

Article

Civil Engineering/ Construction Domain Modeling Methodology

Narmurodova Dilfuza Abdukholic kizi.

1. Lecturer, Termez State University
- * Correspondence: feruza7277@gmail.com

Abstract: Currently, the practice of linguistic modeling of terminological systems of various subject areas is becoming increasingly important and is becoming an urgent trend in domestic and foreign terminology. The term, being a two-sided unit of language, i.e. having a plan of expression and a plan of content, is inextricably linked with thinking, which reflects the dynamic process of human cognition of reality. Therefore, an important task of linguistic modeling is the search for cognitive bases for the systematization of special knowledge fixed in linguistic signs. The method of linguistic modeling thus serves to build an integrative model of knowledge, which is based on linguistic and cognitive foundations, thereby reflecting the actual terminological situation in this professional field.

Keywords: Term, Construction Vocabulary, Building and Architectural Knowledge, General Literary Vocabulary.

1. Introduction

Currently, the practice of linguistic modeling of terminological systems of various subject areas is becoming increasingly important and becoming an urgent trend in domestic and foreign terminology [1].

This position is reflected both in the works of 26 on general and applied terminology (K.Ya. Averbukh, A.S. Gerd, E. I. Golovanova, V. P. Danilenko, V. D. Tabanakova, S. D. Shelov, E. A. Fedotova, M.T. Cabré, M. Popescu, etc.) and in research on theoretical problems of language modeling (Yu. D. Apresyan, N. D. Arutyunova, E. S. Kubryakova, Yu. N. Karaulov, A.D. Shmelev, O. N. Alyoshina, E. F. Kirov, etc.). One of the central problems of an applied nature is considered to be the problem of knowledge modeling, due to the intensive growth of information, insufficient ability to organize information in the process of its structuring, processing, ordering, preservation and exchange [2]. The search for approaches to solving this problem is included in the range of tasks of applied linguistics. The term, being a two-sided unit of language, i.e. having a plan of expression and a plan of content, is inextricably linked with thinking, which reflects the dynamic process of human cognition of reality and forms human knowledge [3].

2. Materials and Methods

Therefore, an important task of linguistic modeling is to find cognitive grounds for systematization of special knowledge, fixed in terminology, which in recent studies is called the "cognitive dimension of our modern civilization" [Popescu 2014: 257]. The term "linguistic model", originated in the mainstream of structural linguistics, found its scientific application in the 70s of the XX century with the advent of mathematical

Citation: kizi, N. D. A. Civil Engineering/ Construction Domain Modeling Methodology. Middle European Scientific Bulletin 2024, 44(4), 8-12.

Received: 10th June 2024

Revised: 11th July 2024

Accepted: 24th Sept 2024

Published: 27th Oct 2024



Copyright: © 2024 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

linguistics and is described in detail in the works of I. A. Melchuk, Yu. D. Apresyan and others. The method of linguistic modeling thus serves to build an integrative model of knowledge, which is based on linguistic and cognitive foundations, thereby reflecting the actual cognitive situation in this professional field. "The modeling function of terminological units is associated with the emergence of new concepts based on existing ones due to the convergence of related concepts, the establishment of an analogy between them" [Golovanova 2010: 85].²⁷ Such systematization is especially relevant at the present time for the subject area of CIVIL ENGINEERING/CONSTRUCTION [4].

The purpose of the simulation is to build a model of the CIVIL ENGINEERING terminological system and compare the conceptual structure of the terminological units under study. The analysis of the terminological system is based on the complex modeling of nominative and conceptual categories and includes various analysis procedures. It is the systematization of concepts, S. V. Grinev notes, that makes it possible to reveal the essential connections and relationships between concepts, to clarify the place of each concept in the conceptual system. "Systematization is carried out by classifying concepts, i.e. their representation in the form of a system in which the hierarchical relations between them are fixed" [Grinev 1995: 91]. The methodology is based on the sequential conduct of identification procedures, taking into account the data of the previous stage of analysis (the stepwise identification method) [5].

Modeling of the construction terminological system was carried out in stages through a comprehensive analysis of terminological units according to various parameters, taking into account primarily paradigmatic relations. The analysis was preceded by a term selection procedure. The selection of terms is a very important stage of the study, which significantly affects the further stages. Within this stage, several important sequences can be identified:

1. Identification of potential sources for the selection of linguistic material; analysis of the content of these documents and determination of the degree of its terminological saturation.
2. A solid selection of lexical units from selected sources.
3. To determine which terminological units should be included in the terminological sample and limit the initial list of terms based on criteria such as frequency, prevalence, relevance to modern scientific discourse. Now let's move on to the consideration of the lexical unit selection procedure itself. So, at the first stage, we selected the most suitable and productive texts for research. The construction sector is one of the central engineering sciences, so there are quite a lot of sources related to construction. As a rule, industry terminology is characterized by two spheres of application, depending on the forms of its existence.

The first is the sphere of fixation, in the form of terminological dictionaries, collections of terms recommended by state standards [6].

The second is the sphere of functioning, where terminological units can be found in texts of a special nature of various genres and styles, such as articles, magazines, textbooks, reports, etc. [Danilenko 1977: 158]. When selecting lexical units, both of these areas of application were taken into account. It is also worth mentioning such an equally important aspect as the definition of quantitative limitations of the terminology base [7]. Thus, the total volume is formed based on the allocation of all relevant terms registered by the compiler of the dictionary. At the same time, no quantitative restrictions were set. In total, the texts of the sphere of fixation selected by us amounted to 60,000 word uses. However, despite the rather high volume, most of the word usage was repeated. The list of reference words, on the basis of which the term selection procedure was carried out, was formed on the basis of professional textbooks on the theory of construction. It should be noted that the largest number of terminological units was selected precisely from the sources of the sphere of fixation, which amounts to 4,355 terminological units. Thus, 5,500 English-speaking building units with translation into Russian in the form of

terminologically well-established equivalents served as the working material for this study [8]. During the selection of an appropriate Russian-language equivalent for a term isolated from 29 original English-language sources, lexical gaps were noticed, "units of the dictionary of one of the languages, which for some reason do not correspond in the lexical composition (in the form of words or stable phrases) of another language" [Barkhudarov 1975: 95]. The total number of terminological units-gaps is 54. The only way to convey the meaning of such terms is the descriptive equivalent of a term that reflects the essence of the term as accurately as possible. Mostly gaps were found among the terms denoting the types of construction objects, the names of parts and structural elements [9].

3. Results and Discussions

This is due to a number of reasons, among which one can distinguish the difference in climatic, natural and cultural features: chalet bungalow/bungalow with elements of a private residential building; link-detached/house separated by a garage; business route/special short road; stacked apartment/ built by a stack of apartments; beam stub bracket; psychiatric projected window/psychiatric protruding window; ranch window/farm window [10]. The further task was to isolate terms from the sphere of functioning, the so-called speech terms.

According to the definition of R. Y. Kobrin, the terms of speech are "non-predicative fragments of a sentence (words or phrases that do not simultaneously contain the object and predicate of an utterance) associated with a special scientific and technical concept, and there are no restrictions on the number of words in phrases" [Kobrin 1976: 177]. The texts of the sphere of functioning served as sources for 1,145 terms. Based on the prevalence and frequency of terms in these texts, a qualitative analysis and final selection of the existing sample were carried out. Many researchers in the field of lexicography note that there are no universal criteria for selecting terms for the dictionary corpus, the reason is seen "mainly in the insufficient development of the linguistic foundations of the theory of terminology, the vagueness of criteria for identifying terms and the almost complete absence of criteria for distinguishing terms" [Kobrin, Pekarskaya 1977: 49]. In terminographic practice, cases are common when dictionaries are formed on an intuitive level, i.e. by selecting basic terms that are important and necessary from the point of view of a particular specialist who selects terms [Gerd 1986: 24; Marchuk 1992: 12].

According to V. P. Berkov, one of the optimal solutions in this situation is to comply with the criterion of particularity, which is due to the task of the dictionary to reflect the real linguistic picture [Berkov 1996: 42]. As a result, the content of the stages looks like this. The first stage is the study of construction documents, explanatory dictionaries to identify the corpus of terminological units, which are nominative units or phrases representing the system of concepts of construction and which cover the subject area outlined by us. The CIVIL ENGINEERING/CONSTRUCTION subject area is an extensive field of knowledge that is represented in various types of professional texts. At the same time, it should be borne in mind that it is impossible to cover all the characteristics of a given area in one linguistic study. Therefore, at this stage, our task was to select the most relevant sources for research containing both normative and customary terms of the field under consideration. To solve this problem, the method of continuous sampling from the relevant dictionaries, periodicals, as well as standard documents and didactic texts in English and Russian was used. The second stage is to establish the affiliation of the studied terms to the construction industry. To solve this problem, English and Russian-language dictionaries on construction in the form of printed publications and electronic versions, as well as textbooks on construction in the appropriate languages are used. With the help of analytical processing of these 31 sources and formal selection criteria (the principle of frequency and prevalence), a list of terms of the construction language was formed.

The third stage is to identify the semantic relationships of terms in the CIVIL ENGINEERING/CONSTRUCTION domain by building a cognitive map. To study the semantics of construction terms, the method of definition analysis, generic and descriptive analysis was used. The choice of these methods is due to the fact that they can be used to establish links between concepts and, therefore, compare the meanings of terms in two dimensions:

1. vertically, when values at different levels of the hierarchy of genus-species relations are compared, that is, the values of hyperonyms with the values of hyponyms.
2. horizontally, when the values of the same hierarchy level are compared, regardless of what relations they are in (with respect to synonymy, antonymy, incompatibility, etc.), a consistent comparison of definitions of different terms makes it possible to identify microfields and analyze individual, isolated (out of context) terms, taking into account the paradigmatic relations between them that is, the correlations "hyperonym-hyponym", "part of the whole", "incompatibility", "synonymy" and "antonymy".

The fourth stage is the comparison of English—language construction terms, taking into account the identified semantic correlations and conducting a statistical analysis of the results obtained during the comparison. At this stage, comparative and statistical methods are used to achieve the task.

The fifth stage is the construction of a terminopoly, taking into account the established correlations between terms within microfields. In this case, we use the concept of terminopolis, which, unlike the terminosystem, is a dynamic formation, cf.: "Terminopolis is the arena of active functioning and interaction of terms from different 32 terminosystems, including from other fields of knowledge" [Vinogradov 2014: 368]. The task of constructing a terminology field is solved by applying a thesaurus approach, that is, the terminology field is represented as a semantic network. In turn, in the terminology field under study, the classification of terms will be oriented by special branches and hierarchically arranged. By means of the so-called semantic deployment, or stepwise identification, we performed the operation of decomposition (decomposition) of the definition and substitution into the definition of interpretations of individual components - terminological semes, or terminosemes. This procedure allowed us to consistently reduce definitions to constructions with a simpler connection between form and content – to a uniform appearance, after which we were able to compare them. Article presents hierarchical schemes of the internal structure of some terms, the definitional components of which have been decomposed into the smallest components. Thus, the representation of a terminological system in the form of a terminopoly is a complex process consisting of several stages.

4. Conclusion

Step-by-step work on modeling the terminological field of construction in comparable languages allows us to create a multi-level classification structure. Such a structure approaches the concept of the cognitive map of science being developed in modern terminology [Novodranova 2010: 149; Vasilyeva 2014: 376]. In the applied aspect, the proposed model of construction terminology can become the basis of a systematizing ideographic dictionary. Definitional and generic analyses make it possible to implement the systematizing function of the dictionary, set its macro- and microstructure and determine the main means of systematization.

REFERENCES

- [1] M. Sakr, "Visualization of structural health monitoring information using Internet-of-Things integrated with building information modeling," *Journal of Infrastructure Intelligence and Resilience*, vol. 2, no. 3, 2023, doi: 10.1016/j.iintel.2023.100053.
- [2] A. Bradley, "Requirements and process analysis for ports and waterways openBIM ISO standards development," *Construction Innovation*, vol. 22, no. 4, pp. 705–726, 2022, doi: 10.1108/CI-02-2021-0032.
- [3] A. Sampaio, "Proposal of curricular program to introduce BIM in a civil engineering school," *Lecture Notes in Electrical Engineering*, vol. 505, pp. 1131–1137, 2019, doi: 10.1007/978-3-319-91334-6_156.
- [4] M. P. De Lessio, "Modelling the planning system in design and development," *Res Eng Des*, vol. 30, no. 2, pp. 227–249, 2019, doi: 10.1007/s00163-017-0272-5.
- [5] T. Häring, "Microgrid Oriented modeling of space heating system based on neural networks," *Journal of Building Engineering*, vol. 43, 2021, doi: 10.1016/j.jobe.2021.103150.
- [6] F. Rondinella, "Laboratory Investigation and Machine Learning Modeling of Road Pavement Asphalt Mixtures Prepared with Construction and Demolition Waste and RAP," *Sustainability (Switzerland)*, vol. 15, no. 23, 2023, doi: 10.3390/su152316337.
- [7] C. Baudrit, "Graph based knowledge models for capitalizing, predicting and learning: A proof of concept applied to the dam systems," *Advanced Engineering Informatics*, vol. 52, 2022, doi: 10.1016/j.aei.2022.101551.
- [8] P. Zheglova, "Full-waveform inversion of cross-hole radio frequency electromagnetic data," *Geophys J Int*, vol. 239, no. 1, pp. 292–313, 2024, doi: 10.1093/gji/ggae247.
- [9] C. Li, "Enhancing Concrete Creep Prediction With Deep Learning: A Soft-Sorted One-Dimensional CNN Approach," *IEEE Access*, vol. 11, pp. 139314–139325, 2023, doi: 10.1109/ACCESS.2023.3340425.
- [10] D. Katsatos, "Comparative Study of Surface 3D Reconstruction Methods Applied in Construction Sites," *IST 2023 - IEEE International Conference on Imaging Systems and Techniques, Proceedings, 2023*, doi: 10.1109/IST59124.2023.10355721.
- [11] Adieva, E. V. Comparative analysis of architectural terms / E. V. Adieva // *Philology, art criticism and cultural studies: development trends*. — Novosibirsk, 2013.
- [12] Alimuradov, O. A., Latu, M. N., Razduev, A.V. Features of the structure and functioning of industry terminosystems (on the example of the nanotechnology terminosystem) / S.D. Shelov. — Pyatigorsk : SNEG, 2011. —112 p.
- [13] Baranov, A. N. Introduction to applied linguistics / A.N. Baranov. — M. : Editorial URSS, 2001. — 360 p. 10. Barkhudarov, L. S. Language and translation (Issues of general and particular theory of translation). Moscow : Mezhdunarod. Relations, 1975. — 240 p.
- [14] Derevyankina, A. S. Achievements and prospects of studying architectural terminology within the framework of various areas of terminology / A. S. Derevyankina // *Bulletin of Medical Internet Conferences*. — 2013. — Vol. 3, Issue 11. — PP. 1228–1230.
- [15] Doymikhen, I. V. Optimization of the structure of explanatory terminological dictionaries: Based on the material of the subject area "Construction and architecture" : disser. ... candidate of Philological Sciences : 02/10/21 / I. V. Doymikhen. — St. Petersburg, 2003. — 174 p.
- [16] Vedernikova, Yu. V. Thesaurus modeling of English terminology of cognitive linguistics: abstract. diss. ... candidate of Philology : 02/10/04 / Yu. V. Vedernikova. Tolyatti, 2013. — 25 p.
- [17] Vinogradov V.V. About fiction. – M.–L.: Publishing House of GIZ, 1930. – 190 p.
- [18] Golovanova, E. I. Basic cognitive concepts and the development of terminology / E. I. Golovanova // *Bulletin of the Udmurt University. Ser. History and philology*. - 2010. — Issue 2. — pp. 85-91
- [19] Golovanova, E. I. Introduction to cognitive terminology: Textbook / E. I. Golovanova. — M. : Flint: Nauka, 2011. — 224 p.
- [20] Karasik, V.I. Linguocultural concept as a unit of research / V. I. Karasik, G. G. Slyshkin // *Methodological problems of cognitive linguistics* / ed. by I.A. Sternin. Voronezh: Voronezh State University, 2001, pp. 75-79.