

Management solutions complex for the cost evaluation of residential cultural heritage objects

Margarita Panteleeva^{1*} and Alexandra Pletneva¹

¹Moscow State University of Civil Engineering, Moscow, Russian Federation

Abstract. With the development of technology mankind seeks to know its past, to preserve all that remains of the ancestors. In all countries of the world there are so-called objects of cultural heritage (hereinafter - OCH), which are valuable from the point of view of history, architecture, culture, and art. In some of them, people still live. As with other housing owners of OCH make transactions, conclude contracts of sale. But one of the most controversial topics, is the question of assessing the value of such housing. The apartment in a monument house cannot cost the same as in a modern house. The question of market value of such objects is voluminous, as it requires considering several factors: maintenance and restoration costs. There is no unified methodology of valuation of houses which are recognized as OCH. But there is no a database for simple search for similar objects. Undoubtedly there are open data of the objects of analogues, but it's not always possible to find the necessary one. As an object of exploitation, OCN has a peculiarity - it does not presuppose demolition. According to the international standards all OCH in the "ideal" representation should be preserved forever. This is the peculiarity of assessment and work with OCH, inside which there is residential real estate. In this regard, special approaches to solving these problems are required. The article offers mechanisms and managerial solutions to create a methodology for the valuation of such objects.

1 Introduction

Several large cities of the Russian Federation have in their housing stock houses that were once built by rich merchants and noblemen. Such objects are certainly of cultural value both architecturally and aesthetically, as well as historically. Even not the most famous names of rich or middle-income people in pre-revolutionary Russia were in one way or another connected with the more famous members of society. For example, the arts, in addition to being financed by the emperor, often needed more pinpoint assistance. Talented people, future artists and architects were most often poor, not immediately recognized, and to show their work at exhibitions, it was necessary to enlist support. There were many such cases, take, for example, Mikhail Vrubel, whose patron was Mr. Savva Mamontov. Dwelling houses having the status of cultural heritage monuments preserve the multifaceted history of Russia, which is why the government pays special attention to these objects.

* Corresponding author: derikova@gmail.ru

According to Article 44 of the Constitution of the Russian Federation, citizens have the right to participate in the cultural life of the country and have access to cultural values and are obliged to preserve historical and cultural monuments [1].

Today in Russia there are more than 200 thousand monuments belonging to the objects of cultural heritage. Of these, seventeen sites are under UNESCO protection [1]. Buildings and constructions, architectural monuments, and other objects which through state expertise have acquired the status of objects of cultural heritage are listed in the unified state register. Table 1 shows the data from the Unified Interagency Information and Statistical System (UIIS) for 2021 [2].

Table 1. Number of cultural heritage objects included in the register [2].

Level of the subject of the placement of the object of cultural heritage	Groups of cultural heritage objects included in the register	Number of objects, in units
Total municipal facilities	All groups	3 722
Total objects of regional importance	All groups	78 600
Total objects of federal importance	All groups	15 655
Total for the subject	Ensembles	9 488
	Total facilities	97 977
	Identified objects of cultural heritage	125 560
	Sites of interest	2 208
	Objects of archaeological heritage	55 542
	monuments	86 281
	Monuments in ensembles	21 284
local (municipal) importance	Ensembles	198
	Identified objects of cultural heritage	0
	Sites of interest	100
	Objects of archaeological heritage	0
	monuments	3 424
	Monuments in ensembles	500
regional significance	Ensembles	6 660
	Identified objects of cultural heritage	0
	Sites of interest	2 030
	Objects of archaeological heritage	0
	monuments	69 910
	Monuments in ensembles	13 041
Federal significance	Ensembles	2 630
	Identified objects of cultural heritage	0
	Sites of interest	78
	Objects of archaeological heritage	55 542
	monuments	12 947
	Monuments in ensembles	7 743

According to Table 1 we state that there are more than 150 thousand objects, which can be residential real estate and at the same time have the status of OKN. In addition, in figure

1 are extended data showing the dynamics of the number of objects of OKN for the period from 2014 to 2021.

The graph in figure 1 is based on the information from the Unified State Register of Cultural Heritage Objects. The Register is designed to ensure automation of technological processes of keeping up-to-date information about the objects of cultural heritage and formation of a unified state database of objects of cultural heritage (historical and cultural monuments) of the peoples of the Russian Federation in electronic form, both at the federal and regional levels. The database allows the employees of the Ministry of Culture and the regional protection authorities to form reports, keep records of the monitoring data on the state of the cultural heritage objects and provide the necessary information about the cultural heritage objects [3].

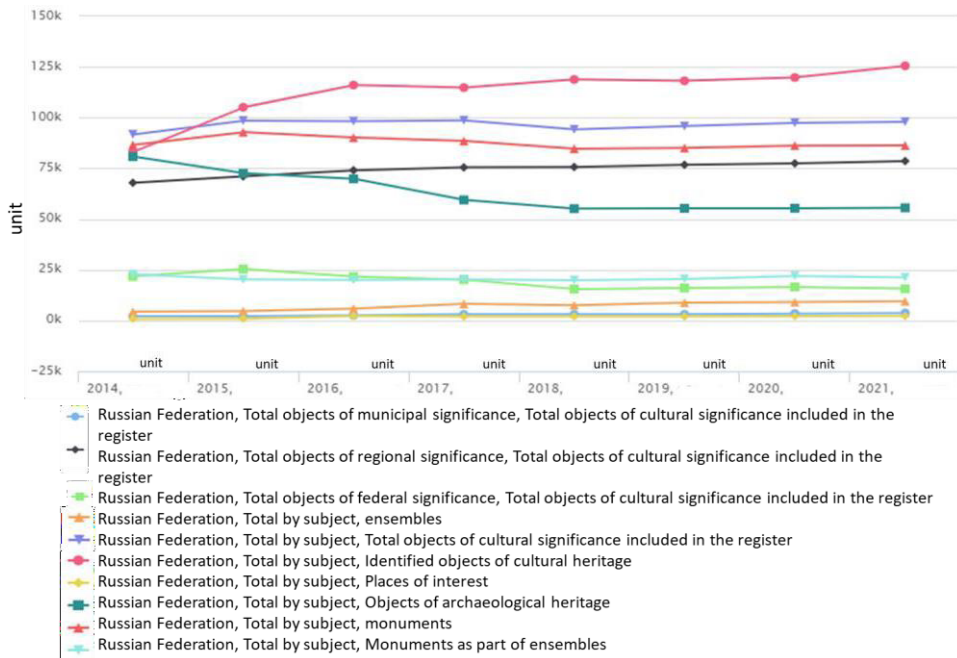


Fig. 1. The number of OCHs included in the registry [2].

However, over the past 10 years in the Russian Federation more than 2.5 thousand monuments have perished. Every year about 150 - 200 monuments of architecture are partially destroyed or completely disappear [1]. To preserve these unique objects, the state carries out their restoration or reconstruction. But after these operations the value of such objects changes significantly. It becomes more and more difficult to assess the new value of the cultural heritage object each time. The reasons for these facts are the following:

1) it is impossible to cancel the regime of real time: market economy and foreign policy conditions, which create additional barriers to the implementation of restoration and reconstruction projects of cultural heritage objects;

2) many houses-monuments are located in the centers of Russian cities. Therefore, ensuring their integrity and preservation requires additional investments for restoration and reconstruction;

3) complete or partial deterioration of engineering systems of housing and communal services;

4) a number of objects of cultural heritage are in an emergency condition and stand idle, because it is expensive to restore them, and it is dangerous for citizens to live in them;

5) it is difficult to find responsible owners for residential buildings, which are objects of cultural heritage, capable of timely implementation of all types of work required to maintain the appearance of historic buildings.

In connection with the arguments presented above, the purpose of the study is to create a set of management solutions to simplify the procedure of cost examination of cultural heritage. In the course of the study, it is planned to solve the following tasks:

- to assess the available data on OCH;
- to study the existing methods of the cost valuation of OCH;
- to work out a concept of solving the problem of the cost valuation of OCH;
- to develop a mechanism for implementing the technology of collecting and processing of data on OCH.

2 Materials and Method

The study used statistical, comparative and comparative analysis, systematic method, analysis, synthesis, economic method, algorithmic programming, auxiliary calculation methods, structural programming.

The main documents for the study were included in the legal and regulatory framework governing the sphere of OKN in Russia [4]:

1. Constitution of the Russian Federation;
2. Urban Planning Code of the Russian Federation № 190-FZ;
3. Land Code of the Russian Federation No. 136-FZ;
4. Federal Law No. 73-FZ "On Objects of Cultural Heritage (Monuments of History and Culture) of the Peoples of the Russian Federation".
5. Federal Law No. 169-FZ On Architectural Activities in the Russian Federation;
6. Law of the Russian Federation No. 3612-1 "Fundamentals of Legislation of the Russian Federation on Culture," approved by Decree of the President of the Russian Federation V. V. Putin No. 808;
7. "Regulations on Zones of Protection of Cultural Heritage Objects (Historical and Cultural Monuments) of the Peoples of the Russian Federation," approved by Russian Federation Government Decree No. 315;
8. Order of the Ministry of Culture of the Russian Federation No. 811 "On Approval of Administrative Regulations for the Provision of the State Service of Issuing a Task and Permit to Conduct Works on the Preservation of Cultural Heritage Objects";
9. GOST R 55653-2013 "Procedure of organization and carrying out works on preservation of objects of cultural heritage. Works of monumental painting. General requirements", approved by the order of Rosstandart № 1206-st.

In addition, to achieve the purpose of the study the following concepts were used:

1) an object of cultural heritage is an immovable property, which is an object of material culture, which arose as a result of historical events that are valuable in terms of history, architecture, culture, archeology, etc., in accordance with Article 3 of the Federal Law № 73-FZ "On objects of cultural heritage (monuments of history and culture) of the peoples of the Russian Federation)" [5];

2) lifecycle cost is the total costs during the life cycle of the product, including the costs of preparation for the purchase of the product, the purchase, possession of the product (product application) and its disposal [6];

3) notation is a syntax in a programming system, which is used to build a system of commands for the interaction of elements [7].

Houses recognized as objects of cultural heritage can cause non-standard situations when assessing the value of housing for restoration or repair work. In this case, factors affecting the final value include:

1. Uniqueness of each object
2. Category of the property (federal, regional, local)
3. Lack of parking
4. Low level of transport accessibility
5. Difficult restoration work
6. High maintenance costs.

Residential buildings recognized as objects of cultural heritage often become the objects of contentious legal situations, as buildings and structures of this type have a wide variety of technical nuances and parameters. There are several methods of appraisal of cultural heritage buildings which give an opportunity to come to partial standardization [7]:

- Standard of the Russian Society of Appraisers Project "Evaluation of immovable monuments of history and culture - STO ROO 21-05-97;
- Methods of economic evaluation of cultural heritage objects (historical and cultural monuments) of the peoples of the Russian Federation from 2015 from the official website of the Ministry of Culture of the Russian Federation;
- Methodological Recommendations on Market Value Assessment of Architectural Monuments (Ministry of Culture of the Republic of Uzbekistan. Samarkand, 2002);
- Methods of economic evaluation of the objects of cultural heritage (historical and cultural monuments) of the peoples of the Russian Federation ("Center for Independent Evaluation", 2005).

All the documents in the above list, in addition to the specific tools, include three basic classical approaches to the valuation of real estate objects (objects of cultural heritage), which are shown in Figure 2 [8].

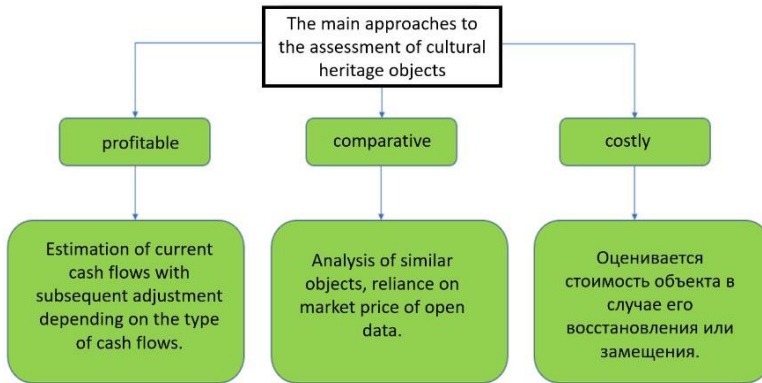


Fig. 2. The main approaches to the assessment of the OCH [Source: Compiled by the authors].

These approaches are common in the theory of value analysis. It is necessary to determine which of them is the most appropriate now for cultural heritage properties with residential real estate. The income approach is relevant because apartments or offices can be rented out or bought and sold. The cost approach can be called "inalienable" because it involves considering the restoration of the object. Objects of cultural heritage require a lot of attention and systematic restoration of any parts. Calculation approach requires finding analogues, which is not always possible due to the lack of information base.

To decide to improve the procedure of evaluation of cultural heritage objects the life cycle of a house - a monument of architecture - requires special attention. The peculiarity of the modern approach is that such objects are "timeless", that is, they are eternal. In fact, nothing is eternal, but in the history of civilization there are examples (Egyptian pyramids) that the life cycle can be "very long". The "perpetual life cycle" must be honored in evaluation.

In this aspect, the topic of valuation of objects of cultural heritage, the determination of market value is disclosed by scientists from different points of view. According to Professor, Dr. Kirill Kulakov "in some cases allowed the development of evaluation methodology to determine the value of the life cycle based on the introduction of additional adjustment factors to the cost, which are focused on the priorities of value formation in the formation of public and private orders. An example of such a conceptual approach is the methodology [8] proposed by the National Association of Designers in 2014, where the selection of projects for financing within the framework of the state order is proposed to be based on the life cycle cost by total cost. The formula is as follows (formula 1):

$$LCC = Zed * Ek * R + Zper * Gk * T * K * R \rightarrow \min \quad (1)$$

where LCC - life-cycle cost; Zed - the sum of one-time costs of design, construction, commissioning, and decommissioning (disposal); Zper - the sum of recurrent costs during operation; Ek - correction index for energy efficiency; Gk - correction index for "green" construction technologies; T - number of periods of repairs before the first major repair; K - correction index for seasonality of deviation from the standards; R - discount factor [8]. With the help of the formula, it will be possible to calculate the value of the object now most accurately.

The ways of solving the problem of assessing the value of cultural heritage objects of residential use proposed in the article were formed based on the following tools [9]:

1. IDEF0 notation

"IDEF0 is a graphical modeling notation used to create a functional model that depicts the structure and functions of a system, as well as the flows of information and material objects that link these functions. IDEF0 methodology is a popular approach for description of business processes. Features of the application of this notation include:

- The use of the context diagram. This is the uppermost diagram, in which the modeling object is represented by a single block with boundary arrows (Figure 3).

- support of consistent decomposition of the process to the required level of detail;
- dominance;
- allocation of 4 types of arrows: "Input", "Output", "Mechanism", "Control".

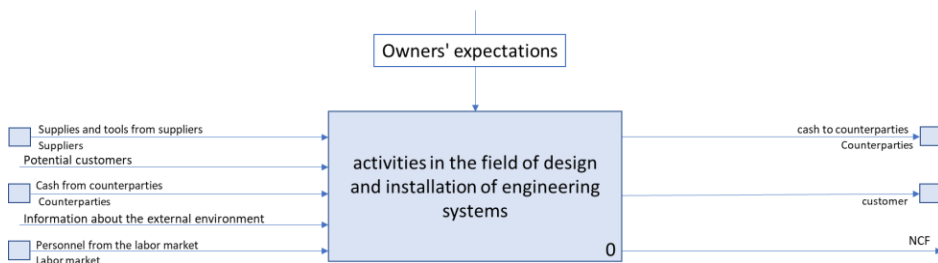


Fig. 3. Context diagram in IDEF0 notation [9].

2. DFD Notation

DFD notation (data flow diagram) literally translates as a data flow diagram. In DFD diagrams, an arrow indicates the transfer of flow from one object to another and, at the same time, the transfer of task focus. One block can include several arrows, so it is impossible to uniquely identify when there is a transfer of control, unlike in IDEF3 in these diagrams. The arrows in DFD are not signed for designation; the entity is transferred between function blocks using separate blocks in the form of a rectangle. Although DFD stands for data transfer, this notation can be used to model material resources. The DFD notation is used

mainly for modeling processes at the performer level, well suited for describing processes for automation purposes" [10].

The listed concepts and methods will be used in the future and will help to substantiate the proposed ideas.

3 Results

The above evidence states that as of today residential buildings recognized as objects of cultural heritage do cause difficulties in evaluation and determination of market value. The authors of the article suggest the following set of management solutions:

1. Creation of a real estate exchange for residential buildings - objects of cultural heritage. The exchange will accumulate data from already established real estate exchanges, such as "Moscow Exchange", and form bids for new objects. The Exchange site allows registered users to increase the number of parameters to describe the entered objects. In this case all the parameters should be divided into 2 groups:

- classical parameters (address; year of construction; significance of the object - federal, regional, local; basic materials; architectural style; name of the architect, according to whose project the object was erected; area of the premises);

- unique indicators (belonging to an era, a noble or merchant family, an imperial family; special materials used in construction; special technology used in the relevant time; the presence of unique elements - sculptures, frescoes, etc.; the authors of these works; known previous owner).

2. Creation of a modern method of evaluation, considering the experience of previous years. For a methodology to combine all the accumulated experience and use part of the tools proposed in the existing methods. The above methods are designed for cultural heritage in general, that is, in addition to residential buildings also to theaters, museums, galleries, monuments, ensembles, etc. It is necessary to create a more highly specialized methodology along the lines of:

1) standard of the Russian Society of Appraisers draft STO ROO 21-05-97 select the following items (item 6) - item. 6.4 Method of comparative sales, item. 6.5. Profit method;

2) Methodical recommendations on the assessment of the objects of immovable property referred to the objects of cultural heritage in accordance with the established procedure - item VIII. Appraisal approaches and methods.

3. Parallel to the creation of the methodology it is necessary to open a special company under the supervision of the state institute which will deal with the sale and storage of information about the apartments in the houses that are recognized as objects of cultural heritage in the cities of Russia. Let the company be called "Cultural heritage sites". The database for such a company will be the Exchange of residential houses-objects of cultural heritage. With the help of DFD information model we will present the decomposition of the system of organization of such a company. In this paper we use the notation of Yordan (Yourdon), in figure 4 we introduce the necessary notations to read the model [10].

Component	Jordan 's Notation
data flow	name →
Process	○ Name Number
Storage	▭ Name
External entity	▭ Name

Fig. 4. DFD model reading notation [12].

Figure 5 shows the author's system of interaction and interdependence of the elements of the company "Cultural heritage sites" from each other based on DFD notation.

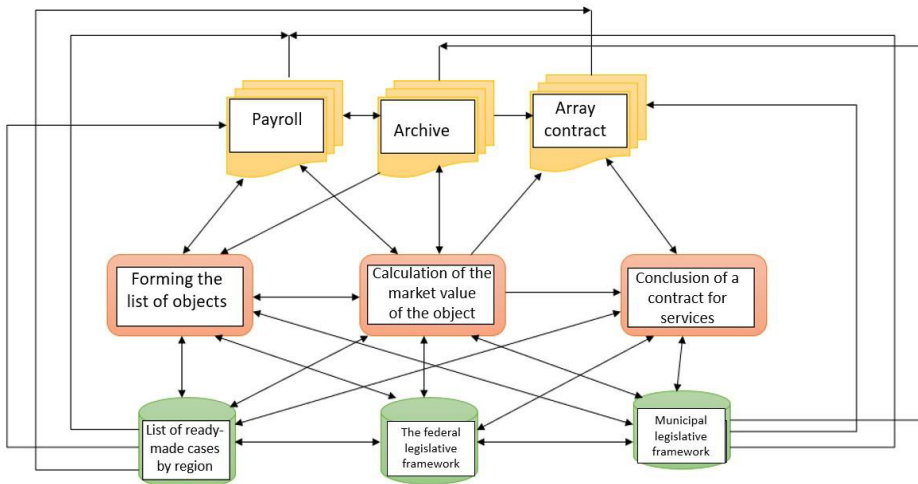


Fig. 5. Decomposition of the system of organization of work of Cultural heritage sites [Source: compiled by the authors].

The work of such a company should be under constant control of government agencies, as it will use the registry of personal data of citizens on their property. Such a company can sell a controlling interest to the state, and it is possible that over time there will be several such companies. The scheme of interaction between the company "Cultural heritage sites", which sells and stores databases on the sale of apartments in houses, recognized as objects of cultural heritage in Russian cities with the state, can be represented by the IDEFO model, shown in Figure 6.

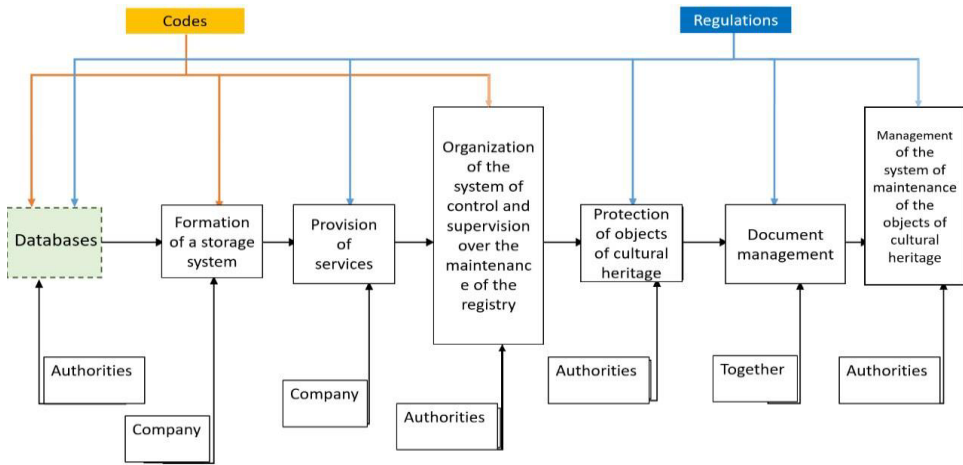


Fig. 6. Scheme of interaction between a company storing data on cultural heritage objects and authorities in IDEFO notation [Source: compiled by the authors].

1. Creation of a service with the possibility to obtain information about the cadastral value of such housing by entering data (number of square meters, year of construction, level of significance of the object and other parameters) [11].

The proposed measures can lead to a simplified system of evaluation of apartments in houses recognized as objects of cultural heritage, as well as reduce the risk of future overpayments for buyers. The conceptual scheme of interaction between the proposed measures is shown in Figure 7.

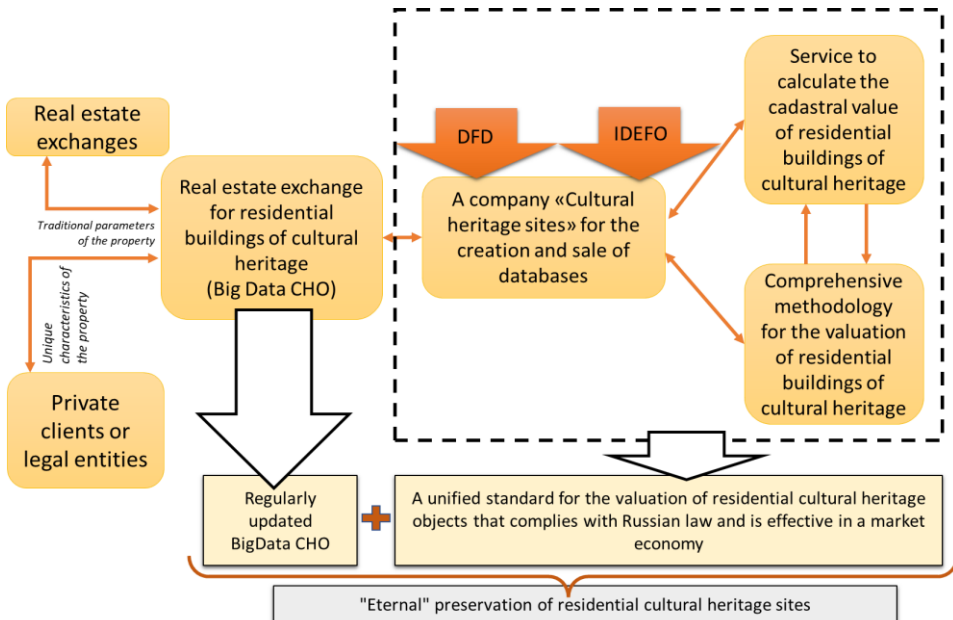


Fig. 7. Conceptual scheme of interaction between the proposed measures to simplify the evaluation of the value assessment of cultural heritage objects [Source: compiled by the authors].

4 Discussion

The proposed set of solutions has both several advantages and some disadvantages. On the one hand, the creation of a separate exchange of houses-monuments of architecture will create comfortable conditions for buying, selling, renting such housing. In addition, the exchange of objects of cultural heritage will be a source of public information for the implementation of a comparative approach to their evaluation. On the other hand, there is a need for an entity in the person of a separate company under the control of a state institute, which would create such a service [12, 13, 14]. It can be reasonable to do it through the state order, but in this case, we need the direct support of the authorities, as there is a high risk of not finding a contractor for such activity. Even if a company is ready to create a website, it needs to enter the data to be entrusted to the authorities, that is, information from the registry. To create a truly quality product will require serious financial resources and legal justification for the transfer of data to third parties from the registry [15, 16].

The negative aspect for the creation of such a system of measures is that many experts involved in the practical evaluation of cultural heritage objects are convinced that each object is unique, and it is impossible to come to a single decision on their evaluation. It is possible to refute or accept this aspect only in practice [17, 18, 19].

In addition, it is very likely that there will be a shortage of personnel to implement such an idea, as highly specialized specialists in archiving, copyright, historical expertise, etc. will be required.

A credible positive side of the proposed solution is to simplify the work of the authorities to collect, store and monitor information about the objects of cultural heritage, which will reduce the burden on the budget and on the owners of such objects.

5 Conclusion

To summarize the above, we note that objects of cultural heritage are of great importance for the country. Residential buildings recognized as objects of cultural heritage are not just a luxury item, but a historical memory of culture, prominent people, the era. Housing in the monument buildings requires special attention, careful treatment, and a lot of expenses.

To assess the value of the apartment in the cultural heritage is not a simple task, requiring a comprehensive approach, as well as professionals with experience and competence to conduct such an assessment. To date there is still no common methodology for assessing the value of cultural heritage objects. The authors of the article propose to solve this issue at the state level by creating special companies and databases, systematizing information on such unique objects. The main purpose of such a comprehensive approach is to create a unified state standard of evaluation of houses, which are the objects of cultural heritage.

Over time, society will have to find ways to solve these problems, because objects of cultural heritage without proper attention may be lost. To preserve for posterity, the most valuable monuments of architecture and everyday life, it is worth integrating all the efforts of researchers in this area under the aegis of the state institution as soon as possible.

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