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TRANSLATION OF SCIENTIFIC AND TECHNICAL TEXT: GRAMMATICAL ASPECT

The article deals with the peculiarities of the grammatical aspect in the context of scientific and technical translation. In particular, the use of passive constructions, syntactic constructions of varying complexity, and the use of two types of the most common grammatical transformations are presented on the example of scientific and technical texts in the field of civil engineering. A high level of information content characterizes the selected texts for translation analysis. The sample articles contain complex logical connections and are rich in construction terminology, which can be a challenge for the translator in conveying the accuracy and reliability of information, as well as in unambiguously understanding the material.

It is found that passive constructions are typical for English-language scientific texts, while Ukrainian is not characterized by excessive use of passive constructions; English-language scientific texts are characterized by short or simple subordinate syntactic units, while translation into Ukrainian is characterized by complex subordinate clauses. The difficulty of choosing the optimal grammatical equivalent is also revealed. When building grammatical structures in the process of translating foreign language texts, translators resort to transformations. The two most common types are presented in this paper: transposition and substitution. Transposition as a grammatical transformation is considered on the example of changing the word order, which is due to the difference between English and Ukrainian, first of all, the absence of a rigid word order in Ukrainian, as it is in English. The rearrangement as a grammatical transformation is considered on the example of changing the gender and case of a noun, its transition from singular to plural, as well as replacing a passive construction with an active one. A qualitative analysis of the presented grammatical translation transformations in scientific and technical texts of the construction industry is carried out.

Keywords: scientific and technical translation, grammatical aspect, construction.

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ПЕРЕКЛАД НАУКОВО-ТЕХНІЧНОГО ТЕКСТУ: ГРАМАТИЧНИЙ АСПЕКТ

У статті розглядаються особливості граматичного аспекту в контексті науково-технічного перекладу. Зокрема використання пасивних конструкцій, різних по складності синтаксичних конструкцій та використання двох типів найпоширеніших граматичних трансформацій. представлено на прикладі науково-технічних текстів у галузі будівництва. Обрані тексти для аналізу перекладу характеризуються високим рівнем інформативності, містять складні логічні зв'язки та насичені будівельною термінологією, що може стати викликом для перекладача в передачі точності й вірогідності інформації, а також в однозначному розумінні матеріалу.

З'ясовано, що пасивні конструкції, характерні для англійськомовних наукових текстів, а українській мові не притаманне надмірне вживання пасивних конструкцій; англійськомовному науковому тексту притаманні короткі або нескладні підрядні синтаксичні одиниці, в той час, коли переклад на українську мову характерний складнопідрядними реченнями. Також з'ясовано складність вибору оптимального граматичного еквівалента. Під час побудови граматичних структур у процесі перекладу іншомовних текстів перекладачі вдаються до трансформацій. В роботі представлено два найпоширеніші типи: перестановка та заміна. Перестановка, як граматична трансформація розглянута на прикладі зміни порядку слів, що зумовлено відмінністю англійської і української мови насамперед відсутністю в українській мові жорсткого порядку слів, як це є в англійській мові. Перестановка, як граматична трансформація розглянута на прикладі зміни роду і відмінка іменника, його переходу з однини до множини, а також заміни пасивної конструкції активною.

Проведено якісний аналіз представлених граматичних перекладацьких трансформацій у науково-технічних текстах будівельної галузі.

Ключові слова: науково-технічний переклад, граматичний аспект, будівництво.

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INTRODUCTION

Currently, the demand for scientific and technical information is changing rapidly in Ukraine. In addition to scientific articles and textbooks that cover general scientific issues, scientific and technical texts in the defense and construction industries are of increasing interest to translators working with scientific and technical translation.

Today, there is an increasing demand for manuals for unmanned aerial vehicles and automated flight control systems, as well as for research on the use of mining and processing plant waste in construction, which can significantly increase the economic efficiency of production and reduce the cost of modern materials.

Foreign-language scientific and technical texts use a lot of special terminology, which is difficult to find in the target language. Therefore, such translation requires a balanced approach and the use of adequate translation grammatical transformations. A deep understanding of the grammatical aspect is the key to high-quality, accurate, and professional translation in the field of science and technology.

RESEARCH AND PUBLICATION ANALYSIS

Delving deeper into the study of translation studies, it is possible to find a number of fundamental studies. It is impossible to avoid a proper description of scientific and technical translation. At a basic level, this can be a broad description of what translation is; its theory and practice. This is what is usually found in translation textbooks.

V. Karaban examines grammatical difficulties, lexical, terminological, and genre and stylistic problems in the translation of English scientific and technical literature [1].

In textbooks by I. Korunets, he analyzes the existing types and kinds of translation, the history of the development of translation principles in Western Europe and Ukraine [2]. I. Korunets also examines in detail the reproduction of linguistic units and phenomena of lexical and grammatical aspects of the English and Ukrainian languages [2].

Scientific and technical translation can be based on two categories of scientific research. The first group covers scientific and technical terminology, and the second group analyzes translation transformations.

The first category is represented by T. Kiyak, V. Koptilov, T. Leshchuk.

The second category includes the works of well-known foreign and domestic scholars who have dealt with the problem under consideration in this study, namely the use of grammatical translation transformations: L. Borysova, T. Kiyak, I. Korunets [2], S. Maksimov [4], A. Mamrak, A. Pidhorna, A. Sitko and others. A. Kolesnyk researched translation techniques for translating the terminology of scientific texts [3]. I. Loschenova and V. Nikishina considered translation transformations an effective means of achieving translation adequacy.

FORMULATION OF THE ARTICLE'S OBJECTIVES

This article aims to present a view on the grammatical aspect of translating a scientific and technical text, focusing on the grammatical features that are important for achieving adequate translation of the text.

PRESENTATION OF THE MAIN MATERIAL

The distinction between grammatical and lexical difficulties in translation phenomena is rather arbitrary, because in every language, grammar is closely related to vocabulary, and the way grammatical forms and constructions are rendered in translation and constructions often depend on their lexical content.

If grammatical aspect is taken into consideration in the practice of scientific translation, some main features will be mentioned: translation of passive structure, translation of short or simple subordinate syntactic units into complex subordinate clauses, correlation of different tense forms in the source and target languages, and use of grammatical transformations.

The first aspect refers to the translation of passive structure typical of English-language scientific texts. The Ukrainian scientific language typically avoids excessive use of passive constructions, favoring active or impersonal structures instead. For example:

The following beams were examined for q purposes: the ferroconcrete beams of the control-series, and the twin beams reinforced only with basalt-plastic reinforcement – Для порівняння було досліджено такі балки: залізобетонні балки контрольної серії та парні балки (балки-близнюки), армовані лише базальтопластиковою арматурою [6, p. 149].

Here, in the English passive sentence, the structure “were examined” is translated as «було досліджено» impersonal passive, common in Ukrainian scientific style;

It was found that the replacement of the metal armature with basalt plastics led to an increase in strength, on average, by 40% – **Заміна** металеві арматури на базальтопластикову **призвела до** збільшення міцності в середньому на 40% [6, p. 149].

Here, in the English passive sentence, the structure “It was found that...” is dropped for clarity and restructured into active form in Ukrainian translation «заміна... призвела до...»;

Similar strength indices were obtained for hybrid reinforcement beams – Подібні показники міцності **зафіксовано** і для балок з комбінованим армуванням [6, p. 149].

Here, in the English passive sentence, the structure “were obtained...” is translated as «зафіксовано», in Ukrainian it is often used verbs like “встановлено”, “зафіксовано”, “отримано” in an impersonal way for reporting results.

Another aspect refers to translation of short or simple subordinate syntactic units inherent in an English-language scientific text into complex subordinate clauses in Ukrainian. Ukrainian scientific style tends to use more complex subordinate structures than English, especially when clarifying cause-effect relationships, conditions, or specifying constraints.

The low rigidity indices of the composite reinforcement limit its application due to the deformation requirements that exist in the building codes of different countries – Низькі показники жорсткості композитної арматури обмежують її застосування **через те, що** у будівельних нормах різних країн **існують вимоги щодо деформаційних характеристик** [6, p. 149].

Here, the English simple prepositional phrase is transformed into Ukrainian full causal clause; “due to the deformation requirements...” is translated as «через те, що... існують вимоги щодо деформаційних характеристик...»;

It is subject to bending structures, in which the displacement and width of opening cracks depend on rigidity indices of armature – Це стосується згинальних конструкцій, в яких переміщення та ширина розкриття тріщин залежать від показників жорсткості арматури [6, p. 149].

Here, the English prepositional phrase is transformed into Ukrainian subordinate relative clause; “in which the displacement and width...” – «в яких переміщення та ширина...»;

One way to overcome this drawback is to use hybrid reinforcement. When concrete structures reinforced, composite armature is used in conjunction with metal armature... – Одним зі способів подолання цього недоліку є використання комбінованого армування, при якому композитна арматура застосовується разом із металевою... [6, p. 149].

Here, the English infinitive clause is transformed into Ukrainian sentence as noun and subordinate clause;

At present, it has been accumulated a certain experimental data base concerning the stress-strain state of structures with hybrid reinforcement using metal and fiberglass armature ... – На сьогодні накопичено певну експериментальну базу даних, яка стосується напружено-деформованого стану конструкцій із комбінованим армуванням, що включає металеву та склопластикову арматуру ... [6, p. 149].

In this example, Passive “has been accumulated” and noun is turned into impersonal Passive and relative clause.

At the same time, basalt-plastic armature is a relatively new type of armature, and therefore the peculiar properties of its work in the building structures have not been sufficiently studied – Водночас базальтопластикові арматури є відносно новим видом арматури, у зв'язку з чим її особливості роботи в будівельних конструкціях досліджені недостатньо [6, p. 149].

Here, the English coordinating conjunction is transformed into Ukrainian subordinate clause of consequence; “and therefore the peculiar properties...” – «у зв'язку з чим особливості ...». The above examples show how **short or simple subordinate syntactic units** in the English sentences (e.g., participial phrases, infinitive constructions) can be rendered as **complex subordinate clauses** in the Ukrainian ones.

To translate scientific texts from English to Ukrainian, it's important to adjust sentence structure and word choice, as well as correlate the tense forms. The use of a wider range of tenses is common in the English language such as present perfect, past perfect, or passive forms, than in Ukrainian, which often relies on context and aspect (perfective or imperfective) rather than strict tense matching. For example:

The deterioration of the existing ferroconcrete structures is mainly due to the corrosion of armature being a part of ferroconcrete – Погіршення стану існуючих залізобетонних конструкцій переважно зумовлене корозією арматури, яка є складовою частиною залізобетону [5, p. 151].

In the above example, in the English sentence the verb is used in Present Simple, and Ukrainian variant shows Past Tense: “...is mainly due to...” – «...зумовлене...». It is also necessary to pay attention to the state-result passive (дієприкметниковий зворот) used in a Ukrainian sentence;

In some developed countries the solution to this issue is the use of composite armature in the reinforcement of concrete structures – У деяких розвинених країнах вирішення цього питання стало застосування композитної арматури для армування бетонних конструкцій [6, p.151].

In the above example, in the English sentence the verb is used in Present Simple “...is...”, and Ukrainian variant shows perfective past «...стало...», as the action is interpreted as an already adopted practice.

When building grammatical structures in the translation of foreign language texts, translators resort to transformations. If the example of translation from English into Ukrainian is taken, the following grammatical transformations are most often used:

- *transposition*; and here it is understood as changing the order of words in a phrase or sentence due to the difference between English and Ukrainian, primarily the absence of a strict word order in Ukrainian, as it is in English. For example:

Формування моделі відбувалось в програмному комплексі ANSYS Student – Model formation took place in the ANSYS Student software package [5, p.7].

This example demonstrates **transposition**, where grammatical structures are changed to fit the norms of the target language: a noun phrase «формування моделі» becomes the subject of the English sentence, adjusting syntax for fluency.

Як уже зазначалося раніше, у роботі розглянуто чотири математичні моделі бетонної балки, що відрізняються матеріалом і діаметрами стрижневої арматури – As previously noted, the study examines four mathematical models of a concrete beam, which differ in the material and diameters of the reinforcing bars [5, p.9].

In this sample sentence introductory clause «Як уже зазначалося раніше...» is simplified and nominalized into “As previously noted...”; Passive impersonal structure «...у роботі розглянуто...» is transformed into active subject with transposition “the study examines...”; Participial clause «...що відрізняються матеріалом і діаметрами...» is transformed into relative clause “...which differ in the material and diameters...”;

У перших двох моделях діаметри композитної арматури верхнього і нижнього поясу дорівнюють відповідним діаметрам сталевих арматур – In the first two models, the diameters of the composite

reinforcement in the upper and lower flanges **are equal to** the corresponding diameters of the steel reinforcement [5, p.9].

This sample sentence demonstrates how Present tense retained «діаметри... дорівнюють...» «...the diameters... are equal to...» but structure rephrased to sound natural in English;

- another transformation is *substitution*; When **translating from Ukrainian into English**, particularly in the technical texts in the defense and construction industries, **substitution** often involves adapting **grammatical categories** that English doesn't express — such as gender and case. Since the English language lacks **grammatical gender** and has minimal **case inflection** (mostly in pronouns), translators substitute gendered or case-marked forms with neutral forms or structural changes. **However, substitution** in translation refers to replacing not only a grammatical element, but also a lexical one in the source language with another structure in the target language that conforms to its norms. Two categories can be distinguished here: gender substitution and case substitution. In *gender substitution* gendered nouns, pronouns or adjectives in the source become gender-neutral in English. In *case substitution* case endings are replaced with prepositional phrases, word order, or possessives in English.

The below given example demonstrates how the **gendered pronoun "his/he"** is dropped as English doesn't require the masculine marker.

Ворожий солдат відкрив вогонь першим. Його поранив наш снайпер – While literary translation is – Enemy **male** soldier opened fire first. **He** was wounded by our sniper – Translation using **substitution** is – The enemy soldier opened fire first **and was** wounded by our sniper.

The below given example demonstrates how the genitive case in Ukrainian (противника, батальйону) becomes a possessive noun or a prepositional phrase in English.

Атака противника була відбита силами батальйону – The attack of the enemy was repelled by the forces of the battalion or The enemy attack was repelled by the battalion's forces.

Ціль була знищена артилерією – «...артилерією...» is the **instrumental case** – The target was destroyed **by artillery**. Here it is translation using **substitution** ("by + noun" phrase in English).

In addition, translation practice often uses calquing, omission, and addition to convey the grammar of the source language. Ukrainian scientific language values clarity and conciseness.

CONCLUSIONS

Scientific and technical translation has its own peculiarities. Grammatical aspect is one of them. Linguists give the grammatical aspect various features and functions within a scientific and technical text. It has its own specific means of expression.

The study analyzed grammatical aspect in the context of using translation of passive structure, translation of short or simple subordinate syntactic units into complex subordinate clauses, correlation of different tense forms in the source and target languages, and use of grammatical transformations in two spheres: construction and military industries. A glimpse into grammatical aspect as the key to high-quality, accurate, and professional translation in the field of science and technology was offered.

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