

Implementing healthy eating principles for consumers in a digital farmers' market system

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Abstract. The production of organic food is one of the directions of transformation of modern agriculture. Their production ensures the reduction of the negative effect on the environment, and their consumption by humans has a positive impact on their health. The paper presents the characteristics of eco-projects that are implemented in Russia and the attitude of the country's population to them. There is a low level of environmental behavior of the country's citizens, so it is required to implement practices related to the formation of eco habits, production and consumption of eco-products. The purpose of the work is to develop a software product project for the organization of a healthy diet, including dishes prepared from eco-products. An analysis of the problem domain has been carried out, making it possible to develop a model of a digital farmers' market that makes it possible to sell eco-products in accordance with the user's choice or the healthy eating programs he follows. In accordance with the model, a description of the functional possibilities of the software product is presented, based on which user interface layouts in the form of mobile application screens are created. The implementation of such a system provides a direct link between the consumer and the manufacturer of eco-food products, as well as approaches of personalized nutrition.

1 Introduction

Environmental narrative and visualization of nature in the modern world impress citizens and thus shape their consciousness [1]. Experts note a high level of differentiation of norms and approaches in solving environmental problems depending on the region [2, 3]. In the postindustrial era, the importance of environmental problems has increased and their solution is facilitated by civic ecoactivism, which is massively supported by the digital transformation of processes that ensure the implementation of numerous eco-projects [4].

For Russia, the environmental agenda is an important component of sustainable development. The emerging geopolitical complexities have had an impact on environmental projects, but there has been a shift in the intra-Russian focus of attention from environmental issues to its social and socio-ecological aspects [5, 6]. The state sets strategic benchmarks and makes tactical decisions aimed at regulating processes by introducing legislative incentives and restrictions. Big business implements socio-ecological projects and strategies

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at the regional level, interacting with local communities and thus forming environmental culture [7].

According to the research results, the index of environmental behavior of Russian citizens is 19%, which indicates a relatively low spread of environmental practices among the population [8]. At the same time, there is an increase in environmental responsibility and awareness of environmental problems with increasing age. It is noted that the index of commitment decreases when moving from declaration of eco-values to action [7, 8].

As noted in the works, the formation of eco-habits requires the implementation and popularization of environmental projects, organizing classes on environmental education [7]. One of such projects is the production of environmentally friendly goods, including food products. In Russia, the law “On Organic Products” came into force, which implies mandatory certification and labeling of food products, the production of which did not use pesticides, antibiotics, food additives, flavor enhancers [9]. Thus, the Russian market of healthy food is being formed. At the same time, there is an increase in demand for such products, as healthy nutrition of citizens provides a reduction in the number of chronic diseases and health care costs [10]. The strategy for the development of organic production until 2030 was approved, which implies the formation of a specific sector of organic agriculture and significantly increase the production of its products for domestic consumption and export [9, 11].

To improve interaction with consumers requires digital transformation of the processes of the market of organic products. The use of software solutions to organize the processes of interaction between producers and consumers contributes to the creation of a unified digital ecosystem, making it possible to form personalized recommendations on product selection, forecast demand, transparently form the price, effectively manage the product delivery chain, etc. [12].

Thus, the purpose of the work is to develop the concept of a software product that ensures the realization of eco-products. This requires to perform the objectives to identify the key processes and their subjects that ensure the sale of eco-products; to establish links between them and rules for changing states; to develop a model of interaction of key users with the software product; to develop a model of user interface.

Theoretical significance lies in the creation of a tool that collects data on consumer requests and producer offers. The results obtained can be used for marketing research, research related to the development or improvement of agricultural production.

Practical significance lies in the creation of a digital ecosystem that unites the proposals of all producers of organic products, providing uniform rules and standards for product realization. The proposals thus obtained will make it possible for all participants of the system to access information on the origin of products, their environmental characteristics, production and health benefits.

2 Methods

Designing a software product is a complex and basic process that results in the formation of a technical project [13]. It includes detailed scenarios describing the functions and features of interaction of software product objects, detailed layouts of the user interface and other documents that define the features of the system architecture and its commissioning [14, 15]. For the accomplishment of the requirements that ensure the creation of the technical project, a set of methods was used, which included object-oriented analysis and Wireframing method.

The application of the object-oriented method makes it possible to represent the system as a group of interacting objects [16, 17]. The model thus obtained is object-based and complies with the principles of abstraction, encapsulation, modularity, hierarchy, typing, concurrency and stability [13, 15, 18]. This approach was used to identify the key processes

and its subjects, qualitative and quantitative characteristics, establishing dependencies between them. A precedent diagram was developed to formalize the results obtained.

Wireframing method is used for visualization of user interface [4, 19]. It is used to develop the main screens of a mobile application using controls that make it possible to evaluate the interaction between them to identify potential negative states of the user when interacting with the software product.

3 Results

According to statistics, in 2023, the turnover of online food sales in Russia increased by 43%, which amounted to 3.7% of total sales [20]. Products can be ordered both through the seller's delivery services and using aggregator resources. It should be noted that one and the same seller can simultaneously sell his products using all the above means. Consequently, for the realization of farm products it is required to create such a software tool that can be integrated into the system of existing aggregators.

Using the stated methods made it possible to establish the main categories of users and the functional possibilities of the software product. Fig. 1 shows the model of interaction of user groups with the software product, which meets the requirements of the methodology of precedent diagram construction.

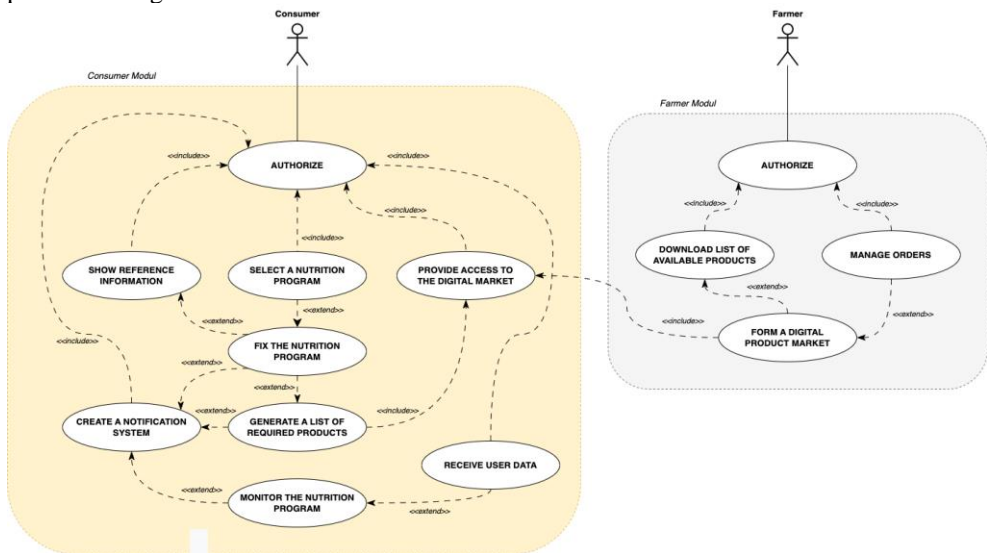


Fig. 1. Model of user interaction with the software product

The basic concept of the software product is that the user is given the possibility to purchase farm food in accordance with their individual preferences. The diagram shows the two main modules and their corresponding functions that make it possible to realize such a concept.

Users with the role “Farmer” have the possibility to place the products he is willing to sell in the digital environment. To do this, he needs to specify the type and quantity of products, their price and delivery conditions. The system functions will automatically make such products available to all users of the system, including external aggregators. In addition, the system will automatically inform the “Farmer” about the status of changes, so that the delivery of the ordered goods can be made in time.

A user with the role of “Consumer” can purchase farm products placed in the digital system. Two order modes are available to him: basic and advanced. At the first authorization

and subsequent authorization, the user simultaneously has access to all the possibilities of the listed modes. He independently chooses the one he will use. It should be noted that the unselected mode can be returned to at any stage of using the software product.

The basic mode implies access to the products placed in the system for realization. The user independently selects the products, supplier and available delivery. At realization of such mode the functional possibilities actually coincide with the functional possibilities of existing aggregators for realization of any type of goods of online stores.

The advanced mode implies the use of functions of personalized nutrition based on farm products. The user is offered to get acquainted with nutrition programs that make it possible to achieve certain goals (for instance, to reduce weight, to provide dietary nutrition, to select a menu in accordance with medical restrictions). Fig. 2 shows the screens of the mobile application of the user interface demonstrating the description of nutrition programs.

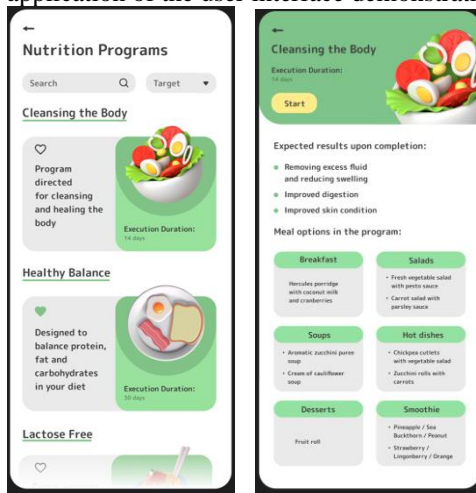


Fig. 2. Mobile application screen layout with description of healthy eating programs

The user has the possibility to get acquainted with the list of available programs (to search and filter the results by the set parameters), terms and expected results of their implementation, menus and foodstuffs necessary for the project implementation, as well as to save the programs he/she likes in his/her personal profile. Based on the viewed and saved programs, the search results for the corresponding user will be refined. Fig. 3 shows the start screen for selecting the nutrition program selection mode.



Fig. 3. Mobile application screen layout with the selection of the nutrition program mode

To automatically select a nutrition program, the user will need to answer questions to refine the search results. Fig. 4 shows part of the mobile application screen layouts that make it possible to obtain information about the user.

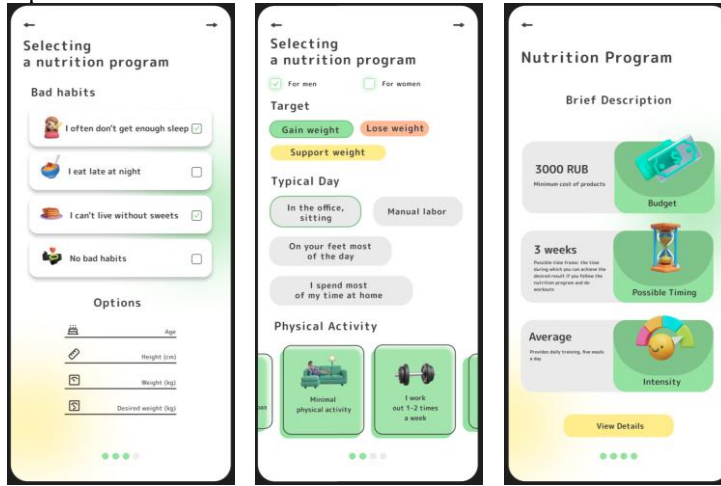


Fig. 4. Screen layout of a mobile user survey application for automatic personalized nutrition program selection

The user will be required to answer questions about the user's condition (and when the system is synchronized with fitness bracelets or applications storing health data can be obtained in the background), lifestyle (level of mobility, bad habits, etc.), current diet, and the goals they want to achieve. The results of the survey will generate a recommended list of nutrition programs, which will be grouped by food cost, time of implementation, and activity.

After selecting the nutrition program, the digital system will automatically set the nutrition schedule in accordance with the days of the week and time, based on which the list of objectives for the accomplishment and notification system will be determined. Fig. 5 shows the screen layout of the mobile application with the distribution of objectives by days of the week in accordance with the calendar dates.



Fig. 5. Mobile app screen mockup with nutrition program calendar

Each objective involves the preparation and consumption of certain dishes. For their preparation, instructional videos are available, as well as a list of products to be purchased. The user can mark the products he/she already has and purchase the rest using the digital farmers' market functionality (the layout of the corresponding screen is shown in Fig. 6).

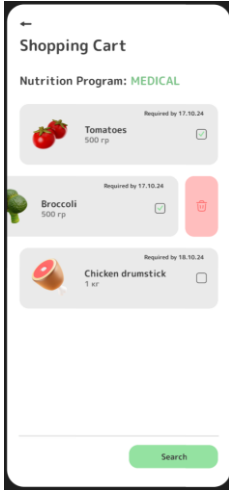


Fig. 6. Mobile application screen layout with a basket of farm products needed to prepare meals according to the nutrition program

The nutrition program adherence monitoring system makes it possible to inform the user in advance about the necessary products for cooking, as well as to analyze the parameters of his activity and changes (if synchronization with a fitness bracelet is set up and a program with physical activity is selected). Otherwise (adherence to the meal schedule, nutritional content and other actions), the monitoring system is based on data obtained manually from the user (for instance, confirmation of the preparation of a meal or its consumption at the appropriate time).

4 Discussion

Effective management requires continuous analysis, optimization and, in some cases, reorganization of processes. The use of modeling methodologies provides the representation of activities as a set of components aimed at performing a certain sequence of operations to identify bottlenecks and risks of errors at each stage [4, 13, 21]. The result of such activities are scenarios, which are presented in a certain form, in accordance with the established notation.

In the work, the analysis of the problem domain made it possible to establish its key characteristics, which made it possible to establish the list of potential users of the designed software product and its functional possibilities. To visualize the results, a precedent diagram was developed, which shows the reaction of the software product to external influences created by users. The reaction is defined by a set of functions that are engaged for the accomplishment of actions specified by the user. A function is a set of actions that can be implemented as a specific program module. This approach is actively used in the development of partially structured information systems [14, 15, 18]. The modular structure of a software product has certain advantages, one of which is the possibility of its scaling. The developed functionalities imply the use of additional resources, including external ones, which will expand the possibilities of the software product. For instance, models can be integrated into the system to provide functions of intelligent product selection, data analysis,

etc. In the works of researchers it is noted that this requires collecting, processing and storing data and establishing rules for changing the states of processes [12, 16, 22]. The use of the stated methods in the work made it possible to accomplish this.

The creation of a software product layout provides the possibility of creating a prototype of the user interface in order to assess the accordance of the selected controls with the given requirements of user scenarios [4, 19]. For the accomplishment of the specified principle, a model representing a set of basic functionalities was developed, categories of users and their possibilities in accordance with the developed model were determined. Based on this, layouts of user interface screens were created, fragments of which are presented in the paper.

5 Conclusions

Organic food is obtained without the use of harmful substances in a favorable natural environment, using means and technologies that have a minimal negative effect on the environment. This is most often done on small or average farms, which may be located at a considerable distance from population centers. Accordingly, the consumer requires the use of online services that can provide ordering of products taking into account the location of the farm.

Creating a software product that provides the possibility of communication between the consumer and the product manufacturer makes it possible to increase the possibility of marketing the finished product to the farmer and increase the diversity in the consumer's diet. In this case, the consumer receives a tool that provides a personalized approach to the organization of his nutrition, based on the indicators of his health, habits and features of life activity.

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