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CHALLENGES AND INNOVATIONS IN SCIENTIFIC AND TECHNICAL TRANSLATION: TERMINOLOGICAL COMPLEXITIES AND ‘FALSE FRIENDS’

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This article explores the dynamic changes in scientific and technical terminology at the start of the 21st century, driven by global advancements in science, technology, and international cooperation. The focus is on the complexities faced by translators in identifying, characterizing, and translating new terms, especially those complicated by ‘false friends of translators.’ The study analyses the processes of terminology formation, the polysemy of terms, and the challenges posed by synonymy and the absence of equivalent terms in the target language. The research employs methods such as literature review, comparative analysis, and lexical-semantic analysis to understand the formation and usage of terminology in English and Ukrainian. It also highlights the influence of English on global terminological vocabulary, particularly in economic and computer sciences. The article emphasizes the importance of accurate translation in scientific communication and suggests strategies for improving translation practices through standardization, training, and collaboration. This research aims to contribute to the ongoing development and standardization of Ukrainian scientific and technical terminology, ensuring clarity, precision, and effective communication in specialized fields.

Keywords: international cooperation; polysemy; scientific terminology; synonymy; translation challenges.

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INTRODUCTION

The beginning of the 21st century is characterized by global changes in all fields of science and technology, processes of their integration and international cooperation. Any changes in the socio-economic and scientific-technical spheres are accompanied by certain changes in the language system. The digital transformation of education due to the COVID-19 pandemic has launched virtual classes. In its turn, virtual educational discourse causes the emergence of new language patterns in English language teaching (Mospan, 2023). Moreover, language can change and develop because the meaning of certain phrases changes in the context of language use (Strongman, 2017). The scientific and technical revolution is one of the most important phenomena of modern times, bringing significant changes to the linguistic model of the world. Scientific and technical terminology is a broad layer of vocabulary that is intensively developing and actively interacting with other layers of vocabulary. It can happen because of the adaptation of developments and changes in the social life system, such as education level, culture, social, and technology mastery (Harya, 2016). One of the most common

reasons for the enrichment of terminological vocabulary is translation, and it is translators who face the problem of identifying patterns in the formation of new terms, their structure, and semantics. For example, Belozerskaya et al., (2010), Dyakov et al., (2000), Pavel (2001), Strongman (2017) deal with issues of normalization and standardization of terminology, intensification of translation activities, and optimization of teaching scientific and technical literature translation. Sysoieva & Mospan (2018) discuss the issues of concepts in the international and national educational contexts and their translation. On challenges in teaching translation professional terminology focus Balliu (2013), Boyko & Koltsova (2023), Killman (2018), Radetska, & Mazur (2023), and Tatu (2016).

In this article, we will examine issues related to defining, characterizing, functioning, and forming terms in scientific and technical literature, the emergence and use of terms known as “false friends of translators”, and the peculiarities of translating these lexical units.

RESEARCH OBJECTIVES

The particular aspect of our research is dedicated to the investigation of the complexities involved in defining and characterizing scientific and technical terms, including their polysemy, systematic relationships, and contextual usage and identification of the most common challenges faced by translators in the translation of scientific and technical terminology, particularly issues related to “false friends of translators” and the absence of equivalent terms in the target language. In the case of the translation of scientific and technical texts, a considerable percentage of translation quality depends on finding optimal correspondences for the specialized language units or terms used to convey the text message (Faber, 2019). Terminology is the basis for specialist communication and should be used with precision in classifications. The complexity of technical content and of specialist knowledge, as well as the overlapping of specialties and fields, makes it increasingly relevant to pay attention to the accuracy of terminology, especially across languages and geopolitical frontiers (COTSOES, 2002). The overarching focus of our research lies in the development of strategies and recommendations for improving the accuracy and consistency of scientific and technical term translation, contributing to the standardization of Ukrainian terminology.

RESEARCH METHODS

To address the challenges of defining, characterizing, and translating scientific and technical terminology, the following research methods will be employed.

Literature review and analysis of existing literature, including books, journal articles, and conference papers authored by leading specialists aim in gaining a comprehensive understanding of the current state of research on scientific and technical terminology, identifying key concepts, definitions, and methodologies used in the field, as well as gaps in the current research.

Comparative analysis in order to analyse scientific and technical terms in English and Ukrainian, focusing on terms that are frequently mistranslated or have multiple

meanings, develop a clearer understanding of how terms function in different linguistic and technical contexts, and identify common pitfalls in translation.

Lexical-semantic analysis to analyse the lexical and semantic properties of terms, including their definitions, polysemy, and systematic relationships to provide a detailed characterization of term properties and propose improvements for terminological consistency and clarity.

By employing these methods, the research aims to: deepen the understanding of scientific and technical terminology formation and usage; identify and address common challenges in the translation of scientific and technical texts; develop recommendations for improving the accuracy and consistency of term translation and contribute to the enrichment and standardization of Ukrainian scientific and technical terminology.

RESEARCH RESULTS

The number of terms and professional jargon formed by specialists in the process of professional communication for their professional knowledge exceeds the number of common vocabulary by at least five times. The lexical composition of scientific and technical literature is characterized by the use of numerous scientific and technical terms, i.e., words or phrases that denote certain scientific or technical concepts. It is often difficult to draw a clear line between terms and common words due to the polysemy of some words. For example, well-known words like “atom”, “vitamin”, and “cosmos” do not play the role of terms in everyday life, while equally common and well-known words like “water”, “direction”, and “pressure” are terms in scientific and technical contexts.

Scientific and technical translation deals with:

- terminological vocabulary;
- general scientific vocabulary;
- common vocabulary

The presence of terms is one of the defining characteristics of a scientific and technical text. Research indicates that in scientific and technical texts, terminological vocabulary accounts for 25%, while general scientific and common vocabulary accounts for 75%.

Due to the complexity and controversy surrounding the definition of the concept of a term, many attempts have been made in linguistics to define terms. Whereas natural language concepts are based on prototypes, classical terminological definitions (CTDs) are based on necessary and sufficient conditions. The socio-cognitive approach to terminology rejects both the possibility and the desirability of CTDs (Hacken, 2010). In this article, we will the definition of a term, which states that a term is a word or verbal complex that correlates with the concept of a certain organized field of knowledge (science, technology), entering into systematic relations with other words and verbal complexes and forming a closed system characterized by high informativeness, unambiguity, accuracy, and expressive neutrality. Terminologies – the lexical components of specialized languages – emerge from theoretical and technological innovation: new scientific insights and novel tools enrich the conceptual and practical

environment of the specialists, and in the process expand their vocabularies (Geeraerts, 2015)

A term can only exist as an element of a terminology system, understood as an ordered set of terms that adequately express the system of concepts of a theory describing a specific specialized field of human knowledge or activity.

In the modern language of science and technology, the following characteristics of a term are distinguished:

- a term is unambiguous within one terminology system;
- a term is systematic (some scholars consider the systematic nature of a term to be dual: As an element of the terminology system and as an element of the language system);
- a term has a clear definition;
- a term is independent of context;
- a term must be precise;
- a term must be short (this requirement should not be achieved at the expense of precision, especially considering that the differentiation of scientific and technical concepts is an objective prerequisite for the use of multi-word terms to most accurately denote a specific concept);
- a term is expressively neutral;
- a term should not have synonyms or homonyms that could hinder mutual understanding;
- a term should be euphonic and comply with the rules and norms of a certain language.

Having listed the main characteristics that modern terminologists attribute to terms, it should be noted that these characteristics are more desirable than mandatory for a large amount of terminological units. Many scholars believe that a terminological unit cannot be considered incomplete or unnecessary just because it lacks a certain property, even though it has been used by users for some time.

A term functioning in different fields of science and technology can be polysemantic. A scientific and technical translator dealing with texts on a specific topic must understand the nature of scientific and technical terms in texts. The translator's task is to determine the affiliation of a term to a specific field and find the appropriate translation for this term. For example, the term "storage" means "memory" in computing, but in other fields, it is used in the sense of "warehouse" or "storage". The technical term "frame" can be translated as: frame (in any device), bed (in machines), skeleton (in construction), shot (in cinema and television), structure, body, truss, etc.

Another phenomenon that contradicts the basic requirements for terms but exists in modern terminology is synonymy. Sometimes the same concept (or object) can be denoted by different words. For example: cargo – freight, radiation – emission, subscriber – user. In such situations, the translator is responsible for avoiding misinterpretation of the term when describing a specific subject situation in a particular scientific-technical field.

Bowker (Bowker, 2020, p. 264) reminds us that terminology is an inevitable part of the translation process, where translators spend considerable time researching,

selecting and deciding upon the most adequate solution for terms in each of their briefs. However, the main problem in translating scientific-technical texts is the absence of corresponding lexical elements in the target language. This raises the issue of creating new terms that would correspond to both the relevant field of science and the standards of terminology.

Terms can be formed in any language in three main ways:

- using the internal resources of the language;
- inventing artificial words;
- direct borrowing of term elements.

It has been calculated that about 90% of new words that appear in each language are terms. Modern Ukrainian terminology is also actively enriched with new units. One of the ways to assimilate such borrowings is to combine them with native or long-borrowed terms, for example: marketing analysis, dumping prices, etc.

In most developed languages of the world, such as English, German, French, etc., direct borrowing is not the main way of creating new terms; instead, various ways of creating new terms using the internal resources of the language (assigning new meanings to existing words, building new words with derivational affixes, compounding bases, forming phrases, and creating abbreviations) are prevalent. However, in the Ukrainian language, the percentage of borrowings at the current stage of language development is very significant.

Any language inevitably undergoes foreign influence, or even influences other languages. Borrowings can be direct (directly from the source language) or indirect (through the mediation of third languages). One of the largest sources of enrichment of international terminological vocabulary in the past century has been the English language (especially in economic and computer terminology). One of the biggest problems for translators, especially in technical translation, is the so-called “false friends of translators”, which arise from the direct borrowing of foreign elements. “False friends of translators” are words and phrases that coincide in form with Ukrainian internationalisms, but express a sufficiently different meaning. Historically, “false friends of translators” are the result of mutual language influence, sometimes arising from accidental coincidences, and in related languages, they are based on common prototype words.

There are approximately several thousand words in English and Ukrainian that can be called “false friends of translators”. These words are found among four parts of speech, namely: noun, adjective, adverb, and verb. Homonymy of parts of speech usually does not cause misunderstandings; the greatest difficulties are caused by words belonging to analogous or adjacent semantic fields and can be found in similar contexts.

In Ukrainian, such words can be conditionally divided into two groups:

- words that have similar spelling and pronunciation but entirely different meanings;
- words that coincide in one of the meanings with the Ukrainian equivalent, but differ in others.

Words in the first group pose less “danger” for translators are given in the Table 1.

False Friends Comparison

Word in English	Word in Ukrainian	Apparent Meaning	Meaning (English)	Meaning (Ukrainian)
Accurate	Точний	Appears to mean 'neat' (not "акуратний")	Means 'exact, correct'	Means 'exact, precise'
Actual	Дійсний	Appears to mean 'current' (not "актуальний")	Means 'real, true'	Means 'valid, effective'
Agitator	Підбурювач	Appears to mean 'campaigner' (not "агітатор")	Means 'a person who stirs up public opinion'	Means 'instigator, provocateur'
Advocate	Прихильник	Appears to mean 'lawyer' (not "адвокат")	Means 'supporter of a cause'	Means 'supporter, adherent'
Aspirant	Претендент	Appears to mean 'postgraduate student' (not "аспірант")	Means 'a person with aspirations'	Means 'candidate, contender'
Clay	Глина	Appears to mean 'glue' (not "клей")	Means 'earthy material'	Means 'clay (material)'
Corpse	Труп	Appears to mean 'body of a building' (not "корпус")	Means 'dead body'	Means 'dead body'
Collaboration	Співпраця	Appears to mean 'enemy support' (not "посібник ворогові")	Means 'working together'	Means 'cooperation, collaboration'
Fabric	Тканина	Appears to mean 'factory' (not "фабрика")	Means 'cloth'	Means 'fabric, textile'
Novelist	Письменник-романіст	Appears to mean 'short story writer' (not "новеліст")	Means 'writer of novels'	Means 'writer of novels'
Physician	Лікар-терапевт	Appears to mean 'physicist' (not "фізик")	Means 'medical doctor'	Means 'general physician'
Preservative	Консервант	Appears to mean 'condom'	Means 'a substance used to preserve food'	Means 'a substance used to preserve food'

Principal	Директор школи	Appears to mean 'principle' (not "принцип")	Means 'head of a school'	Means 'head of a school'
Production	Виробництво	Appears to mean 'product' (not "продукція")	Means 'process of making something'	Means 'production, manufacturing'
Prospect	Перспектива	Appears to mean 'street name' (not "проспект")	Means 'possibility or future opportunity'	Means 'prospect, outlook'
Rapport	Добрі відносини	Appears to mean 'report' (not "рапорт")	Means 'harmonious relationship'	Means 'good relations'

Much greater difficulties arise when translating words belonging to the second group (see Table 2). Here, the translator must demonstrate knowledge not only of the languages used in the translation but also of the subject matter of the text.

Table 2

False Friends Comparison

Word in English	Word in Ukrainian	Apparent Meaning	Meaning (English)	Meaning (Ukrainian)
Aggressive	Енергійний, настирливий	Appears to mean 'aggressive' (hostile)	Means 'forceful or hostile'	Can mean 'energetic, persistent'
Cabinet	Меблева секція	Appears to mean 'cabinet' (furniture)	Means 'cupboard or small storage'	Means 'section of furniture, but also government'
Camera	Фотоапарат	Appears to mean 'camera' (photography)	Means 'device for taking photos'	Means 'photo camera', but also 'cell' (as in jail)
Champion	Борець, захисник	Appears to mean 'champion' (winner)	Means 'winner of a contest'	Can mean 'fighter, defender'
Conductor	Диригент	Appears to mean 'conductor' (transport)	Means 'person leading an orchestra'	Can mean 'orchestra conductor', but also 'bus or train conductor'

Correspondence	Відповідність	Appears to mean 'correspondence' (letters)	Means 'communication via letters'	Can mean 'conformity, match', but also 'article in a newspaper' or 'letter exchange'
Element	Стихія	Appears to mean 'element' (basic part)	Means 'basic or fundamental part'	Means 'natural element' (fire, water, etc.)
Patient	Терплячий	Appears to mean 'patient' (hospital)	Means 'person under medical care'	Means 'patient (medical)', but also 'tolerant'
Phrase	Вираз	Appears to mean 'phrase' (words)	Means 'group of words'	Can mean 'expression', but also 'saying'
Professor	Викладач	Appears to mean 'professor' (academic rank)	Means 'academic teacher'	Means 'teacher, lecturer', but can mean 'professor'
Scandal	Прикрий випадок	Appears to mean 'scandal' (controversy)	Means 'a public controversy'	Can mean 'unfortunate incident', but also 'scandal'
Solid	Твердий	Appears to mean 'solid' (strong)	Means 'firm or hard'	Means 'solid (hard)', but also 'serious, substantial'
Specialty	Фах	Appears to mean 'specialty' (niche)	Means 'a specific area of expertise'	Means 'profession, expertise', but can mean 'specialty'
Type	Друкарська машинка	Appears to mean 'type' (kind)	Means 'category or kind'	Can mean 'typewriter', but also 'category'

Differences in pairs of “false friends of translators” arise due to mismatches in conceptual content, the presence of realia, stylistic characteristics, and lexical compatibility. A specific approach to the classification of phenomena, properties, and relations of objective reality is characteristic of the semantics of all languages. For instance, the English word "artist" means a generalized concept of a representative of art or certain types of art:

Artist – a gifted/talented artist;

Performer, actor – a dramatic artist;

Master of their craft – an artist in words;

Swindler, cheat (U.S.) – he is an artist with cards.

In Ukrainian, this concept primarily refers to a professional actor (which in English is translated as “actor” – “кіноактор”). Secondly, it refers to meanings such as “painter, representative of the arts” (English – “artist”) and colloquially as “master of their craft”.

Differences in the subject-logical content of English and Ukrainian “false friends of translators” are often related to discrepancies in realia. For example, the head of any higher educational institution in Ukrainian is referred to as “ректор”, whereas in English, the term “rector” only applies to heads of several colleges at Oxford. The English equivalents of the term “ректор” are “president”, “principal”, or “vice-chancellor”.

It is also crucial to consider differences in the stylistic characteristics of words that are associated during translation. Words with identical dictionary meanings can differ due to functional-stylistic and expressive-emotional connotations. These difficulties can arise not only in literary texts, as one might initially think, but also in scientific and technical texts. For example, the English word “compilation” means “compiling, collecting facts” and is stylistically neutral, whereas the Ukrainian counterpart “компіляція” has a negative connotation – “a non-original work built on borrowed material”.

Significant challenges also arise from the possibility of incorrect lexical compatibility between English and Ukrainian words. Lexical compatibility characteristics are not always provided or fully disclosed in bilingual dictionaries, so translators must rely on their intuition and knowledge of traditions. For instance, the words “industry” and “індустрія” in the sense of “industry” generally coincide, but are not always interchangeable. When referring to heavy, machine-building, socialist, capitalist, modern, or light industries, the equivalents “промисловість” and “індустрія” are correct in both Ukrainian and English. However, when talking about, for example, the construction, mining, or food industry, it is not customary in Ukrainian to use the term “індустрія”.

The presence of various kinds of semantic discrepancies can be explained by the fact that an international term, assimilated by speakers of a particular language, falls under the influence of national culture, adding new meanings to the initial set of meanings.

Errors related to the incorrect use of “false friends of translators” are common not only among those who are just beginning to learn foreign languages and translate, but also among quite experienced specialists. This leads to many semantic calques and cases of violation of lexical compatibility and stylistic conformity, not only in the process of translation but also in the use of the native language.

The influence of “false friends of translators” on the translation of scientific and technical texts can cause significant misunderstandings, so the use of bilingual dictionaries (such as the Anglo-Ukrainian dictionary by Horot et al, (2006) Large modern English-Ukrainian, Ukrainian-English dictionary by Zahnytko & Danyliuk (2012), terminological, stylistic dictionaries (such as Longman Lexicon of Contemporary English by McArthur (1992), dictionaries of realia (such as The Roydon

Encyclopedia Thousands of Facts (1985)), dictionaries of “false friends of translators” and other reference books is not only desirable but necessary in the process of translating scientific and technical literature.

To address the issue of translating “false friends of translators”, there has been an increasing trend in recent years toward aligning the meanings of international terms and gradually overcoming semantic discrepancies. The International Organization for Standardization (ISO, 2019) has developed a special document – International Unification of Concepts and Terms, which emphasizes the need to give technical and scientific terms the same meaning in all languages to facilitate communication and increase contacts in scientific and technical fields. Therefore, although it is not possible to completely eliminate “false friends of translators” due to the established nature of certain terms in the terminological systems of many fields of science and technology in different languages, it is quite realistic to construct new terms with this problem in mind.

CONCLUSIONS

Scientific and technical texts are marked by a high concentration of specialized terminology, with these terms comprising roughly 25% of the overall vocabulary. The remaining 75% consists of general scientific and common language. However, the polysemy of certain words often blurs the line between terms and everyday vocabulary, making it difficult to distinguish between the two.

Modern terminologists suggest several key characteristics for terms, such as unambiguity, systematic nature, clear definitions, independence from context, precision, brevity, expressive neutrality, and euphony. Despite these ideals, not all terminological units consistently exhibit these qualities.

Translators face significant difficulties due to the polysemy and synonymy of terms, as well as the lack of direct lexical equivalents in the target language. The issue is compounded by “false friends of translators”, which are words that appear similar in form but differ in meaning between languages, leading to potential misunderstandings if not accurately interpreted and translated.

New terms are typically created using the internal resources of a language, the invention of artificial words, or the direct borrowing of term elements. In more developed languages, the creation of new terms from internal resources is more common than direct borrowing. However, in Ukrainian, the proportion of borrowed terms remains notably high.

The influence of foreign languages, particularly English, has significantly enriched international terminological vocabularies, especially in fields such as economics and computing. Borrowings can be direct or indirect, often giving rise to “false friends of translators” and creating challenges for accurate translation.

Achieving effective translation necessitates a deep understanding of both the source and target languages, along with a strong grasp of the text’s subject matter. Utilizing bilingual dictionaries, as well as terminological and stylistic reference materials, is crucial to avoid misinterpretation and to ensure accuracy in translation.

PROSPECTS FOR FURTHER RESEARCH

The national terminology of the Ukrainian language is in the process of formation, and the translation of scientific literature from other languages serves as the main way to enrich professional terminological systems and standardize them. Translators have the opportunity to compare and evaluate the appropriateness of using a particular terminological element in the source and target languages. Moreover, the accuracy and adequacy of the translation directly affect the success of scientific and technical communication between specialists from different countries. Therefore, considering terms as a subject of particular attention in the training and practical activities of translators of scientific and technical literature is undoubtedly a relevant issue that requires comprehensive research.

Efforts to normalize and standardize scientific and technical terminology should be continuously pursued to enhance understanding and communication across disciplines. This standardization is essential for ensuring that terms are used consistently and accurately, reducing ambiguity and misunderstandings in scientific discourse.

For translators, access to adequate training and resources is vital. This includes providing comprehensive dictionaries and other reference materials that are essential for improving the accuracy of translations. Well-trained translators equipped with the right tools are better positioned to handle the complexities of scientific and technical language, ensuring that translations are both precise and faithful to the original text.

Collaboration among linguists, terminologists, and translators is also crucial. The dynamic nature of terminology, which evolves with advances in science and technology, necessitates ongoing research and cooperation. By working together, these professionals can address the challenges of translation and keep terminologies up-to-date with the latest developments.

When developing new terms, it is important to consider both the specific field of science and the established standards of terminology. This ensures that new terms are clear, precise, and fit seamlessly into the existing body of terminology, thereby facilitating better communication and understanding in specialized fields.

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ВИКЛИКИ ТА ІННОВАЦІЇ НАУКОВО-ТЕХНІЧНОГО ПЕРЕКЛАДУ: ТЕРМІНОЛОГІЧНІ ТРУДНОЩІ ТА «ФАЛЬШИВІ ДРУЗИ ПЕРЕКЛАДАЧА»

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У статті досліджуються динамічні зміни, які відбуваються в процесі формування та перекладу науково-технічної термінології на початку 21-го століття, спричинені глобальним прогресом у науці, техніці та міжнародній співпраці. Особлива увага зосереджена на складнощах, з якими стикаються перекладачі під час ідентифікації, характеристики та перекладу нових термінів, особливо тих, які ускладнюються наявністю «фальшивих друзів перекладача». У дослідженні аналізуються процеси формування термінології, полісемія термінів, а також проблеми, пов'язані з синонімією та відсутністю еквівалентних термінів у мові перекладу. У дослідженні використовуються такі методи, як аналіз літературних джерел, порівняльний аналіз та лексико-семантичний аналіз, щоб зрозуміти процеси формування та використання термінології в англійській та українській мовах. Також підкреслюється вплив англійської мови на глобальну термінологічну лексику, зокрема в економіці та комп'ютерних науках. Стаття наголошує на важливості точного перекладу в науковій комунікації та пропонує стратегії вдосконалення практики перекладу через стандартизацію, навчання та співпрацю. Це дослідження має на меті сприяти постійному розвитку та стандартизації української науково-технічної термінології, забезпечуючи ясність, точність та ефективну комунікацію у спеціальних галузях.

Ключові слова: міжнародне співробітництво; полісемія; наукова термінологія; синонімія; виклики перекладу.

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