

Article

# Informatization Management as a Tool to Improve Internal School Control Systems in the Russian Federation (Using Catering as an Example)

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**Abstract:** This paper presents the results from monitoring the organization of catering for children in general education institutions. Monitoring was conducted in August–September 2020. We collected relevant databases for 85 Russian subjects: the total number of indicators—113, the total number of sub-indicators—347, and the total number of data—76,414. This paper investigates the problems surrounding resource provision in regard to organizing nutrition for schoolchildren in the Russian Federation. We analyzed the structure of the informatization in regard to the provision of hot meals for schoolchildren in Russian regions. Moreover, we present cases and best practices surrounding informatization management and personalization of children’s nutrition. The research results reveal that Russia possesses a unified regional information system for accounting/monitoring the organization of children’s nutrition, as an independent specialized information resource (in regard to catering). This paper identifies the levels of information technology used in school nutritional programs for each federal district. We present the results of the analysis, the availability of information resources, and the possibility of automated non-cash payments for meals in general education institutions. Moreover, we analyzed information resources and generated reporting documents on the organization of nutrition for schoolchildren in Russia. Finally, we analyzed the automated assessment of satisfaction, in regard to catering and food quality among children and their parents in Russian regions.

**Keywords:** information technology; general education system of Russia; education management; organization of child nutrition; personalization of nutrition; balanced nutrition and diversity of diet; quality and safety of catering; optimal dietary regime for schoolchildren; physiological need of children for hot meals; staffing of the catering system; information system for accounting and monitoring of catering for children



**Citation:** Mindzaeva, E.V.; Arinushkina, A.A. Informatization Management as a Tool to Improve Internal School Control Systems in the Russian Federation (Using Catering as an Example). *Appl. Sci.* **2021**, *11*, 9471. <https://doi.org/10.3390/app11209471>

Academic Editor: Wojciech Kolanowski

Received: 25 August 2021

Accepted: 7 October 2021

Published: 12 October 2021

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## 1. Introduction

The methodology and criteria used to assess the effectiveness of managing socioeconomic systems, including social nutrition (e.g., nutrition in educational organizations), are poorly developed from scientific, methodological, and practical points of view. Nevertheless, defining key parameters of effectiveness, efficiency, and achieving goals are prerequisites toward forming the concept of management in a socioeconomic system [1,2]. Insufficiently evaluating management effectiveness [3] and functioning of sectoral economic systems is due to the methodological complexity of distinguishing the pure managerial impact and the methods surrounding its quantitative assessment. Assessing management effectiveness is also a sufficiently relevant task for the sphere of social catering. Social catering is a complex inter-industry cluster of a natural, social, and economic nature. It unites enterprises in a long technological chain (agro-food sector, food industry, food trade, and public catering, including food in pre-school and general education organizations),

“from farm to table” [4]. The use of innovative [5] and information technology, in terms of accounting, quality control, and optimization of school meals [6], is becoming nationally important. This includes the development of information systems at the regional and municipal levels, the automation of processes in school catering (including automated parental controls of school meals and an automated accounting system), the possibility of automated development of menus, and preparing reporting documents on catering services in schools.

### *1.1. Synergistic Effect in the Development of a System for Managing Social Catering*

The cumulative and synergistic effects from the rational use of the existing potential, and organization of a network of production, trade, and service enterprises in a particular region, is of particular importance, since the sphere of social catering is marked with a clear territorial order of enterprises. This network combines the economic interests of enterprises and the social components of the total time savings of organizers of social catering, in regard to cooking, visiting trade facilities and laboratories, and improving the quality of service. In this case, organizational impacts and mechanisms aimed at obtaining synergistic effects may include various organizational, economic, technical, and technological measures, as well as the optimization of the organizational structure of catering enterprises in the region. The optimal structures of enterprises (i.e., in regard to their numbers and specializations) should meet the aggregate demand of the region’s population for social catering products and services. In general, the system used to assess the effectiveness of managing social nutrition should combine two groups of tasks:

- Assessing the level and quality of social nutrition;
- Assessing the functioning of the nutrition sector (agricultural sector, food industry, food trade, and social catering).

Assessing the state of sectors in social nutrition and the efficiency of functioning is the result of managerial activity. It characterizes the results of using natural and economic potential and resource bases of agriculture, food industry, food trade, and social nutrition as part of a socially organized nutrition subsystem. Thus, optimizing school nutrition involves consolidating the strategic vectors of consolidation of all participants in the catering system contributing to the development of effective solutions, the introduction of advanced technology, and the achievement and consolidation of quality results. School nutrition in Russia ‘saw’ the beginning of a new stage in its development. Instructions from the Government of the Russian Federation to provide all children in elementary schools with free and healthy hot meals was the driver for the entire ecosystem of nutrition—from the production of high-quality domestic products for children to the daily provisions of healthy diets at schools for every schoolchild, regardless of the region of residence, family income, and health status.

### *1.2. Gaps and Deviations (GAP) from the Principles of Healthy Nutrition for Children and Adolescents in General Education Institutions in Russia*

The relevance of this scientific study within the framework of the research, “Optimization of the system of hot meals in educational organizations implementing programs of general education (regional aspects, best practices)”, conducted in 2020, is determined by several blocks of the problems [7]. These problems were identified at the previous research stage in 2019 [8], namely significant deviations from the principles of rational nutrition of children and adolescents [9] in organized collectives (general education institutions). The principles of rational nutrition include the following requirements:

1. Adequate energy value of diets corresponding to the energy needs of children and adolescents;
2. Balancing the diet in all substitutable and essential nutritional factors, including proteins, amino acids, dietary fats, fatty acids, various classes of carbohydrates, vitamins, vitamin-like substances, mineral salts, and trace elements;

3. Adequate provision of some minor components (different classes of flavonoids, nucleotides, etc.) with food;
4. Maximal variety of diets that include all food groups;
5. Optimal nutrition regimens [10];
6. Adequate technological and culinary processing of products and meals;
7. Providing high flavor values and preserving the original nutritional values of products and meals;
8. Considering the individual features of children (including their intolerance to certain foods);
9. Ensuring the sanitary and epidemiological safety of food and compliance with all sanitary requirements, in regard to the conditions of the canteen, supplied food, transportation, storage, preparation, and distribution.

### *1.3. The Analysis of a Practice-Oriented Block of Problems in Regard to the Organization of Nutrition for Schoolchildren*

The regulatory and practice-oriented block of problems (identified by taking into account the appeals of citizens [11,12] and the results of monitoring) include the following:

1. The lack of a legislative solution to the problem of allocating authority and responsibility for the quality and safety of catering. This problem lies in the fact that the responsibility for the organization of administration is vested in the organizations carrying out educational activities in accordance with federal law “On Education in the Russian Federation” (29 December 2012, no. 273-FZ) [13]. However, the organization of nutrition is a complex multi-cluster process [14] (in various fields [15]). Thus, school principals are often unable to ensure the required quality due to the lack of all necessary competencies and sufficient resources [16] to ensure the provision of these competencies by specialists of the appropriate professional levels;
2. A significant drawback in the organization of nutrition for schoolchildren in Russia is that menus are prepared primarily based on food costs, rather than the physiological needs of children and biologically valuable substances;
3. The unacceptable practice of replacing hot meals with cafeteria products in several regions;
4. The organization of nutrition for schoolchildren in small schools (including those located in areas with difficult climatic and geographic conditions) requires an increase in the availability and quality of nutrition through the introduction of modern food production and transportation technologies;
5. The problems of staffing the catering system in schools and the education system as a whole. Young qualified employees do not replace cafeteria staff since the prospects for staff growth and decent wages are not a priority for regions and municipalities. The work of internship sites is almost leveled, which results in the lack of systematic dissemination of the best regional and municipal experience in organizing catering, which exists in most constituent entities of Russia;
6. Most regional authorities do not understand the need to build a full-fledged catering system using program and project management tools. Program and project management involves the following:
  - The analysis of indicators of socioeconomic development in the region;
  - the models and forms of catering in schools;
  - Budget expenditures on catering (including the cost of re-equipping school canteens);
  - Payments from regional and local budgets for food subsidies to certain categories of children and proposals for their improvement according to their quality and availability;
  - Drafting a design and estimate documentation for reorganizing school catering based on modern food production and transportation technologies;

- The financial and economic justification for the reorganization of the school nutrition system according to the chosen model;
  - The improvement of the regulatory and legal framework of the region in accordance with the implemented approach in the organization of catering;
  - The modernization of school canteens and other facilities of the school nutrition infrastructure and transportation system following the requirements of modern technology and industrial approaches to the organization of nutrition in schools;
  - Training and retraining of personnel to organize catering in accordance with modern requirements;
  - The assessment of the socioeconomic consequences of the reorganization of the school nutrition system, etc.
7. Insufficient use of the potential readiness of business structures to participate in the implementation of social nutrition projects on the principles of the public–private partnership due to the lack of development of normative–legal regulation at the appropriate level of the mechanisms of such interactions, etc.

## 2. Methods

Large-scale discussion of problems and effective catering practices in schools on a systemic level began in 2019 as part of the I All-Russian Conference “Improving the catering system in educational institutions: Practices, models, technologies, the concept.” During this conference, “The concept of catering in educational institutions of the Russian Federation” (concept) was presented for public discussion. The concept involves the following models of the organization of nutrition:

- A model of management structure;
- A model of the organization of nutrition;
- A model of monitoring and evaluation of nutrition.

On the one hand, these models structure the system of nutrition in educational institutions through a single methodology for catering, a single methodology for the formation of national standards and norms, a single methodology for calculating the cost of food, etc. On the other hand, they allow projecting these models on the regional systems of child nutrition and refracting them, taking into account regional peculiarities, the need to adjust regional coefficients and indicators, the state and adequacy of resources, etc.

The monitoring of catering for schoolchildren in general education organizations was conducted in August–September, 2020. The authors collected relevant databases for 85 Russian subjects: the total number of indicators—113, the total number of sub-indicators—347, and the total number of data—76,414.

Based on the data obtained, the authors analyzed the data on the organization of food for schoolchildren in general education institutions. The results of this research are reflected in analytical materials and publications.

Monitoring “The system of hot meals in the daycare centers of general education institutions—2020” was conducted in 85 subjects of the Russian Federation from 7 August 2020 to 20 September 2020. Representatives of the executive authorities of the Russian subjects and the state administrators in the field of education were responsible for filling out the monitoring forms. Among other data, monitoring included the section “Informatization of the school nutrition system.”

The information on general education organizations (state or municipal), as of 20 September 2019, was entered into the monitoring form according to the form of federal statistical observation no. OO-1. Financial indicators were calculated for 2019.

The content of the monitoring was developed, taking into account the recommendations of the annual all-Russian monitoring of the organization of school nutrition based on the analysis of the state of nutrition for schoolchildren at secondary schools, in the areas contained in order no. 213n of the Ministry of Health and Social Development of Russia, the Order of Ministry of Education and Science of Russia “On approval of methodological recommendations on the organization of food for students and pupils of educational insti-

tutions” (11 March 2012 no. 178) [17], and the Letter from the Ministry of Education and Science of Russia “On fostering a culture of healthy nutrition among students and pupils” (12 April 2012 no. 06-731) [18].

### 3. Research: Informatization of the School Nutrition System

#### 3.1. Regional Information System for Accounting and Monitoring of Catering for Schoolchildren

Twenty-seven constituent entities of the Russian Federation (31.8%) of those participating in the monitoring provided zero indicators for all questions in the section “Information support for school catering.” In terms of federal districts, the highest percentage of subjects that provided zero indicators of the total number of subjects in the federal district was found in the North Caucasian Federal District (85.7%), the Southern Federal District (62.5%), and the Far Eastern Federal District (45.5%). These indicators show a low level of application of information technology in the system of school nutrition in these federal districts.

Nine constituent entities of the Russian Federation indicate the existence of a unified regional information system (for recording and monitoring the nutrition for schoolchildren) as an independent specialized information resource in the field of nutrition. However, the links confirming the existence of an independent regional information system of accounting and monitoring of the organization of food for children lead to information resources of different functional purposes. Particularly, these links lead to regional educational portals that are not specialized resources for recording and monitoring nutrition for schoolchildren (St. Petersburg, Voronezh Region, and Udmurt Republic), websites on the “school card” and “electronic school” projects (Ryazan Region, Republic of Bashkortostan, and Saratov Region), automated “pass-through and feeding” information systems (Moscow), Federal level GIS (Omsk Region), and regional unified information and analytical systems in the field of education (Perm Region).

A unified information and analytical system “Monitor” used in the Perm Region is indeed a regional automated monitoring system. Nevertheless, it is a regional system for monitoring education rather than a specialized information resource in the area of school nutrition.

These resources can be used as tools for systematizing and processing information in the field of school nutrition. However, they are not independent specialized information resources for conducting regular, comprehensive, and systematic monitoring of the organization of school nutrition.

Thus, no constituent entities of Russia confirmed the existence of a unified regional information system for accounting and monitoring the organization of nutrition at schools as an independent specialized information resource.

The existence of a unified regional information system for accounting and monitoring the organization of catering for schoolchildren as a section or module of the existing regional information system in the field of education is indicated by 14 constituent entities of Russia.

Several constituent entities of the Russian Federation provided links to regional educational portals and official websites of regional ministries of education. The information systems “pass-through and feeding”, “school card”, and “electronic school” allowing to automate the activities of the administration and teachers of educational institutions, were also mentioned. Many of these systems include modules for accounting for nutrition at the level of the general education organization. Nevertheless, these systems are incomplete and do not allow for accounting and monitoring school meals at the regional level.

Only six constituent entities of the Russian Federation have websites of systems that conduct analytical, statistical, and monitoring research in education in various sections of the database at the indicated links:

- The Komi Republic—the software package “automated distributed information system for monitoring education of the Komi Republic”;

- The Belgorod region—the information system for educational services “virtual school”; (one of the functions of the information system is to conduct analytical, statistical, and monitoring research);
- The Voronezh region—the system of financial monitoring of education in the Voronezh region;
- The Moscow region—the system of electronic monitoring of the state and development of the education system of the Moscow region;
- The Rostov region—State Autonomous Institution of the Russian Federation “Regional Information and Analytical Center for Education Development”;
- The Perm territory—Unified Information and Analytical System (UIAS) in the field of education in the Perm Territory “MONITOR.”

Thus, the existence of a unified regional information system for recording and monitoring the organization of catering for schoolchildren, as a section or module of the existing regional information system in the field of education, is confirmed only by 7% of the subjects of the Russian Federation.

It should be noted that most of the links lead to closed information resources. Thus, to view the information there, it is necessary to be authorized in the system. Therefore, it is completely impossible to check the correctness of the information provided.

According to the information provided in the monitoring, the number of general education institutions connected to the unified regional information system of accounting and monitoring of catering for schoolchildren in the Russian Federation is 9973 (24.9%). Given the above remarks, this indicator does not seem to be correct. To verify this information, it is necessary to conduct a field comparison (to organize a visiting commission), which, on a national scale, requires the organization of additional research.

### 3.2. Municipal Information System of Accounting and Monitoring of Catering for Schoolchildren

According to the information from the constituent entities of the Russian Federation, the municipal information system of accounting and monitoring the organization of catering for schoolchildren is used in 205 municipalities of the Russian Federation. According to monitoring, the number of educational institutions connected to such municipal information systems is 1097 (2.7% of the total number of general education institutions).

Given that no links to information resources are provided for several indicators, and some of the provided links do not confirm the existence of the systems for accounting and monitoring the organization of school meals in some of the Russian subjects, this information does not seem correct. Since the monitoring was conducted remotely, the correctness of the data should be checked in the field by a visiting commission, which, on a national scale, requires the organization of additional research.

The reason for the provision of incorrect data are low awareness of the representatives of the subjects of the Russian Federation of the information resources used in the system of school feeding, and a lack of understanding of the monitoring requests. For example, as evidence of the existence of a municipal information system for accounting and monitoring of catering for schoolchildren in the region, references were made to the “hotline on school meals” sections of the regional ministries of education, the procurement portal, websites of organizations providing school meals, etc.

### 3.3. Information Resources Providing Automation of School Catering

In the item “availability of information resources providing automation of processes of the system of the organization of catering for schoolchildren,” general education organizations were to provide information on the use of certain programs and information systems allowing to automate the functional processes of school nutrition system. School websites, indicated by the representatives of constituent entities of the Russian Federation as separate information resources, were not included in the calculation.

The introduction of cashless payment is one of the key forms of organization and control of meals for schoolchildren in the context of automation of school catering. All

services of the information system developed for cashless payment a priori give the family and their children an option to choose school meals, taking into account various food restrictions (e.g., intolerance to some foods or gluten, etc.). These services allow parents to visit a special website and form a menu for the day or week, organize personalized meals, and synchronize meals of the child at school and at home. The issue of cashless payment is fundamentally important in situations where parents give their children cash to pay for food at school. In this case, parents have no opportunity to control what the child has bought (e.g., buffet meals or food from vending machines instead of hot lunches). Cashless payments make this information transparent, which contributes to the formation of healthy eating behavior in children and their families.

The availability of information resources providing the possibility of automated non-cash payments for meals in general education organizations, with the name and link to the official website, is confirmed by 39 subjects of the Russian Federation (45.9%). According to the indicators provided by the representatives of constituent entities of the Russian Federation, these resources are used by 6977 general education organizations (17.4%).

The following information resources are indicated most frequently:

- System of cashless payment for meals “Ladoshki” (developed by JSC “Raschetnie resheniya” with the support of Sberbank);
- System “School Card” (developed by LLC Processing Center “Aksioma”);
- System “School Card” (developed by JSCB “Avangard”).

Many constituent entities of the Russian Federation use their own regional developments. For example, all general education institutions in Moscow use the services of the project “Moskvenok” to organize school meals (information system “pass-through and feeding”). This service provides the opportunity to manage hot meals, control purchases in the cafeteria, replenish the child’s personal account, etc. In the Republic of Bashkortostan, there is a system “ELSCHOOL”—a unified free e-school project, which, among other functions, allows one to control food in school. The system “Electronic school of the Tyumen Region” includes the “nutrition accounting” module.

The Ryazan and Sverdlovsk regions present interesting experiences. In these regions, the functionality of the card for schoolchildren is integrated with the transport card. The Ryazan Region uses the transport card Umka “School.” It is a personal plastic card, key-chain, or bracelet for schoolchildren at general education organizations in Ryazan. This card is designed for cashless payment of fares in urban passenger transport and is currently integrated with the food program in school canteens and cafeterias. The e-card, a Yekaterinburg transport card, is used in a similar scenario.

The percentage of general education institutions using systems of automated cashless payments for meals by federal districts is presented in Table 1.

The following constituent entities of the Russian Federation indicated the highest percentage of use of systems for automated non-cash payment for meals by general education institutions: Moscow (100%), Belgorod region (100%), Republic of Bashkortostan (100%), Tyumen region (100%), and St. Petersburg (90.4%). The indicators of other subjects of the Russian Federation did not exceed 50%.

The availability of information resources to ensure the use of automated parental control (checking the child’s food, the ban on the purchase of certain types of products, the limit of daily spending in the cafeteria, etc.), with the name and link to the official website, is confirmed by 30 subjects of the Russian Federation (35.3%). According to the indicators provided by the representatives of constituent entities of the Russian Federation, these resources are used by 5615 general education institutions (13.9%).

**Table 1.** The number of educational institutions using systems of automated cashless payments for meals in federal districts of the Russian Federation.

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Volga Federal District	3082	31.60
2	Northwestern Federal District	692	24.59
3	Central Federal District	1626	19.86
4	Ural Federal District	533	19.60
5	Siberian Federal District	621	10.30
6	Southern Federal District	299	7.22
7	Far Eastern Federal District	124	3.80
8	North Caucasus Federal District	0	0.00

*Note:* the data are given, based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted in the territory of 85 subjects of the Russian Federation from 7 August 2020 to 20 September 2020. Representatives of the executive authorities of the Russian subjects and the state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

Popular resources are the same as those listed in the paragraph about using automated cashless systems for meal payments.

The percentage of educational institutions using automated parental controls over school meals by federal districts is shown in Table 2.

**Table 2.** The number of educational institutions using automated parental controls of school meals in federal districts of the Russian Federation.

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Northwestern Federal District	707	25.12
2	Volga Federal District	2448	25.10
3	Central Federal District	1424	17.39
4	Siberian Federal District	618	10.25
5	Ural Federal District	215	7.91
6	Far Eastern Federal District	135	4.14
7	Southern Federal District	68	1.64
8	North Caucasus Federal District	0	0.00

*Note:* the data are given based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted in the territory of 85 subjects of the Russian Federation from 7 August to 20 September 2020. The representatives of the executive authorities of the Russian subjects and state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

The following constituent entities of the Russian Federation indicated the highest percentage of using automated parental control of school meals by general education organizations: Moscow (100%), Belgorod Region (100%), Republic of Bashkortostan (100%), and St. Petersburg (90.4%). The indicators of other subjects of the Russian Federation did not exceed 50%.

The availability of information resources for automated meal selections by children and their parents (legal representatives), with the name and link to the official website, is confirmed by 18 constituent entities of the Russian Federation (21.2%). According to the indicators provided by the representatives of constituent entities of the Russian Federation, these resources are used by 1538 general education organizations (3.8%).

Popular resources are the same as those listed in the paragraph about using automated cashless systems for meal payments and automated parental controls.

The percentage of general education institutions using tools for automated meal selection for children and their parents by federal districts is shown in Table 3.



**Table 3.** The number of general education institutions in federal districts of the Russian Federation using resources for automated meal selections by children and their parents (legal representatives).

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Siberian Federal District	564	9.35
2	Ural Federal District	194	7.13
3	Volga Federal District	386	3.96
4	Central Federal District	273	3.33
5	Far Eastern Federal District	71	2.18
6	Southern Federal District	48	1.16
7	North-Western Federal District	2	0.07
8	North Caucasian Federal District	0	0.00

*Note:* the data are given based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted in the territory of 85 subjects of the Russian Federation from 7 August to 20 September 2020. The representatives of the executive authorities of the Russian subjects and state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

The highest percentage of using resources for automated meal selection by children and their parents (legal representatives) was indicated by the following constituent entities of Russia: Tyumen Region (100%), Kemerovo Region (38.7%), Irkutsk Region (37.5%), and Moscow (35.4%). The indicators of other subjects of Russia do not exceed 25%.

#### 3.4. The Availability of Information Resources to Enable Automated Development of Menus of General Education Organizations

In the context of developing menus for children, it is vital to consider the influence of national traditions and regional food peculiarities.

Article 1 of the federal law “On amendments to the Federal Law ‘On the Quality and Safety of Food’ and Article 37 of the federal law ‘On Education in the Russian Federation’” (1 March 2020, no. 47-FZ) [20] specifies the need to consider national traditions in the organization of catering for schoolchildren. Under the law, public authorities may apply permissible standards for replacing certain food products with other foods in organized groups of children, given social and democratic factors, as well as national, confessional, and local food peculiarities of the population.

In terms of personalized nutrition and the regional variation component of the menu, the influence of national traditions and regional food peculiarities on the system of nutrition for schoolchildren is due to the genetic predisposition of schoolchildren in a particular region to the traditional food diet (there are more than 190 nations and ethnic groups living in the territory of Russia; each nation has its own national and cultural customs) [21].

Thus, the school nutrition system is considered “an element of the system of forming a healthy lifestyle of the whole society, developing food culture, and using health-saving technologies” [22].

In this context, let us consider the introduction of elements of national cuisine in the system of school meals in the regions associated with the physiological and genetic features of the local population. In 2019, the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing approved methodological recommendations “Organization of meals for preschool and school-age children in organized groups in the Arctic zone of the Russian Federation” (MR 2.4.5.0146-19). These recommendations advise including national dishes in the cyclic menu of educational organizations, taking into account the established preferences and eating habits of the indigenous population. These recommendations will reduce morbidity rates among children and adolescents.

In this context, special cooking and food processing technologies are used (e.g., the traditional Halal technology in schools and kindergartens of the Republic of Tatarstan) Figure A1.

General education organizations of the Udmurtian Republic annually hold days of Udmurt cuisine as part of the Urban Native Language Week. National Udmurtian dishes appear on the school menu—Udmurtian and Tazalyk salads, Pushtyshyd and Chorygshyd soups, and second dishes, such as chorygbakchisionen (fish with vegetables) and silen bodi (meat sticks) Figure A2.

Schools in the Republic of Sakha (Yakutia) organize the Ysyakh celebration at the end of the school year. During this celebration, people set a traditional round table of the Sakha people—sandali, which features dishes based on national recipes.

The availability of information resources, providing the possibility of automated development of the menu of general education organizations, with the name and link to the official website, is confirmed by nine subjects of the Russian Federation (10.6%). According to the indicators provided by the representatives of constituent entities of the Russian Federation, these resources are used by 916 general education organizations (2.3%).

The following information resources were indicated:

- “Vizhen-Soft: Nutrition at School” (developed by LLC “Vizhen-Soft,” St. Petersburg);
- “1C: School Nutrition” (developed by LLC “1C,” Moscow);
- Information and analytical system “Avers: Calculation of nutrition menu” (developed by Group of Companies “AVERS” (LLC “FinPromMarket-XXI”), Moscow);
- “BEST-5.Nutrition” (developed by LLC “Company BEST,” Moscow);
- “Calculation of nutrition v.4.0” (developed by LLC “DmSoft,” St. Petersburg).
- “Moy rebenok v shkole” interface of the application Gosuslugi Moscow Figure A3.

The percentage of general education institutions using tools for the automated development of menus is shown in Table 4.

**Table 4.** The number of general education institutions using information resources for the automated development of menus in the federal districts of the Russian Federation.

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Northwestern Federal District	310	11.02
2	Siberian Federal District	488	8.09
3	Far Eastern Federal District	29	0.89
4	Central Federal District	72	0.88
5	North Caucasus Federal District	17	0.53
6	Southern Federal District	0	0.00
7	Volga Federal District	0	0.00
8	Ural Federal District	0	0.00

*Note:* the data are given based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted on the territory of 85 subjects of the Russian Federation from 7 August to 20 September 2020. The representatives of the executive authorities of the Russian subjects and state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

The low percentages in this item may be related to the transition of a significant number of general education organizations to outsourcing, which eliminates the need to develop menus independently and use the corresponding software for this purpose.

The highest percentage of the use of software for the automated development of menus by general education institutions was registered in the Leningrad region (89.3%). The indicators of other subjects of Russia do not exceed 30%.

### 3.5. The Availability of Information Resources That Enable the Automated Generation of Reporting Documents on the Organization of Catering for Schoolchildren

Thirteen constituent entities of Russia (15.3%) confirm the availability of information resources allowing to automatically generate reporting documents on the organization of catering for schoolchildren (calibration journals, statements, calculation cards, etc.) with the name and link to the official website. According to the indicators provided by the

representatives of constituent entities of the Russian Federation, these resources are used by 719 general education organizations (1.8%).

The names of information resources are the same as those listed in the paragraph on using systems for the automated development of menus.

The share of general education institutions using automated report generation by federal districts is shown in Table 5.

**Table 5.** The number of general education institutions in federal districts of the Russian Federation using information resources for the automated report generation.

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Siberian Federal District	497	8.24
2	Northwestern Federal District	59	2.10
3	Southern Federal District	83	2.00
4	Far Eastern Federal District	38	1.17
5	North Caucasus Federal District	17	0.53
6	Volga Federal District	24	0.25
7	Central Federal District	1	0.01
8	Central Federal District	0	0.00

*Note:* the data are given based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted on the territory of 85 subjects of the Russian Federation from 7 August to 20 September 2020. The representatives of the executive authorities of the Russian subjects and state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

As in the previous paragraph, the low shares may be related to the transition of a significant number of general education organizations to outsourcing and the absence of the need to use the corresponding software.

The highest percentage of using resources for the automated generation of reporting documents by general education organizations was indicated in the Murmansk region (37%). The indicators of other subjects of the Russian Federation do not exceed 30%.

### 3.6. The Availability of Information Resources for Automated Assessment of Satisfaction of Schoolchildren and Their Parents with the Organization and Quality of Meals

The availability of information resources providing the possibility of automated assessment of satisfaction of schoolchildren and their parents with the organization and quality of school meals is confirmed by 15 subjects of Russia (17.6%) with the name and link to the official website. According to the indicators provided by the representatives of constituent entities of the Russian Federation, these resources are used by 6134 general education organizations (15.3%).

These information resources include automated feedback systems, automated information systems for cashless payment for school meals, and the services of the “electronic school” projects.

The share of general education institutions using the capabilities of automated assessment of satisfaction of schoolchildren and their parents with the organization and quality of meals by federal districts is shown in Table 6.

The following constituent entities of the Russian Federation indicated the highest percentage of using the automated assessment of satisfaction of schoolchildren and their parents with the organization and quality of meals by general education institutions: Belgorod Region (100%), Moscow (100%), Republic of Bashkortostan (100%), Kemerovo Region (100%), Novosibirsk Region (100%), and St. Petersburg (90.4%). The indicators of other subjects of Russia do not exceed 40%.

**Table 6.** The number of general education institutions using information resources for the automated assessment of satisfaction of schoolchildren and their parent with the organization and quality of meals by federal districts of the Russian Federation.

No.	Federal District	Number of General Education Organizations (EO)	
		pcs.	% of the Total Number of EOs
1	Siberian Federal District	1880	31.17
2	Northwestern Federal District	661	23.49
3	Volga Federal District	2119	21.73
4	Central Federal District	1342	16.39
5	Far Eastern Federal District	64	1.96
6	Southern Federal District	68	1.64
7	Ural Federal District	0	0.00
8	North Caucasus Federal District	0	0.00

*Note:* the data are given based on the monitoring of the organization of catering in public general education organizations (August–September 2020). The monitoring was conducted on the territory of 85 subjects of the Russian Federation from 7 August to 20 September 2020. The representatives of the executive authorities of the Russian subjects and state administrators in the field of education were responsible for filling out the monitoring forms. *Source:* compiled by the authors based on [19].

#### 4. Discussion

Within the framework of the state assignment, we had no goal of ranking federal districts or comparing them. Moreover, determining the best and worst federal districts is also not the easiest task. The leaders in the organization of nutrition for schoolchildren are found both in metropolitan areas with school catering complexes, or other centralized forms of outsourcing, and in rural schools with a high quality of organic products grown in rural territories, few schoolchildren, and “homemade” food. In this case, we find it advisable for districts equipped in a limited extend to develop infrastructure and outsourcing (specialists are engaged in catering and school focuses on training) or focus on the centralization of school catering. A perfect scenario would be the use of a unified software solution for monitoring the nutrition of all schoolchildren in Russia. Nevertheless, the implementation of such a solution requires substantial preparation. Nowadays, there are certain restrictions (e.g., on the use of personal data) limiting the possibility of implementing a unified solution for monitoring school catering. Russia needs to form a legal and regulatory framework and ensure technical equipment necessary (in this case, there is also the issue of technical monopoly, which must be regulated as well). These issues are being addressed gradually. Nevertheless, we believe that the most important issue at the current stage of development lies not in the introduction of a unified software solution, but the provision of the opportunity to control the quality of food and the state of health for all schoolchildren and their parents, even if such monitoring will be carried out the the use of various (not unified) software solutions. We consider the following aspects to be the most important for monitoring children’s food choices and taking care of their health (in order of priority):

- Automated parental control;
- Automated cashless payment systems in schools;
- Automated menu;
- Systems allowing for automatic food choices.

In our opinion, the simplest method of tracking children’s nutrition is automated parental control. During the research, the authors have analyzed various approaches and aspects of the studied problems [23–40].

Nevertheless, the topic of the organization of catering for children in general education institutions is relatively new for the academic community. It is not systematically considered in terms of the science-based methodology of government support for the organization of school (hot) meals in the country and the methodology of its informatization.

The future of the nation depends on the health of the younger generation, and this issue is under the special control of the government [41–47]. In developing effective so-

lutions to existing problems, it is essential to learn how similar problems are solved in countries that have achieved certain successes in education and whose educational management systems represent an example of current practices (prevention of the development of chronic diseases) [48]. The issues of the development of public management of school meals and the provision of free meals in schools and preschools in various countries are presented in terms of restructuring standards, data, and approaches to funding.

For example, in the UK, ever since 13 December 2014, all caterers have had to provide information about ingredients in food and drinks that can cause allergies. Since September 2014, all pre-K, first-, and second-grade students in publicly funded schools have been entitled to free lunch. The compliance with the School Food Standards [49] is mandatory for all publicly subsidized schools. As of 2014, compliance with these standards is a mandatory funding requirement for all academies and free schools [50]. In the UK, children 4–6 years old in public kindergartens, elementary schools, and special schools are entitled to a free portion of fruit or vegetables in their daily lunches under the School Fruit and Vegetable Scheme of the Department of Health and Social Care of the UK.

A detailed comparative analysis of school catering systems (Australia, Sweden, and the UK) [51] leaves open the issue of digitalization of school catering and actualizes the need for differentiated monitoring.

Thus, the digital tools for school meals presented in this research allow personalizing meals and controlling the synchronization of home and school menus. This problem is actualized in various countries (e.g., the United States) in the context of a proven increase in the consumption of low-quality foods at home as partial compensation for the “positive effects of HHFKA [52], on overall dietary quality [53]”, changes in attitudes toward school nutrition policy [54], and differences in food consumption [55].

In terms of digitalizing school meals, forming good nutritional behavior in children, and supporting parents in influencing children’s nutrition, the significant results are as follows:

- “The user-desired features supporting interactivity and personalization” [56];
- The changes in children’s and parents’ eating habits, considering national traditions [57];
- The development of a web-based program for parents designed to prevent weight gain in children and loss of parental control [58];
- Online checking of school menus (Australia), taking into account the regulatory requirements (National Healthy School Canteen Guidelines) [59,60].

For the first time, public and scientific discussion of the models on the systems for managing catering in general education institutions and implementing the “Unified concept of the model of organizing hot meals for schoolchildren in general education institutions of the subjects of the Russian Federation” was carried out during the II All-Russian Conference “Improving the catering system in educational institutions: Practice, models, technologies, the concept” (conference) [61], held 1–2 December 2020, in the city of Saransk, Republic of Mordovia. The materials of the expert sessions and discussion platforms are available on the website “Healthy Nutrition Course” [62].

The information system proposed in the research can be considered as the basis for organizing a situational control center for catering in schools and kindergartens in terms of continuous data monitoring at the level of federal districts, regions, and municipalities. Of particular significance are the functions of parental control, synchronization of the child’s meals at school and at home, the ability to choose meals taking into account food restrictions, and personalization of meals for children. An overview of international scientific developments and practices in educational management in the field of school nutrition is of interest to all persons interested in the exchange of ideas and research results, and conducting discussions of professional issues relevant to shaping sustainable development of education.

Thus, the systematic organization of nutrition in general education institutions has significantly improved the quality of nutrition for schoolchildren in all schools around Russia. Free meals are provided to schoolchildren in grades 1–4. The Russian Federal Service

for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) has developed a menu for children with health problems. Additionally, many schools have started to offer a choice of dishes (2–3 for each position). Nowadays, parental control over food in schools is a priority and online monitoring of school canteens allows parents to track what and how their children eat.

## 5. Conclusions

Considering the negative consequences of malnutrition on children's health, their ability to learn, and physical and intellectual development, it has become evident that there is an urgent need for society and the government to focus on targeted formation surrounding healthy diets in organized children's collectives and improved nutrition for children from socially vulnerable families [63]. This direction should be regulated by special strategic programs to address various causes of malnutrition consistently. Digitization of these processes represents a great opportunity to improve the efficiency of management and control of nutrition in schools, synchronize the "family" and school menus, and use nutrition as a comprehensive pedagogical tool. Simultaneously, it is necessary to provide organizational support for implementing information systems and tools, including the development of appropriate regulations and the organization of training.

The list of information resources presented by the subjects of the Russian Federation includes not only popular software products, well-known on the market of IT services, but also programs of local and regional developers. In several regions of the Russian Federation, territorial segmentation is observed when selecting a software development company. For example, the Irkutsk Region and the Republic of Khakassia use the cashless payment system "Infoshkola" (developed by LLC "EuroSchool-Irkutsk"); the Kaliningrad and Leningrad Regions use the system "Glolaym. School nutrition" (developed by LLC "Glolaym," St. Petersburg). We can conclude that the development of innovative software to automate the activities of general educational organizations, taking into account the regional specifics, is becoming a popular trend.

According to the research results, we can conclude that there is an extremely low percentage of use of information resources providing opportunities that automate the school nutrition systems. At the same time, many specialized companies in the IT market offer services to automate the school nutrition system, considering the current needs of secondary schools. We can assume that a certain proportion of indicators were not entered in the monitoring form. Nevertheless, no representatives of the constituent entities of the Russian Federation asked for advice on how to fill out the relevant monitoring section.

It is also worth noting the unsatisfactory performance of several data entry tasks by representatives of constituent entities of the Russian Federation. The information was often not fully specified (either the names of information resources or a link to the official website were missing). Moreover, the names of software products do not always correspond to the references, complicating the analysis of the indicators in the section. Instead of the name of information resources, there were formulations, such as "program", "LLC", "automated workplace", "information system", etc. These indicators were not considered during the calculations.

The monitoring results allow us to identify gaps in the organization, improve the quality and informatization of school nutrition in the Russian Federation, and increase the quality of management of the process of organizing nutrition in schools. The research has scientifically substantiated the need to develop a law on free hot meals for schoolchildren in elementary schools and its content (federal law "On amendments to the Federal Law 'On the quality and safety of food' and Article 37 of the federal law 'On education in the Russian Federation'" (1 March 2020 no. 47-FZ) [20].

**Author Contributions:** Conceptualization, E.V.M. and A.A.A.; formal analysis, E.V.M. and A.A.A.; funding acquisition E.V.M., investigation, E.V.M. and A.A.A.; methodology E.V.M.; supervision, E.V.M.; writing—original draft, A.A.A.; writing—review and editing, A.A.A. All authors have read and agreed to the published version of the manuscript.

**Funding:** The research was prepared and conducted with the financial support of the Ministry of Education of the Russian Federation as part of the 2021 state task—R&D “Development of a methodology for analyzing data on the education management system” no. 073-00006-21-04, approved by the Ministry of Education of the Russian Federation on 4 June 2021.

**Institutional Review Board Statement:** Ethical review and approval for this study were waived under the Work Plan of the Federal State Budgetary Scientific Institution “Institute of Management of Education of Russian Academy of Education” for 2021, approved at the meeting of the Academic Council, minutes no. 4, of 1 July 2021.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data availability statements are in Russian with the authors.

**Acknowledgments:** Materials for the research are based on the annual report on the research “Optimization of hot meals in educational organizations implementing general education programs (regional aspects, best practices),” conducted in 2020 (research adviser—E.V. Mindzaeva, Candidate of Pedagogical Sciences, Head of the Department of Content, Methods, and Technologies of Education).

**Conflicts of Interest:** The authors declare no conflict of interest.

## Abbreviations

The following abbreviations are used in this manuscript:

EO                    education organization  
IUO RAO        Institute of Management of Education of Russian Academy of Education

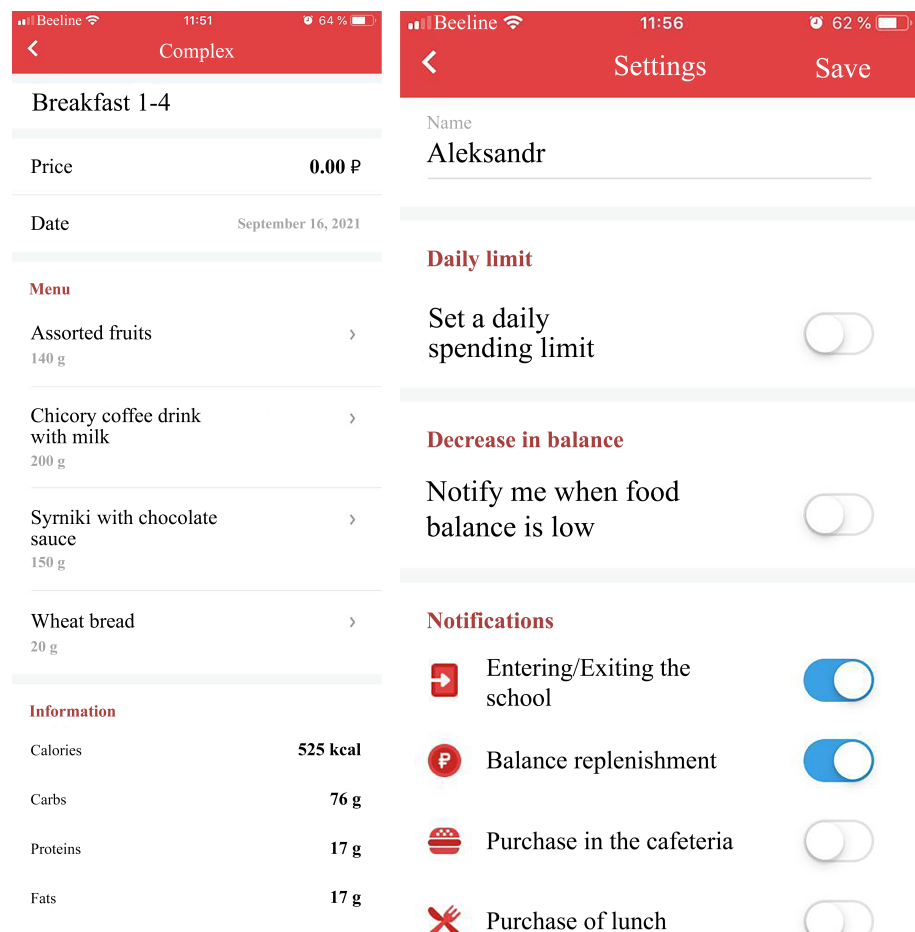
## Appendix A



**Figure A1.** A quarter of Kazan’s educational institutions offer halal meals to children: 131 educational institutions of Kazan, including 38 schools and 93 kindergartens, are provided with halal-cooked meat products (data from the Department of Food and Social Nutrition of the capital of Tatarstan). *Source:* compiled by the authors based on [64].



**Figure A2.** “Days of Udmurt Cuisine” in the Sharkansky District. *Source:* compiled by the authors based on [65].



**Figure A3.** Examples of free hot meals for schoolchildren at elementary school (second grade of a public school in Moscow) in the “Moy rebenok v shkole” interface (section “Attendance and Meals”) of the application Gosuslugi Moscow. *Source:* compiled by the authors based on [66].



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