

# Process modeling for creating digital solutions for household ecoactivism

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**Abstract.** Humanity is having an enormous negative impact on the environment. To reduce this impact, government programs are being developed to modernize various industries by introducing innovative "green technologies". In addition, there is a demand in society for the formation of pro-environmental attitudes, which are expressed in the creation, support or participation in environmental actions or projects, the organization of everyday life and the development of habits aimed at reducing the consumption of resources and the pressure on natural ecosystems. In order to systematize, control and manage such processes in society, it is necessary to create digital solutions. This requires the formalization of existing processes and their digital transformation. All this substantiates the relevance of the topic of the completed work. The paper formulates the goals, objectives, theoretical and practical significance of the research. The use of general scientific methods of analysis and modeling made it possible to establish key objects and connections between them for the implementation of household ecoactivism processes using digital solutions. Based on this, a precedent diagram was created to graphically demonstrate the results obtained.

## 1 Introduction

Modern growth of the level of anthropogenic impact on the environment exacerbates environmental situations, increasing their epidemiological significance for humans, worsening the quality of life and threatening their existence [1, 2]. All this provokes an increase in the level of environmental concern of society in the form of social ecoactivity of creative and destructive orientation [3]. As noted in research, the model of human behavior can differ and be active (he participates in the activities of environmental organizations or protest movements), inactive public (makes donations, pays additional taxes or fees, participates in surveys or signs petitions), private (organizes or manages household processes so that the burden on the environment is reduced or resources are used rationally) and professional ecoactivism (making and lobbying pro-environmental decisions in professional [4].

Researchers dealing with environmental issues not only note the role of the state, business and the non-profit sector, but also the household activities of citizens [5-7]. This requires citizens to use water or electricity wisely, sort garbage, and, if possible, participate in clean-

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up days and other activities related to environmental orientation. Public awareness of relevant actions, successful practices, as well as the presence of opinion leaders on the environmental agenda play a major role in the formation of environmental values [3]. As noted in the results of statistical research, according to the overwhelming majority of respondents, there are no nationally known ecoactivists popularizing environmental values in Russia [Ecoactivism: involvement, motivation, potential: <https://wciom.ru/analytical-reviews/analiticheskii-obzor/ehkoaktivizm-vovlechennost-motivaciya-potencial>].

The main problem of development of household ecoactivism in Russia is the lack of a unified approach to the provision of environmental education, systematic actions, etc. Ecological practices are gradually appearing in the lives of Russians, but it is done solely out of personal responsibility [Conscious ecology vs the power of habit: <https://xn--80ahderddhrbb8o.xn--p1ai/news/tpost/791950f411-osoznannaya-ekologiya-vs-sila-privichki>]. For instance, eco-habits are formed by encouraging the surrender of secondary raw materials for money, coupons and other bonuses. That said, there are numerous different sources of information that report on environmental promotions. To learn about their existence, most often, it is possible only through personal initiative. This fact creates difficulties in popularization of household ecoactivism.

Creating a single platform that aggregates all the information on the environmental agenda in the region and the country would make it possible to attract more people to the problem of negative environmental impact. Thus, the aim of the research is the digital transformation of the processes of household ecoactivism.

This requires the objectives of structuring the object and subject of research, i.e. to establish the key elements, their characteristics and the links between them that affect the changes in the states of processes in the problem area; to create models of processes for their digital transformation.

The object of the research is anthropogenic processes that reduce the negative impact on the environment. The subject of research is the processes of formation of household eco-habits.

The theoretical significance of the research lies in the formation of a model of the influence of collective actions on individual decisions in the field of knowledge of psychology, sociology and ecology. The use of interdisciplinary approach promotes the integration of knowledge from different fields, stimulating the creation of new research directions related to sustainable development processes, education and environmental education strategies.

The practical significance of the research lies in the development of conceptual models based on the processes of reducing negative environmental impact and their use in the creation of software solutions that provide the implementation of technologies that influence social behavior and personal beliefs of a person in the field of ecology.

## **2 Methods**

General scientific methods, which include analysis and modeling, were used as the main research methods that make it possible to fulfill the specified objectives.

Analysis made it possible to visualize the object of research as a set of elements, their properties and relations between them. Additional application of the abstraction method made it possible to identify key aspects of the subject area that have a significant impact on the state of its processes. In works related to the creation of models of complex systems, it is noted that the results obtained in this way are required to be grouped according to the principle of common properties and attributes to create classes of objects [8, 9]. For this purpose, generalization and idealization methods were used.

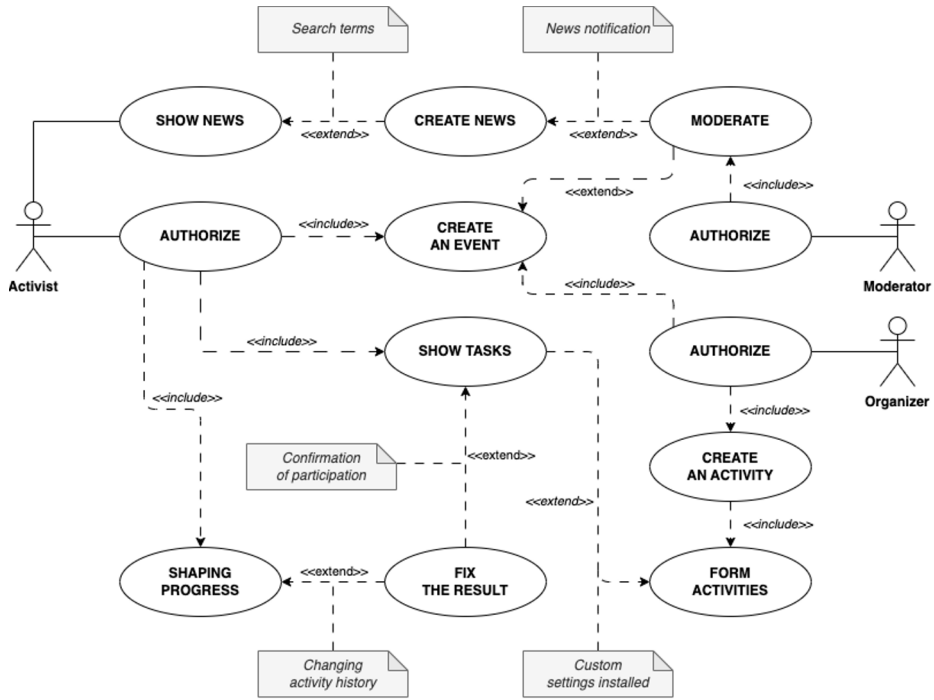
The modeling process makes it possible to obtain and study a real object by reproducing its characteristics (structures, functions) on another object [10, 11]. The application of object modeling methodology made it possible to model business processes using a unified graphical language for describing the characteristics of objects. This approach is used in research related to the mapping of organizational structures, system and structural design [12, 13]. To determine the functional possibilities and behavior of the system when interacting with different categories of users, a model corresponding to the precedent diagram was developed.

### **3 Results**

The analysis of the processes inherent in modern household ecoactivism has shown a certain level of involvement of residents of large cities. In such cities there are programs for sorting and recycling of garbage and, accordingly, the population is offered to throw garbage in certain containers (paper, plastic, etc.), in large retail chains there are containers for collecting used batteries or light bulbs. Recently, plastic bottles and aluminum cans are gaining popularity in specialized machines. It should be noted that a person voluntarily participates in these processes. In some cases, the organizers of the collection of certain types of garbage provide gift certificates or coupons to retail chains for the deposited garbage. The main problem of popularization of such a direction of household ecoactivism is the lack of information about the collection actions, the limited number of places for waste delivery and the lack of synchronization of information about the rules and conditions of different actions (if the organizers have their own Internet resource).

For processes related to the formation of eco habits of careful consumption of resources (for instance, water, electricity, etc.), it is possible to obtain in some cases only statistics on their consumption. Accordingly, there is a lack of information and its systematic provision to the user that demonstrates methods that reduce resource consumption.

Thus, in the digital transformation of household ecoactivism processes, one of the main processes should be the process of obtaining background information, news about actions or achievements in this area from other people. Figure 1 presents a model of digital transformation, including the following possibilities.



**Fig. 1.** A model of user interaction with a digital household ecoactivism system

The main participants of the digital process are the Activist, the Organizer and the Moderator.

To identify each user in the system requires passing the authorization procedure, which involves entering and checking the accordance of user identification data. Each precedent represented in the diagram is a summary of numerous actions that the system performs to implement the specified process. Dependencies occur between processes, which are labeled include (one precedent is executed together with another) or extend (the second precedent is executed only after the previous precedent is executed when the condition specified in the comment occurs).

The main function of the Moderator is to check the published materials for accordance with the internal policy of the system and compliance with the current legislation.

The role of Activist can be performed by any user who wishes to take part in environmental events, receive reference and other information about the events, participate in the processes of resource consumption control, waste sorting, etc.

The role of Organizer is performed by a user who has the possibility to propose an environmental event (for instance, a representative of a trade network, city administration), organize and conduct it. In addition, he will need to register participants and enter their details into the system so that the users Activists can receive bonus activity points.

Depending on the queries in the system, search conditions and activities in which the Activist participated, he/she will be provided with information and activities of the corresponding orientation in priority order. At the same time, the possibility of customizing filters and search conditions for viewing other types of information is not excluded.

In order to attract more people to participate in environmental events and observe the principles of environmental protection, as well as to support the interest of those already participating, there is a possibility to form a progression of participation. This means that each user Activist for participation in events, fulfillment of tasks, sorting garbage, etc. receives bonus points, which can be converted into real rewards from the system partners.

## 4 Discussion

Modeling is an important step that ensures the elimination of numerous problems at the software development stage [12, 14]. The creation of models that represent the real behavior of a complex system is a complex process that involves a detailed analysis of the problem domain, highlighting key features and their evaluation for possible digitization [9, 15]. For this purpose, the research uses a unified set of methods that make it possible to fulfill the formulated objectives [5, 16, 17]. For the current results, a set of such methods was used to obtain characteristic results. These include a list of actors in the realization of the concept of household ecoactivism and potential participants, a list of key processes occurring between them, and conditions for the realization of specific processes.

## 5 Conclusions

Environmental problems are challenges for humanity and threats of planetary scale. Current trends in socio-ecological relations in society are changing due to the increasing number of active actions related to the attempt to influence the rate of technogenic and anthropogenic impact on the environment. To this end, techniques and tools are being developed to support both personal and mass environmental activism.

The creation of software solutions capable of providing the user with information about environmental activism, forming individual trajectories of personal development in the field of ecology, is a solution capable of changing the human attitude towards the environment and resources.

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