THE INTERACTION BETWEEN GRAMMATICAL AND LEXICAL FEATURES OF THE CONSTITUENTS OF MODAL CONSTRUCTIONS WITH THE VERB CAN  
(ON THE MATERIAL OF SUBLANGUAGES OF SCIENTIFIC-TECHNICAL DISCOURSE)

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The article describes the functioning of the verb can in the texts of scientific and technical communication. Using quantitative and distributional methods, the frequency of the structural models with different forms of the verb can and infinitives, which go with it, was determined. The lexico-semantic variants of the verb can in these models were identified. To describe the lexical meanings of infinitives, the entire complex of the infinitives that go with can was divided into lexical layers. This gave the opportunity to test the degree of influence of grammatical forms and lexical meanings of the infinitives as well on the ability of the verb can to vary the number of its modal meanings.

**Keywords:** rank correlation, modal meaning, lexical layer, absolute frequency, modal design, syntactical structure

Recently, the problems of grammar theory with its interest to the behaviour patterns of the language units in real discourse have been pushed aside a little by the elaboration in the field of cognitive linguistics, which describes the cognitive structures and processes in the human mind [4; 6…9]. This also applies to such issues as modality, which includes not only the specific modal verbs, but covers the entire spectrum of speech elements, expressing the value of modality [1; 3; 10; 12; 14…16; 19]. A small number of works devoted to the units of text corpora, which can be found in the available literature and which can be referred to as examples is the research provided by S. F. Belyaeva [2], which describes the operation of the modal constructions in the texts of scientific and technical communication, and another one by M. B. Umatova [18], which represents a comparative analysis of modal verbs in the languages of different language systems.

However, according to the authors of the paper, the range of problems in theoretical linguistics is still far from being exhausted and requires further research. These points include the analysis of modal verbs functioning in scientific and technical discourse, in particular the verb *can*. The content of the modal verb *can* and its internal form are precisely analyzed in Oxford Advanced Learner’s Dictionary by A. Hornby [13], which represents the verb *can* as a token, which has the following set of «modal meanings»: ability or opportunity; «permission» in everyday conversational style; probability and possibility of what is happening; in the interrogative sentences it gives the shadow of the meaning directed on revealing of surprise, absence of attention; indicates what someone or something is considered possible for the existence or implementation; indicates what is considered to be typical.

It should be noted that all the examples that are used in Oxford Advanced Learner’s Dictionary to describe the usage of the verb *can* belong to one functional style, i.e. conversational, where a wide range of modality shades of the studied lexemes in direct dependence on the type of expression is found – from the physical abilities to do something to polite requests. However, they do not reveal the syntagmatic properties of combined word forms, which function specifically in scientific and technical discourse. It can also be observed in scientific and technical dictionaries, which do not even dwell on the meanings of modal verbs [5; 11].

Lack of nomenclature of definitions required for translators and future teachers of non-language universities, including the lexical-semantic variants implemented in scientific and technical discourse of modal constructions with the verb *can*, as well as research carried on in this direction and based on real scientific texts proves timeliness and topicality of the submitted work. Thus, this article states the following aims:

- to determine the probable mutual influence of lexical meaning and grammatical form of the infinitive in modal constructions on the extension of implemented in text corpus modal meanings of *can* and vice versa.

For these aims a linguistic experiment was held, where the following objectives were stated:

- to identify morphological and syntactical conditions for the functioning of the verb *can* (formulas and models of modal constructions), methods of distributed and quantitative analysis being used for this aim;

- to determine the elements of the semantic structure of *can* (set of modal meanings, reflecting the objective reality – extralinguistic environment) that are implemented in sublanguages included in scientific and technical discourse;

- to fix the possible semantic shades which different grammatical forms of the constituents in the selected models of modal structures can give to each other;

- to group infinitives of modal constructions in accordance with their lexical meanings and to form a common, general and terminological layers of the vocabulary; statistical method of rank correlation and the method of survey of experts who possess background knowledge in these areas of science and technology were used for this purpose.

It should be stressed that for the reason of clarity the body of modal structures does not include the units containing adverbial modifiers or additional elements that may impact the modal meaning of the verb *can*, because the authors wanted to avoid evaluation marks, which could determine the disposition of the speaker (writer), the introduction of which into the semantic structure could provide additional shades of expressiveness as if the headstone in this case was epistemic or intentional modality. The main aim of this work is to present examples of sentences of stative nature with the zero level of evaluation. This position is explained by the fact that, according to the authors, the nature of this study requires, firstly, the focus to be directed neither on the relation of the speaker (writer) to the statement nor on the implications, such as those associated with personal feelings or opinion, but on the correctness and accuracy of the speech message, and secondly, as already

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mentioned, the interest is concentrated on the mutual influence of the modal verb and the infinitive in terms of their morphological, syntactical and semantic features.

The material for the experiment was the text bodies of «Power Engineering», «Electrical Engineering» and «Automotive» sublanguages, which are an integral part of scientific discourse and formed by the method of continuous sampling. The basis of text corpora were scientific and technical journals published in the USA and the UK – IEEE Transactions on Power Apparatus and Systems; Power Engineering; Power; Automotive News; Combustion; Control and Optimization; Machine Design; Industrial and Production Engineering; Automotive Engineer. The sample size was 300 thousand tokens. It can be assumed that the usage of the texts that are different as to their research topics in fundamental branches of science and technology will help to make general conclusions, forming style-identifying signs of scientific functional style.

From the database formed by three text corpora all illustrative examples with the verb can were selected using the method of characteristics correlation. Then the obtained structures were classified according to the typological features of structural models with regard to their total absolute frequency (F*).

The formalized representation of the structures was expressed by the following marking:

- V – infinitive without the particle «to»;
- to V – infinitive with the particle «to»;
- Ven – participle II;
- N – noun;
- A – adjective in the function of predicative;
- prp – preposition.

In the analyzed corpora of «Power Engineering», «Electrical Engineering» and «Automotive» 28 models with a total frequency of 1100 language units were discovered. They are represented in the table 1.

The study showed that the highest priority is possessed by the verb constructions which have the forms of the passive infinitive. There appeared to be only 8 of them, but their total frequency (594 usages) covered more than a half (54%) of all usages of modal constructions. They showed almost all methods of variation of constituents in syntagmatic text corpora. The highest total absolute frequency is possessed by the verb can be Ven (F* = 481) construction, it accounts for 88% of all usages of modal constructions with the passive infinitive. Within this group the vast majority of structures – 522 units – is used with the modal verb can in the present tense and only 72 structures with the modal verb in the past tense.

Modal constructions with the infinitive in the active voice appeared on the second place as to their frequency of usage (F* = 361, which is 33%). Data of the table show that these aspectual-temporal forms of the infinitive are diversified enough in this type of the voice.

To determine the possible influence of grammatical forms of the infinitive on the implementation of modal meanings of the verb can a detailed analysis of syntactic structures with passive and active infinitives was carried out, the results of which are shown below.

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### Table 1

<table>
<thead>
<tr>
<th>№</th>
<th>Construction</th>
<th>F*</th>
<th>Power</th>
<th>Electrical</th>
<th>Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>can be Ven</td>
<td>481</td>
<td>228</td>
<td>175</td>
<td>78</td>
</tr>
<tr>
<td>2.</td>
<td>can V</td>
<td>231</td>
<td>113</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>3.</td>
<td>could V</td>
<td>83</td>
<td>28</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>4.</td>
<td>could be Ven</td>
<td>65</td>
<td>18</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>5.</td>
<td>can V N</td>
<td>51</td>
<td>19</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>can V prp</td>
<td>26</td>
<td>11</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>cannot be Ven</td>
<td>24</td>
<td>11</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>can be A</td>
<td>21</td>
<td>11</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>cannot V</td>
<td>19</td>
<td>11</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>10.</td>
<td>can be N</td>
<td>17</td>
<td>1</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>can be Ven to V</td>
<td>15</td>
<td>1</td>
<td>4</td>
<td>10</td>
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<td>12.</td>
<td>could be A</td>
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<td>1</td>
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<td>2</td>
<td>4</td>
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<tr>
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<td>can have N</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>could have Ven</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>4</td>
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<td>7</td>
<td>-</td>
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<td>can V N prp</td>
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<td>18.</td>
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<td>-</td>
<td>2</td>
<td>3</td>
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<tr>
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<td>could not be Ven</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
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<td>1</td>
<td>-</td>
<td>2</td>
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<tr>
<td>21.</td>
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<td>2</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>can V Ven</td>
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<td>2</td>
<td>-</td>
<td>-</td>
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<td>can V N to V</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>24.</td>
<td>could have been Ven</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25.</td>
<td>can N be Ven</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>26.</td>
<td>cannot be Ving</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>27.</td>
<td>cannot V to V</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>28.</td>
<td>could not have been Ven</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Total</td>
<td></td>
<td>1100</td>
<td>468</td>
<td>332</td>
<td>298</td>
</tr>
</tbody>
</table>
ФІЛОЛОГІЧНІ НАУКИ

nect, simulate, cut, digitize, process, store, gauge, iso

tions formed due to the models represented in the

table reveals, basically, only one dictionary meaning
«can be done» in other sublanguages of science and

ting «assumption» or «probability» of objects or

features are added to the modal mean

Based on the above, we can come to the following

Thus, the differentiation in the meanings of the in

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the contexts of the verb can with the verbs belonging to the above mentioned lex
cal layers in the forms of passive and active voice

tions that were determined not only by the method

1. The most frequent modal constructions with the verb can/could, functioning in the corpora «Power Engineering», «Electrical Engineering» and «Automobil
try to determine the possible mutual lexical influence of the verb 

The predominance of the passive forms over active ones is considered to be one of the main characteristics of the scientific style texts, because the absence of the doer of the action can be observed there. However, it can be seen in our study that the active voice forms are also quite numerous. This point is explained by the fact that the objects themselves (turbines, electrical circuits, brakes, motors, etc.) reveal their functioning activity.

2. In text samples of the investigated fields of science and technology there is a definite tendency to ambiguity of the verb can. The only semantic variant in the spectrum of «modal meanings» of the verb can/ could turned to be «the ability to carry any action over something» and the model «can be + name» has the modal meaning of «assumption» or «probability».

3. The analysis of various tense and voice forms of the infinitive in modal constructions shows that the morphological component does not affect the semantics of the verb can.

4. The classification of the infinitives in modal constructions due to lexical layers and further attempt to determine the possible mutual lexical influence of both constituents of the considered structures shows that the expected interaction does not occur. The extra-linguistic factors affect the lexical meaning of the infinitive and «modal meaning» of the verb can/ could as well.

5. From the point of view of determining style distinguishing characteristics of high-frequency modal constructions with can, which reproduce, basically, the modal meaning of «ability» to perform an action, may be deemed to be the normal implementation of the constructions with the verb can in sublanguages of scientific and technical discourse.

6. The knowledge of passive infinitive mainly and active infinitive to a lesser degree is needed for the identification of the semantic structures as to the presented models, because the modal meaning of the verb can/ could is actualised in its one main meaning, which is rather important for practical purposes of the English language teaching in non-linguistic universities. Difficulties in decoding the construction «can be + name» also do not occur, as the main element is unambiguous, and does not affect the lexical-semantic variant of the verb can.

Further research will be devoted to modal constructions with modifiers-adverbs and other additional elements contained in the structures, in order to prove that the introduction of these elements in the structure of modal constructions can or can not affect the implementation of other «modal meanings» of the verb can.

References:
ВЗАЄМОДІЯ ГРАММАТИЧНИХ ТА ЛЕКСИЧНИХ ОСОБЛИВОСТЕЙ КОНСТИТУЄНТИВ МОДАЛЬНИХ КОНСТРУКЦІЙ З ДІЄСЛОВОМ CAN (НА МАТЕРІАЛІ ПІДМОВ НАУКОВО-ТЕХНІЧНОГО ДІСКУРСУ)

Анотація
Стаття присвячена опису функціонування дієслова can у текстах науково-технічної комунікації. За допомогою кількісного та дистрибутивного методів визначені найбільш частотні моделі модальних конструкцій з різними формами дієслова can і інфінітивів, які поєднуються з ним. У цих моделях були визначені лексико-семантичні варіанти дієслова can. Для опису лексичних значень інфінітивів весь комплекс інфінітивів, які з’єднуються з дієсловом can, були розділені на лексичні пласти. Це дало можливість перевірити ступінь впливу як граматичних форм, так і лексичних значень інфінітивів на здатність дієслова can варіювати свої модальні значення.

Ключові слова: рангова кореляція, модальний сенс, лексичний пласт, абсолютна частота, синтаксична структура.