Published in the USA
European Journal of Technology and Design
Issued since 2013.
E-ISSN: 2310-3450
2023. 11(1): 3-8

DOI: 10.13187/ejtd.2023.1.3
https://ejtd.cherkasgu.press

Articles

Semasiological Modeling in Real Estate Management

Boris Sh. Gurgov [a, *]

[a] Educational and Research Institute of Informatics and Control Systems of the Federal State Budgetary Educational Institution MIREA RTU, Moscow, Russian Federation

Abstract

The article examines the technologies of real estate management of public educational organizations. A new control technology is considered. which the author calls semasiological. The term "semasiological" is borrowed from the field of linguistics. It characterizes the interdisciplinary transfer of knowledge. Semasiological control technology is based on semasiological modeling. In this technology, management models are built according to the bottom-up principle. Semasiological modeling is implemented through the use of information units as elementary models. Complex management models are formed from elementary models. Related types of modeling are described: onomasiological modeling and semasiological modeling. The difference between these types of modeling is shown. Information units are used in the modeling type. The article provides an analysis of the types of information units. The article provides an analysis of the types of modeling that is used in real estate management. The main components of semasiological technology of real estate management are described. The article shows the need to use information units as the basis of semasiological modeling and semasiological control. The importance of corporate real estate management in sectoral management is shown.

Keywords: computer scientist, modeling, information models, information units, onomasiological modeling.

1. Introduction

Real estate management of state educational organizations is a management complex that uses the general theory of management, taking into account the characteristics of state educational organizations. State educational organizations belong to the social sphere. They require government support and are economically unprofitable on a micro scale. State educational organizations cannot be equated with commercial organizations that pay for themselves. On a national scale, educational organizations are profitable. Education in the USSR ranked third in terms of efficiency after science and tourism. In accordance with the study of the effectiveness of education by Academician S.G. Strumilin in 1987 (report of the All-Russian Science and Technology Center). The cost of education in the USSR in a secondary higher educational institution was 4,200 rubles. The standard salary of an engineer, a university teacher and the standard pension of a specialist with a higher education was 120 rubles per month. The specialist

* Corresponding author
E-mail addresses: bsgurgov@gmail.com (B.Sh. Gurgov)

paid for his training in 2 years and 2 months. Education in the USSR was not free, but education on credit. A regular loan ends after the end of the term and repayment of the loan. In the USSR, specialists repaid the loan for the rest of their lives. Therefore, they brought huge profits and education in the USSR was effective.

At the same time, the real estate and property of the education system does not differ from the real estate of other industries. However, the non-commercial orientation of state educational organizations requires the use of different criteria for assessing their effectiveness and management than for assessing the effectiveness of commercial firms.

There are a number of trends in modern education and property management. The first trend is the growth of accumulated and information. This trend in the "small" has led to the second trend – the use of information technologies and information systems in management. This trend in the "big" has led to the third trend – the problem of big data (Fan et al., 2014; Lyovin, Tsvetkov, 2017). The increase in the volume and structure of the accumulated information has created the complexity of data and the difficulty of managing such data. The complexity of data and management models is achieved through the universalization of their description and through the development of new models and technologies. Such new models and technologies of management are models of information units (Ozhereleva, 2014; Tsvetkov, 2014), information semasiological models and information semasiological technologies. Up to the present time, semasiological technologies have been widely used in linguistics. There are attempts to apply them in the information sphere. This article develops this direction

2. Results and discussion

System of Units of Semasiological Modeling

In many types of analysis and modeling, formal systems of signs or systems of units are used. Such an experience exists in cartography, where cartographic symbols are used in the construction of maps. Such is the case with applied computer science. Such symbols are called information units. The use of information units reduces complexity and increases the comparability of models and technologies.

There are two approaches to the use of information units. The first approach is used in the study of reality. It is called onomasiological (Pavlov, 2019; Bolbakov et al., 2022). It is based on the detailing of the information set to the level of universal information units. This approach is called "from the general to the specific" Another approach of modeling is called semasiological. It is based on the construction of control models and technologies from a system of universal units or an alphabet. This approach is called "from the particular to the general." This is how word formation occurs in natural languages. The semasiological approach uses rules for word construction and complex models. The semasiological approach is used in computer-aided design systems. In it, drawings and models of objects are designed from graphic primitives.

At present, a field approach is used in computer science and geoinformatics. This approach is based on the use of the model of the information field and the geoinformation field (Bolbakov et al., 2022) as a large information model. A field has indivisible elements. These field elements are information units. Thus, information units can be considered as one of the principles of strategy-based semasiological modeling.

Types of modeling and information units.

There are different types of modeling (Bonate, 2006) that use different kinds of information units. One of the taxonomy of modeling is based on the relationship of the modeling to the source of the modeling. The initial source of modeling is the information set and the information field. In the information field there are images of modeling objects. It is necessary to distinguish between the source of the simulation and the image of the modeling. If the source of OM is a substantial object, then such modeling is called object modeling (Kosova, 2022). Object modeling, in which a system approach is used, is called system-object modeling. If the source of modeling is a process, then such modeling is called processual. If the source of the modeling is the content of the object, then such modeling is called semantic. If the modeling source is the properties of an object, then such modeling is called attributive modeling.

Object modeling uses form and content. Object modeling is used to solve many problems (Tsvetkov, 1991). Modeling requires the use of model elements. These elements simplify model construction and analysis. Such elements are information units. Object modeling uses structural

and semantic information units.

Process modeling (Raev, 2018) is also widely used. Process modeling is used in management. When building processes, you also need to use process elements. Process elements also simplify process analysis. Such elements are procedural information units.

In addition to object modeling, there is content modeling or semantic modeling (Song et al., 2022). Semantic analysis of information also requires the introduction of semantic elements. Such elements are semantic information units. Semantic modeling uses only content.

Structural modeling is a type of modeling. It uses structural information units. Structural modeling uses only morphology.

Meta modeling is one of the types of modeling. It uses meta-models and a variety of information units.

Conceptual modeling is a type of modeling. It uses information constructs as conceptual models and conceptual information units.

Agent-based modeling is a type of modeling. It uses agent models as simple and compound information units.

Heuristic modeling is a type of modeling. It uses heuristics and heuristic procedural information units.

Thus, many types of modeling and analysis require the use of information units.

The development of society is characterized by globalization (Tsvetkov, 2005a), automation, and informatization. The dominant factors in the development of society are informatization and digitalization. All these areas are connected by computer science. Modern Informatics (Gospodinov, 2023) combines different scientific areas by methods of analysis, information approach, and modeling methods. Informatics is an integrator of methodological research. The tasks of computer science are: the acquisition of knowledge (Holzinger, 2019), the formation of a picture of the world, the extraction of spatial knowledge, the identification of latent knowledge and the transformation of tacit knowledge into explicit knowledge All types of knowledge require if possible, it is necessary to create an element of knowledge. Such elements of knowledge are semantic information units.

Information models form information (Tsvetkov, 2005b) and intellectual resources (Zhang et al., 2017). There is a need to create elements of such resources. The elements of information resources are information units.

Situational analysis is now widely used. Situational analysis is required when solving management problems. Situational analysis is performed when building a model of an information situation. Situational analysis is used to identify relationships and connections. Situational analysis requires the application of elements of analysis. The elements of situational analysis are information units.

Exploration of the world around us begins with the collection of information. The main method of gathering information is monitoring. In monitoring, information units are needed to systematize the collected information.

After collecting information, applied problems are solved. These tasks are divided into two groups: cognitive tasks and applied tasks. Important tasks are aimed at developing models that form a picture of the world. However, these models also need to be reconciled. Such alignment is possible if the models are created within a single system. Such a system of complementary writing is a system of information units.

Applied modeling tasks include: construction of applied systems, maintenance of applied systems, solution of applied problems, information support in other applied areas. In order for the results of the constructions to be comparable and analyzable, it is necessary to choose a single description system. Such a system of description is the system of applied information units.

In the process of research, information from the real field and space is transferred to the information field and creates an information set. An information set is originally an unsystematized representation of the real world, like a photograph. For subsequent use and transformation into models and for obtaining knowledge, it is necessary to create a system for analyzing and describing the elements of the information set. The elements of analysis and description of the information set are information units.

Information systems (IS) and geographic information systems (GIS), as well as databases (DB) are widely used in the research process. These systems operate on ordered pieces of

information and ordered operations. Chunks of information and operations are made up of units. These units are information units. Information units are necessary for the operation of information systems. The operation of a computer is based on the use of information units. Computer information units are machine operations and machine words.

The general conclusion is that information units are the basis for modeling and applying methods of informatics in practice. There is no universal system of information units, nor is there a universal language of humanity. Information units form systems in relation to the subject area and the area of research tasks. Complex objects and their models are divisible. It makes it possible to divide them into parts and elements.

In the information field, information models are a reflection of real processes and objects. In geoinformatics, models are represented in the form of digital maps and digital models. To transform models, it uses information morphism. Information morphism carries out a transformation on the basis of information units. In the theory of information units (Todorova, 2023), there are two areas of use: onomasiological (detailing of units) and semasiological (integration of units). Accordingly, two types of modeling are used: onomasiological (OM) and semasiological (SM).

The basis of OM modeling is the study design. The main idea of onomasiological modeling is detailing. At the first stage, clusters or, if possible, objects are isolated from the initial information set. Clusters are transformed into models, models are transformed into parts. On the basis of the selected criterion of divisibility, indivisible elements or information units are obtained. Most applied research is completed at the level of the formation of models and their parts. A complete study involves obtaining indivisible elements of models. In the information field, such models are information units (IUs). In OM technologies, UI elements are the result of modeling. In practice, OM is implemented using the oppositional (Cohen et al., 2016) and dichotomous analysis.

The main idea of semasiological modeling is integration and construction. The basis of SM modeling is the design or design plan. At the first stage, SM technology identifies information units as the basis of the project. Such UIs form systems. For example, in cartography, these are systems of conventional cartographic signs divided into three classes: area, linear, and point. In the programming of the UI system, there are elements of flowchart algorithms. In linguistics, it is the alphabet and thesaurus. Different languages have their own alphabets, i.e. their own UI systems. In the theory of image processing, information units are pixels, voxels and tiles. In computer-aided design theory, graphical primitives form a UI system.

In the second stage, the UI is transformed into parts or aggregates. Models are formed on the basis of aggregates. On the basis of models, a project and, if necessary, a material object are formed. In SM technologies, UI is the starting point of modeling.

When analyzing a text, there are different information units that are formed using different criteria of divisibility. The structural division results in the information unit symbol. The symbol, as a rule, has no meaning. In image processing theory, the structural unit of a flat bitmap image is a pixel. The semantic division of the text leads to the information unit "word". A word has a meaning, so it is an elementary semantic information unit. The word system is included in the thesaurus. Cartographic symbols are also elementary semantic units. The word (SL), taken by itself, has the initial vocabulary formy or lemma.

A word (W) is made up of symbols (Sm), connections between them (Con), has meaning or semantics (Sem), and has a dictionary form (Lem). A more complex semantic information unit is the sentence (Sen). A sentence is made up of words. A sentence (Sen) consists of words (Ws), relations between them (Rel), prepositions (Pret), a word has a case form (case form)), the sentence has a predicative meaning (pred-me) and has a syntax in the construction of words (sint). A more complex semantic IE is the phrase (Phr). A phrase is made up of sentences. Phr consists of sentences (Sen), relations between sentences (Rel), predicative meanings (pred-me), context (Cont), references (Ref), and syntax.The key features of a word are semantics. The key features of a sentence are the relationship between words and the predicative meaning. The key features of a phrase are context and references.

Information units can have dimensions. Figure 1 shows flat and volumetric information units.

Figure 1a shows a flat information unit pixel. Figure 1b shows voxel (Caon, 2004). It is fundamental that information units are formed as a local system.

Fig. 1. Information units of different dimensions

Semasiological control technology.

Semasiological technology of real estate management is based on the use of procedural units, semasiological procedural models and corporate management technology.

The semasiological technology of real estate management includes two stages: preparatory and operational. The preparatory stage includes the creation of a system of procedural and information units and semasiological management models. The operational stage of management includes the development of management decisions and the implementation of management.

Modern real estate management technology has specific trends and features. The main trend is the surge in the development of digital real estate technologies. These innovative technologies involve different approaches. For example, they are called PropTech (real estate technology). They can apply effective real estate portfolio management (e.g., VTS) in different ways. They offer new ways to rent a home (e.g., Airbnb) or hassle-free maintenance (e.g. FixFlo).

There is a trend of applying smart real estate management and creating smart real estate. There is a trend of moving from Facility Management (FM) to Corporate Real Estate Management (CREM) (Appel-Meulenbroek, Omar, 2021). The direction of real estate lifecycle management is developing. It is worth noting the use of Internet of Things technology in real estate management. The last two directions are due to the development of information support for real estate management (Gross, Tuyet, 2019) and information modeling. The International Property Management Association (IFMA) divides property management into asset management, property management, and facility management.

Real estate management of educational organizations is a technological integrated complex for meeting the information needs of the state and the population in educational services and the creation of qualified specialists. The state is both the consumer of the products of the Ministry of Education and the organizer of the education system.

The key parameters of real estate management include the needs for education of the population and the needs of the state for human resources. Interest on the part of the consumer of educational services is aimed at identifying similarities and differences between educational organizations, the economic costs of education and the opportunity costs of educational alternatives. Semasiological property management is a new technology in this field.

3. Conclusion

The management of real estate in educational organizations relies on information support. Modern information support for real estate management includes the use of information and intellectual technologies. These technologies have changed the mechanism of real estate management towards its digitalization. There is a distinction between design, executive and computing technologies of real estate management. Design and executive technologies of real estate management include semasiological management. Semasiological management refers to management technologies and is direct management. Information support for property management also uses semasiological modeling. The term "semasiological modeling" is borrowed from the field of linguistics. It characterizes the interdisciplinaryknowledge system. Semasiological modeling is one of the control support technologies. Semasiological modeling in real estate management uses information units as the basis of management technology. Semasiological modeling simplifies the verification of management processes and increases the reliability of management.

References

Appel-Meulenbroek, Omar, 2021 – *Appel-Meulenbroek, R., Omar, A.J.* (2021). Branding theory contributions to corporate real estate management. A Handbook of Management Theories and Models for Office Environments and Services. Routledge. Pp. 129-139.

Bolbakov et al., 2022 – *Bolbakov, R.G., Sinitsyn, A.V., Tsvetkov, V.Ya.* (2022). Onomasiological modeling in the information field. В сборнике: Journal of Physics: Conference Series. III International Conference on Metrological Support of Innovative Technologies (ICMSIT-III-2022). Krasnoyarsk. P. 2201.

Bolbakov, 2021 – *Bolbakov, R.G.* (2021). Preobrazovaniya v geoinformacionnom pole [Educational resources and technologies]. *Obrazovatel'nye resursy i tekhnologii*. 2(35): 42-49. [in Russian]

Bonate, 2006 – *Bonate, P.L.* (2006). The art of modeling (pp. 1-56). Springer US.

Caon, 2004 – *Caon, M.* (2004). Voxel-based computational models of real human anatomy: a review. *Radiation and environmental biophysics*. 42: 229-235.

Cohen et al., 2016 – *Cohen, J., Moeltner, K., Reichl, J., Schmidthaler, M.* (2016). An empirical analysis of local opposition to new transmission lines across the EU-27. *The Energy Journal*. 37(3).

Fan et al., 2014 – *Fan, J., Han, F., Liu, H.* (2014). Challenges of big data analysis. *National science review*. 1(2): 293-314.

Gospodinov, 2023 – *Gospodinov, S.G.* (2023). Sovremennaya informatika [Modern computer science]. Saarbruken, 157 p. [in Russian]

Gross, Tuyet, 2019 – *Gross, M., Tuyet, M.D.T.* (2019). Information used in public real estate management. *Acta Scientiarum Polonorum Administratio Locorum*. 18(4): 353-361.

Holzinger, 2019 – *Holzinger, A.* (2019). Introduction to machine learning & knowledge extraction (make). *Machine learning and knowledge extraction*. 1(1): 1-20.

Kosova, 2022 – *Kosova, K.V.* (2022). Primenenie principa ob"ektnogo modelirovaniya dlya imitacionnogo modelirovaniya sistemy na primere lesopererabatyvayushchego predpriyatiya [Application of the principle of object modeling for system simulation using the example of a timber processing enterprise]. *Innovacii v himiko-lesnom komplekse: tendencii i perspektivy razvitiya*. Pp. 116-120. [in Russian]

Lyovin, Tsvetkov, 2017 – *Lyovin, B.A., Tsvetkov, V.YA.* (2017). Informacionnye processy v prostranstve «bol'shih dannyh» [Information processes in the space of “big data”]. *Mir transporta*. 15. 6(73): 20-30. [in Russian]

Ozhereleva, 2014 – *Ozhereleva, T.A.* (2014). Systematics for information units. *European Researcher*. 11/1(86): 1894-1900.

Pavlov, 2019 – *Pavlov, A.I.* (2019). Onomasiologicheskoe informacionnoe modelirovanie [Onomasiological information modeling]. *Slavyanskij forum*. 3(25): 45-55. [in Russian]

Raev, 2018 – *Raev, V.K.* (2018). Processual'nye i deskriptivnye informacionnye modeli [Procedural and descriptive information models]. *Slavyanskij forum*. 3(21): 28-32. [in Russian]

Song et al., 2022 – *Song, R., Wen, Y., Tao, W., Zhang, Q., Papadimitriou, E., van Gelder, P.* (2022). Semantic Modeling of Ship Behavior in Cognitive Space. *Journal of Marine Science and Engineering*. 10(10): 1347.

Todorova, 2023 – *Todorova, A.I.* (2023). Teoriya informacionnyh edinic [Theory of information units]. *V sbornike: Sovremennye informacionnye tekhnologii. Sbornik nauchnyh statej 9-j Mezhdunarodnoj nauchno-tekhnicheskoj konferencii*. Burgas. Pp. 220-228. [in Russian]

Tsvetkov, 1991 – *Tsvetkov V.YA.* (1991). Modelirovanie nauchnyh issledovanij v avtomatizacii i proektirovanii [Modeling of scientific research in automation and design]. M.: GKNT, VNTICentr, 125 p. [in Russian]

Tsvetkov, 2005a – *Tsvetkov, V.YA.* (2005). Globalizaciya i informatizaciya [Globalization and information]. *Informacionnye tekhnologii*. 2005. 2: 2-4. [in Russian]

Tsvetkov, 2005b – *Tsvetkov V.YA.* (2005). Informacionnye modeli i informacionnye resursy [Information models and information resources]. Izvestiya vysshih uchebnyh zavedenij. Geodeziya i aerofotos"emka. - 2005. - №3. - s.85-91 [in Russian]

Tsvetkov, 2014 – *Tsvetkov, V.Ya.* (2014). The Semantic environment of information units. European researcher. 6-1 (76): 1059-1065

Zhang et al., 2017 – *Zhang, H., Zhu, S., Xie, R., Huang, T., Liu, Y.* (2017). Intelligent resources management system design in information centric networking. *China communications*. 14(8): 105-123.