Unified digital information environment of the the food industry enterprises of Novosibirsk

Rozhdenstvenskaya L.N.
Novosibirsk State Technical University, NSTU
Novosibirsk, Russia
rogova@corp.nstu.ru

Rogova O.V.
Novosibirsk State Technical University, NSTU
Novosibirsk, Russia
rogova@corp.nstu.ru

Abstract — **The paper presents the prerequisites for creating a unified digital information environment that is necessary in the food industry to ensure decision-making management. The order of a unified digital information environment development focused on the food industry of the megalopolis on the example of the city of Novosibirsk is shown. The analysis of a single data base of food industry enterprises created by authors was carried out. The ranking of the main market operators according to the selected evaluation criteria in accordance with the current legislation has been completed. The proposed unified digital information environment may be interesting: executive authorities to improve the quality of ongoing and analytical activities, and the formation of a cluster of food industry enterprises implementing healthy nutrition, which can be considered as the basis for managing the rationalization of nutrition of the population outside the home. For representatives of commercial structures, the developed unified digital information environment can be recommended: marketing professionals to develop effective marketing and operational strategies to increase the number of potential consumers in the food industry; business owners to optimize the placement created and determine the prospects for the development of functioning enterprises of the food industry, to identify competitive advantages and assess their own competitive potential to study the dominant factors of the external environment of the enterprise; adjustments to the business processes of an enterprise taking into account the established criteria of competitiveness and the influence of determining factors.**

Keywords — digital economy, unified digital information environment, power industry

I. INTRODUCTION

Under the influence of digitalization, there is a significant transformation of various sectors of the Russian economy. There is a need to create and implement digital information environments that ensure optimal interaction of stakeholders: representatives of federal executive authorities, state and private companies, consumers, supervisory and control authorities, potential investors, etc.

Currently, the Russian Federation is implementing the Digital Economy of the Russian Federation program. The main goal of this program is: ".. the creation of the Russian Federation digital economy ecosystem, in which data in a digital form will be a key factor of production in all spheres of social and economic activity".

One of the levels of implementation of this program is the creation and development of information infrastructures in various areas of production. In this case, the information infrastructure means: "A system of organizational structure,

subsystems ensuring the functioning and development of the country information space of and means of information interaction". The program is aimed at improving competitiveness and creating optimal conditions for conducting high-tech business in various sectors of the economy of the Russian Federation [1].

In particular, information technologies are becoming increasingly important for the food industry, helping to develop a growing market and ensuring the accuracy of information for forecasting the dynamics of individual segments. The active development of such sectors as "restaurants without tables", food trucks and delivery services is associated with the desire to reduce the cost of the final product and motivates food industry enterprises to improve the quality of services provided in order to meet the requirements of end consumers [2-4].

This necessitates the formation of a technological space capable of implementing modern consumer standards. The nutrition of the population personalization, due to individual food characteristics, puts forward new requirements for digital technologies that ensure the production of food. The formation of an innovative type of reproduction required approaches to create a new organizational and economic mechanism for its regulation based on new intellectual products [5-6].

The food industry has historically performed a whole range of economic and social tasks. In modern conditions, in addition to solving the problem of ensuring the availability of food (economic and physical), enterprises face an acute challenge of fighting for the end user with the provision of unconditional guarantees of safety and quality of services provided [6-7].

The food industry is a fairly profitable and rapidly growing sector of the Russian economy: the number of enterprises in the food industry in the Russian Federation increased from 63,505 to 82,429 in the period from 2011 to 2017, that is, actually 1.3 times [8].

If we talk about federal districts, then, in particular, the turnover of food industry enterprises in the Novosibirsk region ranks first in the Siberian federal district Table 1 [9].

TABLE I.   FOOD INDUSTRY TURNOVER JANUARY - OCTOBER 2018

Category Name	Million rubles	
	reporting month	period from the beginning of the year
Siberian Federal District	13423.3	119619.5
Altai Republic	67.0	751.6

The Republic of Buryatia	974.3	8557.0
Tyva Republic	69.6	620.8
The Republic of Khakassia	441.5	4224.2
Altai region	959.7	7612.7
Transbaikal region	761.8	7224.6
Krasnoyarsk Region	2309.2	21117.2
Irkutsk Region	1418.0	12664.3
Kemerovo region	1851.0	15603.2
Novosibirsk Region	2589.2	21852.9
Omsk region	1227.9	12138.2
Tomsk region	754.1	7252.8

However, the presented statistics do not cover all enterprises of the food industry that exist on the market. This is due to the fact that enterprises are required to register with the executive authorities that keep statistics and perform quality checks on the services provided in the food industry only if they receive a license to sell alcohol. In this regard, the market has now formed a whole layer of food industry enterprises, the quality of which services can be judged only by consumer feedback left on Internet sites. The current situation significantly complicates the collection of official statistics in this area and the state bodies assessment of the services provided by enterprises of the food industry.

The creation of a unified digital information environment ensuring the implementation of the decision-making mechanism in the food industry would solve this problem.

Technology decision making is widely used in the food industry. In particular, this technology with data visualization is used in practice with:

- Analysis and selection of a supplier of raw materials on a number of criteria, taking into account information about the preferences of the decision maker [10].

- The choice of the territory for the construction of new enterprises, taking into account the analysis of market demand, production capacity, risks of raw materials supply, and so on [11].

- Assessing the location of the food industry enterprise through the analysis of various data visualized using the geographic information system approach [12].

- Formation of the human environment in terms of location and proposals of the enterprises of the food industry to create prerequisites for making decisions about healthy eating to prevent obesity of the population [13].

- Optimization of the ready-made meals delivery as by auto, motor transport, and by alternative delivery methods. In particular, using drones or cargo bikes. This delivery option is optimal in the presence of traffic jams and restrictions for road traffic in an urban environment. The approach proposed in [14] allows you to track and analyze the number of available truckers, as well as the number of consolidation points used, emphasizing the importance of facilitating simulation models, to support operations in highly dynamic and uncertain conditions.

II. RESEARCH METHODOLOGY

The studies presented in this article were conducted on the basis of a data analysis from the the food industry enterprises in the city of Novosibirsk (Siberian Federal District).

Novosibirsk is the third largest city in the Russian Federation. The total population in the city of Novosibirsk in 2018 was 1612833 people. The territory of Novosibirsk is divided into ten districts (table 2) [9].

TABLE II.   THE POPULATION OF THE NOVOSIBIRSK DISTRICTS ON JANUARY 1, 2018 AND THE AVERAGE FOR 2017

City districts of Novosibirsk	Population	
	on 01/01/2018	on average for 2017
Dzerzhinsky district	174360	173879
Zheleznodorozhny district	64972	64971
Zaeltsovsky district	149100	148801
Kalininsky district	200694	200054
Kirovsky district	186408	185768
Leninsky district	302803	301879
October district	225879	224657
Pervomaysky district	87912	87567
Sovetsky district	141911	141632
Central District	78794	78666
Total:	1612833	1607874

The area of Novosibirsk is 505.62 km^2, while the population density is in the range of -3189.81 people/km^2. The largest urban area is occupied by Zaeltsovsky, Soviet, Pervomaisky and Leninsky districts. The dynamics of the food industry turnover in Novosibirsk is presented in table 3 [9].

The difficulty of assessing the food industry market in the city of Novosibirsk lies in the fact that a number of enterprises do not officially declare themselves in the executive bodies that assess the quality and safety of services. This makes it difficult to assess the market, control the quality of services provided and service culture.

The goal of the research is to create a unified digital information environment based on decision-making technology and focused on the food industry of the city of Novosibirsk.

Creating a unified digital information environment consists of the following steps:

1. Determination of the basic requirements for the functionality of the developed unified digital information environment (UDIE).

2. Creating a database of food industry enterprises according to established evaluation criteria.

3. Development of technical specifications for the database developed by UDIE.

4. Development of technical specifications for UDIE.

5. Development of UDIE architecture.

6. UDIE shell development.

7. UDIE testing and debugging.

The main functional requirement for UDIE is to ensure traceability and analysis of specified criteria for assessing food industry enterprises over time (with time) with their subsequent visualization.

The choice of criteria for evaluating food industry enterprises was made taking into account the classification presented in [15]: mobility, name of the subject, name of the enterprise, type of enterprise, specialization in assortment, serviced contingent - the target audience and specialization in it, service specifics, address, location, area of the sales area, number of seats, average check, enterprise working hours, officials the presence of specialized workshops, the number of employees, the availability of additional services to the population. Under the criterion of "type of enterprise" assessment means: restaurant, cafe, bar, canteen, fastfood service, buffet, cafeteria, cooking department. By mobility, food industry enterprises are divided into stationary and mobile. The criterion of "location" assessment refers to publicly accessible and closed-type enterprises serving a certain contingent (enterprises located in schools, hospitals, factories, etc.).

Since the study was conducted in January 2019, the analysis according to the criterion for assessing the "time of operation" (permanent and summer enterprises of the food industry) was not conducted.

As an information field for collecting data on existing enterprises of the food industry, the following were used:

- information on the location of stationary and non-stationary enterprises of the food industry, operating as on 2018. Information is provided by the mayor office of Novosibirsk on enterprises officially registered with the executive authorities controlling this field of activity.

- data from the Russian geo-information program-reference book on the search for goods and services in the city of Novosibirsk "2GIS".

- information from online consumer feedback services on companies in Novosibirsk (novosibirsk.flamp.ru) and the Russian Federation (www.tripadvisor.ru).

TABLE III.   III. DYNAMICS OF THE FOOD INDUSTRY TURNOVER

Period	Million rubles	In %	
		previous period	corresponding period previous year
2018			
January	1823.9	78.6	106.4
February	1845.9	103.7	104.7
March	2147.3	116.6	99.5
January - March	5817.1		101.3
April	2141.8	98.8	100.8
May	2185.4	102.1	101.6
June	2158.6	98.2	99.7
January June	12302.8		101.9
July	2127.2	98.5	98.0
August	2316.8	108.5	102.4
September	2516.9	108.6	105.0
January - September	19263.7		101.9
October	2589.2	101.9	103.9
November	2430.0	93.6	104.8
December	2529.2	103.7	105.2
January December	26812.1		102.7
2019			
January	2149.3	84.7	113.3

- data from online guides to enterprises of the food industry of Novosibirsk (www.menunsk.ru, novosibirsk.allcafe.ru).

- information from online services for checking and analyzing legal entities and individual entrepreneurs of the Russian Federation (zachestnyibiznes.ru, www.rusprofile.ru).

Further, the development of technical specifications and the creation of a database of food industry enterprises according to established evaluation criteria were performed. As a result of the database analysis, the need to develop a unified digital information environment was substantiated and the technical task for its creation was developed. In order to receive subsidies for the development of a unified digital information environment, the justification and terms of reference were submitted for consideration to local executive authorities.

III. RESULTS OF THE RESEARCH

Based on a preliminary analysis of information from the database of food industry enterprises in the city of Novosibirsk created by the authors, it was found that:

- the number of actually existing enterprises of the food industry in the districts of the city is 1.5 ... 1.7 times the number of enterprises officially registered with the executive authorities controlling this field of activity (Fig. 1). And the most active enterprises of the food industry open in Zheleznodorozhny and Kirovsky districts. As an example, hereinafter, the analysis results are presented for five districts of the city of Novosibirsk. For the results of the study in all areas of the city of Novosibirsk, the reader can directly contact the authors of this article.

- The average number of enterprises in the food industry per 1,000 residents is 1.8. The smallest number of enterprises per 1000 inhabitants is in the Dzerzhinsky District (0.77), and the largest is in the Zheleznodorozhny District (4.4). From official sources [16] it is known that, on average, there are less than one catering enterprise per 1,000 people in Russia; in the USA, Germany - 2; in the UK - 4; in Italy, France - 5; China has almost 6 catering enterprises. In this regard, Novosibirsk in this indicator is not inferior to foreign countries. Also, in accordance with the global trends, catering enterprises in the city of Novosibirsk are increasingly opening at shopping, entertainment and health centers.

- it is established that the prevailing types of enterprises in the city of Novosibirsk are canteens, cafes and restaurants. The data obtained is characteristic of the Russian Federation. As an example, Figure 2 presents the results of a study on the Dzerzhinsky District.
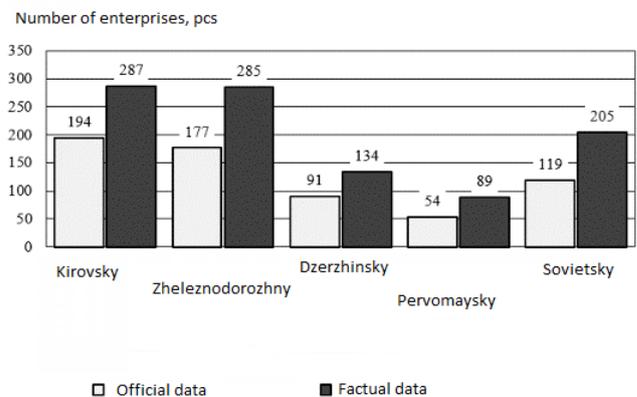

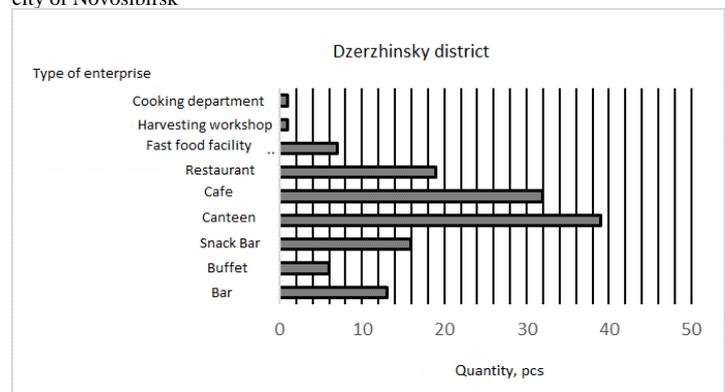Fig. 1 - The number of enterprises in the food industry in selected areas of the city of Novosibirsk

Fig. 2 - Number of enterprises in the food industry by type

- it was found that, depending on the area of the city, the number of enterprises according to the criterion for assessing the "specificity of service" differs significantly (Fig. 3). This is due to the specifics of the placement of workers, sleeping areas, industrial zones of the city of Novosibirsk. In particular, in the central areas, the "specificity of service" prevails by waiters, and in the working areas, self-service.

-It was established that, according to the "number of seats" criterion of assessing in the city of Novosibirsk, enterprises with a number of seats from 51 to 100 are predominant (Fig. 4). The indicated structural distribution is characteristic for all studied areas of the city. Given the dynamics of past years, there is also an increase in the number of food courts, which is directly related to the opening of new shopping centers.

The analysis of the food industry enterprises in the city of Novosibirsk showed that the actual data for the selected evaluation criteria differ significantly from the official data. This once again confirms the need to create and subsequently use a unified digital information environment. This will allow:
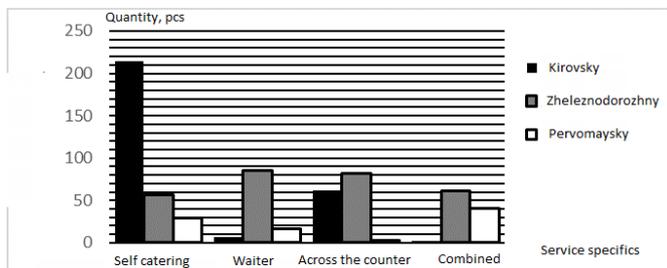

Fig. 3 - Number of enterprises in the food industry according to the specifics of service
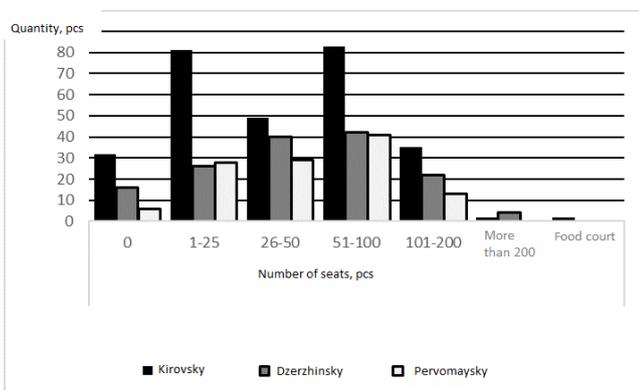

Fig. 4 - The number of enterprises of the food industry by the number of seats

- Marketers perform the ranking and filtering of food industry enterprises according to specified criteria in accordance with both the existing classification in the domestic market and in accordance with international classifiers. This will make the domestic market more "transparent" and attractive for foreign investors and tourists.

- Municipal authorities to monitor the quality of services provided by enterprises, the analysis of the food industry market in order to maintain and develop food industry enterprises that meet the requirements of a healthy lifestyle. In particular, the latter can be carried out by granting the right of primacy to such institutions when holding tenders for the rental of premises in the places of the city with the highest traffic. Also, the availability of data visualization in a single digital information environment enables municipal authorities to leave information about the quality of services provided by the catering industry. This will increase consumer demand and stimulate business owners to improve the quality of services provided.

- Business owners perform a competitive analysis of the environment in order to identify new trends, open a catering business, change the concept or rebrand an existing institution to build the most optimal ways of delivering orders to end consumers with the help of auto and motorcycles, cargo bikes. For food truck owners, a single digital information structure will also allow the selection of the most optimal locations for deployment.

- Consumers choose food industry enterprises in accordance with their individual preferences and with information about the quality of services provided from authorized government authorities and supervising and inspecting authorities.

IV. Conclusions

The paper presents the prerequisites for the creation and development of a unified digital information environment based on decision-making technology and focused on the food industry of Novosibirsk.

The analysis of the created database of food industry enterprises was carried out, which showed that Novosibirsk is not inferior to foreign countries in a number of analyzed indicators. In particular, the average number of enterprises in the food industry per 1,000 residents is 1.8.

It has been established that the number of actually existing enterprises of the food industry in the city districts exceeds by 1.5 ... 1.7 times the number of enterprises officially registered with the executive authorities controlling this field of activity. This proves the need to create a unified digital information environment, reflecting the current and reliable state of the market.

It is shown that the creation and subsequent use of a unified digital information environment will significantly simplify the implementation of analytical and forecast calculations on the food industry market for marketing services workers and business owners, monitoring the quality of municipal services provided by food industry enterprises; implementation of consumer choice of food industry enterprises in accordance with their individual service preferences and nutritional needs.

V. Discussion of Results

In the future, it is proposed to transfer the experience of creating and subsequently using a unified digital information environment from the city of Novosibirsk to the constituent entities of the Russian Federation. The creation of such a unified digital information environment, ensuring the implementation of the decision-making mechanism in the food industry will allow at the federal level:

- carry out an analysis of the current state of the food industry market in various regions of the Russian Federation in order to identify key problems, areas of development and the formation of the modern image of the industry, taking into account global trends.

- create an extensive information and analytical database of food industry enterprises in order to form a balanced development of the industry and rational location of food enterprises in the territories of the Russian Federation.

- to provide favorable conditions for the opening of new and expansion of existing enterprises of the food industry in the conditions of transparency of the competitive environment in the food industry and regional features of the constituent entities of the Russian Federation.

- to ensure the construction of a logistics network for the delivery of orders to the end user by various modes of transport.

- select the best places for deployment to the owners of food trucks.

- improve the quality of monitoring conducted by the authorities in order to ensure the quality, safety of services and culture of service, implemented in the food industry enterprises. According to the results of the monitoring, to carry out the ranking of enterprises or even to issue to enterprises of the food industry a "sign (star) of quality" in order to increase competitiveness and remove their shadow economy.

- monitor the Ministry of Health, taking into account regional specifics, the food trends in the constituent entities of the Russian Federation with a view to further shaping a healthy lifestyle for the population, taking into account the global trend of using local raw materials.

- to create a socially oriented orientation in the field of the food industry by providing various kinds of benefits to enterprises that form a healthy lifestyle of the population and enterprises engaged in serving socially unprotected segments of the population. In particular, the use of preferential taxation, a reduction in rental rates in high-traffic areas will increase the territorial and price availability of food industry services for various groups of the population, as well as achieve an increase in the market share of high-quality products that meet the requirements of healthy eating.

In addition to the above, introducing evaluation criteria in accordance with the international classification of food industry enterprises into the proposed unified digital information environment will make the domestic market more "transparent" and attractive for foreign investors and tourists. This will allow the market analysis to be carried out according to various criteria, taking into account the ranking both by national and international classifications.

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