E. McAfee [29] believe that to achieve digital leadership, compa-

nies need to develop their employees' technical and analytical skills, while economist M. Porter is convinced that a strong and motivated workforce is key to success in the digital world [30]. In our opinion, achieving success in digital transformation requires a detailed study of the employees' competencies, including evaluating the impact of employees' digital workspaces on effectiveness and the moderating role of digital leadership skills [31].

Among the tasks related to ensuring the necessary motivation for employees, the following should be included:

• creating digital transformation (DT) teams consisting of specialists from various fields to help employees better understand the interconnections between different processes and technologies;

• using interactive technologies, such as virtual simulators, where employees can practice using new tools and technologies in a gamified format. This will facilitate the application of new knowledge and skills in practice in a safe and controlled environment;

• organizing internship programs for employees, allowing them to gain hands-on experience with new technologies and tools, both within the company and in collaboration with external partners and suppliers;

• regularly conducting surveys to gather feedback from team members regarding the implementation of digital transformation. This will help identify issues and address them at an early stage, preventing resistance to change;

• creating a motivation and incentive system that encourages the use of new technologies.

Practice-oriented mentoring

According to John Kotter [31] and Jim Collins [32], special attention is paid to mentoring when managing the change process within a company. We also believe that digital transformation (DT) should be initiated by the top management of the enterprise and supported by them. Therefore, it is necessary to ensure mentoring that actively supports DT and initiates changes in the culture and structure of the company — the so-called "DT mentoring." Organizing this requires a shift in the focus of organizational culture. Leaders need to decide how to train employees on the technologies and processes outlined in the DT strategy, so they can later motivate them to apply the new tools by leading by example.

Relevant data

Researchers T. Davenport and C.J. Hogue [33] believe that using data at the company-wide level is a key factor in achieving digital leadership. In our opinion, companies aiming for digital leadership should assess what information is necessary for making business decisions, and how it can be collected, processed, and analyzed. For the effective use of data, management must create a culture that recognizes it as a key asset of the company. Employees need to understand that information is a valuable resource, and its use is a priority in terms of deriving benefits and achieving efficiency not only for the company but also for each individual.

Modern Technologies

G. Hamel [34], V. Mayer-Schoenberger, and K. Kuckier [35] believe that modern technologies, data analytics, and machine learning can help companies create new business models and achieve digital leadership.

Loyal Customers

In our opinion, digital transformation should primarily focus on customers and enhancing their experience with the company. Therefore, it is recommended to assess which changes can increase customer satisfaction and how the company can improve its digital experience.

In the context of the proposed model, ensuring balance, it is important to note the significant role of each component in the overall digital transformation of the company. Excluding even one of these components could negatively affect the results and effectiveness of the company's operations, leaving no prospects for achieving technological excellence.

Thus, the "Corporate Culture" component defines how the company encourages the use of technologies and provides support to employees working with them. Without a proper digital culture, the company may not receive the necessary support to implement digital transformation.

The "Motivated Personnel" component defines the role of staff in the digital transformation process, their knowledge, experience, and capabilities. If the company does not provide its employees with the necessary skills, it may lead to ineffective digital transformation implementation (or it may not happen at all).

The "Practice-Oriented Mentorship" component highlights the need for targeted professional guidance and a strategic vision for the implementation of the company's digital transformation. If leaders are not ready for change, digital transformation may become complicated, inefficient, or even unattainable.

The "Relevant Data" component addresses the role of data in digital transformation, its collection, analysis, and use. If the company fails to work productively with information, it will lead to partial loss of data and inefficient use of technologies.

The "Modern Technologies" component determines the role of technologies in digital transformation, their selection, implementation, and application. If the company makes a mistake in choosing technologies, it could result in ineffective digital transformation implementation.

The "Loyal Customers" component reflects the company's focus on meeting customer needs and creating products and services that meet their expectations. If this component is excluded, the company may lose its competitiveness and customer base.

Thus, all components of the proposed model are essential and interconnected. Excluding even one of them can lead to disruptions in the functioning of the entire system. For example, without considering the needs and expectations of loyal customers, the company will not be able to develop products and services that are in demand in the market. The absence of practice-oriented mentorship and corporate culture that fosters the adoption of new technologies and innova-

tions can lead to falling behind competitors and losing market position. Additionally, the need for highly skilled and motivated personnel becomes increasingly apparent in the context of growing digital competition. In turn, without considering relevant data, the company will be unable to make informed and effective decisions, and without utilizing modern technologies, the company will struggle to compete effectively in the market and meet customer demands.

Staff Survey as a Condition for the Effective Functioning of the Digital Transformation Model

The model presented above has a cyclical nature, which hides significant feedback within its components for management purposes. This is why we consider conducting a survey to collect data (feedback) on the outcomes of changes as a condition for the effective functioning of the model.

The survey was initially designed to gather feedback from employees and managers of industrial enterprises (which have either already completed their digital transformation or are still in the process of digital business transformation) in order to study their experiences and perspectives regarding the effectiveness of work processes in this area. To increase the response rate, the survey
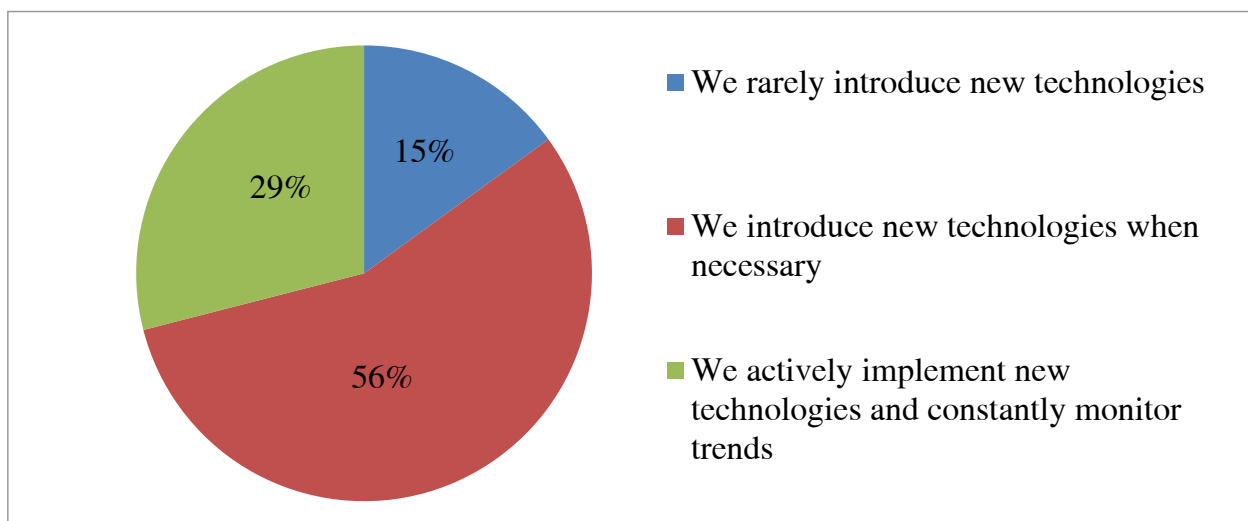
Fig. 4. **The frequency of introduction of new technologies in industrial companies of the EAEU countries**

Source: compiled by the authors.

could, for example, be developed and conducted in a digital format with elements of gamification, as represented on the Digital platform Happy Job[9] (patented by RAO), for research on employee engagement, loyalty, and satisfaction.

The survey involved employees from 102 industrial companies in the EAEU countries, which allowed the collection of empirical data based on case studies.

The survey consisted of 4 blocks (A, B, C, and D).

Block "A — Digital Maturity" — allows for the assessment of the current level of digital maturity of the company and can help identify how ready it is for digital transformation (DT) and how actively it is applying digital technologies in its operations. The information gathered through the survey can also be useful for identifying bottlenecks in the company's digital strategy and finding solutions to improve it.

According to more than half of the respondents, in their companies, the implementation of digital technologies occurs as needed (55.9%); moreover, a third of the organizations actively use innovations and constantly monitor current trends (*Fig. 4*).

It is important to note that the analysis of issues and solutions in the field of digital transformation (DT) and achieving digital maturity (DM) in the surveyed companies showed that most employees highlight the need for automation and optimization as key strategies for addressing DT challenges. At the same time, the percentage of employees who do not see any obvious problems is relatively low (8.7%), which may indicate limited awareness of DM issues in only some organizations. However, the indication of a shortage of qualified personnel (35.5%) points to the need for greater attention to the development of human resources in the DT process and efforts aimed at searching for and attracting talent (*Fig. 5*).

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[9] Happy Job (official website). URL: https://happy-job.ru/ (accessed on 21.09.2024).
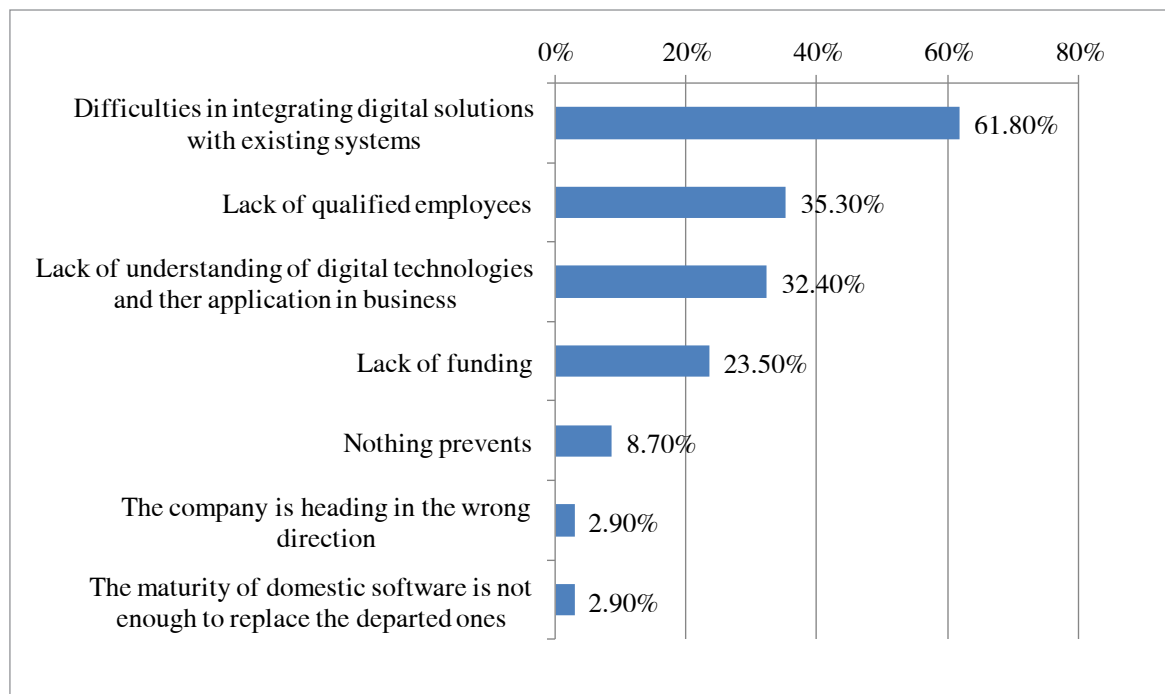
Fig. 5. **Problems that, according to personnel, hinder the achievement of digital maturity of industrial companies in the EAEU countries**

Source: compiled by the authors.

Block **"B — Risks and Security"** is aimed at assessing the company's readiness to protect its data, as well as analyzing the threats that arise during digital transformations and the security measures planned or already implemented to prevent incidents.

The survey revealed a relatively low level of knowledge among both staff and management in the area of information security (*Fig. 6*).

Block "**C — Digital Transformation**" is designed to help both in identifying how successfully the company is implementing new digital tools (in terms of their benefits for business processes) and in evaluating the challenges that arise on the way to achieving and/or maintaining digital leadership.

In the survey conducted, in response to the question: "How would you assess the results of

- Very high level of knowledge (5 points)
- Quite a high level of knowledge (4 points)
- Average level of knowledge (3 points)
- Low level of knowledge (2 points)
- Very low level of knowledge (1 point)
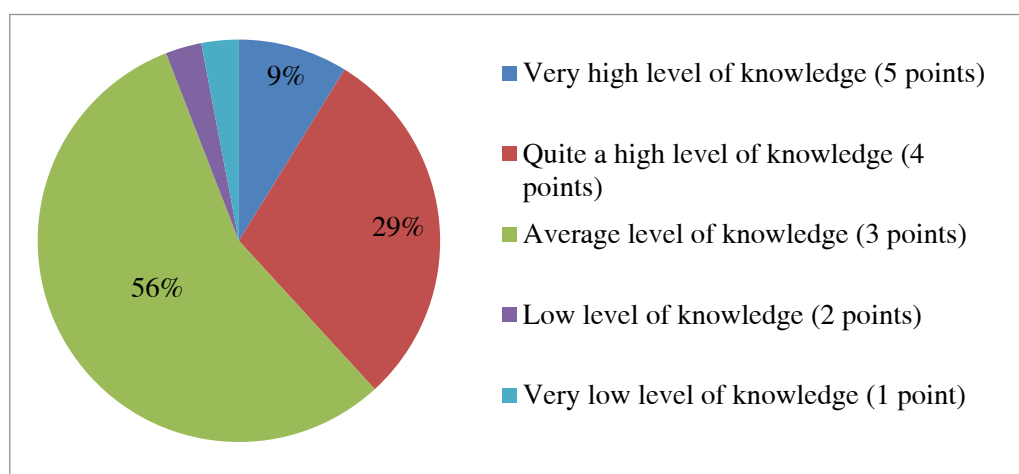
Fig. 6. **Assessment of the knowledge of their colleagues in the field of information security by respondents representing industrial companies of the EAEU countries**

Source: compiled by the authors.

- Not successful enough
- Successful in some areas
- Successful in most ereas
- Very successful
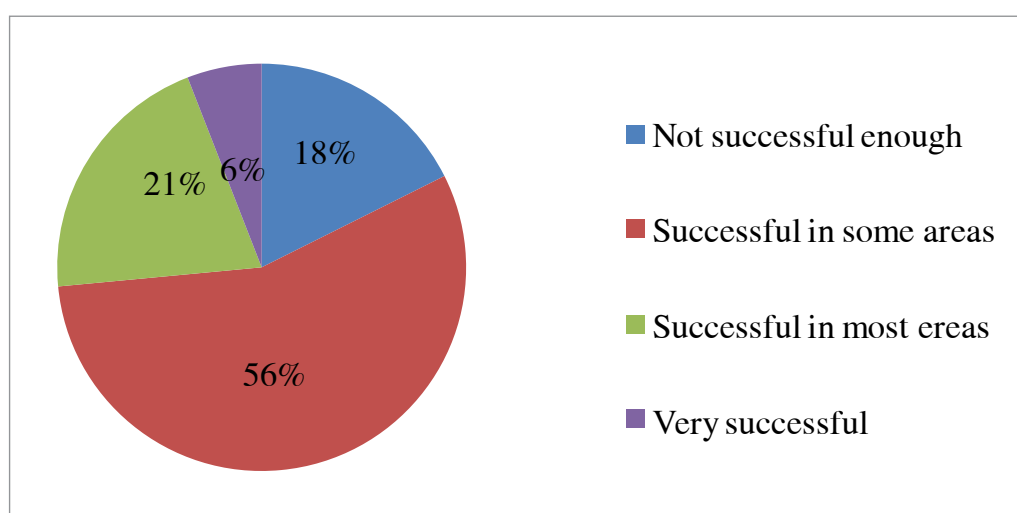
Fig. 7. **Results of digital transformation of industrial companies of the EAEU countries according to the opinion of the staff**

Source: compiled by the authors.
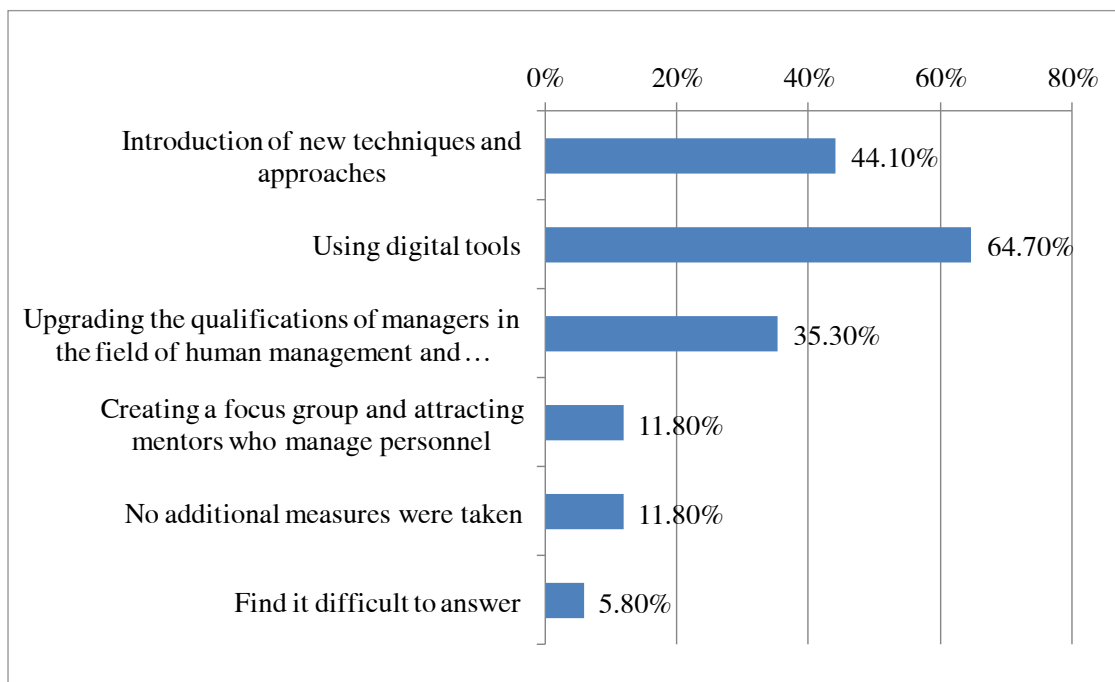
Fig. 8. **Measures taken by industrial companies of the EAEU countries to improve the efficiency of personnel management processes**

Source: compiled by the authors.

your company's digital transformation at this moment?", only 5.9% of respondents stated that they consider the results to be very successful, while 55.9% noted that the results of digital transformation in their organizations are successful only in certain areas (*Fig. 7*).

Block "**D — Personnel**" contributes to understanding how ready the company's employees are for changes related to the implementation of new technologies, what skills are necessary for employees and management to successfully adapt the company to innovations, and what challenges may arise when engaging employees in digital transformation.

Regarding the measures taken by industrial companies in the EAEU countries to enhance personnel management efficiency in the context of digital transformation, the following results were obtained (*Fig. 8*).

One of the outcomes of the survey was the identification of practices by the studied companies regarding the enhancement of personnel

management efficiency in the context of digital transformation (see the *Table*).

The distinguishing feature of the proposed survey is the anonymity of the respondents, which helps gather the most relevant feedback and provides the opportunity to identify areas for development in the first priority.

CONCLUSION

The proposed balanced development model shows that achieving technological leadership in the context of digital transformation largely depends on the digital maturity of the staff, which, in turn, involves two key factors: digital culture and mentoring (or transformational leadership).

According to the hypothesis presented in the article, it is shown that, unlike popular concepts which suggest the start of digitalization from establishing customer needs and advancing technological solutions, it is within the framework of the balanced model that significant

Table

**Practices of industrial companies of the EAEU countries in matters of increasing the efficiency
of personnel management processes in the context of digitalization
and the consequences of their implementation**

№	Indicator	The share of the surveyed companies, %	Examples of tools	Consequence
1	Introduction of new techniques and approaches	44.1	Implementation of project management systems based on Agile principles; use of design thinking methods for solving business tasks; application of change management methods	Improvement of the company's flexibility and response to changes; faster implementation of innovations; reduction in time to implement new solutions
2	Using digital tools	64.7	Implementation of digital platforms for personnel management (e.g., HR platforms); use of online systems for performance evaluation; application of data analytics systems to monitor staff effectiveness	Automation of personnel management processes; increased accuracy of data analysis; improved decision-making based on actual data
3	Upgrading the qualifications of managers in the field of human resources management and digital technologies	35.3	Organizing training seminars and webinars for managers; courses on digital technologies for HR specialists; mentoring programs in digital technologies	Increase in managers' competencies; more effective management of digital processes; quick adaptation to new requirements
4	Creating a focus group and attracting mentors who manage personnel	11.8	Formation of groups for discussing digital initiatives; involving experts with experience in digital technologies to consult management and staff	Exchange of experience between digital leaders and management; development of more effective strategies for implementing digital innovations
5	No additional measures were taken	11.8	None	Retention of outdated management methods; high risk of falling behind competitors in the rapidly evolving digital technology landscape
6	Find it difficult to answer	5.8	Unknown	Difficulties in adapting to digital changes; lack of clear understanding of the necessity and effectiveness of the measures being taken

Source: compiled by the authors.

attention is given to the company's employees. This allows for a reevaluation of the theoretical and applied basis of digital transformation (DT) in terms of the importance of developing the organization's digital culture, thereby contributing new insights to the development of science.

The proposed approach allows us to argue that the formation of a digital culture under the management of a digital mentor ensures the best result for digital transformation, provided that feedback from staff exists (which, in our case, is implemented through surveys).

It is important to note that the tool we recommend also brings significant benefits not only to the company as a whole but also to each individual employee, due to the ability to express opinions about their work in the organization (management, colleagues, processes), assess their significance within the framework of digital transformation, and influence the improvement of processes within the company. All of this contributes to the balanced development of relationships within the team and enhances the importance of the skills and achievements of each individual employee.

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ABOUT THE AUTHORS

Igor M. Stepnov — Dr. Sci. (Econ.), Prof., Prof. at the Department of Corporate Finance and Corporate Governance, Financial University, Moscow, Russia
http://orcid.org/0000-0003-4107-6397
Corresponding author:
stepnoff@inbox.ru

Marina Yu. Telegina — consultant, First Training Group LLC, Moscow, Russia; research assistant, MGIMO University, Moscow, Russia
http://orcid.org/0000-0002-5314-883X
myutelegina@yandex.ru

Evaluation of the Effectiveness of Communications Between the Department of Transport and Development of Road Transport Infrastructure of Moscow and the Population Within the Framework of the Implementation of Strategic Projects

R.A. Abramov[a, b], Yu.Yu. Temnikova[a]

[a] Plekhanov Russian University of Economics, Moscow, Russia
[b] Institute of Economics, Management and Law of Moscow State Pedagogical University, Moscow, Russia

ABSTRACT

The article examines the assessment of the effectiveness of communications between the Moscow Department of Transport and Development of Road Transport Infrastructure (DTRDTI) and the population in the context of implementing strategic projects. The purpose of the study is to determine the level of information transparency and accessibility of data on the department's key initiatives for citizens. The materials and methods include the comparative and content analysis as well as statistical processing of data from DTRDTI's official websites, publications in the media, social networks and other platforms for the period from 2018 to 2022. The methods of content analysis, comparative analysis and statistical data processing are used. The sample covers 1,520 news stories and information messages. The results show that DTRDTI actively informs Muscovites about the progress of strategic projects. Over the study period, the number of publications increased by 67%, and audience reach, and coverage increased by 84%. A special section "Strategic Projects" has been created on the official website of the department, which is updated weekly. Press conferences, briefings and meetings with journalists are regularly held. In 2022, the Moscow Transport mobile application was launched, allowing to track the work on projects and diverse activities of DTRDTI in real time. The use of VR and 3D modeling technologies for visualization of future objects is noted. At the same time, some problems were identified: uneven presentation of information on different projects, insufficient adaptation of content for perception by non-specialists, lack of versions in foreign languages. It is concluded that DTRDTI demonstrates a high level of information openness. At the same time, it is necessary to ensure a more balanced and accessible coverage of the projects being implemented for a wider audience, as well as to develop new communication channels and formats. The experience of the DTRDTI can be of value not only for the relevant agencies of other regions, but also for the scientific community. The approaches and analysis algorithms proposed in the article are applicable for media audit and optimisation of information activities of authorities of different levels.

Keywords: transport; infrastructure; strategic projects; communications; information openness; Moscow

INTRODUCTION

The current stage of public administration development is characterised by qualitative changes in the mechanisms of interaction between the government and the society. On the one hand, challenges of digital transformation open up unprecedented opportunities for a quick and extensive delivery of information for citizens on the activities of government agencies. On the other hand, these challenges create new requirements to the level of transparency, accountability and involvement of people in the process of making decisions socially significant. [1]These trends are manifested especially during the implementation of large infrastructure projects that deal directly with the interests of significant groups of people. As international practice demonstrates, insufficient consideration of social effects, lack of communication with local communities are among the key factors which cause untimely fulfilment, or 'stalling' in many programmes of development, including those in the field of transport [1; 2].

Moscow, being the largest agglomeration of Russia and one of the leading megapolises in the world with metropolitan area, carries out large-scale activities to modernise the transportation system. In accordance with the state programme 'Development of the transportation system'[2] in the period from 2012 to 2024, the city is actively building new metro lines, roads, junctions, transport hubs for interchanges. The key subject of management for these processes is the Department of Transport and Road Transport Infrastructure Development (DTRDTI). Taking into account the multimillion audience of passengers involved in transportation services, it is of critical importance to build effective commu-

nications of such Department with population to inform people on the essence and consequences of the ongoing transformations [3].

At the same time, the city transport sector is traditionally in the focus of public attention and it is often criticised by various interest groups. Significant technical and organisational complexity of new projects, the need to fundamentally restructure the habitual patterns of transport behaviour of citizens, the presence of transitional periods of reduced comfort of movement — all these aspects make high reputational risks for relevant institutions [4]. These conditions require a proactive, scientifically verified information policy, which is of particular need for a sustainable dialogue between management structures and citizens of Moscow. It is also of paramount importance for obtaining a balance of interests.

In view of the above consideration, the purpose of this study was to assess comprehensively the effectiveness of communications between the DTRDTI and Muscovites for the implementation of key infrastructure initiatives and for development of recommendations to improve information interaction in the context of better quality of public administration. To achieve this goal, the following tasks were solved in the following way:

• Communication messages from the DTRDTI were analysed regarding their dynamics of volume, structure and coverage about the topic of strategic projects of transport infrastructure development for the period 2018–2023.

• Key qualitative characteristics of publications were revealed, including their genre, diversity, multimedia spread and adaptability for the target audience.

• Key indicators of user engagement were determined: level of interactivity of communication platforms, feedback dynamics, as well as emotional tone of messages.

• Comparative analysis was carried out to find out the effectiveness of various channels

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[1] Concept, role and forms of mass communications. Grandars. ru. 2021. URL: https://www.grandars.ru/student/marketing/massovye-kommunikacii.html

[2] State Program of the Russian Federation «Development of the Transport System». Approved by the Order of the Government of the Russian Federation of 28.12.2012 №. 2600-r. URL: https://mintrans.gov.ru/documents/8/2904

and mediums of information interaction between the DTRDTI and Moscow's population.

• Practical recommendations were developed to optimise communication activities of the Department, taking into account both the best international patterns and the specifics of realities of Moscow's developing media.

The scientific novelty of this research involves the development of methodology for assessing the effectiveness of dialogue between public administration bodies and the population regarding the implementation of infrastructure projects on the basis of a systematic approach and integrated application of modern methods of analysis of large data arrays. The proposed theoretical and practical approaches make it possible to transfer the study of public participation mechanisms to a new level distinguished by managerial analytics and validity.

MATERIALS AND METHODS

The empirical basis for the study included 1.520 information entries about strategic projects of Moscow transport infrastructure development implemented and published by the DTRDTI from January 2018 to December 2023. The sampling included the following publications:

1. 890 publications from the official website of the Department, including 465 news, 112 interviews and comments provided by the DTRDTI representatives, 84 press releases, 229 analytical materials (infographics, presentations, brochures).[3]

2. Publications in the leading mass-media of Moscow: newspaper Moskovsky Komsomolets (MK) with 18 million readers, as well as TV and Internet channel Moscow 24 (15 million viewers). A total of 320 articles and stories were analysed, including 210 materials from MK, as well as 110 news and programs of Moscow 24.

3. Publications in official groups and pages of the DTRDTI were copied to post in social network-

ing platforms: VKontakte (14 thousand subscribers), Telegram (32 thousand subscribers). A total of 210 materials.

4. Publications posted on the Department's official page of the Active Citizen portal: 100 entries, including: 47 news on the progress of projects, 32 surveys and polls, 21 reports to give results of discussions.[4]

The sampling was made by all-round selection of publications with key words: the name of the Department, names of its heads, names of the projects (Great Ring Line, MCC, Moscow Central Diameters, Greater Moscow, etc.). Automated parsing generated by means of Python libraries (Scrapy, NLTK, Pymorphy2[5]) was used for the search and processing of Internet publications. Subsequently, the data array was processed and organized deleating, so-to-say, all information noise (advertising messages, not useful, unrelated mentions, etc.).

During the research, the DTRDTI's internal documentation was also analysed, including media plans, regulations for handling citizens' appeals, standards and regulations for information support of projects. A total of 67 documents, comprising 340 pages.

The scientific and practical significance of the work lies in the development of a methodology for assessing the effectiveness of communication between government agencies and public, as well as for the development of means for information support of management decisions in the field of transport. The results and recommendations obtained is available to improve the quality of project management, develop the dialogue between the government bodies and citizens during the implementation of transformations in urban infrastructure.

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[3] Department of Transport and Development of Road Transport Infrastructure of the City of Moscow. Official website. URL: https://dt.mos.ru/

[4] Department of Transport and Development of Road Transport Infrastructure of the City of Moscow. Official website. URL: https://dt.mos.ru/

[5] Parsing or web scraping — automated collection and structuring of the data from public sources with such tools as Python library Scrapy, NLTK, Pymorphy2.

RESEARCH RESULTS

The analysis of communication activities of Moscow's Department of Transport and Road Transport Infrastructure Development has revealed a number of key trends and regularities. First, there is a steady increase in the number of publications devoted to the implementation of strategic projects of transport system development. In 2018, the DTRDTI official website and mass-media posted 210 publications on this topic. Six years later in 2023, their number reached 402, increasing by 91.4 per cent. Peak values were detected in 2020 (378 publications), in 2021 (401 publications) and in 2022 (392 publications). The obvious reason for this is a very active phase of construction of key facilities: the Great Ring Subway Line (GCL), the Moscow Central Diameters — MCD-1, MCD-2, MCD-3, MCD-4, as well as sections of the North-East and South-East Chords [5]. At the same time, the number of posts in the Department's groups in social networks has grown 2.5 times within six years: namely, from 28 to 70.

The audience of the DTRDTI communication channels has also significantly expanded. Thus, the average monthly number of unique visitors to the official website in 2023 was 327.000 compared to 156.000 in 2018 (+109.6 per cent). The number of the Department's subscribers in social networks increased 3.4 times over the same period: namely, from 16.500 to 56.000. According to Medialogy data,[6] the total user reach, including all publications in online media, surpassed 28 million in 2023, which is twice as much as in 2018 (14 million).

The qualitative analysis of publications demonstrates a shift of emphasis in the information agenda of the DTRDTI. At the initial stage (2018–2019), the main focus was concentrated on explaining the essence of strategic projects, their objectives and forthcoming expectations regarding its results. In majority, the information provided looked more like an overview and offered a general idea of large-scale transformations. In 2020–2021, the focus shifted towards the progress of construction activity: more photos and video reports were posted regularly from construction sites, as well as infographics on the progress of commissioning new facilities. In 2022–2023, the emphasis was placed on informing citizens about practical aspects of public use of new infrastructures: opening of new stations and lines, changes in ground transport routes, tariffs, benefits, etc. [3]. Such identified trend can be characterized as a transition from the strategic line of communications, aimed to shape up an 'image of the future', towards a more utilitarian task to focus on the current needs of the audience. This indicates the growth of applied significance of the DTRDTI, as a source of relevant information in the framework of everyday life of Muscovites.

The quality of visual component of publications from the DTRDTI has significantly improved. In 2018, infographics and multimedia materials were visible in only 35 per cent of website publications. In 2023, this indicator reached 85 per cent. The number of photos grew remarkably from 2.5 to 9.3 in an average per a single publication, and likewise, more videos and animation images posted. Now 3D-models and renderings are often used for visual demonstration of future constructions. This allows to showcase in detail not only exteriors, but also internal structures of metro stations, transport and interchange hubs and other elements of infrastructure [6].

In 2022–2023, virtual and augmented reality technologies were used. The DTRDTI website presented immersive tours of new metro lines and MCDs used for tracking places by more than half a million viewers. According to experts, such visualisation experience with photos, videos, infographics is one of the most effective way to convert a technically complicated information into a more easy-to-get message for anyone, even for users with lack of experience [7].

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[6] Technologies of media and social networks analysis. Medialogy. URL: https://www.mlg.ru/about/technologies/

An important indicator of communication quality is approach to different target groups. To evaluate the readability level of texts, the DTRDTI used one of the most popular readability test with the Flesch-Kincaid reading index. Its value (score) ranges from 0 to 100. The higher it is, the easier the text is comprehended.

As can be seen from *Table 1*, initially in 2018, the average readability level of publications was 17.6, which corresponds to perception ability of readers with higher education (Master's degree and above). In 2023, the Flesch-Kincaid reading index rose to 50.8. Thus, it revealed a positive dynamics of content perception by Moscow residents: publications provided by the DTRDTI became easier-to-understand even for people with general secondary education. Anyway, there is still potential for further adaptation and simplification of texts.

A very special attention was focused on opinions and comments of experts in such publications. In 2023, the share of puclications with quotes from scientists, representatives of relevant agencies and industry specialists reached 62 per cent against 24 per cent in 2018. At the same time, many more protagonists, or speakers, among engineers, designers, ordinary employees of the DTRDTI, and not only top officials, informed about the nuances of their work and share their professional experience with the audience. Such 'humanistic' approach made the image of the Department more presentable and the communication more lively and trustworthy [8]. According to A. Bisembaeva, Deputy Head of the DTRDTI, 'the main goal is to speak with Muscovites the same language, to be as honest and open as possible about all aspects of our activities through human-interest stories about people' [5].

It is worth considering separately the practice of using the results of sociological research in publications. In 2018–2023, the DTRDTI together with the Analytical Centre conducted a series of large-scale surveys among Muscovites dedicated to assessing the quality of the transport complex and people's attitude to the implemented infrastructure projects. A quarterly research made a representative sample of 5000–5500 people using telephone and street interviews, as well as online surveys. According to the survey data obtained, the share of citizens, who positively assess changes in the transport sphere, increased from 58 per cent at the beginning of 2018 to 85 per cent by the end of 2023. At the same time,

Table 1

Evaluation of readability of the DTRDTI publications on the Flesch–Kincaid scale

Year	Flesch — Kincaid Index	Readability Level
2018	17.6	Very complicated texts — higher education is required
2019	25.4	Complicated texts — higher education is required
2020	34.9	Texts of medium complexity, higher or specialised secondary education is required
2021	40.1	Texts of slightly below average complexity — specialised secondary education is sufficient
2022	45.2	Texts of slightly below average complexity — complete secondary education is sufficient
2023	50.8	Texts of medium complexity — complete secondary education is sufficient

Source: compiled by the authors.

the number of respondents who are aware of the DTRDTI's key projects increased from 63 per cent to 97 per cent over six years.

References to the research findings regularly show up in the Department's publications, which makes an additional argument to support the initiatives underway. This technique helps to reinforce communication messages with objective data and demonstrate the public demand for positive changes. According to experts, the reliance on sociology is an integral element of any effective public administration: it allows both making decisions and, at the same time, taking into consideration realistic expectations and needs of people [9].

Content analysis of publications allows to identify several main communication techniques which were used by the DTRDTI to increase the trust of the audience:

1. Reliance on facts and figures. The majority of publications contain detailed statistics on the progress of projects, including the dimension of sections built, the number of new stations, the growth of passenger traffic, etc. Infographics and elements of data-driven journalism are widely used. For example, the series of publications *Transport in Figures* provides information on the progress of commissioning of various infrastructure facilities and on changes in the main aspects of performance of urban transport-related system. The information provides detailed graphs and diagrams that make it possible to see the effect of the ongoing transformations.

2. Emphasis on benefits for specific categories of citizens. The materials specifically indicate how infrastructure development improves life-style of different categories of citizens of Moscow: passengers of public transport, motorists, residents of specific districts, etc. [4]. For example, articles about the launch of the MCD provide a detailed information of its benefits for people, who live in areas along the railway lines: increased transport accessibility, reduced travel time, new transfers opportunities. This is how, the personification of

infrastructure agenda is created and linked to the practical needs of the public.

3. Attention to detail. These publications have many specific details on technologies, materials and equipment, which aims to suggest the audience a sense of transparency and competence. For example, the series of publications *How the Metro is Built* describe step-by-step the organization of work with all the nuances: from design and approval of documentation to tunneling and finishing stations. The narrative contains many accurate facts, interesting details and opinions of experts: for example, how tunnel-boring machine operates, or how claddings of new stations differ. All this allows the reader to get a feeling of complete involvement in the process [1].

4. Demonstrating openness to dialogue. In addition to conveying its own position, the DTRDTI regularly encourages a feedback in its communication — it initiates surveys, polls and collects ideas from residents on various aspects of projects. A striking example is the crowdsourcing project *The Metro We Want*, which was launched in 2019. Within the framework of the project, Muscovites could suggest their own ideas about design of the BCL stations under construction. By the end of 2023, over 10.000 concept suggestions appeared from 8.000 participants, 35 of which were selected to be realized. On the one hand, such initiatives increase the involvement for citizen and give them a sense of participation in large urban projects. On the other hand, they serve as additional source of interesting ideas and first-hand insights for the DTRDTI [10].

For a more detailed understanding of the DTRDTI's communications strategy, a series of interviews were conducted (a sample arranged twelve of its employees, including heads of specialized departments). Respondents answered questions about the key objectives and principles of interaction with city residents, means, key target audiences, and indicators of communication effectiveness.

As a result, this clearly indicated, that building a dialogue with residents is one of the top priorities in the activity of the DTRDTI. As the Deputy Head of the Department A. Bisembaeva noted, "lack of proper information support for the implementation of any, even the most useful and popular project, may lead to risks of losing reputational costs. People need to understand clearly, what, how and, most importantly, why we do it. Moreover, we must not use a bureaucratic language, we need to speak simply and accessibly, with real examples and visualization" [5].

The department has built a system for managing information flows, including several levels. At the strategic level, the Public Relations Department, together with the Senior Management, determined the key priorities of the communications policy, developed general standards and regulations for conveying information properly, as well as monitored and evaluated the effectiveness of interaction with the audience. Key performance indicators of communication activities are determined in the Strategy for the Development of the Moscow Transport System and linked to the target guidelines of the program as a whole.

At the tactical level, specialized departments of the DTRDTI are responsible for the implementation of the information policy. They are in charge of specific projects and areas (metro, ground transport, traffic management, etc.). Their functions include: prompt delivery of information to citizens on the progress of work and changes in transport services, as well as collecting and processing feedback. For effective interaction with residents, these departments set up special hotlines, project accounts in social networks and sections on the department's website. Each specialist is responsible for communications in their area and works out a personal plan to create content and make reports on its implementation.

At the operational level, employees of the DTRDTI Press Service — SMM specialists, content managers, designers, and developers — are in charge of direct information service. They pre-pare texts, infographics, posts for various channels, moderate discussions in the comments and monitor public reaction. According to the head of the press service, T. Gavrilova, the functionality of this unit has significantly expanded in recent years: "If we mainly worked earlier on informing mass-media, now the lion's share of our activities is direct interaction with Moscow residents, along with interaction online in 24/7 mode. The content structure has also changed: we provide more multimedia, infographics and videos. We are actively mastering new formats — games, stickers, masks, chat bots. The main principle is to provide information not only promptly, but also in the most entertaining way possible" [5].

To coordinate the work carried out at all levels, the DTRDTI uses special management tools. In particular, a unified knowledge domain operates on the projects in development and implemented. It is accessible to the press service staff and those responsible for information support. It contains key facts, figures, infographics, and templates for the whole news background used for preparation of publications. This unified knowledge domain is regularly updated and it serves to ensure the unity of all the messages sent to the audience. There operates a content planning system as well. It is aimed to work out monthly media plans with key publication topics, develop potential publications well ahead and plan various articles for different channels. A separate section of management tools is in charge of working with feedback from citizens.

A special Situation Center was founded in the DTRDTI to process all transport-related requests from residents, which it receives on a daily basis via a variety of channels, like hotline, electronic reception, social networks and meetings with citizens. The center's employees classify requests by type (question, complaint, suggestion, etc.), subject matter, and degree of urgency: if it requires a prompt response, or not. All requests are entered into a unified CRM system, where their life cycle is tracked right up to the final response to the

citizen. Based on the feedback analysis, thematic digests are generated, brought to the attention of the DTRDTI management and taken into account, when planning further communications.

An important element of communications management is assessment tool of effectiveness. The DTRDTI has formed a set of monitoring indicators to classify the level of information support for projects, including both quantitative metrics (publication dynamics, coverage, audience involvement, etc.) and qualitative ones (text sentiment, key topics of discussion, etc.). Specialized services are used to proceed automated monitoring, (Medialogy, IQBuzz, etc.). They allow running a survey of a broad range of data from various web sources. Communication activity reports are reviewed weekly at operational planning meetings of the Department and are taken into account when making management decisions.

In addition to internal analytics, the DTRDTI organizes an independent assessment of effectiveness of communications on a regular basis. Starting from 2019, regular sociological research were conducted to study the level of awareness and involvement of Muscovites in transport development issues. A whole variety of qualitative and quantitative methods is used: road or telephone-based surveys, focus groups, in-depth interviews, online panels. A comprehensive awareness of citizens' perception of the DTRDTI's activity is formed on the basis of all collected and identified information, including growth areas and points of human pressure that require research and development [2]. The survey results serve as a guidance for information campaigns of the Department. For example, if public reveals a low level of awareness of a particular infrastructure project, the information services increase coverage and use of additional communication tools for this topic.

It is worth noting the practice of involving experts on the outsourcing basis in assessing the effectiveness of the DTRDTI interaction with the audience. In 2020 and 2022, ANO Dialogue specialized in research of digital transformation of governance made comprehensive communication audits. Based on the results of the auditing, the DTRDTI has got specific recommendations to optimize formats, channels and sentiment analysis of communication. Most of recommendations were accepted and implemented, which had a positive impact on the progress of key engagement indicators. Participation of external experts on a regular basis will be proceeded, also within the framework of annual public reports on the department's activities.

Thus, the department has formed a multi-level management system for information flow aimed to ensure a complete, reliable and accessible information related to the progress – up to accomplishment of key infrastructure projects. Building an open dialogue with residents is of top priority, which is determined in the target guidelines for the development of the transport system. The DTRDTI management attaches a major importance to the quality and intensity of communications, so that operational meetings discuss such issues regularly. For this purpose, modern targeting tools are used to deliver information messages in a more personalised way. For example, information campaign about development of bicycle infrastructure generates well ahead special publications prepared for cyclists. Likewise, within the framework of programs to improve road safety, special publications were launched for motorists and pedestrians, etc. The peculiarities of communication behavior between different generations are taken into account too: for older people, the emphasis is made on traditional mass media (print media and TV), for young people, only digital channels and social networks will do [11].

Another important management principle is the omnichannel nature of communications. The DTRDTI strives to ensure all information sources that are of significant value for the target audience. In addition to mass channels (website, media, social networks), the Department is developing niche platforms popular among certain

categories of citizens. For example, they post materials for motorists on specialized forums and Telegram channels, for students — in university and college chats and on YouTube, TikTok platforms. People with disabilities find information via special formats of interaction: the DTRDTI website implemented screen access technologies and accessible tours are conducted on a regular basis along the construction sites [6].

Proactive nature of communications is the fundamental position of the Department. It aims to respond promptly in order to cover news-worthy events, and not only: it also systematically forms its own agenda. It regularly initiates publications to describe the progress of key projects, their target benchmarks and interim results. This approach allows maintaining a substantial interest of the audience and minimising a risk of spreading false information.

In addition, the DTRDTI has established a constant monitoring system throughout the media environment to identify possible reputational threats. Response comments and explanations are promptly prepared, as a reaction against each negative signal and, if necessary, they take meas-

ures to adjust certain decisions [12]. The use of Big Data analysis and processing technologies in the DTRDTI contributes to effective targeting of information. In particular, anonymised data on passenger movements with the Troika card allowed to find out key target segments in terms of transport behavior models. Then a communication trajectory is built for each of the passenger in regards of his/her needs and specifics of media consumption [10]. In addition, data arrays generated by city residents (complaints, comments, survey data, etc.) are scrutinised on a regular basis to identify problem areas and model public reaction about certain initiatives of the DTRDTI.

Modern digital analytical tools make a considerable contribution to upgrade the efficiency of the Department. Specifically, the DTRDTI's Situation Center employs machine learning and natural language processing (NLP) technologies to automatically detect and classify messages by emotional tone, as well as highlight key problems and questions from citizens. This allows tracking down promptly the audience's reaction to the Department's information policy and figure

Table 2

Statistics of communication initiatives of the DTRDTI (2018–2023)

Indicator	Year					
	2018	2019	2020	2021	2022	2023
Total number of initiatives received (in thousand)	2.400	3.800	6.200	8,500	11.200	14.700
Share of initiatives for metro development (in per cent)	52	49	45	42	39	35
Share of initiatives for ground transportation (in per cent)	32	35	38	41	44	47
Share of initiatives for road construction(in per cent)	16	16	17	17	17	18
Number of participants in crowdsourcing projects (in thousand)	58	97	124	168	205	253
Number of citizen proposals implemented	125	216	354	479	638	815

Source: compiled by the authors.

Table 3

Dynamics of the emotional tone of messages and information of key DTRDTI projects in mass-media and in social media (2018–2023) (in per cent)

Projects	Year					
	2018	2019	2020	2021	2022	2023
BCL						
Positive Mentions	56	62	67	71	74	77
Neutral Mentions	28	27	25	23	21	19
Negative Mentions	16	11	8	6	5	4
MCD						
Positive Mentions	–	48	54	59	65	72
Neutral Mentions	–	34	32	30	28	24
Negative Mentions	–	18	14	11	7	4
Development of street-road network						
Positive Mentions	37	41	46	52	57	63
Neutral Mentions	42	43	43	42	40	35
Negative Mentions	21	16	11	6	3	2

Source: compiled by the authors based on data from the Medialogia monitoring system. URL: https://adindex.ru/assets/catalogue/2023_09/141618_Brand%20Analytics.pdf /

out potential reputational risks. Collected digital traces, such as search queries, routes on maps and navigators, etc. are used to identify the needs of city residents and make a computerized model of demand for future infrastructure [7].

Engagement and interactivity methods become more and more important for the DTRDTI's communication operations. In addition to collecting traditional feedback via comments and surveys, the Department permanently launches various crowdsourcing initiatives that allow Muscovites to get involved directly in the formation of the transport agenda. Among the highlights are such projects as *Metro on Self-Governance* (collecting ideas for improving the operation of the Moscow's subway), *Moscow Central Diameters through the Eyes of Passengers* and *Greater Moscow — Convenient Transport*ation (collecting suggestions for improving the route network).

Within the period of 2018–2023, the number of messages with initiatives about transport issues from citizens increased by 6.1 times: from 2400 to 14700 (*Table 2*). The number of materialised suggestions increased by 6.5 times: from 125 in 2018 to 815 in 2023. The audience of specialized crowdsourcing projects expanded significantly: from 58000 to 253000 (+336 per cent). This indicates a high efficiency of the DTRDTI's activity to

Table 4

Indicators of work with appeals from citizens of the DTRDTI (2018–2023)

Indicator	Year					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
Total number of appeals received (in thousand)	67.4	98.2	112.6	127.8	138.9	152.4
of which:						
Requests for information (in per cent)	49	51	54	58	62	66
Complaints and claims (in per cent)	37	34	31	28	25	22
Suggestions for improvement (in per cent)	14	15	15	14	13	12
Share of requests answered timely (in per cent)	87.4	91.2	93.5	96.1	98.3	99.2
Average response time (in working days)	6.2	4.8	3.7	2.4	1.5	1.2
Level of user satisfaction with handling requests (in per cent)	72	76	81	87	92	95

Source: compiled by the authors based on data from the CRM system of the DTRDTI. URL: http://www.letters.kremlin.ru/digests/periodic/yearly/285

get Muscovites involved in the transport agenda. The structure of incoming initiatives continued to demonstrate the trend of shifting the focus from the metro (35 per cent in 2023 versus 52 per cent in 2018) towards surface transportation and the MCD (47 per cent in 2023 versus 32 per cent in 2018). The road construction among all other messages and proposals remains status-quo: 16–18 per cent.

An important indicator for communications management in the media space of the activities of the DTRDTI is the dynamics of emotional tone of discussion and its projects. The corresponding data are shown in *Table 3*.

Positive dynamics of perception were noted in almost all key areas. The share of positive mentions of the BCL increased from 56 per cent in 2018 to 77 per cent in 2023. The number of negative assessments of this project has decreased by 4 times over 6 years (from 16 to 4 per cent). The launch of traffic along the entire ring, opening of new stations, all junctions of BCL with radial lines

and MCD, as well as active information support contributed to a stable positive image.

Emotional tone of the social voice about MCD significantly improved as well. The commissioning of stations along the third and fourth diameters, the expansion of free-of-charge transfer zone and information on benefits of the new type of transport raised the share of positive mentions of MCD: from 48 per cent in 2019 (the start of the project) to 72 per cent in 2023. The share of negative mentions decreased from 18 to 4 per cent in the same time period.

Significant progress is also notable regarding the development of network of streets and roads. Thanks to a balanced information policy, an emphasis on the benefits of new road facilities for the city and its residents, and prompt response to problematic signals, the share of positive publications increased in by more than 1.5 times (from 37 to 63 per cent). As to the share of negative stories, it decreased over tenfold from 21 to 2 per cent. Certain conclusions about the quality of

interaction between the DTRDTI and the target audience can be made on the basis of analysis of feedback parameters (*Table 4*).

In 2018–2023, the number of requests from citizens to the DTRDTI increased by 2.3 times (from 67400 to 152400). At the same time, the share of complaints and claims in the total volume dropped from 37 to 22 per cent. At the same time, the share of reference and information requests increased from 49 to 66 per cent, which indicates a growing interest of citizens about current realities of the transport system and the projects implemented. The share of constructive ideas for improvements remains status-quo: 12–15 per cent. The quality of the DTRDTI's responses to requests from citizens has noticeably improved. The share of requests that were responded within the specified time-frame (30 days) reached 100 per cent (99.2 per cent in 2023 versus 87.4 per cent in 2018). The average preparation time for response has decreased by 5.2 times (from 6.2 to 1.2 business days). This turned out to become possible thanks to regular updating the standard response database in the CRM system, optimization of end-to-end message processing programmes, as well as due to active development of digital communication channels.

According to surveys, the level of satisfaction of Muscovites with the activity of the DTRDTI in regards to public requests reached 95 per cent in 2023 in comparison to 72 per cent in 2018. The increase of this indicator became possible thanks to a prompt definition of the status of requests, individualized approach towards responses and taking into consideration the opinions of applicants for developing decision-making process to solve the problem.

CONCLUSIONS

The presented analysis shows a significant progress reached by the DTRDTI in building an effective dialogue with Muscovites in communication, regarding key areas of development of transport system.

The targeted work made by the Department ensures sustainable positive dynamics of the level of awareness, support and trust from Moscow residents, thanks to the use of a wide range of channels and formats of interaction, adaptation of content to the needs of target audiences, rapid response to feedback and involvement of citizens in the formation of the transport agenda.

Analytic research of the quantitative and qualitative characteristics of publications for the period 2018–2023 revealed a number of key trends. First of all, a systematic increase in the volume of communications. At the same time, the Department is actively developing new channels and formats of interaction, meanwhile paying special attention to digital environment. This is confirmed by a twofold increase in the number of the DTRDTI subscribers in social networks. At the same time, the share of multimedia content revealed an increase of 78 per cent in the structure of publications.

Significant progress was also achieved in terms of quality of information messages. Besides, materials for publication have become more substantive and focused on specific target audiences. Infographics, storytelling, and expert comments are used more actively as well.

At the same time, a number of problem factors still remain, primarily related to the insufficient adaptability of content for unprepared users. The average level of readability of texts from the DTRDTI sources is quite comprehensive for readers of higher education, but it should be adapted for an average reader. Besides, the potential of international communications was not properly developed: the share of publications in foreign languages does not exceed 2 per cent, which curbs the opportunities to promote and share advanced Moscow experience worldwide.

Summarizing the stated above, it can be confirmed as a fact, that the DTRDTI has managed to build an effective system of information support for strategic projects. The Department maintains a regular dialogue with residents, ensures transparency and accountability of its activities using

a wide range of channels and tools. Consistent build-up of quantitative and qualitative indicators of communications offer an opportunity to predict more success in the future. Thus, if the average annual growth rate of the number of publications was 13.5 per cent in 2018–2022, then by 2030, this indicator may reach 20–25 per cent (taking into account the development of new media). This means, that by the end of the current decade, the annual volume of information materials regarding the development of Moscow's transport infrastructure will exceed 1.500 units with a total coverage for 45–50 million people.

Such prognosis about the future is certainly indicative and may vary depending on the dynamics of industry and general social factors. However, in any case, it is obvious, that the effectiveness of the implementation of strategic projects will be determined above all by the quality of information support. If so, further development of communication activity should remain a priority for all participants in the process of urban transformation.

In conclusion, we must note that the experience of the DTRDTI can be useful both for specialists from relevant departments in other spheres of business, as well as for representatives of scientific community. A systematic study of the best practices of interaction between government bodies and people during the implementation of infrastructure projects should undoubtedly become the subject of further academic research. This will make it possible to form a reliable source of evidence and develop specific recommendations for higher effectiveness of public administration.

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ABOUT THE AUTHORS

Ruslan A. Abramov — Dr. Sci. (Econ.), Prof., Prof. of the Department of Public and Social Management, Plekhanov Russian University of Economics, Moscow, Russia; Director, Institute of Economics, Management and Law of the Moscow State Pedagogical University, Moscow, Russia
https://orcid.org/0000-0002-1736-5693
abramovra@mgpu.ru

Yulia Yu. Temnikova — Postgraduate student of the Department of Public and Social Administration, Plekhanov Russian University of Economics, Moscow, Russia
https://orcid.org/0009-0001-8583-8624
Corresponding author:
temnikova_yuliya@internet.ru

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Implementation of Integrated Services of Intelligent Supply Chains by Leading Chinese Logistics Companies

S. Chunxing
RUDN University, Moscow, Russia

ABSTRACT

The article examines the restructuring of global supply chains within the framework of the active development of China's logistics services market. It is established that with the continuous improvement of the country's digital economy, these services can become one of the important directions for the development of large Chinese companies operating in this industry. The **purpose** of the work is to study the implementation of integrated intelligent supply chain services, analyze the practice of their application, and their impact on the growth of turnover and income of leading logistics enterprises in the country — Xiamen C&D Group Corp. Ltd., SF Express Holding, YTO Express — in 2021–2023. The paper describes the step-by-step mechanism of the intelligent supply chains of Chinese companies and its innovative component. It is determined that the studied organizations adhere to the principle of digital excellence, promote digital industrialization, jointly create a common logistics big data platform (the country's digital logistics ecosystem), and apply new business formats and a modern logistics model to facilitate the industrial transformation and modernization of China's economy. To achieve the goals of the study and analyze the restructuring of global supply chains within the framework of the active development of China's logistics services market, methods of scientific analysis of scientific literature and economic analysis of reports of leading logistics companies in China, comparative analysis, content analysis, and case studies were used to study examples of the implementation of intelligent supply chains in Xiamen C&D Group Corp. Ltd., SF Express Holding, YTO Express.

The results of the research can be useful for international organizations and partners of China engaged in joint logistics projects and initiatives to enhance cooperation and coordination efforts.

Keywords: global supply chains; logistics market; intelligent supply chains; Chinese logistics companies; cross-border e-commerce; digitalization

INTRODUCTION

The restructuring of global supply chains, the dynamic economic growth of the Asia-Pacific region, and the vast and rapidly expanding potential of the logistics market have catalyzed the modernization of integrated services with intelligent supply chains among leading Chinese logistics companies.

The Asian region accounts for 45.4% of global logistics industry expenditures, with total spending exceeding $ 10 trillion.[1] The strengthening of China's strategic role in global supply chains, the support of trade agreements by institutions such as the Regional Comprehensive Economic Partnership (RCEP) [1], and the rapid expansion of cross-border and domestic e-commerce[2] contribute to the increasing trade volume between Asian countries (including China) and the rest of the world. This has led to a growing demand for logistics services in the region, opening new opportunities for industry players operating in China and other Asian countries.

The development of cross-border e-commerce and the expansion of national brands into international markets have fueled the growth of China's logistics network. As demand for Chinese exports rises, logistics operations become a crucial pillar supporting the creation of an "external circulation" economy. According to data published by China's General Administration of Customs, the volume of international e-commerce trade in China reached 2.4 trillion yuan in 2023, marking a 15.6% increase compared to 2022. Where as exports accounted for 1.8 trillion yuan, reflecting a 19.6%[3] year-on-year increase.

In the long term, the strengthening of manufacturing supply chains, the enhanced competitiveness of domestic brands, and the expansion of overseas e-commerce platforms and independent websites will provide Chinese logistics companies with greater opportunities to enter global markets [2, 3].

In recent years, enterprises in this industry have been actively developing new international freight routes, integrating multimodal transportation resources (maritime, air, and rail), accelerating the construction of export channels, and continuously improving overseas hubs, ground networks, and warehouses. These efforts contribute to the further strengthening and expansion of China's international logistics network [4, 5].

For data analysis, the author of this article employed a multi-purpose research method. Through the study of three well-known Chinese logistics companies — Xiamen C&D Group Corp. Ltd., SF Express Holding, and YTO Express — and their use of integrated services for intelligent supply chains, the effectiveness and positive impact of these services on trade turnover and revenue growth of the examined companies during 2021–2023 were substantiated.

CURRENT STATE OF CHINA'S LOGISTICS INDUSTRY

China's logistics industry is characterized by high competition and significant market fragmentation. Apart from express delivery, market concentration in other segments — such as freight transportation, integrated logistics, and cross-border logistics — remains low. At the same time, while the overall logistics market in China is fragmented, it is showing a trend toward increased consolidation. According to the China Federation of Logistics and Purchasing, the top 50 logistics companies in China accounted for 18% of the industry's total revenue in 2023, which is 3 percentage points higher than in 2022.[4]

International express logistics giants are expanding their networks and businesses through

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[1] Overview of China's logistics development. URL: https://www.gov.cn/test/2005–07/06/content_12477.htm

[2] China E-Commerce Market Research Report 2023 URL: https://pdf.dfcfw.com/pdf/H3_AP202401261618317500_1.pdf

[3] China E-Commerce Market Research Report 2023 URL: https://pdf.dfcfw.com/pdf/H3_AP202401261618317500_1.pdf

[4] Overview of China's Logistics Development URL: https://www.gov.cn/test/2005–07/06/content_12477.htm

ongoing mergers and acquisitions. The Chinese market holds potential for the emergence of world-class logistics companies, as the country's leading enterprises possess the necessary capabilities for consolidation and advancement.[5]

With the rise of new social media platforms, e-commerce, and local services, the rapid growth of emerging economic sectors and consumer scenarios is driving demand for flexible and efficient supply chains. The trend of "expressification" in logistics is becoming increasingly evident. At the consumer level, express delivery services are deeply integrated into daily life, providing instant responses and becoming essential for enhancing customer satisfaction and loyalty on e-commerce platforms and among sellers [6, p. 12]. There is a noticeable shift toward "small-batch, high-frequency deliveries" with direct-to-consumer shipping, which increases the demand for high-level order fulfillment from start to finish [7, p. 99].

As supply chain design systems evolve and improve, companies are striving for efficient coverage of target users — primarily digital consumers — and precise delivery services. This necessitates the active development of integrated logistics service capabilities tailored to an "omnichannel + unified warehouse + digitalization" model [8, p. 231].

Based on China's state policy objectives for modernizing the logistics industry,[6] we will examine the practical implementation of integrated services for intelligent supply chains by the country's leading logistics companies.

Xiamen C&D Group Corp. Ltd.[7]

Xiamen C&D Group Corp. Ltd. operates primarily in supply chain management and real estate.

Additionally, in 2023, the company acquired a controlling stake in Meikailong, a leading operator of home goods and furniture shopping centers, as well as a business platform for the home goods industry.

The company's 2023 annual report indicates that despite a challenging market environment, Xiamen C&D Group Corp. Ltd. maintained relatively stable operational performance. Its annual revenue reached approximately 763.68 billion yuan, reflecting a 7.9% increase compared to 2021. The net profit attributable to shareholders of the listed company amounted to approximately 13.104 billion yuan, marking a 108.83% growth (*Table 1*).

The operating and net profits attributable to the parent company and generated by the supply chain operations segment in 2023 amounted to 593.366 billion yuan and 3.953 billion yuan, respectively. The net profit attributable to the parent company decreased by only 1.38% year-on-year.

As of the end of 2023, Xiamen C&D Group Corp. Ltd. had total assets of 820.85 billion yuan, net assets of 224.64 billion yuan, and net assets attributable to the parent company's owners of 695.11 billion yuan. In 2023, the company ranked 11th in the Fortune China 500 list of the 500 largest publicly traded companies in China, rising four positions from the previous year.[8]

The significant growth in the indicator "net profit of the parent company" was primarily driven by restructuring income, resulting from the acquisition of a controlling stake in Meikailong in August 2023 and its inclusion in the consolidated financial statements. If restructuring income and Meikailong's operating results from September to December 2023 are excluded, the net profit of the parent company would have decreased by 21.30 billion yuan (or 33.95%).[9]

For many years, Xiamen C&D Group Corp. Ltd. has maintained a leading position in supply

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[5] Competition in the Chinese logistics market in 2023 URL: https://pdf.dfcfw.com/pdf/H3_AP202306081590590658_1.pdf?1686253768000.pdf

[6] Logistics Policy Release. 2023 URL: http://www.cflp.org.cn/upload/resources/file/2023/08/14/135301.pdf

[7] Xiamen C&D Co., Ltd. Annual report for 2023 URL: https://stockn.xueqiu.com/SH600153/20240415598685.pdf

[8] Xiamen C&D Co., Ltd. Annual report for 2023 URL: https://stockn.xueqiu.com/SH600153/20240415598685.pdf

[9] Xiamen C&D Co., Ltd. Annual report for 2023 URL: https://stockn.xueqiu.com/SH600153/20240415598685.pdf

Xiamen C&D Group Corp., Ltd. 2021–2023 Economic Performance Indicators

Indicator	2021	2022	2023	Difference between 2023 and 2021 indicators	Growth rate of the indicator in 2023 compared to 2021, %
Total Assets, billion yuan	602.62	664.94	820.85	218.23	136.2
Revenue, billion yuan	707.87	832.83	763.68	55.81	107.8
Net Cash Flow from Operating Activities, billion yuan	41.14	15.48	29.40	–11.74	71.5
Net Profit, billion yuan	1.84	2.58	10.70	8.86	581.5
Weighted Average Return on Net Assets (%)	15.19	12.62	24.85	9.66	–
Weighted Average Return on Equity (%)	12.63	12.62	24.85	12.22	–

Source: compiled by the author based on the annual report Xiamen C&D Co., Ltd. URL: https://stockn.xueqiu.com/SH600153/20240415598685.pdf

chain operations for raw materials. The company is distinguished by its strong corporate culture, experienced personnel, and ability to integrate goods, markets, logistics, finance, and information resources across various industries. It specializes in customized supply chain solutions and products, providing stable and efficient services.

Aiming to become a leading global supply chain operator, Xiamen C&D Group Corp. Ltd. has actively expanded its global procurement and sales network, now covering over 170 countries and regions. Between 2013 and 2023, it has signed contracts with more than 120,000 suppliers and clients, including around 20,000 international partners.

The company has built a strong reputation in industries such as pulp and paper, textiles, alcoholic beverages, agriculture, mineral fertilizers, and automotive. Its efficiency and service quality continue to improve, fostering a positive cycle of growth and increased profitability.

From 2021 to 2023, Xiamen C&D Group Corp. Ltd. was included for three consecutive years in the "Top 100 Chinese Companies by Brand Value" list. In 2023, it ranked 7th among the "Top 100 Chinese Companies by Brand Value Growth". The company has also been repeatedly recognized as a "National Enterprise Honoring Contracts and Trustworthy Business", a "Leading Enterprise in Foreign Trade and Economic Quality & Efficiency", and has been listed among the "Top 500 Chinese Foreign Trade Companies". Additionally, it was included in the "First Group of National Demonstration Enterprises for Supply Chain Innovation and Application" by the Ministry of Commerce and classified as a "5A-Level Enterprise for Supply Chain Services" according to national logistics industry standards.[10]

As a leading Chinese supply chain management service provider with a global presence, the company has developed a comprehensive "LITF" system. This system integrates resource management, logistics planning, inventory control, risk management, online transactions, cost optimization, and supply chain financing to address the core needs of upstream and downstream manufacturing cycle clients.

[10] Xiamen C&D Co., Ltd. Annual report for 2023 URL: https://stockn.xueqiu.com/SH600153/20240415598685.pdf

Built on four key elements — "Logistics", "Information", "Finance", and "Trade" — LITF leverages Internet technologies, including the Internet of Things (IoT), to facilitate information sharing and extend supply chain services across all business processes of its partners.

SF Express Holding

Another Chinese company, the logistics group SF Express Holding, also maintains a strong market position and competitive advantages. In 2023, its revenue reached 258.4 billion yuan, securing its place as the largest logistics enterprise in China and Asia and ranking fourth globally among comprehensive logistics service providers (see *Table 2*).

SF Express Holding adheres to a long-term sustainable development strategy and forward-looking strategic planning, allowing it to optimally leverage business opportunities, implement innovations, and expand its range of services in the logistics sector while collaborating with clients to navigate economic cycles.

The company's advantages include:

1. Own diversified logistics network connecting Asia with the rest of the world. Through organic growth and external acquisitions, SF Express Holding continues to build a more advanced product system that covers the entire supply chain and offers diverse service scenarios within a single integrated logistics platform, connecting both domestic and international clients at all stages of service provision.

Due to its efficient and reliable logistics infrastructure, the company's competitive advantages are continually growing: it is represented in all cities in China and 202 countries worldwide. The logistics group is the largest air carrier in the country, with a fleet of 103 cargo aircraft (owned and leased), performing 152 domestic

Table 2

SF Express Holding Economic Performance Indicators for 2021–2023

Indicator	2021	2022	2023	Difference between 2023 and 2021 indicators	Growth rate of the indicator in 2023 compared to 2021, %
Total assets, billion yuan	209.90	216.84	221.49	11.59	105.5
Total liabilities, billion yuan	111.98	118.56	118.21	6.23	105.6
Net assets, billion yuan	97.92	98.29	103.28	5.36	105.5
Revenue, billion yuan	207.19	267.49	258.41	51.22	124.7
Cost of goods sold, billion yuan	181.55	234.07	225.27	43.72	124.1
Gross profit, billion yuan	25.64	33.42	33.14	7.5	129.3
Net cash flow from operating activities, billion yuan	15.36	32.70	26.57	11.21	173.0
Weighted average return on net assets%	6.81	7.34	9.19	2.38	—

Source: compiled by the author based on the SF Holding Co., Ltd. URL: https://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESZ_STOCK/2024/2024–3/2024–03–27/9901153.PDF

and international flights to 65 international airports.[11]

The company has built and put into operation Asia's largest air cargo hub in Ezhou, which will help create a spoke network connecting China with foreign countries and enhance its competitiveness in delivery services. Additionally, SF Express Holding manages an extensive fleet of ground, rail, and maritime transport, providing customers with multimodal transport services for both domestic and cross-border shipments. It also operates 1,900 warehouses, 396 sorting centers, and more than 44,000 owned and agency service points worldwide. Notably, after acquiring and integrating Kerry Logistics, the company strengthened its presence in Southeast Asia and enhanced its international freight capabilities. Thanks to its diverse logistics network and high-quality services, SF Express Holding is able to collaborate with clients from various industries to create efficient domestic and international supply chains.

2. Leadership in various logistics segments in China and Asia as a whole. Using its highly efficient and dense network of offices, the company implements a "1 to N" expansion strategy, quickly transforming from a primary domestic express service provider into a leading global comprehensive logistics service provider. Due to its ability to offer fast, accurate, and secure door-to-door services, SF Express Holding is the absolute leader in the domestic express delivery market. In other segments, such as freight transportation, cold logistics, third-party urban delivery, and independent third-party supply chain solutions, the company also holds leading positions in the industry.

SF Express Holding independently manages the entire logistics chain at all stages, from collection to delivery. Its vertical management structure ensures a high degree of strategic unity ("top-down") and quick implementation of operational decisions, allowing the company to adapt promptly to market changes, successfully introduce new business models in a short period, and create powerful operational capabilities. This structure also facilitates dynamic resource management and standardization of all processes, enabling the company to maintain its position as the leader in service efficiency and customer satisfaction in the courier delivery sector for many years. Furthermore, this integrated approach allows SF Express Holding to provide both standardized and customized services that meet the ever-growing needs of clients. As a result, the company's share in the supply chain increases, key customer groups develop, and growth surpasses the industry average.

SF Express Holding is the only large-scale comprehensive logistics service provider in the country that operates independently from major e-commerce platforms, meaning it can serve all clients on equal terms. By the end of 2023, over 1.95 million.[12] consumers had utilized its services.

YTO Express

YTO Express is a leading integrated courier logistics operator in China. With hub sorting centers and a flat network of end franchisees, the company focuses on courier services. It promotes digital and intelligent development, actively improving the logistics ecosystem and expanding its activities in international markets. YTO Express, focusing on customer needs, also provides comprehensive services, including trade, air freight, and supply chain logistics.

As of the end of 2023, its courier service network covered all provinces, autonomous regions, and municipalities in China: prefecture-level cities and above were fully covered, and counties were covered by 99.89%.[13]

Throughout 2023, YTO Express dynamically optimized its network structure. By the end of the

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[11] SF Holding Co., Ltd. URL: https://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESZ_STOCK/2024/2024–3/2024–03–27/9901153.PDF

[12] SF Holding Co., Ltd. URL: https://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESZ_STOCK/2024/2024–3/2024–03–27/9901153.PDF

[13] YTO Express Co., Ltd. Consolidated Annual Report 2023–2024 URL: https://q.stock.sohu.com/newpdf/202457934748.pdf

YTO Express Economic Performance Indicators for 2021–2023

Indicator	2021	2022	2023	Difference between 2023 and 2021 indicators	Growth rate of the indicator in 2023 compared to 2021,%
Total assets, billion yuan	34.22	39.26	43.37	9.15	126.7
Revenue, billion yuan	45.15	53.53	57.68	12.53	127.8
Net cash flow from operating activities, billion yuan	4.01	7.39	6.04	2.03	150.6
Net profit billion yuan	3.44	3.78	3.60	0.16	104.7
Weighted average return on net assets,%	11.72	15.91	13.37	1.65	–
EBITDA to total debt ratio	1.58	1.96	1.64	0.06	–

Source: compiled by the author based on consolidated annual report of YTO Express Co., Ltd. 2023–2024. URL: https://q.stock.sohu.com/newpdf/202457934748.pdf

reporting period, the number of its franchisees reached 5,071, and the number of end delivery stores exceeded 82,000. The company opened 73 of its own hub sorting centers nationwide and installed 238 sets of automated sorting equipment. Its fleet of trunk transport vehicles totaled about 7,500 units, with 5,354 owned by the company. YTO Express owns 13 aircraft, including 2 Boeing 767–300s, 10 Boeing 757–200s, and 1 ARJ21–700, with the number continuing to grow.

In 2023, the company's revenue reached 57.684 billion yuan, and its net profit amounted to 3.6 billion yuan (see *Table 3*). The total number of deliveries during this period was 18.854 billion units.

The process of providing courier services by YTO Express consists of the following stages: parcel collection, sorting, trunk transportation, and delivery. Sorting is mainly carried out through the company's own hub sorting centers, while collection and delivery are handled through the franchisee network. YTO Express uses its own information platform to monitor operational nodes, manage routes, sorting centers, and franchisees,

as well as for billing, allowing complete control and tracking of the cargo lifecycle and oversight of the entire network's operations.

Parcel collection is carried out by franchisees in the sender's area — either through pick-up services or at their stores. Meanwhile, the company's information platform receives updates on the progress of this process via electronic waybills and PDA,[14] automatically selecting the appropriate route from the database. Once collection is complete, franchisees perform preliminary sorting, package the items, and send them to the origin sorting center, where weighing, unpacking, final sorting, and repackaging of parcels occur. Next, the parcels are transported through air, road, or rail trunk services to the destination sorting center, where they are unpacked and distributed to franchisee delivery zones. The franchisees then receive the parcels and organize their delivery to recipients using YTO Express's systems "Xingzhe" and "Smart Delivery," which provide couriers with optimal routes, increasing efficiency and ensur-

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[14] PDA — Integrated logistics information processing platform

ing control and management of parcel deliveries throughout the network.

Responsibilities are divided as follows: franchisees are responsible for the operations of the end network, while the company handles route planning, trunk transportation, sorting, and coordinating all operational processes in the network.

The advantages of this model (due to centralized resource distribution) include strong control over the key nodes of the network and its high stability. In addition, the company uses an advanced information platform for monitoring and managing numerous franchisees and effectively controls service quality based on its own system of standards.

The lowest level of the courier service network consists of the final stores, the main ones being the "YTO Mama" stations. These are managed by franchisees within the operational and management system provided by the company. Their duties include collecting, delivering, and initial sorting of parcels. YTO Express and its franchisees make use of various social resources, including smart mail lockers, third-party stations, and "Cainiao" stations, which, together with "YTO Mama," form a convenient and high-quality final delivery network.

Throughout 2023, the company continued to expand its international development strategy, implementing the "Express Delivery Abroad" project. YTO Express effectively utilizes the advantages of its global network of overseas stations, professional team, own air fleet, and extensive transport network, focusing on key markets and high-quality clients. The company continues to optimize the product matrix for cross-border logistics, expand international logistics chains, and develop multinational courier and supply chain businesses.

By strengthening its capabilities to provide integrated services, YTO Express aims to create a courier service platform that harmoniously coexists with partner platforms, using, as mentioned earlier, a management model with its own hub sorting centers and a flat network of final franchisee stations.

Thus, as the process of building modern logistics systems accelerates, the intelligent solutions of leading Chinese companies in this segment are gradually being integrated into key operational scenarios, a significant part of which is the intelligent logistics service platforms. In creating these, companies rely on the modern capabilities of the industry to apply artificial intelligence to create applied solutions based on it — such as applications with full connectivity (for example, access to capacities and their assessment, warehouse/yard management, transportation execution, order tracking, etc.). These digital platforms can manage and deliver goods for the key participants of the logistics park[15] (such as cargo owners, carriers, service providers, consignees, and drivers), effectively solving current issues of low levels of informatization, operational automation, and intelligent management of park assets, as well as investments and freight costs.

At the same time, the creation of a unified digital ecosystem for China's logistics industry and its inclusion of national companies will allow the development and efficient use of transport portals through the application of intelligent logistics mini-programs. This will expand the possibilities of integrating logistics parks and contribute to their intelligent transformation.

CONCLUSION

Over the years of supply chain development, large companies with a high concentration of business have emerged in this field. However, in China, despite the significant growth rate of the industry and a large number of participants, concentration in the supply chain sector remains low, creating opportunities for growth. Leading Chinese enterprises can leverage economies of scale to gain advantages in procurement

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[15] The logistics park is a specialized economic and industrial zone.

prices, sales channels, logistics resources, capital costs, and risk management, thereby providing stable and efficient services to clients, reducing their costs, and improving efficiency. This will strengthen the positions of these enterprises and create a mutually beneficial cycle.

The specialization of production has become an important source of competitive advantages. An increasing number of industrial companies are focusing on research and development and manufacturing, while outsourcing procurement, sales, and logistics to professional supply chain operators. The practice of applying integrated intelligent supply chain services helps reduce operational costs for leading Chinese logistics companies and enhances their operational efficiency. Additionally, supply chain operators, by providing comprehensive services to small and medium-sized enterprises, contribute to their high-quality development.

The studied experience of leading Chinese logistics companies (Xiamen C&D Group Corp. Ltd., SF Express Holding, YTO Express) shows that they are actively transforming into supply chain service providers by introducing digital transformation into the operations of their internal networks, creating innovative digital scenarios, and developing digital customer service capabilities. Leading market players continue to explore intelligent, autonomous, and visualized technologies, and in the long term, the highly efficient principle of their operations will penetrate an increasing number of manufacturing and consumer scenarios, gradually covering the entire logistics market. This will initiate technological upgrades and innovations, facilitate the digital transformation of supply chains, and reduce costs while improving efficiency.

According to international experience, modern enterprises in the logistics sector will continue their transformation and development by utilizing market opportunities to expand service offerings and strengthen resource integration across the supply chain. The increasing concentration in the industry will contribute to reforms and the consolidation of business in large, financially stable, and integrated companies with a wide range of services.

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ABOUT THE AUTHOR

Sun Chunxing — postgraduate student, RUDN University, Moscow, Russia.
https://orcid.org/0009-0009-1185-8946
sunchunxing7@mail.ru

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Human Resource Management Ecosystem in the Context of Business Digitalization

D.S. Salin, N.V. Vittenbeck

Russian Foreign Trade Academy of the Ministry for economic development of the Russian Federation, Moscow, Russia

ABSTRACT

In the context of digital economy business is increasingly choosing the ecosystem model of development, which leads to scientific interest in the formation of new approaches to human resource management (HRM). The role of human capital within business ecosystems is growing; both internal and external participants create its value to the organization. Many stakeholders get involved in working out HRM solutions, including managers, employees, HR specialists, ecosystem partners, suppliers and HR services providers. With a view of co-creating value and enhancing business competitiveness in the market, there comes a need for the formation of HRM ecosystems integrating necessary resources. The aim of the research is to determine the characteristic features and structural model of HRM ecosystems in the context of business digitalization. Currently, HRM ecosystems are at an early stage of formation and represent technocratic models in the form of a «marketplace» of multiple HR tools, which constitutes the risk of their overloading and turning into a "patchwork" of digital technologies. The emerging transition towards human-centric HRM ecosystems shifts the focus from technologies to strategic business goals and people's well-being in the working place. The scientific result of the research is the identification of technocratic and human-centric HRM ecosystems distinctive features as well as the suggestion of a structural model-in transit, comprising humanitarian and technological components. Within the research, there were used general scientific methods of comparison, analysis, generalization, as well as scientific interpretation of the authors' theoretical and practical experience. The research outcomes may be of interest to scientific and business communities in terms of developing the methodology of the ecosystem approach to HRM in the context of business digitalization.

Keywords: ecosystem; digitalization; business ecosystem; human resource management (HRM); HRM ecosystem in the context of digitalization; technocratic ecosystem; human-centric ecosystem; digital employee experience (DEX); digital comfort

INTRODUCTION

Ecosystems as a model of business development have become widely spread in the last decade, which has sparked natural and growing interest among researchers. The focus of analysis is on the essence of business ecosystems, their typology, advantages, risks, and development prospects [1–5].

As is well known, the concept of a "business ecosystem" was introduced at the end of the last century by American scholar J. F. Moore, who noted the analogy of coevolution (the process of mutual evolution of interdependent species) in nature and in the competitive business environment. Analyzing the latter, Moore proposed considering a company and its development prospects not within the framework of industry affiliation but as part of an ecosystem that includes multiple industries. The shift from industry competition to ecosystem cooperation creates new synergistic opportunities for businesses [6].

Large-scale geopolitical, socio-economic, and technological processes in the subsequent period have shaped and continue to create the prerequisites for the development of ecosystem models as an evolutionary stage for economic entities, based on the idea of creating unique value propositions for customer groups. This approach allows for the formation of a powerful competitive advantage with the potential to capture target markets [1]. According to a forecast by McKinsey, by 2025, business ecosystems will generate up to 30% of corporate revenue, potentially totaling $ 60 trillion [7].

One of the key drivers behind the spread and diversification of ecosystem models is the digitalization of business and society. The explosive growth of technology, the emergence of online sales channels, and digital platforms have enabled businesses to offer customers an unlimited range of products, as well as make the user the center of the business model (client-centered approach). Modern ecosystems are built on the principle of "total customer coverage", aiming to meet both current and potential needs (Client-360[1]). As a result, each user becomes a separate market segment for the ecosystem, receiving "seamless access" to a wide range of services within the ecosystem, including financial, lifestyle, transportation, education, healthcare, and others. Ecosystem participants, in turn, multiply and monetize their customer bases, enhancing technological capabilities and innovation potential. Examples of successful ecosystems include Amazon, Microsoft, Google, Apple, Baidu, Alibaba, Tencent, and major banks (JPMorgan Chase & Co., Goldman Sachs Group, Inc., etc.). Ecosystems are formed by companies with advanced technologies and strong intellectual capital [8]. Global analytical reviews indicate that "digital champions" (companies with high levels of digital maturity) are at the forefront of the process of creating business ecosystems and are maximizing their advantages.[2]

In the context of digitalization, a business ecosystem refers to the collective of a company's business units and external partners, united through a single technological platform to achieve a competitive advantage [4].

The advisory report of the Bank of Russia, "Ecosystems. Approaches to Regulation", provides a number of objective assessments of the current stage of ecosystem solutions in Russia[3]:

• Russia is characterized by strong national ecosystems in the local market, which pose significant competition to global players.

• A distinctive feature of Russia is the leading role of the financial sector in creating ecosystems.

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[1] The future of the banking industry after 2023. 2023. PLUS world. URL: https://plusworld.ru/journal/2023/plus-9–2023/budushchee-bankovskoy-otrasli-posle-2023-goda/ (accessed on 07.07.2024).

[2] Digital Champions in 2025. PWC. URL: https://www.pwc.com/gx/en/industries/industrial-manufacturing/digital-supply-chain/digital-champions-2025.html (accessed on 07.07.2024).

[3] Ecosystems: approaches to regulation. Report for public consultation. Bank of Russia. 2021. URL: http://www.cbr.ru/content/document/file/119960/consultation_paper_02042021.pdf (accessed on 07.07.2024).

• The largest Russian ecosystems include Sber, Yandex, T-Bank, VK (Mail.ru), VTB, and MTS.

• Depending on the criteria for admitting participants, there are two types of ecosystem models — closed or open. The first does not publicly disclose the rules for admitting participants. A limited number of partner companies provide goods and services, and internal competition is absent. In the open model, admission to the platform is based on publicly disclosed criteria by the ecosystem, and admission is possible even for competing entities.

• An analysis of the business models of the largest global and Russian ecosystems shows that all of them operate under a hybrid model, combining open and closed segments. For example, the VTB ecosystem includes not only its own financial services but also six key development industries: technology companies, advertising services, e-commerce and retail, telecommunications, entertainment, and transportation. In the current period, the only open segment is the housing ecosystem "Metr Kvadratny" (services for searching, verifying, evaluating, and purchasing real estate, as well as planning and conducting repairs).

As noted in the Bank of Russia's report, "companies mentioned in the context of ecosystems (groups of companies) are at different stages of creating value chains within their individual business models.[4]"

Although the ecosystem as a form of business development is still in the process of formation, the approach is also extending to the subsystems of organizations, including one of the key elements in the value creation chain —human resource management (HRM) [9]. It is logical to assume that HRM ecosystems, which are crucial in the value creation chain, are predominantly im-plemented in large resource-intensive companies within sectors such as banking, telecommunications, or big tech, just like business ecosystems.

However, unlike business ecosystems, the ecosystem approach to HRM is only beginning to attract the attention of researchers. In the pre-pandemic period, there were rare mentions of HRM ecosystems (human resource management ecosystem), but even the surge in their popularity following the COVID-19 pandemic has drawn more interest from practitioners than from scholars. The research base on this topic is in the early stages of development and is represented by individual publications in academic journals [10, 11].

The relevance of this study is driven by the need for a scientific understanding of the ecosystem approach to human resource management, which is being shaped in the context of digitalization and the development of business ecosystems.

RESEARCH METHODS

The methodology applied by the authors is determined by the limited number of publications on the topic of HRM ecosystems in academic journals and the relatively closed nature of information regarding corporate practices, given the intense competition and stringent requirements of international and Russian legislation concerning information security (compliance). In the process of studying existing analytical materials, thematic reviews, practical case studies from banking and fintech companies, and information from various web sources (secondary research), general scientific research methods were employed: comparison, analysis, generalization, as well as scientific reflection on the theoretical and practical experience of the authors.

RESEARCH FINDINGS
1. Formation of a Technocratic (Digital) HRM Ecosystem

The widespread adoption of the concept of "ecosystem" in HRM is mainly driven by technology companies providers of digital solutions

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[4] Ecosystems: approaches to regulation. Report for public consultation. Bank of Russia. 2021. URL: http://www.cbr.ru/content/document/file/119960/consultation_paper_02042021.pdf (accessed on 07.07.2024).

for working with personnel [12, 13], which are forming a rapidly growing and highly competitive HR Tech market in Russia and abroad. After the exit of foreign providers from the domestic market (such as Oracle, SAP, Cisco, SuccessFactors, Jira, Confluence, SharePoint, etc.), leading players in the Russian HR Tech sector include companies such as Mirapolis, ISpring, Verme, Molga Consulting, and WebSoft. Major IT giants in the HR sector, such as HeadHunter, Superjob, Avito Rabota, and Rabota.ru, are expanding their own ecosystems by acquiring smaller players or integrating numerous startups.[5]

According to HR Tech terminology, the HRM ecosystem is referred to as "digital" and includes a universal digital platform that integrates a set of specialized services or applications with seamless (no additional registration) access to each from a single point of entry, i.e., following the "single window" principle. Typically, such services support the basic functions of HRM, corresponding to the stages of the "employee life cycle" (ELC) — from hiring to termination.

Common technologies that form a digital ecosystem in the context of basic HRM functions include personnel management platforms such as universal (HRMS), predictive (futuristic HRMS), and recruitment platforms; mobile applications for "digital hiring"; technologies using artificial intelligence (AI), AI-based chatbots; knowledge management systems (LMS/TMS) and augmented reality (AR); mobile apps, including BYOD technologies[6]; "virtual care" services, corporate portals, and internal social networks [14–16].

HR Tech providers offer comprehensive solutions ("turnkey" ecosystems) or meet local consumer needs (microservices approach). Leading services in demand are hiring and electronic personnel document management (EDM) services.

On the one hand, the potential of HR Tech creates a wide range of opportunities for the efficient solution of HR tasks; on the other hand, researchers note that the consumption of digital solutions by client enterprises is often chaotic. To justify their many needs, clients cite the increasing volume of tasks and the complexity of internal processes and procedures, as a result of which the "employee journey map" (EJM) — the movement of an employee in the company's information space according to internal policies and procedures —becomes a long path through the labyrinths of hierarchical structures, which is characteristic, for example, of large banks. The number of modules or applications in the HRM ecosystem can reach several dozen units, with various control tools being particularly popular: time tracking, task completion, meetings with mentors, employee burnout, and so on. The "digital chaos" in Russian organizations is exacerbated by the need for import substitution due to the departure of Western software providers. According to experts, this issue has not affected only 27% of Russian companies.[7] Large domestic businesses have been consumers of expensive imported software for decades, and the transition to Russian technologies requires time and significant investment. As a result, companies are forced to engage in "firefighting" and implement new software in response to emerging problems. In the competitive HR Tech market, providers are eager to respond to any customer requests, resulting in the risk of transforming the HRM ecosystem into a "patchwork quilt" or a "zoo of software products.[8]" It is fair to note

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[5] From small startups to ecosystems: the Russian HR Tech market is undergoing a transformation. HR Tech Market Overview. 2023. URL: https://www.cnews.ru/reviews/hr_tech_2023/articles/ot_malenkih_startapov_do_ekosistem (accessed on 16.07.2024).

[6] BYOD (Bring Your Own Device) — technologies that allow access to company resources from employee mobile devices.

[7] Employee digital workplace. Map of Russian IT products to replace Microsoft, Jira and Confluence. TADVISER. 2023. URL: https://clck.ru/3F84t7 (accessed on 16.07.2024).

[8] HR trends 2023. How the Russian HRM system replaced foreign analogues. 2023. TopFactor. URL: https://www.topfactor.pro/blog/hr-trendy-2023-kak-rossiyskaya-hrm-sistema-zamenila-zarubezhnye-analogi/?ysclid=m4424r9qzi702153353 (accessed on 16.07.2024).

that this "accumulation" of technical solutions is also observed in Western practices. For example, A. Jenkins, former CEO of Barclays Bank, referred to banks at this level of digitalization as "museums of technology", with a heap of "software" and "hardware.[9]"

This situation appears to be typical for technical or technocratic HRM ecosystems and corresponds to the initial level of digital maturity in HRM.

S. Strohmeier, in his fundamental research [17], identifies the following stages of digitalization in HRM:

• digitization — the technical process of converting analog HR information into digital format for automated processing;

• digitalization — the socio-technical process of using the potential of digitization for operational and strategic HR objectives;

• digital transformation — the socio-technical sub-process of digitalization, involving the application of digitization potential to achieve strategic HR goals;

• digital HRM — the socio-technical result of HR digitalization.

At the initial stage of digitalization (digitization), the priority is placed on technologies. This is why, when forming HRM ecosystems, there is currently a risk of "accumulation" of digital tools (often harmful to the human element). The main clients of these tools are HR professionals, who thus "strengthen" their traditional functions. The "harm" to the human element arises from the predominant focus on technology without considering the real needs of employees and managers, or their direct involvement in decision-making about the implementation of innovations.

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[9] Banks are becoming "museums of technology" says ex-Barclays boss. Finextra. 2023. URL: https://www.finextra.com/newsarticle/42458/banks-are-becoming-museums-of-technology-says-ex-barclays-boss?utm_medium=dailynewsletter&utm_source=2023–6–13&member=117943 (accessed on 16.07.2024).

2. Transition to the Formation of a Human-Centered HRM Ecosystem

A logical alternative to technocratic HRM ecosystems is human-centered HRM ecosystems, corresponding to a higher socio-technical process of digitalization (in S. Strohmeier's terminology). Within this framework, the focus shifts from technology directly to the person — the employee or manager.

A positive development in this direction is the introduction of the concept of "digital employee experience" (DEX), which refers to the interaction of an employee with the company's digital tools and services from the moment of hiring until resignation [18]. This definition draws an analogy with customer experience (CX) — the perception of a company by a customer as a result of their interactions [19]. As is known, managing customer experience is one of the key tools of modern marketing. This experience is studied, among other ways, through the "customer journey map" (CJM), which sequentially describes and analyzes the customer's "path" to receiving a product or service. Shortening this path, "cutting corners," and providing convenient navigation create a positive impression from the interaction with the company, thereby increasing its competitiveness [20].

The application of a marketing (human-centered) approach to the "internal digitalization" process reveals several issues of "digital chaos" and helps address them. For instance, it becomes clear that from the employee/manager's perspective, work and HR processes are not separated into distinct streams, but rather merge into a unified flow, consolidated through the employee's digital workspace. In the case of a "zoo of solutions," such merging creates difficulties for the worker, causes dissatisfaction, increases the risk of mistakes, and ultimately reduces productivity. Progressive employers see their task as improving the effectiveness of the digital workspace and ensuring its comfort, but solving this issue is often still delegated to technology [21].

One solution to this situation is the development of fundamentally new digital platforms that integrate both production and HR functions, specifically —customer relationship management systems (CRMS) and human resource management systems (HRMS). Such solutions are possible based on cloud technologies, such as customer data platforms (CDP) or data management platforms (DMP[10]). The capabilities of these platforms allow for the addition of other systems within the organization, including HRMS. In the context of intense competition, particularly in the banking sector, such unique solutions are considered proprietary information. However, IT analysts confirm the practical experience of implementing integrated CRMS and HRMS.

It is known from open sources that large companies with powerful technological infrastructure and a staff of highly skilled IT specialists are developing their own in-house HRM platforms based on the analysis of employees' digital experiences.

A notable example in this case is Alfa-Bank, which faced the problem of fragmented IT infrastructure during the pandemic and created its own HR platform, "Alfa People.[11]" The task was addressed in the "digital workplace" concept and consisted of several stages: describing the employee/manager experience using the Employee Journey Map; analyzing 9 HR blocks from recruitment to termination (identifying 23 applications and 109 processes/programs); discussions with employees and compiling a registry of 200 "pain points/problems"; creating the Alfa People platform (an HR Tech product that combined 200 processes and 23 programs with a single entry point for employees and managers in two formats — adaptive web and mobile app);

implementing new development logic — from the employee's workspace and from teams (for managers), rather than from HR process names, as it was in the previous services; forming the main sections of Alfa People based on the "self-service" principle (profile, news, events, services, departments, HR support [human help]); introducing the Voice of Employee (VOE[12]) metric to measure the usability of Alfa People (on a 5-point scale); and continuous improvement of the platform in the direction of further personalization based on VOE monitoring.

Earlier (in 2019), Sber carried out a similar, but more large-scale development by launching the digital HR platform "Pulse" [22]. The uniqueness of this solution lies in the fact that the bank initially offered it to participants in its business ecosystem, and in 2024, it launched an upgraded version of the platform as a commercial product (which incorporated GigaChat and Kandinsky neural networks). The number of users of "Pulse" is steadily increasing and currently exceeds 300,000 people. This fact is undoubtedly exceptional in a competitive environment and once again demonstrates Sber's leadership potential. However, there are grounds to believe that the translation of corporate technologies in HR into the "open code" principle, as an example, will evolve into a trend and further into practice, providing the company with a competitive edge in the market (similar to product competition).

In addition to the development and implementation of universal digital platforms, the evolution of HRM ecosystems is linked to artificial intelligence (AI). According to researchers, its use is not just a stage in the development of HRM ecosystems, as AI plays a direct role in their formation. As S. Raisch and S. Krakowski write, "people train algorithms, and algorithms train people" [23]. The authors refer to this phenomenon as co-evolution and see the further development of any phenomenon

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[10] The future of the banking industry after 2023. PLAS 2023. URL: https://plusworld.ru/journal/2023/plus-9–2023/budushchee-bankovskoy-otrasli-posle-2023-goda/ (accessed on 07.07.2024).

[11] How we created a Digital Workplace for employees. Alfa Bank. 2022. URL: https://habr.com/ru/companies/alfa/articles/689700/ (accessed on 20.07.2024).

[12] Voice of Employee — translated from English.

involving AI as entirely in line with the principle of reciprocity. A number of scholars believe that, with regard to HRM ecosystems, it is precisely AI that will allow the transition from the "digitization" stage aimed at automating processes to the expansion of HRM ecosystem capabilities for solving business and people-related tasks (augmentation). The implementation of AI as an independent component creates a new model of ecosystems, which the authors call "extended HR ecosystems" [24]. This approach draws an analogy with the popular concept of super teams — "people plus digital technologies," the creation of which, in Deloitte's reviews, is considered a current trend in the formation of human capital.[13] In any case, the symbiosis of people and technologies requires primary attention to the people involved. Thus, when discussing an extended digital HR ecosystem with AI participation, researchers highlight the need to consider factors such as: close interaction between the company's top management — the CEO, the Chief HR Officer, and the Chief Digital Officer (CEO, CHRO, CDO); involving key employees, HR, and IT specialists in decision-making processes related to AI; an adaptive approach to different categories of personnel when implementing AI — in particular, taking into account the differences between young "digital natives" and older workers (digital immigrants); ethical issues of AI (employee information security, data privacy protection, the option to refuse to provide personal information or participate in assessment procedures using AI).

Nevertheless, when analyzing extended HRM ecosystems, specialists in the field tend to remain within the framework of the technocratic model and focus predominantly on the technological component. In this regard, attention is drawn to scientific works by authors who, while considering HRM ecosystems in the context of digitalization, focus on their humanitarian aspect.

For example, E.A. Mitrofanova and A.E. Mitrofanova [11] identify two components of the HRM ecosystem: 1) the personnel ecosystem — a collection of participants both within the organization and outside it; 2) the technological HRM ecosystem — a platform (marketplace) where various human resource management technologies are offered. These authors, studying the structure of the personnel ecosystem and the required skills ("hard," "soft," and digital), and the need for new approaches to managing integrated human resources (in particular, Agile technologies), rightly conclude that the "platform" should be adjusted to suit people, taking into account the scale of tasks in new socio-economic conditions and transformational processes in the labor market.

Nevertheless, by emphasizing the humanitarian component of HRM ecosystems (and even distinguishing it as independent), researchers see the goal of its formation as solely focused on managing the structure of personnel in the increasingly complex conditions of the gig economy.[14] A similar approach can be found in the publication by E.P. Kostenko [10], which discusses in detail the personnel ecosystem, which can include: full-time and part-time employees, contractors, freelancers, remote and gig workers engaged through mobile applications (usually in the fields of development, services, and delivery), crowdsourcing specialists with part-time/short-term employment using specialized virtual platforms/marketplaces, focused on various projects and individual tasks — as a new challenge for organizations.

However, it seems that this conclusion limits the opportunities and potential for the development of HRM ecosystems and does not fully align with their operational practices. For example, the banking sector is one of the leaders in applying the ecosystem approach to HRM,

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[13] International trends in the field of personnel management — 2020 Deloitte Insights. 2020. URL: https://delovoymir.biz/res/upload/columns/Deloitte_HR-trends-2020_RU.pdf (accessed on 25.07.2024).

[14] The gig economy is a work model when a business does not hire employees, but attracts third-party specialists to carry out individual projects and tasks.

but banks, due to the nature of their activities, follow a very conservative hiring policy and do not engage freelancers or gig workers on a large scale.

Nevertheless, the application of the ecosystem concept to various aspects of human resource management ("labor market ecosystem," "talent ecosystem" [25], "recruitment ecosystem") is supported by both researchers and practitioners, which indicates the productivity of this approach to understanding current processes in the labor market.

Table

Distinctive features of technocratic and human-centric HRM ecosystems

Essential distinctive features	Technocratic HRM ecosystem	Human-centric HRM ecosystem
Goal	Digitization of HR information for process automation and optimization of HR procedures	Integration of key (unique) resources to ensure business competitiveness
Focus	Digital HR technologies	People + technology, with a focus on solving strategic business tasks and ensuring the well-being of people in business
Structure	Digital HRM platform + services	Stakeholders (managers, employees, HR specialists, external partners) + unified information environment based on digital technologies
Customer	Primarily HR specialists	Managers (business managers), employees, HR specialists, partner pool
Principle of Formation	HR functionality in accordance with the employee life cycle (from hiring to termination)	Creation of value for all participants of the HR ecosystem according to the employee/manager/partner journey map, integration of HR tools into main business processes
Advantages	Equipped with digital technologies, quick access to new HR tools and services, improved operational HR efficiency, cost reduction	Consideration of the real needs of employees/managers/partners, personalization of services, customization for functional tasks, creation of comfort (including digital) at the workplace, ability to ensure the necessary level of competence, productivity, effectiveness, and engagement in the interests of all participants of the HRM ecosystem
Disadvantages	Accumulation of HR tools due to a microservice approach ("patchwork quilt" of technical solutions) at the expense of the person (employee, manager, partner)	Complexity of implementation (time and effort costs) in conditions of a rigid hierarchical organizational culture, significant investments

Source: compiled by the authors.

3. The Transitional HRM Ecosystem as a Result of Combining Technocratic and Human-Centric Models

A review of existing perspectives on HRM ecosystems in the context of business digitalization highlights several key characteristics (see *Table*):

• HRM ecosystems develop within the framework of business ecosystem growth and therefore reflect many processes and phenomena characteristic of business ecosystems. These include the co-evolution of their entities (reflecting the biological metaphor), the evolutionary nature of ecosystems themselves (transitioning from an earlier technocratic form to a more advanced human-centric one), and the impact of digitalization as a transformative factor.

• An HRM ecosystem corresponds to an organization's level of digital maturity. Currently, digitalization is in the "digitization" phase, meaning the conversion of information from analog to digital format for automation purposes. At this initial stage, HRM ecosystems tend to be technocratic, focusing on technology and functionality, often harmful to human factors. Excessive enthusiasm for digital tools and microservice infrastructures has led to corporate IT landscapes becoming a "patchwork quilt" of digital solutions.

• However, the practices of leading employers — particularly in banking and fintech — indicate a shift toward a higher level of digitalization, understood as a socio-technical process. This transition involves the formation of human-centric HR ecosystems that emphasize workforce structure and skills, take employee needs and digital experience into account, introduce digital workplaces, manage the employee lifecycle, and address ethical issues related to digitalization.

As mentioned earlier, HRM ecosystems are currently at the very early stages of formation and are developing within the framework of individual models. However, the analysis conducted
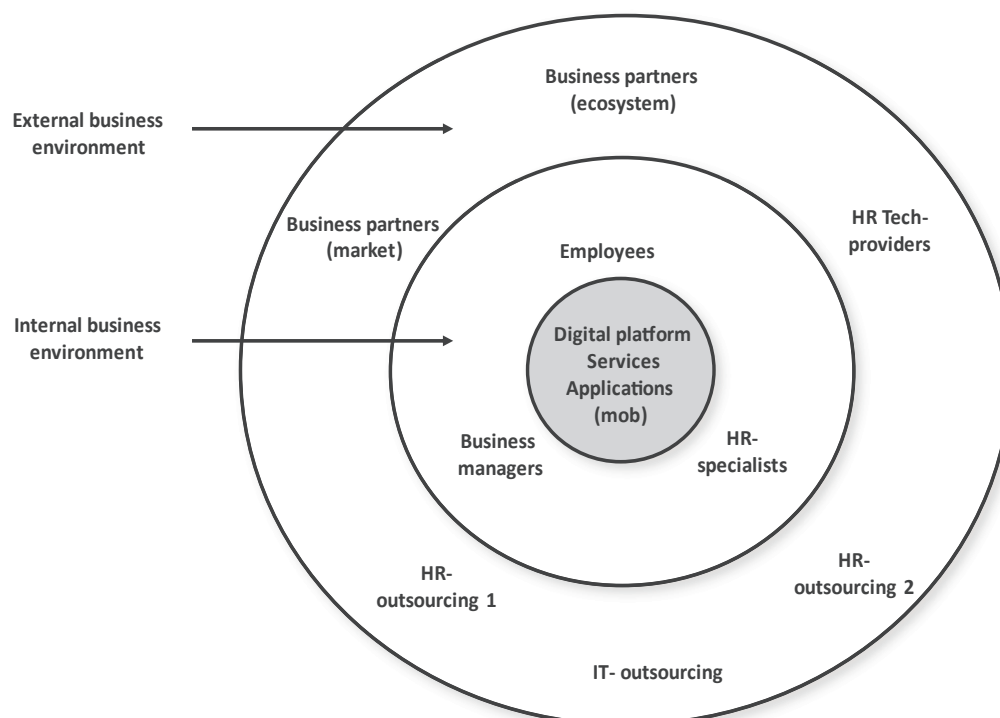
Fig. HRM **ecosystem in the context of digitalization**

Source: compiled by the authors.

allows us to present the HRM ecosystem in the form of a structural model of a transitional period, combining characteristics of both technocratic and human-centric ecosystems (see the *Figure*).

The goal of forming an HRM ecosystem is to integrate resources to ensure business competitiveness in the market. The HRM ecosystem includes two contours: internal and external. The first is the internal business environment (company, strategy, organizational culture, policies and procedures, business processes). The second represents the broader socio-economic, political, and industry contexts, as well as the labor market.

It is evident that such an ecosystem is formed under the influence of external circumstances. For instance, the negative geopolitical and socio-economic situation in recent years has triggered the need for import substitution and served as a catalyst for the rapid development of Russian fintech.

Regarding the internal environment, several global studies on digital maturity, including those by SAP, Deloitte, and iR&D Club, have noted that the hierarchical organizational culture prevalent in Russian companies is one of the main barriers to digital transformation [26]. Environmental factors and the effects of influence on the HRM ecosystem may become promising areas for further scientific research.

By analogy with the business ecosystem, it seems reasonable to talk about the HRM ecosystem in a broader sense, distinguishing two components: the humanitarian (people) and technological (digital technologies) aspects.

The internal component of the humanitarian aspect covers employees, managers (business managers), and human resources specialists (HR specialists). Currently, digital technologies meet the needs of these three subjects of the HRM ecosystem (with a clear predominance of HR specialists' requests). However, the further development of self-service and self-manage-ment tools for personnel, as well as the creation of new digital solutions (platforms) that allow the integration of management cycle functions (planning, organization, motivation, control) under the guidance of business managers into business processes, will lead to the reduction and subsequent transformation of the HR specialists' functions (in the HR Zero concept [15]) and an increase in the role of employees and managers in HRM processes [27].

The external component of the humanitarian aspect is formed in accordance with the business strategy of the company that owns the HRM ecosystem and, accordingly, contains an open list of participants. The minimum composition includes:

• HR function partners: recruitment, training, and consulting companies, agencies providing services (cleaning, catering), medical centers (health insurance), and other providers of health, safety, and employee well-being services (HR Outsourcing 1 on the *Figure*);

• IT and HR function partners — providers of digital HR Tech solutions.

The expansion of participants in the HRM ecosystem occurs in line with the growth of the business scale of the company-owner, the presence of its own business ecosystem, involvement in the ecosystem of another business, or moving beyond the perimeter of the business ecosystem. In the latter case, a characteristic example is Sber which made the users of its HR platform "Pulse" participants in its business ecosystem and clients, and launched the platform as a commercial product. Thus, the external component of the HRM ecosystem can also include:

• Business partners and clients of the company-owner (within the ecosystem);

• Business partners and clients outside the business ecosystem (market);

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[15] HR Zero — This is the principle of organizing HR processes in a company, in which HR specialists, using digital technologies, transfer some of their functions to business managers and directly to employees.

• Organizations providing outsourcing services for personnel if the HRM ecosystem owner actively engages freelancers and other gig workers (HR Outsourcing 2 on the *figure*);

• IT companies (mainly startups), whose personnel participate in the independent or joint development of IT solutions for the company-owners within business incubators or aggregators (IT outsourcing).

Similar to business ecosystems, HRM ecosystems can be open, closed, or hybrid in nature. Given their early stage of development, the issue of typology is not addressed in this article. However, it can be assumed that HRM ecosystem models will primarily develop according to a hybrid type, combining both closed and open segments. The former will focus on integrating targeted (unique) resources that the company — owner of the business ecosystem — deems important in a competitive environment (e.g., a partner pool). The open segment, on the other hand, could involve personnel recruitment. Due to the acute shortage of labor in the job market, many companies use publicly available recruiting platforms, job boards,[16] services, and chatbots, which facilitate a broad hiring funnel (any applicant can enter the system, submit their resume, and, if selected, undergo the full recruitment process). The classification of HRM ecosystem models as they evolve could be an interesting area for further research.

The technological component of the HRM ecosystem (digital platform(s), services, applications, including mobile) ensures its operation according to the defined parameters and models. As digital technologies improve, the microservices architecture of HRM will be integrated into a unified digital environment (based on a single high-tech platform that integrates business processes and HRM) following the "open-source" principle, with seamless access to necessary resources for various

categories of users — from company employees to potential clients and partners.

CONCLUSION

The research conducted in line with the set objective and the obtained results allow for several conclusions that define the scientific novelty of this work:

• Based on the existing understanding of the digitalization process, technocratic and human-centric HRM ecosystems have been identified, which correspond to different stages of digital evolution: the former corresponds to the initial (technical) stage, while the latter aligns with the subsequent (sociotechnical) stage.

• Distinctive characteristics of technocratic and human-centric HRM ecosystems have been defined. The technocratic ecosystem is characterized by a focus on technology; the primary customer is HR; it involves the digitization of numerous HR functions within hierarchical organizational structures of large companies (resulting in accumulation / a "patchwork" of digital solutions). The human-centric ecosystem focuses on people; it is distinguished by digital comfort; and all stakeholders in the ecosystem are considered customers.

• The authors' definition and structural model of the HRM ecosystem of the transitional period have been proposed, including the humanitarian (people) and technological (digital technologies) components. These elements are observed in the practices of advanced employers (such as accounting for digital employee experience, adjusting digital technologies according to the "employee roadmap," etc.).

• Possible directions for the development of the HRM ecosystem have been outlined, with the focus being the creation of a unified and comfortable information environment for all ecosystem participants, aimed at the joint creation of value and improving the business's competitiveness in the market.

• As the ecosystem approach evolves, different HRM ecosystem models (open, closed, and

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[16] A job board is a type of career site on which employers post vacancies and applicants post resumes.

hybrid) may arise according to the competitive business strategy in the market, which could be the subject of future research.

The analysis, considering the fragmented scientific and methodological base on HRM ecosystems, leaves a wide field for further research. For instance, topics related to the external environmental factors influencing the formation of HRM ecosystems, practices of interaction among their participants (including necessary competencies), as well as the possibilities and limitations of HRM ecosystems' functionality, comprising systemic risks, can be of undeniable interest.

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ABOUT THE AUTHORS

Dmitry S. Salin — postgraduate student of the Department of Management and Marketing, Russian Foreign Trade Academy of the Ministry for economic development of the Russian Federation, Moscow, Russia
Corresponding author:
ds000777@mail.ru

Natalya V. Vittenbeck — Cand. sci. (Psychology), Assoc.Prof., Assoc. Prof. of the Department of Management and Marketing, Russian Foreign Trade Academy of the Ministry for economic development the Russian Federation, Moscow, Russia
SPIN-код 6906–7536
vitte@mail.ru

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ORIGINAL PAPER

Methodology for Managing Employee Performance in Modern Commercial Organizations

A.T. Samatoev
Polyus (company), Moscow, Russia

ABSTRACT

The purpose of this study is to create a method for managing the productivity of employees of a commercial organization and assess its potential effectiveness through theoretical modeling of the result. The principle of the method is based on the iterative redistribution or reallocation of the employees among the company's departments or structural units taking into account the current and potential changes in order to increase their labor productivity. Modelling analysis was performed using the retrospective data of the commercial organization — the period under consideration was equal to 39 months. The calculation assessed the dependence of changes on two indicators that noticeably affect the results: the number of cities where the company is present and the number of positions available in the company; it also determined the likely effect of the increase in labour productivity of employees when using the method. The influence of quantity of job positions and cities where company operates on the final result was also determined. The modeling carried out allows to draw a conclusion about the potential effectiveness of this approach, especially for organizations with one or in the same location and/or employing a large number of people performing similar functions, as it does not require significant financial outlays. The content and the results of the work presented in the article will be of interest to both HR practitioners and representatives of the scientific sphere.

Keywords: team; division; key performance indicators; labor productivity; organizational changes

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INTRODUCTION

The purpose of this article is to present an approach to solving the problem of automating the process of re-grouping work units/teams within a company in order to maximise the level of their fulfilment of key performance indicators (KPIs). Despite the fact, that the modelling carried out is mainly theoretical, it is based on real data from the functioning of a commercial entity over a period of 39 months. The calculation of the method was based on conditions close to reality (for example, restrictions were introduced regarding the frequency of changes, employee locations were taken into account, etc.).

Three areas of research under consideration can be distinguished in relevance to the issue of generating conditions to make high-performing work units. The first one examines approaches to arrange/build organisational structures, the second one explores teams and the work of employees in them, and the third one analyses organisational behaviour.

Nowadays, there are relatively few studies published regarding organisational design. They can be separately grouped as follows [1].

Research work that examine the conformity between existing organisational structures and workers' tasks and skills, using a decision-theory approach that focuses on providing an efficient assignment of tasks among multi-agent team members. The main problem of such models is that, although organisational members need to coordinate their actions, each member has to deal with different tasks and skills to make decisions.

The research of decision rules, which analyses the impact of various organisational structures and their internal rules regarding the quality of

outcome results, as well as the role of hierarchies in the emergence of psychological biases in decision making. Such a research seeks to find out the answer to the question: how it is possible to change the structure of a company in order to minimise the effects of the employees' mistakes?

Studies were accomplished to explore the mechanism of adaptation and recovery for companies operating through learning by trial and error.

Analysis of the influence of a company's structure on information processing examines the interrelationship between its organisational structure, the cognitive behaviour of individual employees and decision making process. This specific research is based on the motivation, that managers apply a few simplified models to the problems they identify, to the feedback they receive, and to the solutions they implement.

Scientific studies also compare the effectiveness of various principles of business development, such as State entities, private companies and voluntary/non-profit entities. The studies come to the conclusion that the private sector is most focused on the results of its activities, meanwhile voluntary and non-profit entities are far less focused on such targets [2].

Researchers also draw attention to the issues related to the impact of digital transformations on the construction of an organisational structure that at the same time keep changing, ensuring the company's non-stop adaptation to market requirements [3]. Transformations require companies to change their locations depending on new, dynamically emerging and disappearing perspectives, as well as also an all-round integrity of environmental turbulence, IT systems and organisational potential. Some authors call this a 'digital ecodynamics' — the phenomenon that "does not separate the three main elements, but manifests the integrity of the interactions between them" [3].

Due to the growing influence of digital transformation, companies increasingly avoid keeping to traditional bureaucratic structures and switch to new relevant forms of organisation [4].

From a scientific perspective, it is also of considerable interest to assess the impact on organisational structures by external shocks, such as the COVID-19 pandemic. Researchers categorise these impacts into short-term and long-term effects, depending on the consequences [5].

Short-term effects include shifting a substantial proportion of work to online remote modes and delegating certain tasks to managers operating locally. These changes may be accompanied by adjustments in remuneration practices, with a greater emphasis on performance-based rewards, as well as increased formalisation of processes aimed at maintaining control over employees and reducing information asymmetry. In the long term, the pandemic's effects will lead to a growing reliance on technological solutions in work organisation and organisational structures, a decline in interdependence and coordination between company divisions, an increase in remote working and a greater prevalence of temporary employment.

Researchers also study the work groups' productivity by means of identifying several key factors which influence outcomes [6], including team management approaches, cohesion, feedback, internal support, and adaptability. However, if an entity is scritinised as a whole, HR departments play a definite role in shaping labour productivity through such areas as training and development, compensation and benefits, work schedule management and employee onboarding [7].

Thus, in both approaches, the following principle holds true: fostering conditions that positively influence team productivity is essential at both the departmental and organisational levels. This conclusion is confirmed by research works which examine the impact of working conditions on employee productivity [8].

One of the popular approaches in the research work of team performance involves the analysis of the effectiveness of units operating in synergy with autonomous computer systems. In the future, it turns out quite possible that numerous business processes become completely autonomous, elimi-

nating the human involvement. However, currently, scientists claim, that interaction between people and autonomous agents, ('autonomous agent' herein relates to autonomous computer systems) will require to reach shared objectives [9–11]. The following research areas dealing with this subject are outlined in scientific sources [12].

• The impact of an agent's autonomy level on the performance of employees organisational settings. The findings indicate, that as the autonomy level increases, the work becomes less irksome, it enhanced efficiency in communication, coordination and overall productivity.

• Variations in the interaction of autonomous agents and people, in interdependence of the individual characteristics of the latter. For instance, team members with a low spatial ability level and their colleagues with the highest level of attention exhibited the most significant increase in productivity with increasing agent autonomy. Conversely, employees with high spatial abilities demonstrated lower situational awareness.

• The impact of the degree of "transparency of thinking" in an autonomous agent on the work process revealed, that high transparency is often beneficial: it elucidates the agent's decision-making approach. However, it should be noted, that high transparency can lead to an increase in the employee's workload and a subsequent feeling of complacency, which in its turn can result in a reduction of vigilance when monitoring the work of an autonomous agent and it can potentially cause a critical error.

• The choice of mixed teams with employees and autonomous agents. During the study period, all-human teams proved to be of higher efficiency [13]. However, the progress of modern technologies (for example, the use of generative neural networks) may potentially transpose this trend.

• The effectiveness in solution of different objectives. The research work proved positive results of mixed work teams dealing with solution of interdependent and not very complicated objectives.

• In general, preparation for the work in mixed teams has been found quite effective for all participants of the teams.

As to the organisational behaviour, several areas have been identified as potential venues to enhance labour productivity. Among the related scientific works, some of them analyse the use of feedback as a tool to augment the employee efficiency [14], or development of labour relationships among employees, or fostering a high-level consciousness and commitment to the organisational values, that constitute its corporate culture [15]. These factors have been found to influence significantly on the outcomes and efficiency of employees' work [16].

The findings of many research works (including some of them obtained by the author of this article) confirm the considerable impact on labor productivity in general by means of the accepted behavioral norms and organizational behavior.

METHODOLOGY

The database and regression coefficients utilized in the present research work were drawn upon the author's earlier research [17]. It provides an analysis of the personnel data of an outsourcing company,[1] within which some of the employees with monthly key performance indicators (KPIs) were acknowledged for the period from January 2020 to March 2023 (39 measurement points; annual and quarterly KPIs were not considered). The total number of observations was 27.859. KPIs were determined within a month for each position, and the maximum and minimum values were elaborated (within the range from 100 to 0). The remaining values were calculated proportionally to these regulations.

KPIs of the employees were re-grouped into three categories:

• Group 1 is directly related to the state of the country's economy (e.g. revenue, profitability, etc.);

• Group 2 is indirectly related to the state of the country's economy (e.g. number of selected

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[1] Henceforth, the information of strictly personal matter shall be kept in confidence to prevent the disclosure of commercial secrets.

employees, duration of customer debt under contracts, etc.);

• Group 3 is not related to the state of the country's economy (e.g. number of errors in reporting, percentage of trained employees in the department, etc.).

Following the aforementioned preparatory calculations, the assessment method to evaluate panel regression was employed to identify the factors influencing the level of KPI achievement. Among the latter, both organisational parameters were taken into account (for example, the staff number of employees' colleagues in the department), as well as personal characteristics (for instance, the gender, level of education, marital status, etc.).

The analysis yielded the following parameters for this study within the framework of all three KPI groups:

• Average value of colleagues' KPI. An increase in this factor by one unit will result in an increase in the employee's value for the first KPI group by 0.328; for the second group, such an increase in the KPI of colleagues by 1 unit leads to an increase in the employee's KPI by 0.268, and for the third group, by 0.588.[2]

• The number of colleagues in the department is only relevant for the first group of KPIs. This parameter exerts a negative influence for the first group: one extra person in the number of colleagues results in a reduction of each employee's KPI values by 0.737.

The aforementioned results were obtained based on the analysis of data from one single entity. Therefore, they may be different for other companies.

The characteristics of the quantitative variables are represented in *Table 1*.

This article analyses the potential for using the results obtained to improve organisational productivity. The only tool used here is the organisational change: transfers of employees between departments according to a specific algorithm. This ap-

proach enables to increase potentially employees' productivity without a significant increase in costs and expenses. The data on the impact of the average KPI of colleagues and their number in a department helps to make a model, that reflects the potential for improving labour productivity by changing the values of these factors.

The objective of such algorithm is to maximise the mean KPI of employees. The calculations were made through the following Steps:

Step1. Calculating the mean KPI of departments in the month under consideration.

Step 2. The department with the highest mean KPI is selected.

Step 3. The employees from the remaining departments are selected on the basis of the following condition: replacing them with the lowest-performing employees from the department with the highest mean KPI. This would result in an increase in the final average KPI of the leading department. It should be noted that such replacement means swapping two employees between departments, without any increase in the number of employees from either department.

Step 4. One of the employee swapped in Step 3 is selected due to his/her most beneficial average KPI for both departments (which he/she left or entered). The effect is defined as max (A–B), where A is the prognosed amount of the average KPI of the two departments after the transfer, and B is the current amount of the average KPI of the two departments.

Step 5. The calculation of the new KPI of these two departments after the transfer (these mean KPIs of the departments) will be used in the following Steps.

Step 6. Thereafter, the cycle is repeated over again (starting with Step 2) for the department selected in Step 2 and all the remaining employees.

Step 7. If none of the remaining employees meets the specified condition, the cycle is repeated for the next department (for example, not with the highest average KPI, but with the next to one) until all the departments' indications are analised. The employees are not taken into consideration for the

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[2] For all of the aforementioned changes, the p-value is less than 0.01.

Characteristics of quantitative variables

Variable	Number of observations	Average	Standard deviation	Minimum	Maximum
Group 1 KPI	12.468	43.069 76	25.693 42	0	100
Group 2 KPI	20.494	50.548 44	30.514 38	0	100
Group 3 KPI	19.132	73.025 58	32.6866	0	100
Average KPI of colleagues (Group 1 KPI)	7.734	37.888 97	20.140 89	0	100
Average KPI of colleagues (Group 2 KPI)	13.047	51.7782	25.619 21	0	100
Average KPI of colleagues (Group 3 KPI)	13.131	72.634 41	30.9533	0	100
The amount of colleagues	27.859	4.562 619	9.254 274	0	48

Source: compiled by the authors based on [17].

calculations, if they were transferred within the framework of the previous steps of the algorithm count.

Step 8. To bottom-line, the result is saved and the process is repeated all over again using the data of the next month.

Besides, the algorithm includes a number of conditions determined to enhance realistic features of the model:

1. An employee is permitted to be transferred no more than only once within each three months.

2. The swap of an employee between departments is permissible only if the employee geographically lives in the same city as the target department. This condition is intended to limit unrealistic transfers of a significant number of employees between locations. The remote work factor is not taken into account in this modelling.

3. The employees must be swapped if they have the same job positions. The rationale behind this condition is to preserve the organisational structure, which depends on the business objectives of the enterprise. Notably, the replaced employees must not be the only individuals in equivalent job position within their respective departments. It is imperative, that each of them has at least one

more colleague of the same joи position, otherwise, the transfer would make no sense.

4. To maintain the organisational structure, the number of departments must be the same as initially. This is why, the replacement of employees is permitted exclusively between individuals in equivalent positions, without increasing or reducing the total number of employees.

5. Any employee is involved as participant in the algorithm count, only if he/she is of a KPI value.

Some other factors of the model should be noteworthy:

1. The number and composition of personnel are saved as settings by default and correspond to real data (the staff turnover should be reflected).

2. All changes are based only on the data of the month in question: the calculation does not take into account information on which employee will quit next month: in reality, it is often hard to predict such information.

3. Within the framework of this model, a secondary goal is aimed to preserve the productivity level of the best teams and avoid gross damage to the functioning of the company. Thus, the algorithm used may not be the optimal solution to the problem of maximising the average KPI of the company. The

task is rather to simulate possible changes with minimal risk to the business processes of the company.

4. The impact of such factors as remuneration level and managerial influence is beyond the evaluation scope of the model. The appointment and transfer of top managers is hardly possible to realistically assess within the framework of the model due to many complex subjective or objective reasons. Moreover, the level of remuneration significantly depends on market conditions, therefore it is beyond the scope of this analysis.

In view of the aforementioned factors, the research work eventually developed two options of the algorithm:

• Option 1. The calculation is made on the monthly basis. The algorithm optimises the data for month X, the next one is for month X+1, and optimises the values all over again, without reference to previous results. The final graph reflects the potential for changes within a short period of time (one month). Another words, the analysis for each month is carried out, so to say, "from scratch", without any reference to the results obtained for previous time-frame periods.

• Option 2. Accumulated difference between the original average value of the company's KPI and its value after optimisation is added to the calculation results for Option 1. Thus, the obtained graph, which is based on the results, reflects the cumulative-change effect over the period under review. This version assumes that, the results of the analysis indicate, that each time, appropriate personnel changes are made, and the actual data are updated by the amount of the productivity's cumulative change.

RESULTS AND DISCOURSE

The following results were obtained on the basis of the use of the original data set *(Fig. 1):*

Detailed results of this and subsequent calculations of values are presented in *Tables 2–7.*

It is evident, that the enhancements are quite slim: the difference between the mean KPI value, as well as per the initial data and its post-algorithmic mean value ranges from 0 to 0.49 points per month. An average difference is 0.087 points per month.

The obtained results are attributable to the characteristics of the data, related to the limitations within the calculation algorithm. The primary obstacles to obtain enhanced optimisation values are the following prerequisites of initial data obtained:

• due to a particular distribution of personnel by cities (50 per cent of employees are con-

Fig. 1. **The 1st calculation algorithm**

Source: compiled by the author.

First calculation algorithm values

Number of the month (from January 2020)	Initial KPI values	Results of the first KPI calculation algorithm	Difference
1	64,983	64,983	0,000
2	50,604	51,037	0,434
3	55,629	56,059	0,430
4	49,514	49,569	0,055
5	49,139	49,199	0,060
6	58,269	58,348	0,080
7	57,230	57,415	0,185
8	57,079	57,573	0,494
9	57,396	57,694	0,298
10	56,388	56,472	0,084
11	53,004	53,313	0,309
12	49,295	49,318	0,023
13	53,703	53,728	0,025
14	54,470	54,495	0,025
15	54,121	54,173	0,051
16	55,805	55,860	0,056
17	53,292	53,292	0,000
18	57,459	57,529	0,070
19	54,827	54,869	0,042
20	50,742	50,763	0,021
21	51,293	51,324	0,031
22	49,226	49,301	0,075
23	49,085	49,109	0,023
24	53,986	53,986	0,000
25	56,832	56,912	0,080
26	55,546	55,627	0,081
27	58,522	58,653	0,131
28	54,726	54,726	0,000
29	61,597	61,597	0,000
30	59,350	59,350	0,000
31	62,357	62,357	0,000
32	62,625	62,673	0,049
33	62,859	62,859	0,000
34	60,497	60,533	0,036
35	62,103	62,108	0,006
36	63,144	63,144	0,000
37	62,693	62,693	0,000
38	64,362	64,431	0,068
39	64,259	64,345	0,087

Source: compiled by the author.

centrated in 10 per cent of the cities of presence, with a substantial number of the latter);

• due to job positions (61 per cent of employees are employed in 4 per cent of positions, meanwhile the rest of them are spread across a broad range of job positions).

These factors in combination significantly reduces the efficiency of the algorithm: the majority of the personnel potentially can't be eligible for transfer, since employees could be transferred only if they take the same job position and work in the same location.

The second algorithm reflects the cumulative effect of changes (see *Fig. 2*) and it will lead to an effect of 3.4 points in the 39th month.

At the same time, even in view of specified limitations, the potential economic effect can be quite tangible: a medium-sized company will show the overall increase in employee's productivity of by 3.4 points, which 39 months later could reach, for example, 2 million Rubles (if we reduce the fulfilment of each average KPI point to 10.000 Rubles with a personnel of 200 employees [the number is given as an example and does not correspond to this indicator of the company under consideration]). Most impor-

tantly, the implementation of this method results in a negligible increase for organisational costs.

For a territorially stand-alone company, the effect can be considerably higher.

Let us analyse the algorithm applied to a modified data set to assess the impact of reducing the number of cities and company positions.

To start with, regarding the change in conditions for the number of locations in different cities, let us assume that the number is limited to one (stand-alone location), meanwhile the total staff number is maintained as before. Thus, we obtain the following result (*Fig.* 3).

The graph illustrates a substantial growth for the efficiency of the algorithm, as a follow-up of the alteration in conditions. The difference in each month ranges from 1.4 to 4.05 points, and the mean value for all these months is 2.53 points. Hence, one can come to the conclusion, that the efficiency of the method will be considerably elevated for geographically stand-alone companies (or departments located in single plots of the territory).

Using the second algorithm, the resulting difference over a period of 39 months is 98.93 points
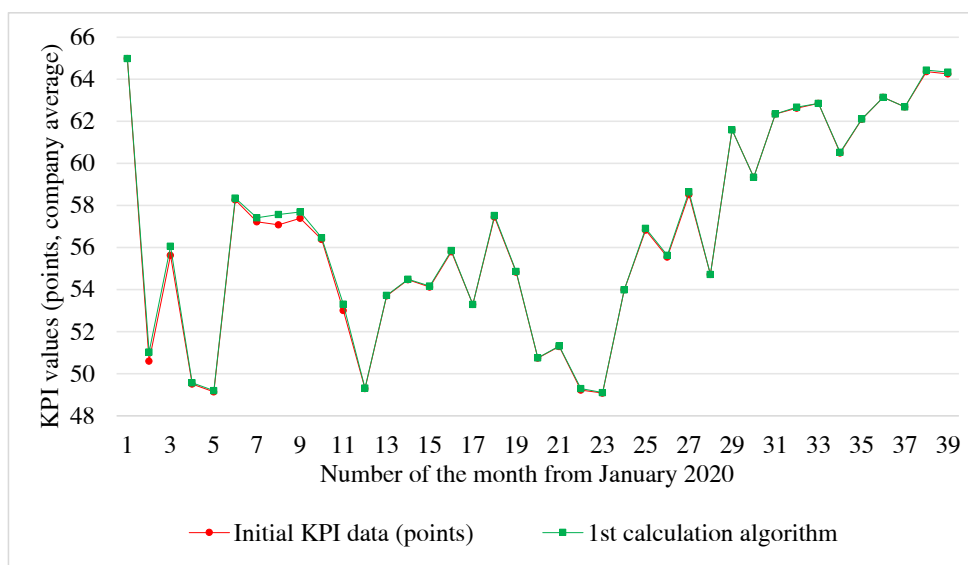

Fig. 2. **The 2nd calculation algorithm**

Source: compiled by the author.

The 2nd calculation algorithm values

Number of the month (from January 2020)	Initial KPI values	Results of the second KPI calculation algorithm	Difference
1	64.983	64.983	0.000
2	50.604	51.037	0.434
3	55.629	56.492	0.863
4	49.514	50.432	0.918
5	49.139	50.117	0.978
6	58.269	59.326	1.057
7	57.230	58.473	1.243
8	57.079	58.816	1.737
9	57.396	59.430	2.035
10	56.388	58.507	2.118
11	53.004	55.432	2.427
12	49.295	51.746	2.451
13	53.703	56.179	2.476
14	54.470	56.971	2.500
15	54.121	56.673	2.552
16	55.805	58.412	2.607
17	53.292	55.899	2.607
18	57.459	60.136	2.677
19	54.827	57.547	2.720
20	50.742	53.483	2.740
21	51.293	54.064	2.771
22	49.226	52.072	2.846
23	49.085	51.954	2.869
24	53.986	56.855	2.869
25	56.832	59.781	2.949
26	55.546	58.576	3.031
27	58.522	61.684	3.162
28	54.726	57.888	3.162
29	61.597	64.759	3.162
30	59.350	62.512	3.162
31	62.357	65.519	3.162
32	62.625	65.835	3.210
33	62.859	66.069	3.210
34	60.497	63.743	3.247
35	62.103	65.355	3.252
36	63.144	66.396	3.252
37	62.693	65.945	3.252
38	64.362	67.683	3.321
39	64.259	67.666	3.407

Source: compiled by the author

1st calculation algorithm values: stand-alone city location

Number of the month (from January 2020)	Initial KPI values	Results of the first KPI calculation algorithm	Difference
1	64.983	67.343	2.360
2	50.604	52.841	2.237
3	55.629	57.978	2.349
4	49.514	50.979	1.465
5	49.139	50.671	1.532
6	58.269	60.077	1.808
7	57.230	59.250	2.020
8	57.079	59.356	2.277
9	57.396	59.543	2.148
10	56.388	58.478	2.090
11	53.004	55.229	2.225
12	49.295	51.101	1.806
13	53.703	55.320	1.617
14	54.470	56.640	2.169
15	54.121	56.038	1.917
16	55.805	57.770	1.965
17	53.292	54.730	1.438
18	57.459	59.116	1.657
19	54.827	56.614	1.787
20	50.742	52.938	2.195
21	51.293	53.706	2.413
22	49.226	50.817	1.591
23	49.085	51.132	2.046
24	53.986	56.541	2.555
25	56.832	59.671	2.839
26	55.546	58.809	3.263
27	58.522	61.622	3.100
28	54.726	57.813	3.087
29	61.597	64.911	3.313
30	59.350	63.396	4.046
31	62.357	65.800	3.443
32	62.625	66.601	3.977
33	62.859	66.591	3.732
34	60.497	63.755	3.258
35	62.103	65.680	3.577
36	63.144	66.716	3.572
37	62.693	66.096	3.403
38	64.362	67.552	3.190
39	64.259	67.726	3.468

Source: compiled by the author.
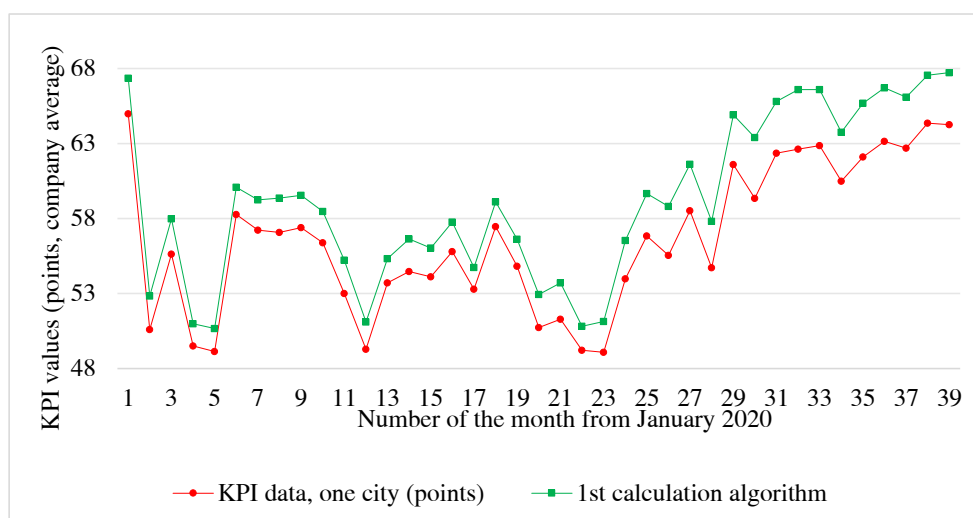
Fig. 3. **1st calculation algorithm: one city**

Source: compiled by the author.
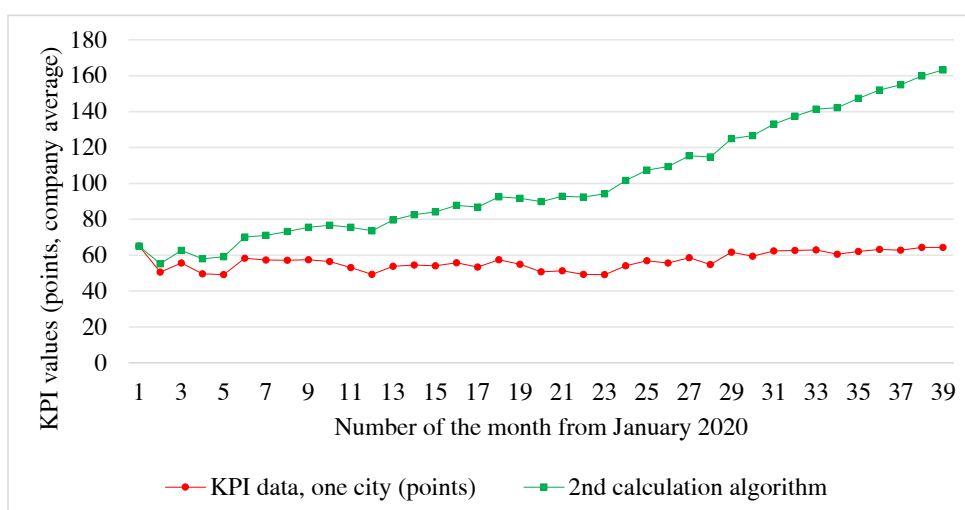
Fig. 4. **2nd calculation algorithm: one city**

Source: compiled by the author.

(*Fig. 4*), and the overall increase (relative to the original version of the data) is 98.93–3.4 = 95.53 points. Subsequently, we present the application of the algorithm to a data set, in which the number of positions was significantly reduced (*Fig. 5*). The data was re-grouped into three categories, comprising 53.6 per cent, 28.3 per cent, and 18.1 per cent of the staff, respectively. Notably, the number of cities remained unchanged compared to the original analysis.

The observed difference in each months ranges from 0.097 to 0.693 points and an aggregate mean difference throughout all months is 0.412 points. This indicates that a reduction of the number of job positions leads to a substantially smaller outcome, rather than reducing the level of territorial distribution of workers. Never the less, the overall impact has increased proportionally to the implementation of the algorithm on the original data.

Table 5

2nd calculation algorithm values, stand-alone city location

Number of the month (from January 2020)	Initial KPI values	Results of the second KPI calculation algorithm	Difference
1	64.983	64.983	0.000
2	50.604	55.201	4.597
3	55.629	62.575	6.946
4	49.514	57.925	8.411
5	49.139	59.082	9.943
6	58.269	70.021	11.752
7	57.230	71.002	13.771
8	57.079	73.127	16.048
9	57.396	75.591	18.196
10	56.388	76.674	20.285
11	53.004	75.515	22.511
12	49.295	73.612	24.317
13	53.703	79.637	25.934
14	54.470	82.573	28.103
15	54.121	84.141	30.020
16	55.805	87.790	31.985
17	53.292	86.715	33.423
18	57.459	92.538	35.079
19	54.827	91.693	36.866
20	50.742	89.804	39.061
21	51.293	92.768	41.475
22	49.226	92.292	43.066
23	49.085	94.197	45.112
24	53.986	101.653	47.667
25	56.832	107.338	50.506
26	55.546	109.315	53.769
27	58.522	115.392	56.870
28	54.726	114.683	59.956
29	61.597	124.867	63.270
30	59.350	126.666	67.316
31	62.357	133.116	70.759
32	62.625	137.361	74.736
33	62.859	141.327	78.468
34	60.497	142.223	81.726
35	62.103	147.406	85.303
36	63.144	152.019	88.876
37	62.693	154.971	92.278
38	64.362	159.831	95.468
39	64.259	163.195	98.936

Source: compiled by the author.

Table 6

First calculation algorithm values: 3 job positions

Number of the month (from January 2020)	Initial KPI values	Results of the first KPI calculation algorithm	Difference
1	64.983	65.432	0.449
2	50.604	51.260	0.656
3	55.629	56.142	0.513
4	49.514	49.687	0.173
5	49.139	49.353	0.214
6	58.269	58.520	0.251
7	57.230	57.785	0.554
8	57.079	57.686	0.606
9	57.396	58.028	0.632
10	56.388	56.694	0.305
11	53.004	53.646	0.642
12	49.295	49.578	0.283
13	53.703	53.949	0.245
14	54.470	54.568	0.098
15	54.121	54.249	0.128
16	55.805	55.917	0.113
17	53.292	53.480	0.189
18	57.459	57.635	0.176
19	54.827	55.233	0.406
20	50.742	51.008	0.266
21	51.293	51.514	0.221
22	49.226	49.417	0.191
23	49.085	49.465	0.380
24	53.986	54.231	0.245
25	56.832	57.322	0.490
26	55.546	56.067	0.521
27	58.522	58.980	0.458
28	54.726	55.012	0.286
29	61.597	62.071	0.474
30	59.350	59.996	0.646
31	62.357	62.901	0.544
32	62.625	63.192	0.567
33	62.859	63.503	0.644
34	60.497	61.190	0.693
35	62.103	62.589	0.486
36	63.144	63.801	0.657
37	62.693	63.302	0.609
38	64.362	64.779	0.417
39	64.259	64.922	0.664

Source: compiled by the author.
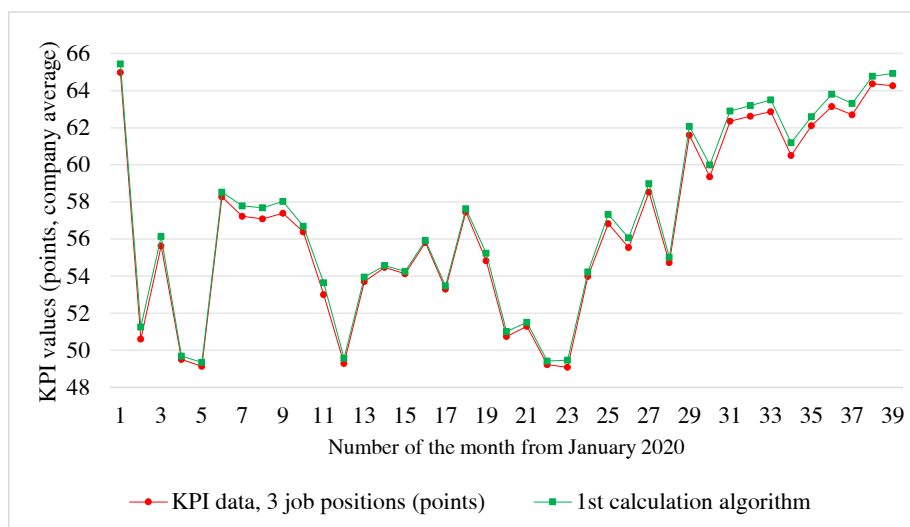
Fig. 5. **1st calculation algorithm: 3 job positions**

Source: compiled by the author.
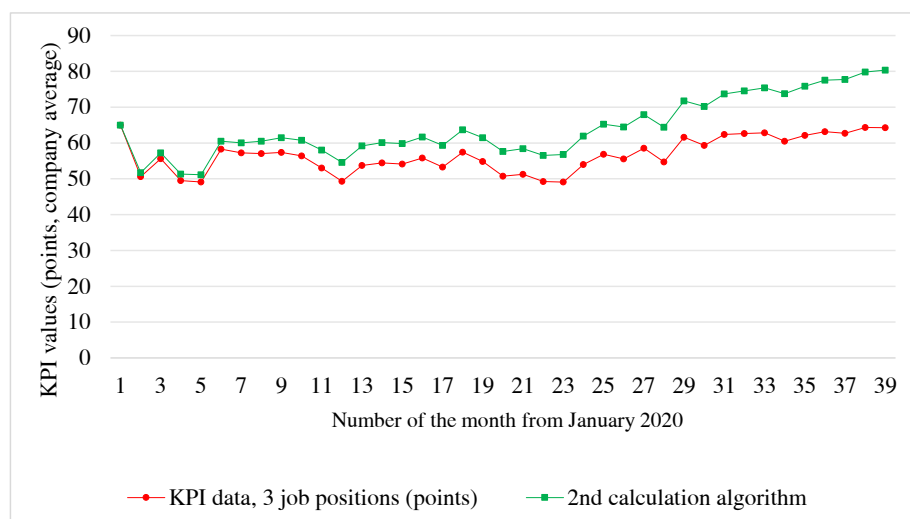
Fig. 6. **2nd calculation algorithm values: 3 job positions**

Source: compiled by the author.

The difference between the mean KPI of the original data and the result of the algorithm application is 16.09 points (*Fig. 6*). The overall increase (relative to the original version of the data) is 16.09–3.4 = 12.69 points.

As a summary of the abovementioned, the findings of this research work reveal, that the most effective application of the algorithm will be used for the enterprises with compact locations and no geographical spread, or for companies with employees who quite welcome any relocation (if their presence at the workplace is mandatory). The application of the algorithm is also rational in remote work settings, where the physical location of the employee is less mandatory, however, with a significant impact of colleagues on productivity [17]. The implementation of this instrument is also beneficial for companies with a numerous labour force involved and doing the same job operations.

Second calculation algorithm values, 3 job positions

Number of the month (from January 2020)	Initial KPI values	Results of the second KPI calculation algorithm	Difference
1	64.983	64.983	0.000
2	50.604	51.708	1.104
3	55.629	57.247	1.618
4	49.514	51.304	1.790
5	49.139	51.143	2.004
6	58.269	60.524	2.255
7	57.230	60.040	2.810
8	57.079	60.495	3.416
9	57.396	61.444	4.048
10	56.388	60.742	4.354
11	53.004	58.000	4.996
12	49.295	54.573	5.278
13	53.703	59.227	5.523
14	54.470	60.092	5.621
15	54.121	59.870	5.749
16	55.805	61.666	5.862
17	53.292	59.342	6.050
18	57.459	63.685	6.226
19	54.827	61.459	6.632
20	50.742	57.640	6.898
21	51.293	58.412	7.119
22	49.226	56.536	7.310
23	49.085	56.775	7.690
24	53.986	61.920	7.934
25	56.832	65.256	8.425
26	55.546	64.491	8.946
27	58.522	67.926	9.404
28	54.726	64.416	9.690
29	61.597	71.761	10.164
30	59.350	70.160	10.810
31	62.357	73.711	11.354
32	62.625	74.545	11.921
33	62.859	75.424	12.565
34	60.497	73.755	13.258
35	62.103	75.847	13.744
36	63.144	77.546	14.402
37	62.693	77.704	15.011
38	64.362	79.790	15.428
39	64.259	80.350	16.091

Source: compiled by the author.

As a whole, this approach can be categorised as incremental and used for the companies operating in the conditions of maintaining organisational structure and business processes. It is quite possible to assume, that such an approach will primarily trigger to boost high productivity by means of a rapid diffusion of best practices of skills among the staff. For this reason, such a method rendered is incompatible with major transformations and significant changes in business processes. Quite possibly, this effect may also be related to psychological factors: when a high-performance environment would motivate employees to improve their labour productivity.

In any case, further research is required in order to determine the consequences and evaluate the effectiveness of the proposed methodology. This should also include exploring alternative approaches to team optimization in view of alterations in the prerequisites and particularities of organisational work. Such alterations may be relevant in such instances as the following:

• lower sensitivity to the frequency of relocations;

• relocations aimed at increasing labour productivity in a distinct department of the company (for example, establishing multiple distinct competence centres with a high level of efficiency), or in the case of the lack of attention to other structural units; or, on the contrary, under the conditions of focusing on higher productivity of mid-level employees;

• mathematical change in the algorithm for the sake of redistributing employees in order to increase efficiency, etc.

CONCLUSIONS

The considered research work proposes algorithms to generate high-performance units. It also analyses potential effects based on the prerequisites obtained by the author in his previous works. The considered model contributes to estimate the potential growth of the level of accomplishments of key performance indicators in the case of using the revealed impact of high team productivity on an employee's indicators. The findings of the research work also draw the conclusion, the company's territorial unity could potentially lead to a substantial growth of labour productivity.

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ABOUT THE AUTHOR

Artem T. Samatoev — Organizational design expert, Polyus (company), Moscow, Russia
https://orcid.org/0009-0009-3941-4925
aptcam90@gmail.com

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Methodological Tools of Consulting Companies for Evaluating the Effectiveness of Organizations

A.A. Timofeev, A. Yu. Anisimov
Synergy University, Moscow, Russia

ABSTRACT

The article is devoted to a comparative analysis of existing opportunities and directions for evaluating the effectiveness of organizations using the resource-cost method (static model), Pareto optimality and the dynamic standard method (dynamic model). **The purpose** of the study was to identify the content of alternative approaches and models used by consulting companies to determine the effectiveness of organizations that produce and sell goods and services. The methodology described in the article is based on neoclassical economic theory. In the course of the work, a conceptual analysis of significant scientific alternatives to static and dynamic models for assessing economic efficiency was carried out. Any of them (or a combination of them), as established by the authors of the study, can be equally applied in the activities of all economic entities, including consulting companies. **The results** obtained include the definition of a set of methodological tools within the framework of the resource-cost method, the Paretian optimum and the dynamic standard method; substantiation of the equivalence and mutual complementarity of scientific model alternatives to efficiency, the interaction of the process and the result of efficiency assessment based on the principle of complementarity; evaluation of the organization's activities in a static efficiency model as an example of the implementation of the principle of complementarity. The results of the study can be applied both in the practice of management consulting and regular management of the organization.

Keywords: efficiency; resource-cost approach (method); dynamic standard method; Pareto-optimality; management consulting

INTRODUCTION

Efficiency, as both a characteristic and a target function of organizations, represents a critical practical and theoretical issue. Its scientific investigation at all levels of the economy is highly relevant for consulting firms. From an economic perspective, the full realization of the target function is the fundamental condition under which the maximum (or acceptable) result is achieved while ensuring the minimally necessary and sufficient expenditure of all resources used to accomplish this goal [1, p. 96].

The authors of this article propose the hypothesis that organizational efficiency, despite its logically identical essence, is assessed and manifested differently depending on the level of the economy (nano-, mini-, micro-, meso-, and macro-). These variations occur from the perspective of both individual organizations and groups of organizations within industries and national production sectors.

The subject of this study is the methodological tools for assessing organizational efficiency through the resource-cost method (static model), Pareto optimality, and the dynamic norm method (dynamic model).

Such an assessment represents a rather complex scientific problem due to the following factors:

First, the market comprises a large number of companies that differ in scale, resources, costs, production technologies, and service delivery methods. While they share some common performance indicators, many are entirely different. This diversity makes it challenging to apply a single universal methodology for accurately determining efficiency.

Second, not all economic efficiency indicators can be precisely quantified within a specific measurement framework. As a result, dimensionless values are often used for evaluation.

Third, the impact of external and internal environmental factors on organizations is highly specific in each case. This necessitates the development of custom models that complement general alternative approaches to assessing resources for improving economic efficiency.

Given the above, we believe that the core issue lies in the development of a set of general and specific indicators that would enable a representative assessment of the potential for efficiency improvement.

MODELS OF ECONOMIC EFFICIENCY

In our view, such models can be divided into two major categories: the static model (used in situations involving comparative statics of efficiency indicators) and the dynamic model for analyzing and evaluating efficiency.

Let us examine the first model in more detail. In addition to the classical Pareto optimum, the *resource-cost approach* (method) has been developed. According to this approach, efficiency (E_{ij}) is defined as the ratio of the final results (effects) of an organization's production and commercial activities (R_i) to the resource costs (C_j), required to achieve them.

In its most general form, economic efficiency can be expressed by the equation:

$$E_{ij} = R_i/C_j \qquad (1)$$

From the perspective of the resource-cost approach, economic efficiency can be characterized as follows:

a) the economic efficiency of organizations is essentially the same across different economic levels, as expressed by equation (1), and is independent of their economic scale;

b) efficiency assessment includes both general and highly specific indicators, meaning there may not be a single universal methodology;

c) quantitative and qualitative assessments can be combined into a single integral criterion of economic efficiency;

d) the general resource-cost approach does not exclude the use of complementary specific models of economic efficiency;

e) within this approach, it is reasonable to distinguish between *resource* efficiency (related to

resource utilization) and *target* efficiency (focused on production processes).

Economic efficiency in resource utilization is revealed and characterized by indicators such as productivity (labor and capital) and profitability (return on equity, return on borrowed capital, and returns on fixed and current assets).

Labor and capital productivity is determined as the ratio of total, average, and marginal outputs (measured in physical or monetary units) to strictly fixed input volumes — such as work hours (in man-hours), workforce size (in machine-hours), or the number of equipment units (in units). Productivity indicators reflect the economic efficiency of resource utilization from a material and physical perspective (*Table 1*).

Profitability indicators assess resource efficiency from a monetary perspective, representing the ratio between the value of output (at wholesale or market prices) and the organization's assets. These indicators are calculated based on the following financial performance metrics: revenue, profit (or loss), commercial margin, cash flow, net cash income, and others (*Table 1*).

Based on the logic of the indicators presented in *Table 1*, the overall criterion for an organization's economic efficiency over the reporting period (calendar year) is the return on equity:

$$EEO_{t-1} = NPr / E(NAO)*100\%, \qquad (2)$$

where:
EEO_{t-1} — economic efficiency of the organization for the reporting period;
NPr — net profit for the reporting period;
E(NAO) — equity (net assets of the organization).

Target efficiency is an economic assessment of processes and operations, reflecting the degree (level) of goal achievement in relation to the resources spent. This indicator is calculated using equation (1).

Let us consider the necessary conditions for achieving the target function, specifically the resource expenditure constraints under which it can reach its maximum values:

$$\begin{cases} F(z) \to \max(\min), \\ g(z) \le B, B > 0, \\ a_i > 0, i = \overline{1,n}, \\ b_j > 0, j = \overline{1,m}, \\ pi, pj > 0 \end{cases} \qquad (3)$$

where:
$F(z)$– target function; z– goal of economic activity related to service production;
$g(z)$ — cost function;
B — producer's budget constraint;
a_i, b_j — resource utilization coefficients of the organization;
pi, pj– resource prices.

The indicators of target economic efficiency are revealed through performance factors (*Table 2*). In an organization's production plans, its economic goals are always quantitatively linked to the increase or decrease of a particular aggregate indicator (for example, increasing production volume and/or reducing resource costs).

Therefore, when calculating performance indicators, the formula for base or chain growth rates should be used:
Base growth rate:

$$\rho_{1-0} = Q_1 — Q_0 / Q_0 *100\%, \qquad (4)$$

Chain growth rate:

$$\rho_{t|t-1} = Q_t — Q_{t-1} / Q_{t-1} *100\%, \qquad (5)$$

where:
ρ_{1-0} — base growth rate indicator;
Q_1– current indicator value;
Q_0– base indicator value;
$\rho_{t|t-1}$ — chain growth rate indicator;
Q_t — current indicator value;
Q_{t-1} — previous indicator value.

The number of performance indicators can be increased through specific and general indicators of economic efficiency, taking into account the industry-specific features of the organization and the evaluation methodology. Suppose that in the case of evaluating organizations in the service

sector (such as those providing sanatorium-resort services, including medical, physical culture, sports, and fitness services), it is acceptable to use general indicators such as "Growth of Sanatorium-Resort Activity Quality (GS-RAQ)" and/or "Growth of Sanatorium-Resort Services Quality (GS-RSQ)," which are assessed by growth indices (increase) of resort-health attractiveness and customer satisfaction with the quality of sanatorium-resort services.

An important indicator is the integral economic efficiency indicator (IEEI), which is created to provide a comprehensive picture and represents a synthesis of general indicators of productivity, profitability, and organizational performance.

From a microeconomic perspective, economic efficiency is determined by the solvency demand presented by a given market in accordance with the utility of the products and the equilibrium market prices associated with them. Accordingly, the need for growth in economic efficiency for organizations is driven by the mobility of consumer behavior regarding the goods and services they supply to the market, as the intensity and volume of effective demand for products directly affect their competitiveness and growth resources.

The assessment of economic efficiency in organizations within the framework of consumer choice theory mainly relies on the concept of Pareto-optimal market equilibrium. In this case, in addition to producers and sellers of goods, households (consumers and buyers of products) also benefit, which is expressed in indicators of optimality and efficiency according to Pareto (i.e., the Pareto efficiency area covers the economy of welfare).

Thus, a system is efficient (Pareto-optimal) if, under conditions of perfect or imperfect competition, the marginal rates of substitution of production factors and goods in the processes of production and consumption are equal for all producers and consumers. Regarding the activities of organizations, the conditions for Pareto efficiency determine the rules they follow, optimizing their benefits (economic profit, revenue, costs, etc.) in

markets characterized by perfect and imperfect competition.

These rules include the evaluation of marginal, average, and gross revenue, marginal costs, and prices per unit of production. Adhering to the conditions of Pareto efficiency provides organizations with opportunities to earn profit, which fully aligns with the economic efficiency criterion according to equation (2).

In our opinion, consulting companies should conduct the analysis and assessment of the economic efficiency of an organization's activities within the framework of a static model in the following sequence:

1) diagnosis of management, financial, and economic issues and "bottlenecks" in the organization's operations;

2) formulation of the general task of analyzing and assessing the economic efficiency of its activities;

3) calculation of numerical values for summarizing efficiency indicators;

4) justification for the addition of partial and summarizing efficiency indicators;

5) analysis of economic efficiency based on growth rates of indicators and application of a generalized economic efficiency criterion to its results;

6) development of a unified 5-level evaluation scale;

7) transformation of summarizing efficiency indicators into unified variables and conversion into dimensionless form;

8) consolidation of unified variables (using the arithmetic mean formula) into an integral indicator;

9) integral assessment of economic efficiency based on the evaluation scale;

10) conclusions about the reasons and factors behind the negative or positive state of the organization's activities based on the assessment of economic efficiency [2, p. 122–123; 3, p. 467–469].

The synergistic effect of the Integrated Performance Efficiency Indicator (IEEI), according

Summary indicators of the economic efficiency of resource use

Performance indicators	Calculation formula
1	2
Output of marketable products (in value terms)	PL = RSMP / AANPP, where: PL – labor productivity (thousands of rubles); RSMP – revenue from the sale of marketable products (thousands of rubles); AANPP – average annual number of production personnel (people).
Labor Intensity	LI = TWH / VMP, where: LI– labor intensity; TWH – total working hours spent on production; VMP – volume of marketable products in natural units.
Labor Effectiveness	PL = BPr /WF, where: PL –labor productivity (rubles/rubles); BPr – balance profit from all activities (thousands of rubles); WF – wage fund, including social contributions (thousands of rubles).
Production Capacity (Organization)	CPW = EWT* NIE / LIP , where: CPW– capacity of main production workshops (units); EWT – effective working time of equipment (hours); NIE – number of identical equipment, units; LIP – labor intensity per unit of product (hours/unit). CA=NWTFW*WA / LIP*AOWS, where: CA – capacity of auxiliary (assembly, installation, etc.) workshops (units); NWTFW – nominal working time fund of the workshop (hours); WA – workshop area (m²); LIP – labor intensity per unit of product (hours/unit); AOWS – area of one workstation (m²).
Production Capacity (Organization)	PCEY= PCBY+ PCCDY– PCRDY, where: PCEY – production capacity at the end of the year; PCBY – production capacity at the beginning of the year; PCCDY – production capacity commissioned during the year; PCRDY – production capacity retired during the year. $AAPC = PCBY + \dfrac{PCRDY \cdot NMIEY}{12} - \dfrac{PCRDY \cdot NMDEY}{12}$, where: AAPC – Average annual production capacity NMIEY– number of months from the moment of capacity introduction until the end of the year; NMDEY – number of months from the date of disposal of capacity until the end of the year.
Organization's Production Capacity Utilization Rate	$RUPCO = \dfrac{AVMP}{AAPC}$, where: RUPCO – Organization's Production Capacity Utilization Rate; AVMP – annual volume of marketable products (thousands of rubles).
Intensive Equipment Load Rate. *Extensive Equipment Load Rate*	RIEL = AAAPC / PCTDS *100% where: RIEL – Intensive Equipment Load Rate; AAAPC – Average annual actual production capacity of the enterprise; PCTDS – Production capacity of the enterprise according to the technical data sheet. REEL= AVAMP / AVEMP *100%, where: REEL – Extensive Equipment Load Rate; AVAMP – annual volume actual of marketable products (thousands of rubles); AVEMP – annual volume effective of marketable products (thousands of rubles).
Integral Equipment Load Rate	IELR= RIEL* REEL / 100%, where: IELR – Integral Equipment Load Rate.

Source: compiled by the authors.

Table 1

Summary indicators of the economic efficiency of resource use

Profitability indicators	Calculation formula
3	4
Fixed Asset Turnover (FAT)	FAT = AVMP/AAVFAC *100%, where: FAT – fixed asset turnover; AVMP – annual volume of marketable products (rubles); AAVFAC – average annual value of the company's fixed assets (rubles).
Fixed Asset Capacity	FAC = AAVFA /AVMP*100%, where: FAC – fixed asset capacity; AAVFA – average annual value of fixed assets (thousands of rubles); AVMP – annual volume of marketable products (thousands of rubles).
Capital Intensity	CI = AAVFA/ AANPP, where: CI – capital intensity; AAVFA– average annual value of fixed assets (rubles); AANPP – average annual number of production personnel (people).
Fixed Asset Renewal Rate	FARR =VNIFA/ VFABY *100%, where: FARR – fixed asset renewal rate; VNIFA – value of newly introduced fixed assets (thousands of rubles); VFABY – value of fixed assets at the beginning of the year (thousands of rubles).
Fixed Asset Disposal Rate	FADR= VRFA / VFAEY*100%, where: FADR – fixed asset disposal rate; VRFA – value of retired fixed assets (thousands of rubles); VFAEY – value of fixed assets at the end of the year (thousands of rubles).
Fixed Asset Depreciation Rate	RD = ADA / AAVFAC*100%, where: RD – depreciation rate; ADA – annual depreciation amount (thousands of rubles).
Organization's product profitability	OPP = QPr / TCP *100%, OPP – organization's product profitability; QPr – gross profit from core operations (thousands of rubles); TCP – total cost of production (rubles).
Profitability of the organization	PrAO = BPrAA / TFCA *100%, PrAO – profitability of the organization; BPrAA – balance profit from all activities (thousands of rubles); TFCA – total fixed and current assets (thousands of rubles).

General indicators of the economic efficiency of the target function of the organization

Performance indicators	Calculation formula, units of change
Growth of Labor Productivity	$P_{t|t-1}(P_{1|0})_{GLP} = \partial GLP / GLP * 100\%$, where: $P_{t|t-1}(P_{1|0})_{GLP}$ – chain (base) indicator of labor productivity growth rate; ∂GLP – relative increase in the labor productivity indicator over the period; GLP – previous (base) value of the indicator.
Reduction of Labor Costs	$P_{t|t-1}(P_{1|0})_{RLC} = \partial RLC / RLC * 100\%$, where: $P_{t|t-1}(P_{1|0})_{RLC}$ – chain (base) indicator of reduction in labour costs in growth rates; ∂RLC – relative increase in the labour cost indicator; RLC – previous (base) value of the indicator.
Growth of the Return on Fixed Asset	$P_{t|t-1}(P_{1|0})_{GRFA} = \partial GRFA / GRFA * 100\%$, where; $P_{t|t-1}(P_{1|0})_{GRFA}$ – chain (base) indicator of the return on assets in growth rates; $\partial GRFA$ – relative increase in the return on assets indicator; GRFA – previous (base) value of the indicator.
Growth of Product Profitability	$P_{t|t-1}(P_{1|0})_{GPPrA} = \partial GPPrA / GPPrA * 100\%$, where: $P_{t|t-1}(P_{1|0})_{GPPrA}$ – chain (base) indicator of product profitability in growth rates; $\partial GPPrA$ – relative increase in the indicator of product profitability; GPPrA – previous (base) value of the indicator.
Growth of Organizational Profitability	$P_{t|t-1}(P_{1|0})_{GOPrA} = \partial GOPrA / GOPrA * 100\%$, where: $P_{t|t-1}(P_{1|0})_{GOPrA}$ – chain (base) indicator of organizational profitability in growth rate; $\partial GOPrA$ – relative increase in the organizational profitability indicator; GOPrA – previous (base) value of the indicator.

Source: compiled by the authors.

to the results of our previous studies, ultimately manifests for the observer as an emergent property of the system [2, p. 121–122]. This understanding of the problem of evaluating economic efficiency lies in the presence of "… a mechanism for the emergence of emergent properties, which allows for the separation of wholes from systems as a collection of elements…" [2, p. 122].

"*Emergent property* (EP), *holism* in the activities of organizations, is the main and important resource of their efficiency, stability, and a condition for growth" [2, p. 122–123]. An organization that lacks the property of integrity is merely an aggregate of elements, which reduces its efficiency

and growth potential, as in this state, it gradually degrades. "The emergent property itself has a material carrier — a single *mediator* for all parts (elements) of the system, possessing qualities independent of them" [2, p. 123].

THE TOOLKIT OF THE DYNAMIC MODEL FOR EFFICIENCY ASSESSMENT

The dynamic model for evaluating an organization's efficiency is based on the method of dynamic norms (DN), the methodology of which was formulated in general by I. M. Syroezhin [4], and later systematized and methodologically developed by his followers [5–7].

The research and methodological toolkit of management consulting is built on the basis of the DN method, which involves constructing an ordered normative system of performance indicators for the organization in the form of a reference series, and then determining deviations of the actual arrangement of indicators from the normative (reference) one [8].

The integral indicator (II), obtained using the DN method, reflects the direct relationship between performance and the quality of the organization's management and its numerical characteristics. Therefore, the higher the (II) value, the more significant the financial and economic outcomes of managerial activities, and vice versa [8].

The process of forming the reference series is of an expert nature, and "the system of indicators will be representative of the organization's mode of operation if ranks of speeds and accelerations are established, i.e., a stable order of changes in the structural components of activities and the rates of their changes" [9, p. 116].

EXPERIENCE IN APPLYING THE STATIC MODEL FOR ASSASSING ORGANIZATIONAL EFFICIENCY

Variations in methodological approaches to efficiency evaluation based on the static and/or dynamic model depend, for example, on the preferences of the consultant (researcher) on one hand, and the state of the object of evaluation on the other.

Let us assume that an express diagnosis and evaluation of the organization's performance are required based on the analysis of its financial documents, which can be carried out using a resource-cost method. Such a situation often arises in the course of the current adjustment of the company's policies in the areas of finance, production, personnel, sales, marketing, etc., within the framework of its socio-economic development strategy.

Management decisions are most often made by the management based on the conclusions of management consulting specialists. In our case, a unique example of such an organization, where the goal of improving production-economic efficiency is an essential element of the development strategy, is JSC "Russian Railways", for which social aspects of activity are of primary importance.

The social responsibility and the volume of social investments of JSC "Russian Railways" are determined by a component of the company's infrastructure, such as the presence of institutions on the balance sheet of its subsidiaries that provide services in sanatorium-resort rehabilitation and recreational medicine.[1]

Two subsidiaries of JSC "Russian Railways" in the Ural Federal District (UFD) — Sverdlovsk and South Ural Railways (YUZHD) — possess some of the best social infrastructures in the Russian Federation in terms of technical equipment, material base, personnel qualifications, and the volume of services provided by sanatorium-resort rehabilitation institutions. Therefore, a significant aspect for the holding company is the question of improving the efficiency of their operations.

The social facilities of YUZHD (based on their management principles, control, and development) can be divided into the following groups: culture, sports, and health promotion for adults and children. The management of these facilities is carried out by the Directorate of Social Affairs (DSA) of YUZHD, a branch of JSC "RZD," which currently has 10 sanatorium-resort rehabilitation and recreational medical facilities on its balance sheet: 3 sanatorium-prophylactics, 2 sports complexes, and 5 children's health centers.

Among these 10 institutions, the most representative object in terms of a combination of factors is the children's health complex "Alyonushka" (CHC "Alyonushka"). It is located in the most picturesque and ecologically clean area of the South Urals, on the territory of the Ilmen Nature Reserve, in the mountains, by the shores of

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[1] JSC "Russian railways" (official website). URL: https://company.rzd.ru/

Table 3

Dynamics of the performance indicatorsof CHC "Alyonushka"

Indicator	Absolutevalues, year			Growth, %	
	2019	2020	2021	2020/2019	2021/2020
Patient population, persons	152	132	133	−13.2	0.8
Income, thousand RUB	116 401.8	108 589.9	110 538.1	−-6.7	1.8
Expenses, thousand RUB, including:	112 029.4	103 296.3	107 268.0	−7.8	3.8
wages	45 981.5	41 661.5	42 968.3	−9.4	3.1
material costs	29 023.4	35 409.8	35 142.8	22.0	−0.8
Depreciation of fixed capital	6082.2	2568.0	2337.4	−57.8	−9.0
DSA management expenses	7648.5	6445.0	6912.7	−15.7	7.3
Financial result, thousand RUB	4372.4	5293.6	3270.1	21.1%	−38.2%
Expense recovery from income, %	103.9	105.1	103.0	1.2	−2.0

Source: compiled by the authors.

Note: Disclosure of information for 2022 is limited based on the Resolution of the Government of the Russian Federation No. 351 dated 12.03.2022.URL: https://www.garant.ru/products/ipo/prime/doc/403593706/

the Big Yelanchik Lake. In terms of infrastructure for recreation and sports activities, as well as the condition of medical equipment, the complex is one of the best in the UFD.[2]

Let's consider CHC "Alyonushka" from the perspective of the economic components of its activities aimed at providing services such as health promotion, recreation, and treatment:

a) fixed capital (FC);

b) working capital (WC);

c) production capacity (PC);

d) labor productivity (LP);

e) service prices and tariffs (SPT);

f) service profitability (SPrA);

g) profitability of social infrastructure facilities of the DSS YUZHD (PrASIF);

h) quality of sanatorium-resort activities (QS-RA);

i) quality of sanatorium-resort services (QS-RS).

Table 3 presents the dynamics of performance indicators of CHC "Alyonushka" for the period 2019–2021.

From *Table 3*, it follows that the growth rates of the indicators over the three years (2019–2021) are unstable. Among the total expenses, the largest relative change in 2020 was observed in the "depreciation of fixed capital" indicator — a decrease in depreciation charges by 57.8%; meanwhile, the growth of material costs was 22.0%, and management expenses decreased by 15.7%. As a result, the financial performance of the complex increased by 21.1%.

In 2021, there was a noticeable, though minor, increase both in the number of consumers of sanatorium-resort health improvement and recreational medicine services and in the income and expenses of the complex. At the same time, the growth of management expenses in DSA was twice as large as the increase in wages.

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[2] South Ural Railway. Social sphere. JSC "Russian Railways" (official website). URL: https://yuzd.rzd.ru/ru/6236/page/103290?id=10307#main-header

Table 4

Diagnostics of the economic efficiency of sanatorium-resort rehabilitation and recreational medicine institutions of the DSA of the South Ural branch of JSC Russian Railways

Indicator	Formula	The actual value of the indicator dimension less view		The optimal value of a dimension less indicator
		2020	**2021**	
Output of goods in monetary terms at selling prices	PL = PSMP / AANPP	642.67	672.00	max, thousand RUB/ person
Labor intensity	LI = TWH / VMP	0.18	0.17	min, hour/ item
Labor productivity	PL = BPr/ WF	−0.05	−0.04	max, RUB/RUB
Production capacity of organization	CPW = EWT*NIE/ LIP	10 040	10 289	max, hour, an FA per item
Capacity utilization rate of an organization	$RUPCO = \dfrac{AVMP}{AAPC}$	0.3	0.3	1,00
Intensity equipment loading ratio	RIEL = AAAPC / PCTDS *100%	60	59.9	100%
Extensive equipment loading ratio	REEL= AVAMP / AVEMP *100%	97.3	97.3	100%
Integral equipment loading ratio	IELR= RIEL* REEL / 100%	58.38	58.28	100%
Return on fixed assets	FAT = AVMP/AAVFAC *100%	108	130	max, %
Capital intensity	CI = AAVFA/ AANPP*100%	93	77	min, %
Capital labour ratio	CLR = AAVFA/ AANPSO	597.06	515.61	max, thousand RUB
Fixed assets renew ratio	FARR =VNIFA/VFABY *100%	no data	no data	max, %
Asset disposal ratio	FADR= VRFA / VFAEY*100%	no data	no data	max, %
Depreciation ratio of fixed assets	RD = ADA / AAVFAC*100%	0.42	0.36	max, %
Profitability of the organisation's products	OPP = QPr / TCP *100%	− 2.1	−1.5	max, %
Profitability of the organization	PrAO = BPrAA /TFCA *100%	−2.1	−1.8	max, %
Labor productivity growth based on performance	$P_{t|t-1} (P_{1-0})_{GLP} = \partial GLP/ GLP*100\%$	−6.15	−30.54	max, %
Labor productivity growth based on output	$P_{t|t-1} (P_{1-0})_{GLP} = \partial GLP/ GLP*100\%$	11.69	4.37	max, %

Table 4 (continued)

Indicator	Formula	The actual value of the indicator dimension less view		The optimal value of a dimension less indicator
		2020	**2021**	
Reduction in labor costs	$P_{t\|t-1}(P_{1-0})_{RLC} = \partial RLC / RLC * 100\%$	−3.06	−6.15	max, %
Growth in the return on assets of the organization	$P_{t\|t-1}(P_{1-0})_{GRFA} = \partial GRFA / GRFA * 100\%$	47.99	17.41	max, %
Growth in the profitability of the organization's products	$P_{t\|t-1}(P_{1-0})_{GPPrA} = \partial GPPrA / GPPrA * 100\%$	40.47	−17.61	max, %
Growth in institutional profitability	$P_{t\|t-1}(P_{1-0})_{GOPrA} = \partial GOPrA / GOPrA * 100\%$	−8.25	−36.75	max, %
Growth of sanatorium-resort activity quality	$P_{t\|t-1}(P_{1-0})_{GS-RAQ} = \partial I_{AQ} / I_{AQ} * 100\%$	−7.7	−33.8	max, %
Growth of sanatorium-resort services quality	$P_{t\|t1}(P_{1-0})_{GS-RSQ} = \partial I_{SQ} / I_{SQ} * 100\%$	11.60	8.75	max, %

Source: compiled by the authors.

Table 5

The evaluation scale of the level of economic efficiency of the activities of the "Alyonushka" children's health resort complex and the system of sanatorium-resort health and recreation institutions.

The level of economic efficiency	The range in values of the integrated assessment of economic efficiency (E_{integr})
Absolutely efficient activity	5,00–4,00
Highly efficient activity	3,99–3,00
Efficient activity	2,99–2,00
Low efficient activity	1,99–1,00
Inefficient activity	ниже 1,00

Source: compiled by the authors.

Table 6

General indicators of the economic efficiency of the target function of CHC Alyonushka complex

Performance indicators,%	2020	2021
Labor productivity growth (PL) in output	6.91	1.02
Reduction in labor costs (WF)	−10.37	3.04
Growth in return on assets of the complex (CI)	57.12	12.66
Growth in product profitability of the complex (OPP)	23.84	−68.10
Growth in profitability of the complex (PrAO)	65.15	−46.72
Growth in the quality of sanatorium-resort activity ($P_{t\|t-1}(P_{1-0})_{GS-RAQ}$)	9.80	−18.20
Growth in the quality of sanatorium-resort services ($P_{t\|t-1}(P_{1-0})_{GS-RSQ}$)	22.90	14.31

Source: compiled by the authors.

Table 7

Unifiedvariables of dimensionlessform

Values of the initialindicator X^i (2021 y.)	Formula	$X^i_{max.}$	$X^i_{min.}$	The value of the unifiedvariable Xj', $j>0-1,7$
1,02	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	11.69	1.02	0
3,04	$X' = [(X^i_{max} - X^i) / (X^i_{max} - X^i_{min})] * N$	3.04	−6.15	0
12,66	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	47.99	12.66	0
−68,10	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	40.47	−68.10	0
−46,72	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	−8.25	−46.72	0
−18,20	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	−7.7	−33.8	3.08
14,31	$X' = [(X^i - X^i_{min})/(X^i_{max} - X^i_{min})]*N$	14.31	8.75	5

Source: compiled by the authors.

To analyze and assess the efficiency of the activities of "Alyonushka" health resort complex, it is necessary to diagnose the economic problems and "bottlenecks" of all the profile institutions included in it, which involves calculating the economic efficiency indicators according to *Tables 1* and *2*.

The results are presented in *Table 4*.

The growth of the quality of sanatorium-resort activities ($P_{t|t-1}$ (P_{1-0}) $_{GS-RAQ}$) and the quality of sanatorium-resort services ($P_{t|t-1}$ (P_{1-0}) $_{GS-RSQ}$) is proposed to be assessed by the growth rates of the resort-health appeal index ($\partial I_{AQ}/I_{AQ}*100\%$) and the satisfaction index for the quality of sanatorium-resort services ($\partial I_{SQ}/ I_{SQ}*100\%$).

The evaluation scale of the level of economic efficiency of the activities of the "Alyonushka" children's health resort complex and the system of sanatorium-resort health and recreation institutions is presented in *Table 5*.

Table 6 shows the dynamics of the economic efficiency of the "Alyonushka" children's health camp based on the calculation of chain growth rates of aggregate indicators according to formula (5), and *Table 7* presents the transformation of aggregate efficiency indicators into standardized variables and their conversion into a dimensionless form.

The integrated assessment of economic efficiency (IAEE) is calculated based on the values of standardized variables for each indicator… (*Table 7*) and "…their aggregation using the arithmetic mean formula" [2, p. 125]:

$$IAEE = (0+0+0+0+0+3,08+5)/7 = 8,08/7 = 1,154. \quad (6)$$

Thus, according to *Table 5*, the score of 1.154 indicates that the sanatorium and health institutions involved in "Alyonushka" CHC are operating effectively, but require adjustments due to instability and low performance indicators. For the DSA of the South Ural Railway (YUZHD) — a branch of JSC "RZD," this conclusion can serve as an indicator for refining the strategy for social sphere development, income policy, service quality, and profitability.

Since 2018, the South Ural Railway has consistently ranked 8th-9th among 16 branches of JSC "RZD" based on the indicator "Use of capacities of children's health camps" according to the assessment by the Corporate Property Department (CPI) of the company.

CONCLUSIONS

To summarize the above, we can conclude that the models and methods for analyzing and assessing the effectiveness of organizations, which are subject to management consulting and auditing, are of equal value. The scientific problem lies in the fact that effectiveness, on the one hand, is a central theme in the development of economic science and its basic category. However, on the other hand, there are many types of effectiveness in the economy, determined by the object and subject, their motives, goals, constraints, results, and the process of activity, as well as equilibrium [10, p. 52].

Accordingly, the solution to the problem of effectiveness in the article is viewed as a rational choice of methodological tools depending on the aspects (three in total: process, result, equilibrium) in which the relevant indicators are analyzed and evaluated.

For each aspect, a separate model is proposed: dynamic for the process; static for the result; and the Pareto optimality for equilibrium market situations. Furthermore, the methodologies within the dynamic and static models of effectiveness are interchangeable and complement each other during the work of management consulting specialists.

However, more often than not, consultants in consulting companies are faced with choosing one option from different variants of method interaction, which is modeled based on well-known scientific relationships between process and result.

Such interactions can take the form of a chemical reaction, genetic mutation, epistemological negation and rupture, or a complementary combination of process and result based on the principle of complementarity.

In our view, consulting companies apply models and methods of analysis and assessment of effectiveness (as well as its provision in the activities of organizations) based on the principle of complementarity, treating them as conceptual alternatives for research. In the future, the development of the scientific task, which involves conducting such analysis and assessment, will consist in the precise selection and reasonable combination of the methodologies presented in this article.

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ABOUT THE AUTHORS

Artem A. Timofeev — Postgraduate Student of the Department of Entrepreneurship and Competition, Faculty of Business, Synergy University, Moscow, Russia
https://orcid.org/0000–0002–5841–7664
Corresponding author:
2TimofeevAA@ruex.su

Alexander Yu. Anisimov — Cand. Sci. (Econ.), Assoc. Prof., Deputy Director for Educational and Methodological work of the Faculty of Information Technology, Assoc. Prof. of the Department of Information Management named after prof. V.V. Dick, Synergy University, Moscow, Russia
https://orcid.org/0000–0002–8113–4523
anisimov_au@mail.ru

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The Influence of Empowerment on Collaboration and Knowledge Sharing and their Influence on Project Success

S.M. Wagan, S. Sidra, M.M.U. Hoque
Business School, Sichuan University, Chengdu, People's Republic of China

ABSTRACT

The purpose of this research is to evaluate the effects that empowerment has on the sharing of information and cooperation in an effective project management setting. The purpose of this study is to investigate the direct impacts of empowerment, which will be evaluated based on autonomy and responsibility, on efficiency of cooperation between members of a team, the sharing of information, and the accomplishment of the project. A total of 228 Pakistani project managers were surveyed via the use of questionnaires, and the results were analyzed through the use of SPSS 25.0 and SMART software PLS 4. The findings demonstrated that empowerment has a beneficial impact on the cooperation and information sharing that occurs between team member exchanges and other project teams, which in turn has a favorable influence on the success of the project. While the responsibility of collaborators reflects positively in cooperation and information sharing, the autonomy that is assigned to the exchanges that take place between members of the project team encourages the sharing of knowledge and facilitates the success of the project. Not only do these findings help to the enhancement of theoretical understanding about project management, but they also enhance the practice of project team management. There is an increase in the likelihood of the project being successful as a result of their guidance to project managers on the delegation of autonomy and responsibility to team member exchanges. The research makes a contribution to the cultivation of improved project management techniques and highlights the significance of leadership abilities in the accomplishment of successful project outcomes.
Keywords: project management; project success; knowledge sharing; collaboration; empowerment; autonomy; team accountability; team members exchanges

1. INTRODUCTION

The interest in project management has grown significantly in recent years, with both academics and professionals recognizing its potential to enhance efficiency, effectiveness, and competitiveness in complex and unpredictable environments. This has led to the establishment of professional organizations like the International Project Management Association (IPMA) and Project Management Institute (PMI). However, project results often disappoint stakeholders, and skilled project managers face cases when the projects are considered failed. Projects are essential tools for organizations to organize activities and achieve desired objectives, and success of these projects determines the success of the enterprise. They are the main component used to implement strategies, and an organization gains value when they are in line with strategic objectives. Promising initiatives have a beneficial impact on the organization, impacting its short- and medium-term development as well as its long-term expansion.

However, estimating the costs of failed projects remains a challenge, as significant resources are spent annually on projects with high failure rates. Both professionals and academic demonstrate a strong interest in the factors contributing to project success since every organization strive to increase the likelihood of successful project outcomes and minimize losses from project failures. Project success factors are key elements that enhance the probability of success and represent distinct solutions aimed at improving project outcomes.

Effective project execution involves delivering or improving goods or services to align with an organization's strategic objectives. Achieving project success is of crucial importance and often requires a substantial organizational commitment. Project success cannot be measured in a single way since it depends on a variety of elements and may be assessed in a number of ways.

This study seeks to address the research question: What management factors determine project success? It aims to investigate the influence of empowerment on knowledge sharing and collaboration among project team members and evaluate how these factors collectively contribute to project success. By addressing existing gaps in the literature and the lack of consensus regarding determinants of project success, this research seeks to advance both theoretical understanding and practical application in the field. It uses a deductive, quantitative, transversal, conclusive, and causal research methodology to conduct an empirical study. Primary source data will be collected from project team member and analyzed using SPSS 25.0 and Smart PLS 4 software. Project success criteria are subjective and can be influenced by factors like usability or acceptance of new processes. Project success factors are defined as elements that enhance the likelihood of successful outcomes and represent independent interventions that increase the probability of success. However, there is no universal method for measuring project success, as it depends on many factors and can be assessed through various frameworks. Effective project execution includes activities related to project control, including review processes, monitoring progress, and ensuring stakeholder satisfaction. This study will evaluate the role of empowerment, knowledge sharing, and collaboration in facilitating efficient project execution and achieving project success. Through this comprehensive analysis, the research aims to provide valuable insights into the management factors that influence project success and offer practical guidance for enhancing project management practices.

1.1. Problem Formulation

Empowerment is widely regarded as a critical factor that can enhance collaboration and knowledge shar-

ing among project team members. However, there is little clarity on how these factors individually and collectively influence the critical success of a project. Precisely, the relationship between empowerment and team dynamics affecting project outcomes remains underexplored, and a lack of consensus persists in the existing literature regarding critical success factors in project management. The present study seeks to investigate how empowerment influences collaboration and knowledge sharing, and examines their combined impact on project success. The research paper deals with the complicated relationship of empowerment, collaboration, and knowledge sharing regarding project success. The authors propose a comprehensive set of objectives to capture the multi-dimensional aspects of their study, which are outlined as follows:

1.2. Objectives of the Study

Empowerment Effects: The research investigates the impact of empowerment on information sharing and cooperation within a project management context. Specifically, it explores how autonomy and responsibility contribute to enhancing team performance and facilitating project success.

Direct Effects on Team Performance: The direct influences that empowerment has on team cooperation, information sharing, and the overall accomplishment of projects are considered here. This section addresses how empowered team members effectively collaborate and coordinate to achieve project goals.

Management Factors of Project Success: An essential objective is to identify management factors that determine project success. The study delves into various aspects that help in the successful execution of a project.

Influence of Empowerment on Knowledge Sharing: The authors seek to assess how empowerment affects knowledge sharing and collaboration among project team members and its combined impact on project success.

Literature Gaps: The study attempts to fill the gaps in the existing literature on project success determinants and hopefully will resolve the lack of consensus regarding the factors that define and drive project success. Critical Analysis of Influential Factors: Finally, this

research aims to provide a critical analysis of the factors influencing project success, contributing both to theoretical advancements and practical applications in project management.

2. LITERATURE REVIEW

Project management is a crucial aspect of organizational success, driven by technological and cultural changes. It involves teams from various corporate functions working together to achieve defined objectives. A clear understanding of the human dimension is essential for effectively engaging and motivating stakeholders. Projects are temporary endeavors with long-lasting social, economic, and environmental impacts. Project managers possess leadership and collaboration skills to boost project management. According to the Project Management Institute, a project is defined as a brief endeavor that produces a special product, service, or outcome.

2.1. Project success

Project success is a complex and multidimensional concept that depends on the perception and perspective of stakeholders. There is no universally accepted definition of "absolute success" in project management, and the measure of success is likely to change over time. Over one third of projects fail to meet their objectives, making understanding and obtaining information about the surrounding environment essential for identifying promising opportunities. Success means different things to different people, encompassing aspects such as aesthetic appearance, technical proficiency, adherence to budgetary constrains, and employee satisfaction. The concept of success is ambiguous, inclusive, and multidimensional, with definitions linked to specific contexts. For instance, [1] proposed a model categorizing success factors into five dimensions, including the "iron triangle" criteria (time, cost, and scope) alongside stakeholder satisfaction, project impact, organizational benefits, project efficiency, and future potential. Furthermore, [2] distinguished project factors into internal and external categories, highlighting the critical role of project managers in integrating external influences to enhance project success.

2.1.1. Financial success of the project

Project financial performance is the overall cost performance of production and transactions, minimizing planned costs. It can be measured using various criteria and can be obtained from existing projects or budgets. Cost control involves determining if an accounting code structure was developed during the planning phase, which facilitates the systematic recording and organizing of cost-supporting documents. Once established, this framework provides a basis for allocating costs to specific activities, enabling the calculation of actual costs and their comparison with budgeted figures. Deviations can be positive or negative, indicating good cost control or weak control.[1] Deviations are calculated from accounting records but do not provide information about the causes of deviations, making it necessary to include this information in progress reports. Financial performance measures indicate whether the implementation and execution of a company's strategy are contributing to improving results [3]. However, measuring financial performance poses unique challenges, as there is little consensus on which measurement variable to apply. Market measures report historical performance data, whereas accounting-based measures focus on future-oriented information. Market measures are less susceptible to different accounting procedures and represent the assessment of a company's ability to manage and control resources effectively.

2.1.2. Critical project success factors

Critical success factors (CSFs) play a vital role in ensuring project success by enabling the effective allocation of scarce resources to controllable aspects of a project. However, there is significant debate and inconsistency regarding the definition, terminology, and prioritization of these factors. The challenge of identifying CSFs persists due to the complexities of executing projects in a global, dynamic, and continuously evolving market environment. Early research concentrated more on factors that led to project failures, such as poor project manager selection, inadequate planning, and a lack of

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[1] MWOTAJI: Making women's options for HIV prevention in Tanzania accessible, and joining implementation science capacity building. 2023. Health for a Prosperous Nation (HPON). URL: https://hpon.or.tz/mwotaji-3/

top-level management support. It has been proposed that the best way to enhance project performance is to replicate important project success elements in new projects. The idea of CSFs has changed throughout time. According to [4], these are the goals or aspects of business management that require heightened attention to ensure the success of projects and organizations. The following factors were identified by [5] as critical to project success: political stability; prior experience with methodology and tools; environmental influences; knowledge gained from previous experiences; project size, duration, complexity; and diverse team perspectives. Additionally, success is influenced by the availability of sufficient resources; effective leadership; advanced technology; realistic schedules; controlled risks; sponsor requirements; organizational adaptation; supplier performance; acceptance of failure; provisions for testing; and political stability.

2.2. Factors influencing project success

The success criteria for a project should not be defined from the beginning but include factors that influence its success. These factors must be identified and incorporated in a timely manner throughout the project life cycle. The [6] recommends selecting appropriate processes within process management groups to meet project objectives, adapt product specifications and plans, comply with requirements, and balance competitive demands related to scope, deadline, cost, quality, resources, and risk. Success and failures factors in management projects can be classified into five groups: project, manager, team, organization, and environment. A project is considered a failure if the final results do not meet expectations, even if the original expectations were reasonable. Stakeholders' perspectives on success criteria also play a role in project success. Project managers measure success by meeting deadlines, budgets, and objectives, while the project team considers personal satisfaction and career development as important factors. Consumers focus on primary deliverables, viewing internal organizational benefits as secondary. Meeting approximately 85% of a project's requirements is often sufficient to consider it successful. Identifying the key and secondary success elements

aids in risk decision-making and helps project managers create plans for risk management [7]. These factors provide project managers with opportunities to adjust success variables to increase the likelihood of achieving desired outcomes [8]. Team-member exchanges (TMX), encompassing team cooperation, knowledge sharing, and empowerment, are integral to effective project management. These three components collectively contribute to the successful execution of projects and enhance overall organizational performance.

2.2.1. Empowerment

A leadership idea known as empowerment encourages people or teams to make decisions on their own and share knowledge with one another. This approach has gained increasing importance in today's complex work environment, where project managers face challenges such as resource limitations, globalization, and rapidly advancing technologies. Employee participation in empowerment programs increases their autonomy and commitment to the job. It is characterized by the distribution of authority among project managers and might be called formal leadership or staff leadership. Empowerment programs are more effective than typical hierarchical systems in terms of motivating workers since they improve their effectiveness, psychological health, and sense of their own competence, independence, and experience.

2.2.2. Autonomy

Employee autonomy refers to their ability to organize and decide how best to carry out their jobs. It is essential to project management because it enables managers to act quickly to address team requirements and make choices [9]. Autonomy plays a pivotal role in effective leadership, facilitating timely outcomes and fostering accountability within teams. Work autonomy within a project team allows members to share decision making power regarding techniques, goals, and work sequences. People's urge to feel in charge of their actions is linked to their demand for autonomy. Project autonomy may be classified into four categories: resource autonomy, social autonomy, goal definition, and structural autonomy [10]. While training is crucial for quick development, shared decision making fosters the autonomy necessary for co-

hesive teamwork. To sum up, project team autonomy improves project agility across all project kinds.

2.2.3. Team Accountability

Team accountability is the responsibility of a project team to meet performance criteria such as deadlines, costs, quality, customer needs, and information sharing. Resources are allocated to projects in exchange for expected results, with management mechanisms such as planning, support, and communication ensuring optimal use. Support from management fosters an innovative climate, strategic vision, and clear priorities, while customer collaboration is crucial for project quality.[2] Efficient practices lead to high-quality results, minimizing use of resources and time, resulting in project completion on time and within budget. Integration of project management processes includes unification, consolidation, communication, and interrelationship. Efficient project teams meet stakeholders' expectations, achieving higher levels of efficiency and effectiveness in design [11]. This leads to better project success ratings, and satisfaction from customers, investors, and project teams.

2.2.4. Collaboration between team member exchanges (TMX- Team member exchange)

Team member exchange (TMX) is a method of measuring reciprocity between team member exchanges. It involves a member's perception of the quality of exchange, including ideas, feedback, and assistance [12]. This exchange can lead to better interaction, knowledge sharing, work performance, organizational commitment, and job satisfaction. By improving TMX, negative effects associated with low conscientiousness or interpersonal conflict can be mitigated, fostering creativity and positively influencing both individual tasks and overall team productivity [13]. Therefore, the quality of exchanges among team members plays a crucial role in enhancing overall organizational performance.

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[2] Implementing personalized cross-sector transitional care management to promote care continuity, reduce low value utilization, and reduce the burden of treatment for high-need, high-cost patients. Agency for Healthcare Research and Quality. 2021. URL: https://digital.ahrq.gov/ahrq-funded-projects/implementing-personalized-cross-sector-transitional-care-management-promote

2.2.5. Knowledge management

Knowledge management involves activities focused on acquiring knowledge from experience and from others to fulfill an organization's mission. It involves systematic, explicit, and deliberate application of knowledge to maximize efficiency and knowledge creation. [14] identifies five key dimensions of knowledge management: identification, creation, storage, sharing, and validation. This work focuses on the "knowledge sharing" dimension.

2.2.5.1. Knowledge sharing

Knowledge sharing is crucial for environmental management, improving performance and fostering idea generation. However, obstacles exist, especially in large multinational companies and complex product development teams. Effective knowledge life cycle management can facilitate efficient knowledge sharing within organizations and project teams [15]. High knowledge quality can lead to better performance, innovative products, increased sales, and cost reduction. Knowledge quality can be categorized into intrinsic, contextual, and actionable dimensions. Intrinsic knowledge is precise, reliable, and timely, contextual knowledge is relevant and valuable, and actionable knowledge is adaptable, expandable, and easily applied to tasks, demonstrating its usefulness and profitability.

2.3. Deduction of research hypotheses and conceptual model design

The literature review reveals that project success is directly influenced by empowerment, autonomy, and team accountability. Knowledge sharing and collaboration among team members exchanges are key determinants of project success [16]. Autonomy permits business managers to create effective work strategies and reimburse for knowledge gaps, while knowledge sharing is essential for greater autonomy. Based on these insights, the study aims to analyze the following research hypothesis:

H1: Autonomy positively influences knowledge sharing.

Project teams with work autonomy have less accountability and motivation as they are able to choose their own work procedures, goals, and hierarchy [17].

In order to lead effectively and encourage timely outcomes, autonomy is crucial. In project teams, autonomy enables members to share authority regarding techniques, goals, and work sequences, thereby facilitating responsiveness to diverse tasks across various projects. This leads to the following research hypothesis:

H2: Autonomy positively influences project success.

Individuals respond to complexity and problems in their work in different ways. Assigning accountability to project team members encourages them to overcome obstacles. A fundamental idea in human resource management is social autonomy [18], which is described in project management as the project manager's flexibility to direct team conduct and promote communication. Therefore, this study intends to analyze the following research hypothesis:

H3: Autonomy positively influences collaboration between team members exchanges.

Feedback from member exchanges within the project team improves mutual support, team cohesion, and expertise [19]. Employees can complete activities more quickly and effectively in a knowledge-sharing environment [20]. Additionally, this setting encourages effective use of the information at hand, which raises productivity levels all around. Therefore, this study aims to analyze the following research hypothesis:

H4: Knowledge sharing positively influences project success.

Organizations are encouraged to prioritize cooperation and adapt their work arrangements to facilitate knowledge exchange and collaboration among team members [21]. High- quality knowledge can lead to better performance, innovative products, increased sales, and cost reduction [22]. Learning from one another's experiences and encouraging a sense of togetherness among team members, promotes an open culture. Based on this, the following research hypothesis is proposed:

H5: Collaboration between team members exchanges positively influences team sharing knowledge.

Collaboration between members of a project team that have high-quality relationships fosters individual work output and team productivity [23]. Given its impact on team performance and the success of the project as a whole, this collaborative dynamic can significantly improve organizational performance, particularly in project settings. Accordingly, the following research hypothesis is proposed:

H6: Collaboration between team member exchanges positively influences project success.

The quality of exchanges among team members can enhance overall organizational performance. This process involves establishing meaningful connections with colleagues, responding effectively to customer needs, and organizing project tasks for optimal delivery [24]. This approach is essential for good interaction with customers and meeting the project manager's goals. Therefore, this study intends to analyze the following research hypothesis:

H7: Team accountability positively influences knowledge sharing.

Team accountability is the responsibility of a project team to meet performance criteria such as deadlines, costs, quality, customer needs, and information sharing. Project management helps organizations implement principles, practices, methodologies, tools, and techniques that may or may not determine project success [25]. Good practices in meeting performance criteria promote project success, while poor project management often contributes to project failures. In light of this, the study proposes the following research hypothesis:

H8: Team accountability positively influences project success.

Team effectiveness is a result of input, process, structure production, and coordinated action among team member exchanges. One critical mechanism driving team effectiveness is collaboration among team members with high-quality exchanges characterized by reciprocity and open communication [26]. Such collaboration is fundamental for enhancing team performance, meeting planned objectives, and improving individual contributions. Accordingly, the study seeks to examine the following research hypothesis:

H9: Team accountability positively influences collaboration between team member exchanges.

Based on the hypotheses derived from the literature review, a conceptual research model has been designed, as illustrated in *Fig. 1*.
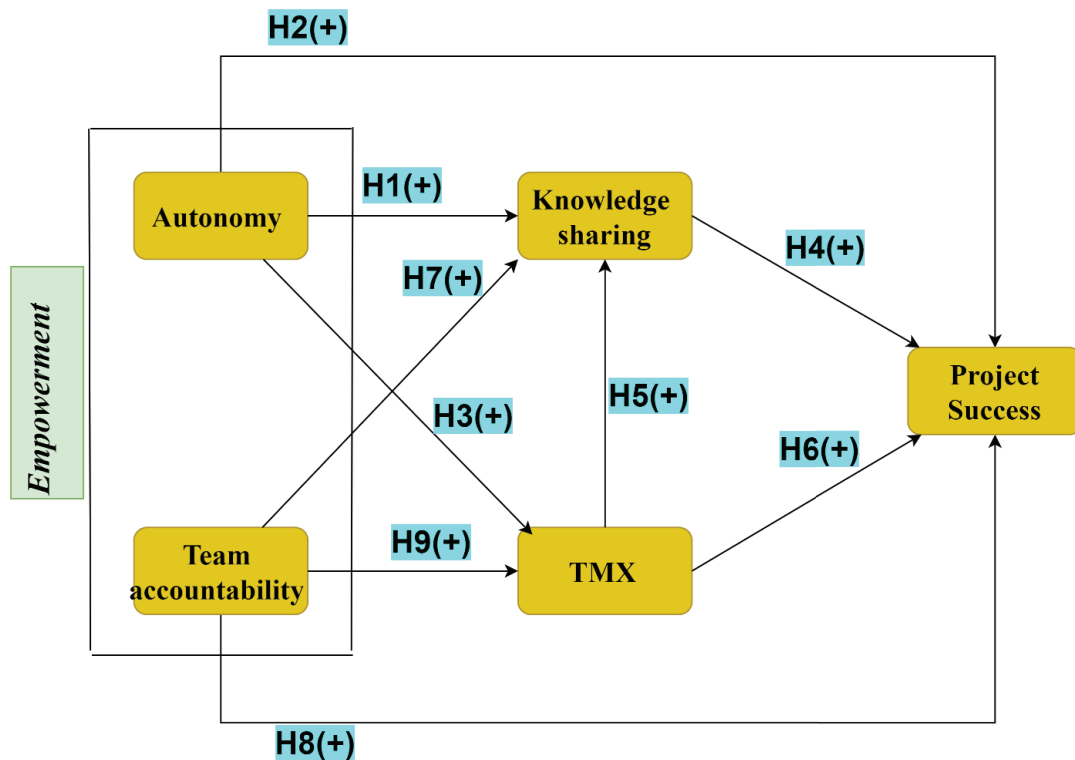
Fig. 1. **Proposed research model**

Source: compiled by the authors.

3. RESEARCH METHODS

3.1. Characterization of the study

This study uses the deductive method to analyze project management teams in the Sindh region, focusing on the integration of elements within the last six months. The research is confirmatory in nature, aiming to validate different alternatives and hypotheses. It adopts a cross-sectional causal design to provide insights into the problem under investigation. The study is classified as quantitative, as the data collected can be measured and analyzed statistically [27]. The target population was identified through a five-phase process, and data collection was conducted via email and LinkedIn, targeting companies in the Sindh region. Data collection took place in March and July 2021, despite the COVID-19 pandemic. A sample size of 228 participants was determined, ensuring the robustness required for statistical analysis with small samples. Strengths: The quantitative part of the research is well presented, with a survey of 228 Pakistani project managers. Responses were analyzed through the SPSS 25.0 and SMART PLS 4 software, allowing good statistical analysis. The results show a positive significant relationship among empowerment, collaboration, knowledge sharing, and project success, hence giving good insights into the best project management practices.

3.2. Instruments and procedures for data collection

A questionnaire was created using Google Forms to analyze and compare results from respondents. It consists of three parts: identifying companies, analyzing main variables, and characterizing respondents. The questionnaire aims to understand the company's purpose, size, number of projects, type, and duration for project management [28]. It also addresses variables like project success, empowerment, collaboration, and knowledge sharing. Data collection began by emailing a list of companies in the Sindh region and publicizing it online on LinkedIn. The questionnaire used nominal scales for the first and third parts and 7-point Likert scales for the second part.

3.3. Sociodemographic characterization of the sample

Data collection resulted in 228 valid observations from respondents who stated that they belonged to project teams. From the characterization of the sample presented in *Table* 1. 48 individuals (21.05%) were female and 180 individuals (78.95%) were identified as male. For the most part, responses were obtained from individuals aged 31 and 40 years of age (N = 96; 42.10%). The academic qualifications of individuals are distributed across five levels of education, where the majority of individuals have a master's degree (N = 98; 42.98%) as shown in *Table 1*. When we observed the seniority of individuals in the company, we found that 101 respondents (44.3%) remained in the company for 3 to 5 years. *Table 1* summarizes the sociodemographic profile of the analysis conducted in this investigation.

This study uses a deductive and confirmatory methodological approach, with a sample of 228 individuals, mostly male, aged 31–40, with a master's degree and 3–5 years of experience in their companies. The data collection methodology is presented, with a questionnaire chosen as the instrument. The questionnaire was designed with a simple layout, vocabulary, and size, following literature recommendations. The 7-point Likert scale was chosen to measure variables. The questionnaire was disseminated to companies in the Sindh region via email and LinkedIn. Data analysis and processing were performed using SPSS 25 and SMART PLS 4.

4. RESULTS AND DISCUSSION

In the first phase, the study assessed the consistency and validity of the measurement model by analyz-

Table 1

Sociodemographic characterization of the sample

Sociodemographic characteristics	Frequency	Percentage
Gender		
Female	48	21.05%
Male	180	78.95%
Age		
Less than 30 years old	85	37.28%
Between 31 and 40 years old	96	42.10%
Between 41 and 50 years old	34	14.91%
Between 51 and 60 years old	13	5.70%
Academic qualifications		
Basic education	0	0.00%
High school	11	4.82%
Graduation	87	38.16%
Master's degree	98	42.98%
Ph.D	32	14.04%
Experience at the company		
Less than 2 years	81	35.53%
Between 3 to 5 years	101	44.3%
Between 6 to 10 years	34	14.9%
More than 10 years	12	5.26%

Source: compiled by the authors.

ing the multicollinearity of various items and interpreting the results obtained. In the second phase, the structural equation model was estimated using SMART PLS 4. Finally, the results were interpreted and discussed, providing a critical analysis of the factors influencing project success.

4.1. Analysis of multicollinearity

Following the characterization of the sample, a descriptive analysis was conducted on the indicators of the measured variables. In this way, the mean and standard deviation of the responses were obtained, taking into account the use of a 7-point Likert scale (*Table 2*). From *Table 2*, the following average values of the items that make up each variable can be observed: Project Success with Average (M) = 6.05; Collaboration between team member exchanges M 6.04; Knowledge sharing M 5.99; Empowerment M 6.09. Therefore, the highest averages are considered to refer to items that measure characteristics of empowerment. Analyzing in greater detail, the highest average is found in item 11 "We seek to understand the customer's needs" when registering an average of 6.22, followed by item 14 "Working as a team" with an average of 6.15, and item 5 "There is a clear understanding of the roles and responsibilities of each employee" with an average of 6.14. From the previous table, it was analyzed that knowledge sharing has average values of its items, which leads to the consideration that there may not be high levels of sharing of knowledge in the project teams analyzed.

In a preliminary analysis, it is important to analyze multicollinearity through analysis of the value of the VIF (Variance Inflation Factor) coefficient. This VIF value checks whether a given item presents a correlation with the other items that make up the model, avoiding thus biases caused by the existence of multicollinearity. In this sense, they must all questions with VIF values greater than 5 must be eliminated. In this follow-up, all items that presented values of VIF above 5. As a result, *Table 2* presents the VIF values and it can be seen that the items under study meet the criteria proposed by the literature (VIF < 5) and that there will be no analysis problems arising from the existence of multicollinearity.

4.2. Study of the consistency and validity of the measurement model

To study the validity of the measurement model, the average variance extracted indicator was used (AVE), through which it is possible to verify to what extent, each of the items of each concept relates to the remaining items of the concept. In this form, it is understood that, from the moment in which the values of the average variance extracted exceed the minimum value of 0.5, the various items that are associated with each other and the construct present convergent validity. Following the thought described, it can be seen in *Table 3* that all constructs in the investigation have convergent validity since they are above the threshold value of 0.5.

The study analyzed the internal consistency of factors using a composite reliability index, which measures the relationship between items used to measure a concept. Composite reliability values range from 0 to 1, with an acceptable level of reliability suggested at 0.7. All constructs have values above 0.7. The alpha coefficient of Cronbach is used to verify the reliability of the concepts, with values above 0.7 indicating reasonable reliability. The study's constructs have alpha Cronbach scores ranging between 0.739 and 0.882. The discriminant validity (*Table 4*) verification aims to understand the difference between the questions used to measure a given concept or construct from other questions that measure other constructs. This is done using Fornell's criterion and Larker's criterion, which compares the square roots of the AVE values of each construct with the correlations between concepts or latent variables. The matrix of correlations presents the connections between different concepts, with the square roots of the AVEs superior to inter-construct correlations.

In the analysis carried out on the validity and reliability of the measurement model, it is considered that the concepts under analysis verify the assumptions to consider that the measures used are valid and reliable so that it is possible to estimate the structural model and, in this way, carry out the test of hypotheses under study.

4.3. Structural model estimation results

The study used SMART PLS 4 software to estimate the measurement model and evaluate the determi-

VIF values of the adjusted model

Variable	Question	Items	VIF	Mean	Standard Deviation
Project success	1	In general, projects that were economically successful	1.360	6.12	0.607
	2	The projects were completed within the initially scheduled deadlines	1.210	6.08	0.571
	3	The initially planned budgets were not exceeded	1.537	5.95	0.666
	4	Projects usually have a positive return on investment	1.321	5.96	0.609
	5	The project deliverables were of high quality and met the required standards.	1.431	6.14	0.748
Autonomy	1	There is a clear understanding of the roles and responsibilities of each employee	1.332	6.02	0.697
	2	Communication is open between team member exchanges.	1.231	6.00	0.786
	3	There is standardization of work to reduce rework in project documentation	1.455	6.13	0.697
	4	Policies and procedures are documented.	1.696	6.10	0.623
	5	Researching ways to improve customer service	1.672	6.10	0.673
Team Accountability	1	All members actively participate	2.062	6.22	0.68
	2	There is easy access to information for all workers	1.530	6.14	0.579
	3	Each team member was clear about their responsibilities and roles within the project	1.32	6.10	0.596
	4	Team members communicated effectively with each other throughout the project	1.54	6.15	0.538
	5	Team members managed their tasks and deliverables effectively	1.631	6.09	0.604
Collaboration between team members exchanges	1	Team member exchanges often ask their colleagues for help	1.524	6.02	0.743
	2	Team member exchanges often offer extra help to their colleagues	2.063	6.08	0.743
	3	Team member exchanges are willing to complete the work assigned to their colleagues	2.181	6.09	0.52
	4	Team members communicate effectively with each other to achieve project goals	1.376	6.11	0.628
	5	Team members trust each other to deliver high-quality work	1.547	6.01	0.715
Knowledge Sharing	1	The company has procedures for sharing experiences	2.372	5.94	0.677
	2	The company promotes the distribution of information to business partners	2.193	6.01	0.679
	3	Disclosure of information is carried out in a uniform manner	2.162	5.99	0.748
	4	In all activities, the company seeks to share information	2.655	5.94	0.757
	5	I share my work-related skills and expertise with my colleagues when they ask for it	2.212	5.98	0.764

Source: compiled by the authors.

nation coefficients of Pearson (R^2) to understand the causal relationship between variables (*Fig. 2*). The R^2 values must be greater than 0.2 to indicate a strong relationship, and greater than 0.1 to avoid a scarcity of information.

The study-dependent latent variables, Knowledge Sharing, Collaboration between team member exchanges (TMX), and Project Success, all have values above 0.1, indicating a strong relationship. The significance of the statistical relationships of

Table 3

Average Variance Extracted (AVE), Composite Reliability & Cronbach's alpha coefficient Values

Construct	(AVE)	Composite reliability	Cronbach's alpha
Autonomy	0.651	0.849	0.783
Knowledge sharing	0.745	0.935	0.882
Project Success	0.534	0.856	0.739
TMX	0.751	0.855	0.815
Team accountability	0.676	0.849	0.873

Source: compiled by the authors.

Table 4

Discriminant Validity

Construct	Autonomy	Knowledge sharing	Project Success	TMX	Team accountability
Autonomy	0.829	–	–	–	–
Knowledge sharing	0.639	0.879	–	–	–
Project Success	0.543	0.502	0.768	–	–
TMX	0.451	0.736	0.456	0.841	–
Team accountability	0.467	0.742	0.434	0.788	0.836

Source: compiled by the authors.

each coefficient was determined using bootstrapping resampling with 5000 samples. The t-values of the standardized path coefficients (Std β) associated with R^2 indicate the statistical probability of confirmation or rejection of hypotheses, with t-values equal to or greater than 1.96, as a minimum confidence level of 95% is used.

From the analysis of *Table 5*, it appears that from testing the 9 hypotheses that the investigation proposes to study, 6 hypotheses are corroborated (H1, H2, H5, H7, and H9) as they present t-value equal to or greater than 1.96, which indicates that they are statistically relevant, and the remaining hypotheses tested were not corroborated by the present research.

4.4. Discussion of Results

The study investigates the factors influencing project success through a critical discussion. Hypothesis H1 suggests that project managers intervene in organizations to ensure that those involved understand and take ownership of project structure elements. Trust, fairness, leadership style, and empowerment are important in the role of the project leader, as they positively influence knowledge sharing, fairness, and empowerment.

Hypothesis H2 confirms that autonomy positively influences project success, as it is an independent action by individuals or teams to bring an idea to completion. However, hypothesis H3 does not obtain statistical support, as tasks assigned individually by the project manager may result in little collaboration between team members exchanges.

Hypothesis H4 does not obtain statistical support, possibly due to the focus on project success as economic success rather than financial success. High quality knowledge sharing can lead to better performance, innovative products and processes, increased sales, and reduced costs.

Hypothesis H7 validates hypothesis H7, as employees who receive empowerment from the project manager report having the opportunity to discuss
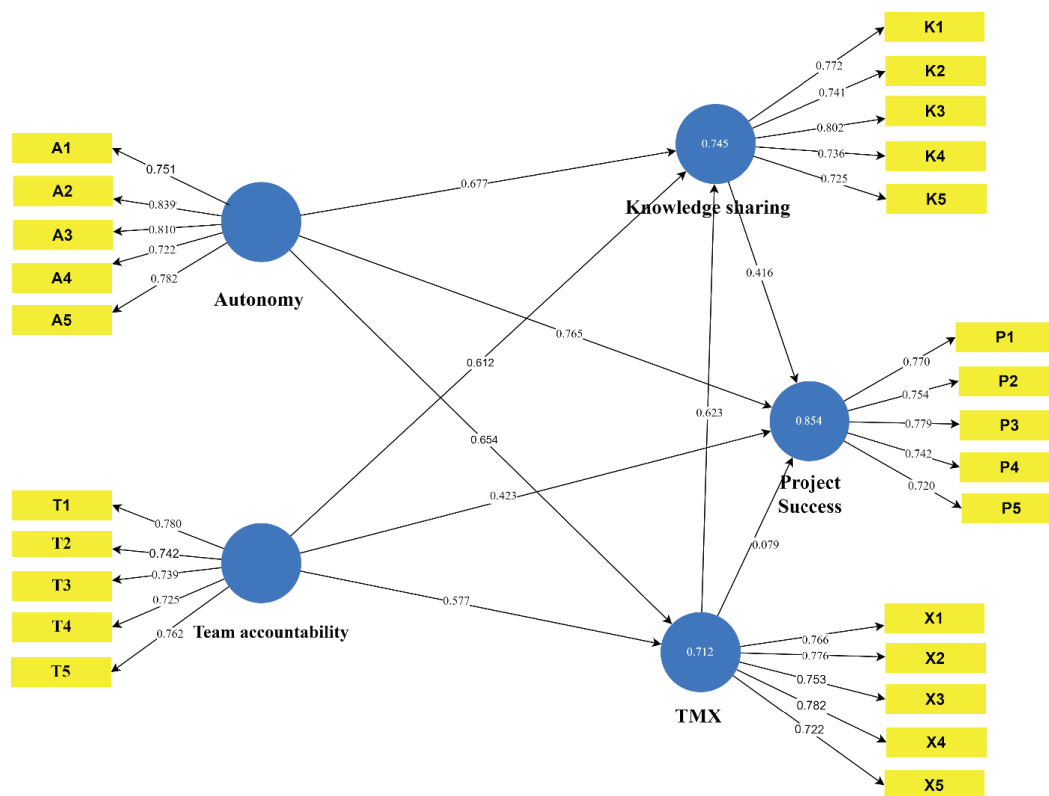
Fig. 2. **Structural model- Structural coefficients and Rˢ values**

Source: compiled by the author.

problems with their managers and influence decisions made by their organizations.

Hypothesis H8 tests whether team accountability positively influences the success of the project. Overall, the study found that collaboration between team members exchanges positively influences knowledge sharing and project success. Group membership is crucial for fostering social identity and collaboration within a group.

The results of this study bring out a number of interesting differences between the research model proposed and the structural model pointing to areas where the model can be refined. Most importantly, the fact that a revised model does not overrun originally planned budgets does not serve as a definition of a successful project, indicating the need for a better definition of what constitutes success. Also, from a theoretical point of view, the exclusion of empowerment and project success from the structural model points to the incompleteness of the model itself. These results indicate that future research should focus on explicitly justifying the elements of the

model, rigorously testing theoretical frameworks, and examining the role of empowerment in project success. Addressing these gaps will aid in the development of more robust models that capture the complex interactions between budget management, empowerment, and project outcomes.

5. CONCLUSIONS

The study explores the impact of knowledge sharing on project success, focusing on empowerment, autonomy, team accountability, and collaboration. It found that autonomy and collaboration positively influence knowledge sharing, while collaboration is crucial for maintaining team unity and increasing project success in terms of cost, deadline, quality, and customer satisfaction. The study also found a positive relationship between collaboration and employee performance. The autonomy of project team member exchanges significantly influences project success and knowledge sharing. Team accountability is also crucial for knowledge

Hypothesis test result

Hypothesis	Relationship	Std β	T-Value	P-Value	Validation
H1	Autonomy -> Knowledge sharing	0.129	3.131	0.01	Validated
H2	Autonomy -> Project Success	0.115	2.485	0.010	Validated
H3	Autonomy -> TMX	0.080	1.505	0.108	Not Validated
H4	Knowledge sharing -> Project Success	0.240	0.360	0.795	Not Validated
H5	TMX -> Knowledge sharing	0.120	2.471	0.010	Validated
H6	TMX -> Project Success	0.125	1.715	0.070	Not Validated
H7	Team accountability -> Knowledge sharing	0.116	2.527	0.015	Validated
H8	Team accountability -> Project Success	0.144	0.080	0.944	Not Validated
H9	Team accountability -> TMX	0.064	9.364	0.000	Validated

Source: compiled by the authors.

sharing and collaboration. The study suggests that companies that promote employee autonomy in project team member exchanges are more successful in their projects. The responsibility of project teams influences collaboration and knowledge sharing, allowing for increased organizational knowledge.

The study emphasizes the importance of a project manager with a defined leadership style to shape their team and promote personal growth. Companies should focus on developing specific behavioral trends and styles among business managers to achieve project success. Further investigation into factors influencing project success is also essential.

5.1. Limitations and suggestions for future work

This study has limitations, including a small sample size and non-probabilistic convenience, which requires caution when drawing conclusions from the general population. The data was collected in a single moment and at the same source, posing a risk of contamination due to common method variance. For future research, it is recommended to conduct a larger study with a larger number of respondents, conduct the study in more sectors and countries, and include other critical factors of success in mediating variables like emotional intelligence and project leadership. Deepening the definition of the project,

segmenting it for simple and complex projects, and separating public and private companies in the sample definition are also suggested. Additionally, case studies and pilot projects in companies with the concepts evaluated in this work can provide real tests that highlight the difficulties faced by projects, making more relevant information available to organizations. This will help to improve the understanding of project management and its impact on success.

5.2. Originality of the Solution to the Problem

An integrative approach has been adopted for the study, considering not only the concept of empowerment in isolation but also its interaction with collaboration and knowledge sharing. This multidimensional perspective is relatively underexplored in the literature, which often treats these concepts independently. In this research, these elements are interconnected to offer a novel framework for understanding their collective impact on project success. The study's contextual focus on Pakistani project managers provides insights that are particularly relevant to a region where project management practices may differ from those in Western contexts. The localized focus adds originality because it creates awareness about the unique cultural and organizational factors that influence team empowerment and

collaboration. The strong empirical methodology and advanced statistical analysis, using SPSS 25.0 and SMART PLS 4 respectively, on responses from 228 respondents, provide concrete evidence in support of the hypotheses formulated. The empirical findings provide strong evidence in support of the proposed hypotheses, distinguishing this study from theoretical discussions that lack empirical valida-

tion. In conclusion, the novelty of this research lies in its integrative approach, contextual relevance, empirical validation, contribution to filling existing gaps in the literature, and practical implications for project management practices. The study also highlights significant gaps in current knowledge regarding how empowerment drives project success through collaboration and knowledge sharing.

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ABOUT THE AUTHORS

Shah Mehmood Wagan — PhD Student of Management Science & Engineering, Business School, Sichuan University, Chengdu, Sichuan, China
https://orcid.org/0009-0003-0449-2655
Corresponding author:
shah.mehmood04@outlook.com

Sidra Sidra — Master Student of Engineering Management, Business School, Sichuan University, Chengdu, Sichuan, China
https://orcid.org/0009-0003-1689-3296
sidra_scu@outlook.com

Mohammad Mesba Ul Hoque — Master Student of Engineering Management, Business School, Sichuan University, Chengdu, Sichuan, China
https://orcid.org/0009-0006-0113-8644
mesbahoque@stu.scu.edu.cn

Authors' declared contribution:
Shah Mehmood Wagan — conceptualized and led the design of the current research study. Performed statistical data analysis using SPSS 25.0 and SMART PLS 4. Crafted the manuscript and coordinated final revisions based on comments from contributing authors.
Sidra Sidra — contributed to the literature review and the theoretical framework of the study. Contributed to the data collection by distributing questionnaires among the project managers. Provided critical insights into the drafting and editing of the manuscript.
Mohammad Mesba Ul Hoque — contributed to the development and the implementation of the research design was done. Participated in result discussion and implication for Project Management. Read the final manuscript, ensuring clarity and coherence of presentation.

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Hyperlocal Marketing: Conceptual Representation Status, Technological Foundations and Directions of Development

E.V. Griva, A.A. Sidorov

Tomsk State University of Control Systems and Radioelectronics (TUSUR), Tomsk, Russia

ABSTRACT

Hyperlocal marketing is a modern format of interacting with customers in the offline segment of retail and services, aimed at increasing sales by optimising strategies for promoting specific products. In conditions of market saturation, traditional marketing methods become less effective, so the use of new approaches allows companies to attract customers on a point-to-point basis and adapt their offers to specific locations and audience needs. Over the past decade, interest in hyperlocal marketing as a business development tool has grown in Russia, and at the same time it has become almost entirely expressed exclusively in practical terms. Its scientific implementation has not yet been recorded.
The purpose of this study is to systematise the existing concepts and technologies in the field of hyperlocal marketing in order to identify its current state and prospects for development. Within the framework of the defined vector, both the technological prerequisites and requirements of this tool for ensuring the basic process in the field of offline retailing are considered, and an empirical basis for the inductive-deductive analysis of the subject field for the formation of patterns of consumer behaviour management and optimisation of the marketing policy of business agents is formed. In the course of the work, it was found that hyperlocal marketing in retail is highly dependent on the development of the Internet of Things (IoT). The use of such technologies can improve customer interaction, increase service levels and predict consumer behaviour patterns. Based on the considered instrumental and technological solutions discussed above, companies are able to create personalised marketing strategies and optimise business processes to maximise profits.
Keywords: hyperlocal marketing; Wi-Fi radar; retail; hyperlocal targeting; data analysis; Wi-Fi marketing

INTRODUCTION

Hyperlocal marketing in retail is a tool that allows for the most accurate and personalised communication with consumers in specific, rather limited geographical spaces. It is based on the use of data on customers' location, their behavioural characteristics and preferences and is aimed at creating unique and relevant marketing offers.

Unambiguous definition of the term 'hyperlocal marketing' still is not available in Russian sources. Never the less, it usually describes a kind of marketing aimed at attracting potential customers from a limited area, usually within a radius of several kilometres from the business location [1–2]. In foreign literature, hyperlocal refers to a form of targeted and niche marketing aimed at consumers in a specific neighbourhood, city or even a specific building [3–4]. Despite a larger number of international research works compared to domestic ones, the designated problematics beyond Russia is covered very fragmentarily. The reason is that consideration of hyperlocal marketing began relatively recently, only in the last decade, however, at the same time, currently, a number of companies have already successfully used in practice the relevant tools.[1]

Hyperlocal marketing is becoming increasingly important in the light of development of the Internet of Things (IoT) and emergence of a number of innovative technologies such as global navigation systems, Wi-Fi radars, mobile applications and geomarketing platforms that allow retailers not only to locate their customers, but also analyse their behaviour, preferences and shopping habits in real time [5]. French scientists G. Cliquet and J. Baray explained the way this type of marketing develops along with the emergence and rapid

widespread of smartphones [6].

The scientific study of hyperlocal marketing in retailing is important for understanding its impact on consumer buying behaviour, effectiveness of marketing campaigns, improvement of customer service, as well as development of new methods of market analysis and demand forecasting. In light of a highly competitive retail environment, where customers expect personalised offers and high levels of service, hyperlocal marketing constitutes an important mechanism to meet the demands of the target audience [7]. The given study is aimed to increase knowledge of the impact of existing technologies in the field on consumer behaviour, optimise marketing strategies and develop solutions to elaborate retail and service performance.

A deep understanding of hyperlocal marketing could lead to more effective forecasting and adaptation to changes in the market, which becomes an important aspect of successful development. Besides, the use of hyperlocal marketing in retail might help increase conversion and customer loyalty through a more accurate and personalised approach to the audience.

TECHNOLOGIES OF HYPERLOCAL MARKETING
Wi-Fi-marketing

Wi-Fi marketing is a tool that uses active Wi-Fi radar technology to attract consumers and increase sales. It allows retailers to provide their customers with access to the Internet and, accordingly, connect with them through various communication practices (e. g., through messages in mobile applications, e-mail newsletters, push-enabled notifications, etc.). [8]. Wi-Fi marketing enables companies to effectively use Wi-Fi networks to collect data about visitors, their preferences and behaviour, which in turn helps to create personalised marketing campaigns and improve service. A key element of Wi-Fi marketing is

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[1] Hyperlocal targeting. Hunch. URL: https://www.hunchads.com/solutions/hyperlocal-targeting (accessed on 23.06.2024); Hyperlocal Targeting. Consumer Intelligence Group. URL: https://consumerig.com/hyperlocal-targeting-and-retargeting/ (accessed on 24.06.2024).

active Wi-Fi radars, through which there is constant interaction with customers' devices. This enables businesses to collect customer data, analyse customer behaviour, make per-

All methods of hyperlocal targeting contribute to increasing the effectiveness of advertising campaigns, improving customer interaction and increasing conversion [10]. This is of especial importance in a high-competition environment: since personalisation and relevance become key factors of marketing success.

sonalised offers and recommendations.

According to the data of research, more than half of the customers prefer to stay longer in entities, or premises, which open up for visitors a free access to guest Wi-Fi without password. In the meanwhile, these customers do not mind, that they provide their personal data for the access to the internet potentially used for targeted marketing, which in the final analysis will bring financial opportunities to all parties involved. It is interesting to note that the same people are also the ones who are most likely to make a profit from the business activities in the end [8]. Businesses have the opportunity to consider which information they would like to collect, meanwhile customers may choose what information they would like to reveal: e.g. phone number or email address [9].

There are a few methods to collect data for Wi-Fi marketing purposes:

• Registration for connecting to the Internet: during the process of connecting to the Wi-Fi network, customers are requested to provide their personal data (name, email address and phone number), which may be required for fu-

ture interaction.

• Analysis of user behaviour. Wi-Fi marketing can be used to collect information about how often customers use the Wi-Fi, how long they browse the internet and which websites they visit. This information could be useful for the feedback on the users' Internet activity and for identifying trends.

• Conducting surveys. Companies may provide visitors with the access to online surveys via their own Wi-Fi network. This would allow companies to collect additional data from their customers, including information about their browsing habits and preferences.

• Audience segmentation. Such information can be used to identify narrower sustainable groups based on online behaviour, age, gender, etc.

Currently, hyperlocal targeting is the primary method of Wi-Fi marketing. It allows companies to identify exact locations of potential customers and a method of targeting advertising efforts to their specific whereabouts. Excluding locations where the target audience is not present helps to optimise advertising budgets and focus on more promising locations and/or areas. Narrowing the distance by setting a radius around a shop or area allows marketologists to pinpoint which consumers are nearby and may be interested in the company's products or services. Key location queries synchronised with external data increase the relevance of advertising messages, provide a more precise accuracy in finding out the needs and interests of the target audience.

All methods of hyperlocal targeting contribute to increasing the effectiveness of advertising campaigns, improving customer interaction and increasing conversion [10]. This is of especial importance in a high-competition environment: since personalisation and relevance become key factors of marketing success.

Triangulation via Wi-Fi-radars
The principle of determination of the loca-

tion of a potential customer to whom a message should reach is the backbone for hyperlocal marketing. Undoubtedly, current businesses successfully use a variety of tools (provided by mapping services) that target advertising messages to specific users located in a certain area. The relevant tools detect location systems equipped with navigation devices, smartphones and tablets. However, due to lack or poor signal permeability through walls and ceilings of buildings, this method is not always effective. This poses a need for more reliable methods of positioning in closed spaces.

The technology of passive Wi-Fi radars is based on conventional Wi-Fi routers and the principles of triangulation. Triangulation by means of Wi-Fi routers makes an effective geolocation that utilizes Wi-Fi networks and is based on measuring the signal transmission time between hotspots and a device to determine the latter's location and the distance to it (see *Figure*) [11–12].

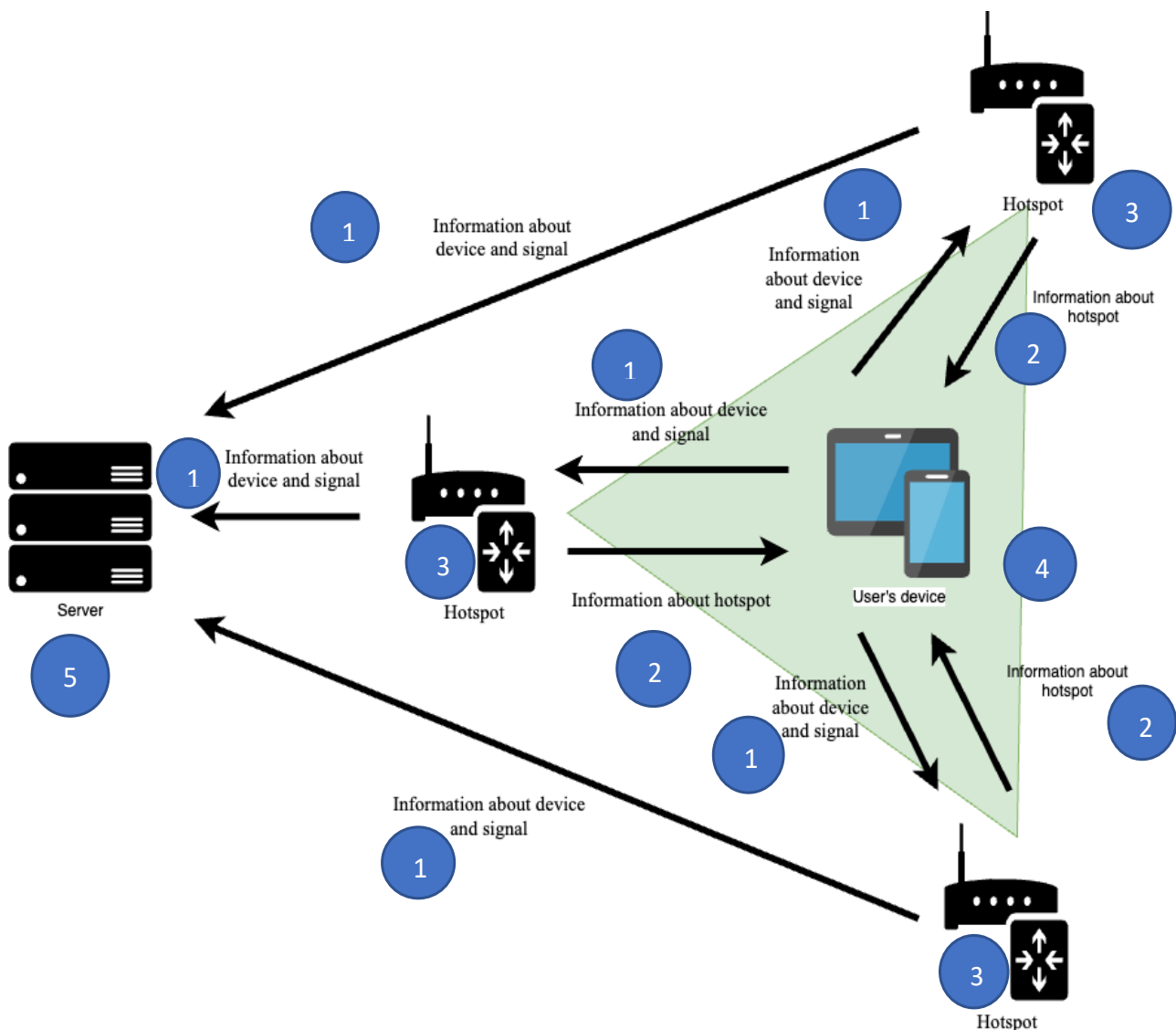To improve accuracy packet time stamping and phase comparison are used. Triangulation

Fig. **Triangulation via Wi-Fi routers**

Source: compiled by the authors.

works in areas where GPS signal is not available. The result depends on the density of hotspots, obstacles, and other environmental factors.

Involving the use of Wi-Fi router data to analyze human behavior and understand human habits can provide valuable information for businesses.

The main benefits of using triangulation via Wi-Fi routers include wide coverage and affordability. However, the following aspects must be taken into account [13]:

• the accuracy of the result depends on the density of access points in the vicinity of the clients' devices;

• precision can be reduced by influencing factors such as, for example, low number of radars or their distance from each other;

• Wi-Fi signal is susceptible to interference, but modern routers are adapted to this, the signal strength determines the proximity of the device to the hotspot;

• for correct positioning at least three Wi-Fi hotspots and their location information are needed;

• poor triangulation may occur with time delays due to multiple unconnected hotspots and slow Internet signal speed.

Wi-Fi triangulation technology requires accurate distances and signal strength to effectively establish device coordinates. Wi-Fi radar method can obtain information about a person, open up prospects for analyzing his or her behavior and habits even if he or she is not connected to a hotspot. Devices belonging to a specific person communicate with the Wi-Fi router even when there is no direct connection, due to non-stop network monitoring and router location detection to optimize data transmission.

Big data analytics and recommendation systems in retailing

Big data analytics in hyperlocal marketing is the process of extracting valuable insights from a broad spectrum of information generated through the use of the retail service technologies or spheres of services described above. As the massive amounts of data grows (on consumer purchases, transactions, social media interactions, and, what not, even on the weather) which are collected by companies, its processing and interpretation becomes increasingly complex and cannot be done manually [14]. This is why automated methods of information analysis play a key role in making effective management decisions, optimising business processes and improving customer satisfaction, which in combination becomes a

The active use of Big Data analysis and predictive analytics of information received from various devices will allow for more accurate demand forecasting and optimisation of inventory management, reducing both the risks of excessive stocks and shortage of goods

vital necessity for businesses.

One of such methods is demand forecasting. This method uses Big Data to analyse purchasing trends, consumer preferences, seasonal fluctuations of consumer activity, and other relevant factors, which helps retailers predict demand for specific goods and services [15]. It also contributes to retailers more information on optimised levels of inventory, as well as adjust discounts offered, develop marketing campaigns and, as a result, it increases business efficiency and satisfaction of target audience.

Corporations are able to evaluate data on consumer preferences and behaviours aiming to improve customer interactions and increase the probability of repeated purchases.

Companies can maximize profits by means of optimising price formation based on analysis of their competitive environment, demand, and other factors. Utilising sales, demand, and forecast information might enable retailers to adequately assess inventory and avoid surpluses and shortages. Analysing customer information could help create accurate profiles and improve marketing strategies.

Recommendation systems become one of the most common applications of Big Data analytics. They are a set of algorithms, programs and services which analyse user preferences and behaviour and try to predict what might be of interest for them. In retail sphere, this complex and multifaceted process is characterised by a number of peculiarities, which are carefully considered, so that retailers could effectively use information and make justified solutions, improve business processes and interact with consumers.

USE CASES OF HYPERLOCAL MARKETING

Targeted advertising

Targeted advertising in hyperlocal marketing is a special type of communication in the framework of which advertisings are deleivered only to users who are located within a certain radius of destination of the businesses or the objects of its interest. As understood traditionally by marketing experts, this type of advertising involves selecting a target audience based on demographics, interests, behaviour and other parameters, regardless of the physical location of the users. In contrast, hyperlocal targeted advertising includes an element of geographic affinity. It aims to embrace audiences that have definitely visited certain territories (zones) before, becoming more accurate and relevant to specific moments in time and place. This increases the effectiveness of advertising by taking into account both geographical and behavioural characteristics of consumers.

Typical business cases of its use in hyperlocal marketing can be considered in the following venues:

• café or restaurant adverts about menu, promotions and reviews, which is relevant for users in the neighborhood;

• shop or salon adverts with information about availability and prices for users looking for such products or services in a particular area;

• event adverts with information about the date, time and location of events for users interested in the topic and located in a particular area.

Thus, to set up targeted advertising in hyperlocal marketing it is necessary to use special tools and platforms that allow you to determine the geographical location of consumers and tune up the display of advertising correspondingly, however in addition to this criterion a few other criteria should be used [16]:

• the following socio-demographic characteristics should to be considered –

• gender, age, education, income, etc;

• interests should be taken into consideration — hobbies, pastimes, preferences, needs, etc;

• behaviour should be taken into account: visiting websites, watching videos, installing apps, buying products, etc;

• retargeting, which means to show adverts repeatedly to those who have already interacted dealing with a certain business or product.

A few prominent Russian and international business enterprises have already effectively employed hyperlocal targeting strategies, such as:

• Yandex.GO, a division of Yandex, which utilises this technology to display advertisements for promotion of its services during rush hours at train stations, airports and other locations, so that potential customers may require an instant and convenient means

of transportation or modes of food delivery. The advertisements contain information on the cost of services, waiting time spans and benefits of the service.[2]

• IKEA (Sweden) introduces in Russian areas with operating or soon-to-be opened shops the hyperlocal targeting system to focus on advertising of its products and services: product array characteristics, warranty conditions, information on how-to-assembly furniture, as well as delivery and other benefits of cooperation with the company.[3]

Customer identification in Wi-Fi networks
Customer identification over Wi-Fi is the process of confirming the identity of a user who connects to a free guest network in a public place such as a café, restaurant, hotel, shopping mall, etc. The corresponding identification, related to compliance with legal requirements regarding security and Internet access control, is also used for marketing purposes to collect customer data, analyse their behaviour and send them personalised offers and increase their loyalty.

To identify a customer via Wi-Fi in marketing, they use a special login page, where the following authorisation methods are offered:

• through social networks (VKontakte, Google, etc.), where the user authorises access to his/her profile or friends;

• via email, with address confirmation by means of a link;

• via text messages, by receiving a confirmation code;

• through the use of a voucher or, so-to-say, an identity document, as part of personalisation, when accessing Wi-Fi.

Here are a few examples of customer identification cases in Wi-Fi networks related to some strong business players:

• Starbucks coffee shop chain promotes its products and services within a specific location by means of advertising on the Wi-Fi-network login page through identification via email address. The advertisement contains information about new products, promotions, bonuses and loyalty programme. Besides, Starbucks collects data on attendance, session length, preferences and feedback from visitors.[4]

• Aeroflot, which identifies passengers by their ticket numbers, to provide access to onboard Wi-Fi during the flights. This makes it possible to control the quantity and quality of connected users and offer them additional services such as food ordering, entertainment, flight information, etc.[5]

In addition, having identified the customer, some businesses use triggers to attract his/her attention in the future. For example, a customer receives messages about short-term promotions and gets offers to visit a store or establishment when in a Wi-Fi coverage area.

Recommendation systems
Recommendation systems in retail are the systems that analyse data about customers' purchases, browsing, ratings and other actions in physical shops, so that they suggest products or services that may interest customers or meet their needs. In this way, offline retailing boosts customer satisfaction and loyalty as well as it increases average cheque and sales.

Such systems can be categorised according

[2] Right on targeting by audience segments.
URL: https://yandex.ru/adv/news/tochno-po-adresu-giperlokalnyy-targeting-po-segmentam-auditoriy (accessed on 01.07.2024).

[3] How IKEA evolved its consumer experience by integrating online and offline. iProspect.
URL: https://www.renascence.io/journal/how-ikea-uses-technology-to-improve-customer-experience-cx-in-retail (accessed on 01.07.2024).

[4] Starbucks Tests Wi-Fi Sign-Up That Asks For Email Addresses. Marketing Dive.
URL: https://www.marketingdive.com/news/starbucks-tests-wi-fi-sign-up-that-asks-for-email-addresses/519940/ (date of call: 01.07.2024).

[5] Information technologies of Aeroflot. TAdviser.
URL: https://www.tadviser.ru/a/435523 (date of call: 01.07.2024).

to the type of information collection and the channel of communication with the customer, i.e. to distinguish among them:

• systems that use information about purchases, views or evaluations (collected through reward cards, mobile applications, QR codes and other methods) that provide confirmation of users' identity. Recommendations can be delivered to consumers via text messages, push notifications, emails and other methods of communication channels;

• systems that operate on data from third-party sensors or devices, providing recommendations through digital screens, audio messages, interactive booths and other visualisation tools;

• systems that utilise information about a client's social networks, interests or personal characteristics collected through online profiles, surveys, games, etc.;

• systems that use information from third-party sensors or devices to provide recommendations through digital screens, audio messages, interactive stands and other visualisation tools.

Referrals can also come through personal advisors, bots, chat rooms and other means of communication.

Here are a few examples of offline-retail recommendation systems that are used by Russian and international companies:

• Recommendation system 'Vkusvill' is able to analyse customers' purchase histories, views, reviews or demand and it suggests products that may be of interest for them. The system uses information about other customers' purchases of the same or similar products to display video and text blocks on digital screens in the shop "Customers, who bought this product, also bought…" and "Some similar products you might like to buy…"[6]

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[6] Vkusvill Case: How to Increase Profits and Make Friends with Customers with the Help of a Recommender System. Retail.ru. URL: https://www.retail.ru/cases/dva-v-odnom-kak-s-pomoshchyu-rekomendatelnoy-sistemy-uvelichit-pribyl-i-podruzhitsya-s-pokupatelyami/ (accessed on 02.07.2024).

• IKEA's recommendation system analyses both data on social networks, interests and personal characteristics of customers collected through online profiles, surveys, games and other interaction methods, and information on the shopping locations, movement or even custom-

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The future of hyperlocal marketing is largely attributed to the rise of Internet of Things, by means of which retailers gain extensive data on customer behaviour and preferences, as well as their previous purchases and habits.

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ers' eye gaze directions (which products they focus their special visual attention), obtained by means of video cameras and sensors. The system offers recommendations through chatbots, digital screens, audio messages, interactive stands or other means of communication and visualisation [17].

However, along with the advantages described above, recommendation systems have a few disadvantages, such as problems of cold start, data sparsity, scalability, etc., which require constant attention and optimisation.

Smart staff allocation

Wi-Fi-radars help to improve staff performance. The company is able to assign employees to the areas where their special skills, experience and preferences will be most needed. This will allow the company to adapt to the dynamics of consumer demand and take into account the professional characteristics of each employee.

Optimising location for the staff by means of allocating employees according to the number of visitors in particular areas can increase customer loyalty, reduce the number of complaints

and increase conversion rates. Moving employees according to the customers' attendance or specifics of the working spaces boosts work efficiency, ensures labour safety and cleanliness [18]. Such activities help to reduce costs, increase staff motivation and improve customer service.

To implement smart staff allocation, companies resort to various technologies and methods, for example, special software that analyses data from Wi-Fi radars and other sources and eventually makes recommendations. Such systems are also used to monitor and evaluate the work of the workforce in order to provide feedback for encouragement, support, or, on the contrary, suggest penalties for inactivity.

DISCOURSE ANALYSIS

Hyperlocal marketing is a promising marketing trend for offline retailing. The findings of this study demonstrate that companies resort to a variety of technologies in order to analyse consumer behavior aiming to enhance the shopping experience and increase sales. In Russia, however, this marketing method has not yet achieved the same level of popularity compared to its traditional international counterparts. A vast majority of retail companies prefer to keep to traditional methods of marketing strategies due to scarce information on advantages of this novel approach, as well as due to lack of awareness regarding its underlying technologies. A short supply of clear and robust theoretical reflection in Russian academic circles furthermore hinders the discourse and integration of hyperlocal marketing strategies, which impedes capacity of business communities to enhance the efficacy of their marketing strategies.

Notably, foreign sources of information contain descriptions of technologies, ways and cases when hyperlocal marketing was implemented, however companies often conceal their developments in this area to sustain its competitive priorities. The development of artificial intelligence, machine learning and the Internet of Things speeds up the development of new solutions, such as cashierless shops. The potential of hyperlocal marketing is based

The results of this study are aimed not only to expand the understanding of hyperlocal marketing, but also to provide a basis for further research in this area, which opens up opportunities for improving marketing practices and developing innovative approaches in the retail segment.

on the influence such systems, as Internet of Things, data analytics, artificial intelligence, and development of mobile and smart technologies. Forecasting of this trend enables to obtain a more profound comprehension of its fundamental technologies and their impact on marketing trends.

It is also noteworthy that the proliferation of hyperlocal marketing may be hindered by the fact, that it is frequently misinterpreted as a form of relationship marketing.[7] While both methods aim to build long-term customer relationships, hyperlocal marketing is distinguished by its conceptual differences. It makes offers and promotions delivered to customers only when they are in close proximity to the business, increasing the possibility for immediate action. Furthermore, content can be

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[7] Relationship marketing is the management of building long-term mutually beneficial relationships with key partners which operate interactively in the market: customers, suppliers, distributors. The functioning of relationship marketing marked a shift in the marketing paradigm: the transition from thinking exclusively in terms of competition and conflicts towards the way of thinking in terms of interdependence and co-operation.

tailored to local conditions in real time, enhancing its relevance and appeal to the local population.

To accelerate the introduction of hyperlocal marketing it is advisable to implement new models, methods and algorithms aimed at improving the considered solutions. The options described above for using current technologies allowed the authors of the article to determine the vector of further research.

It was revealed that this topic is considered (albeit fragmentarily) by representatives of domestic professional community. The sources studied during the work contain similar hypotheses and note the accelerated development of artificial intelligence and online goods delivery services in retail [19–20]. This thesis is positioned as a starting point for further research in the field of hyperlocal marketing.

CONCLUSION

The future of hyperlocal marketing is largely attributed to the rise of Internet of Things, by means of which retailers gain extensive data on customer behaviour and preferences, as well as their previous purchases and habits. This enables to create customised and unique marketing strategies. Thanks to the Internet of Things, it becomes possible to arrange smart retail spaces that use various, Internet of Things-related devices to collect a proper data about users and optimise their shopping experience.

A significant influence on the development of hyperlocal marketing has become thanks to 'Wi-Fi radar' technology, which uses Wi-Fi signals to monitor the movement of people indoors, helping companies to improve customer interactions. By analysing data from smart devices and Internet of Things, it is possible to create digital twins of shops and customers and predict the latter's behaviour. Smart devices also help to optimise product assortment and marketing strategies, while information on customer movement in-store is used to improve service. These innovations have a huge potential to transform traditional marketing and retail management practices.

By analysing data from smart devices and Internet of Things, it is possible to create digital twins of shops and customers and predict the latter's behaviour.

Having studied the identified trends and existing tracks in hyperlocal marketing from the perspective of developing Internet of Things technologies, it is possible to talk about a very particular pin-point use of marketing strategies in the future. The results of the study indicate the possibilities of further in-depth analysis of the impact of Internet of Things on hyperlocal marketing and finding ways to improve the effectiveness of communication between retailers and customers. It is worth pointing out, that implementation of hyperlocal marketing technologies can significantly improve the efficiency of interaction with consumers through increasing their engagement and loyalty. This, in turn, will lead to increased sales and improved financial performance of companies. Moreover, the active use of Big Data analysis and predictive analytics of information received from various devices will allow for more accurate demand forecasting and optimisation of inventory management, reducing both the risks of excessive stocks and shortage of goods.

It is also important to note that investment in the development and implementation of personalised marketing strategies and smart technologies can lead to a long-term economic effect, which results into an increased return

on investment and business competitiveness. Thus, the results of this study are aimed not only to expand the understanding of hyperlocal marketing, but also to provide a basis for further research in this area, which opens up opportunities for improving marketing practices and developing innovative approaches in the retail segment.

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ABOUT THE AUTHORS
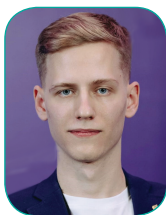
Egor V. Griva — Postgraduate student, Assistant of the Department of Data Processing Automation, Tomsk State University of Control Systems and Radioelectronics, Tomsk, Russia
https://orcid.org/0009-0008-3879-9416
Corresponding author:
egor.v.griva@tusur.ru

Anatoly A. Sidorov — Cand. Sci. (Econ.), Assoc. Prof., Head of the Department of Data Processing Automation, Tomsk State University of Control Systems and Radioelectronics, Tomsk, Russia
https://orcid.org/0000-0002-9236-3639

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