Development of digital solutions for organizing resort treatment

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Abstract. The paper defines the importance of resort treatment in Russia. It is established that the system is being reformed in terms of creating new recreational clusters and consolidating existing organizations by merging and modernizing them. All this complicates the structure of new organizations and increases the number of business processes. Effective management requires specialized software products that direct and monitor processes and resources of medical organizations; this substantiates the relevance of the work carried out. Using structural and mathematical analysis, quantitative and qualitative characteristics of key processes are established. Based on the results obtained, their formal model is developed and the concept of an information system is created. A description of the functional capabilities of the system and the categories of users to whom they are available is presented.
Keywords: digital transformation, business process, information system, healthcare, recreational area

1 Introduction

An important component of restoring and maintaining the health of citizens is resort treatment which allows for targeted and effective improvement of the population's health and medical rehabilitation of patients [1]. It is carried out for preventive, therapeutic and rehabilitation purposes and aims to prevent, improve and strengthen the body's defenses using natural healing factors while staying at a resort, in a health-improving area or in spa organizations [2, 3].

Resort treatment in Russia is regulated by the order of the Ministry of Health of the Russian Federation which lists the main stages of such treatment and the requirements for organizations carrying out such activities. The period of stay at a sanatorium in accordance with this order lasts from 14 to 21 days. At the same time, it is possible to reduce this period to two or four days or choose a course of individual treatment procedures without staying at a sanatorium. Notably, the effectiveness of a short-term stay is minimal for health improvement [State Register of the Resort Fund of the Russian Federation: https://kurort.minzdrav.gov.ru/articles/2].

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Such procedure increases the load on the ecosystem of the organization providing resort treatment services. To effectively implement business processes in such organization, their digital transformation is required [4, 5] – digital technologies will help manage the tasks that arise during the stay of patients, the ability to access data on the course of treatment, procedures and their schedule, and monitor compliance with the prescribed regimens.

Thus, the paper *aims to* develop a concept of an information system that ensures resort treatment. To do this, it is necessary to fully define the objects and processes included in the ecosystem of a resort organization; establish the qualitative and quantitative characteristics of such objects and processes, as well as the rules affecting changes in them; develop functionality requirements for the software product and create a prototype of its user interface.

The *theoretical significance of the research* lies in systematizing processes occurring in an organization implementing health resort activities and in creating their formal model. Such model can be used for effective process management (distributing workload between personnel, reducing routine work and identifying "bottlenecks", for example, those increasing the time required to fulfill a task).

The *practical significance of the research* is creation of a tool for making management decisions and providing access to the resources of a health resort organization. The developed software product systematizes and unifies the processes taking place in different health resort organizations and provides the ability to monitor such organizations by state or regional supervisory agencies.

2 Materials and methods

To perform the tasks, the software development life cycle model was a sequential execution of stages, each using a certain set of methods.

As noted in the works related to software creation, an important stage here is formalization of the problem area, i.e. analysis of user requirements and formalization of existing processes [6-8]. Thus, at the first stage, the processes occurring in resort treatment organizations were statistically and structurally analyzed. With their help, key objects and processes for digital transformation, and their qualitative and quantitative characteristics were identified. The obtained results were indispensable for creating formal models. In the analyzed literature sources, such models represent an image of a real object suitable for different types of work depending on the modeling methodology. Such works, for example, may include imitation of control actions in order to predict changes in the properties of an object [9, 10], demonstration of certain structural aspects [11, 12] or digital transformation [13, 14].

For digital transformation of the created formal model, the object-oriented design method was used. The obtained results influence the quality of the development stage, ensuring the encapsulation of properties, parameters and methods of the established objects [6, 7].

3 Results

Statistics for 2023 show that the number of resort services consumers in Russia increased by 6% and amounted to 6.8 million people (6.4 million people in 2022) [Healthcare in Russia: https://rosstat.gov.ru/storage/mediabank/Zdravoohran-2023.pdf]. Of these, 89% received treatment on vouchers, i.e. used a full course of treatment, accommodation and meals on the territory of the resort. The remaining 11% used only the treatment services, i.e. visited the resort without staying in it. The small number of such consumers is due to the

location of most resorts at a distance from large settlements, which causes inconvenience and additional costs for transfer services. With increased number of resort treatment consumers, the number of organizations providing the relevant services does not change. Figure 1 shows a graph of the number of such organizations in 2019-2023, compiled based on the market analysis for health resort services in Russia [https://businesstat.ru/images/demo/resorts_russia_demo_businesstat.pdf].

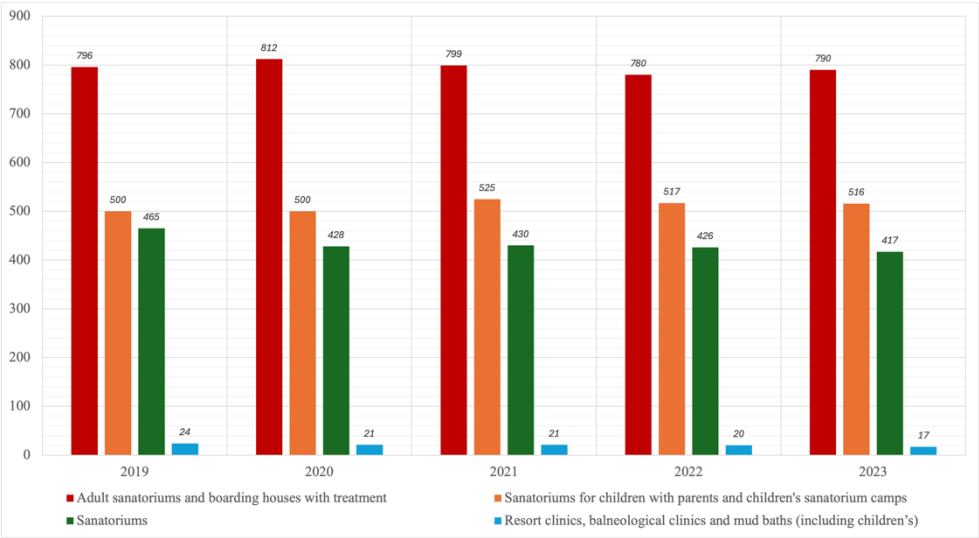

Fig. 1. The number of health resort organizations in Russia in 2019-2023

Health resort organizations are heterogeneous in terms of types and number of personnel and clients. The unit of accounting can be either a small boarding house with 50 beds or a large multi-profile resort consisting of several sanatoriums and having a turnover of several billion rubles per year. The reduction in the number of organizations is largely due to high capital costs for maintenance of health resort complexes, insufficient funding of the industry, and the tendency to merge and re-profile budgetary and departmental organizations [Analysis of the health resort services market in Russia: https://businesstat.ru/images/demo/resorts_russia_demo_businesstat.pdf].

Statistics show that the number of visitors to health resort organizations is increasing; moreover, organizations themselves are merging. All this increases the number of business processes and complicates their structure. Thus, the main concept of the software product is the ability to provide resources to visitors and to provide personnel with a tool to manage visitor flows. Access to the functionality of the information system will be provided to the following categories of users:

- *the administrator* creates a visitor's profile and determines their access to the system resources;
- *the doctor* enters information into the system about the prescribed treatment course for the visitor and, if necessary, monitors the implementation of treatment prescriptions;
- *the nurse* records the visitor's completion of medical procedures prescribed by the doctor;
- *the consumer* who purchased a full treatment course and accommodation at the resort;

- *the course buyer* who purchased only treatment without accommodation at the resort.

Below is a screen layout of the user interface, allowing any visitor to select a treatment course at the resort (Fig. 2).

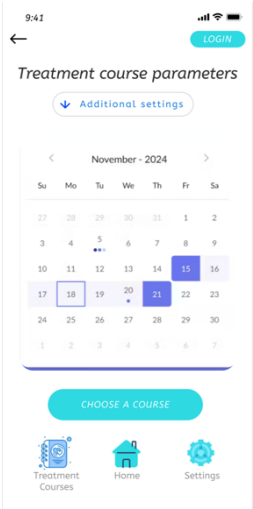

Fig. 2. Screen layout of the mobile application for selecting a treatment course based on individual parameters

The consumer can use the selection of treatment courses by specifying the desired dates and diseases. The system will automatically select the appropriate course with a detailed description. It is possible to manually configure the selected service package (for example, exclude some procedures or accommodation). In any case, all changes will subsequently be agreed upon with the doctor conducting the examination at the resort.

After the treatment plan is approved, a schedule of visits to treatment procedures and a notification system for the consumer will be automatically generated. In some cases, the consumer will be able to manually reschedule an appointment for another time if free time is available. A visit to treatment procedures performed by a medical professional is confirmed by the relevant employee in the system, and a corresponding entry is made with content available to both the consumer and the doctor. The consumer manually confirms compliance with recommendations by filling in a diary in the system (for example, by entering the amount of water consumed or exercises performed). Individual parameters are entered into the diary automatically (for example, distance covered or pulse rate when using appropriate measuring instruments).

4 Discussion

The obtained results are valid for the applied methodologies of formalizing the problem area and correspond to the formulated goal. In the works related to information systems design, the subject area requirements are analyzed, the key objects involved in the processes and the rules of their interaction are also subjected to structural analysis, and a list of external factors that can significantly affect the change in the system characteristics is established [6, 15, 16]. Based on the results of the work, the key functional capabilities of the information system are determined and a list of user categories is compiled.

The main advantage of the designed information system is the availability of information and the creation of a tool that ensures communication between different

categories of users. This corresponds to the principles of creating software products in the studied works [7, 8, 12]. The developed concept of the information system allows it to be scaled in accordance with the changing needs of the health resort industry. The next stage of system development is implementation of an intelligent mechanism that provides the ability to process medical data in order to identify patterns and the ability to automatically adjust the exercise system depending on the current state of the consumer. At present, the array of processed data and the formal description of the problem area allow creating a knowledge model on the basis of which artificial intelligence functions can be created. This is confirmed by the nature of the models obtained in related studies [9-11].

5 Conclusion

Improving the system of receiving medical procedures and of marketing and information support for resort treatment will improve the quality of treatment and rehabilitation and availability and efficiency of using natural healing factors. This, in turn, will ensure the development of recreational areas and attract additional funds to the region's economy, contributing to sustainable development.

Active implementation and use of modern digital tools in organizing a resort changes the approach to commercial activities. Thus, the organization system becomes both innovative and adaptive to various external challenges, which is a key factor for successful competition in the relevant services market.

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