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Functional-semantic peculiarities of translating cybersecurity terminology

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Abstract

Purpose: This study aims to analyze the challenges and strategies involved in translating English cybersecurity terminology into Uzbek, with particular attention to preserving the functional and semantic features of the source terms.

Research methodology: The research applies a descriptive-analytical approach by examining existing terminological units in English and their Uzbek equivalents. Comparative linguistic analysis and semantic mapping are used to identify patterns of borrowing, adaptation, and equivalence in translation.

Results: The findings indicate that most Uzbek cybersecurity terminology originates from English, often entering through direct borrowing or partial adaptation. While many terms maintain functional accuracy, semantic distortions occur when literal translation is applied without contextual consideration. The research also highlights that some terminological units enrich the Uzbek lexicon, while others pose challenges in achieving precise equivalents due to cultural and linguistic differences.

Conclusions: Translating cybersecurity terms requires strategies that balance linguistic accuracy with functional clarity. The study concludes that a hybrid approach—combining direct borrowing with contextual adaptation—is the most effective way to maintain the semantic integrity of specialized terms.

Limitations: The study is limited to selected cybersecurity terms and does not encompass all branches of information technology. Broader corpus-based research may be needed to generalize the findings.

Contribution: This research contributes to translation studies and applied linguistics by providing insights into the mechanisms of term transfer between English and Uzbek, offering practical recommendations for translators, linguists, and ICT professionals.

Keywords: *Cybersecurity, Information Technology, Semantics, Terminology, Translation*

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1. Introduction

Translation is becoming more and more common in all spheres of life, and with the rapid development of technology and the expansion of scientific and technical information, the importance of scientific and technical translation has also increased. Also, in the era of global computerisation, research into methods of translating cybersecurity terms into English is undoubtedly relevant. Of particular importance in this process is the field of scientific and technical translation (Paulsen, 2018). Philologists, linguists and translation specialists attribute the difficulties in translating scientific and technical terms to such factors as the widespread use of various abbreviations, the dominance of some syntactic changes over others, the use of stylistic meanings in naming terms, and the transfer of

several terms from other fields to cybersecurity as hybrid terms, which, as a result, increases the semantic load of these terms (Henrico & Putter; Xu & Wang, 2016).

In recent decades, the digitalization of society has fundamentally transformed not only communication practices but also the linguistic landscape of many languages. The emergence of new technologies has generated an unprecedented influx of neologisms, many of which are directly borrowed from English, the current lingua franca of science and technology. Cybersecurity, as a rapidly evolving domain, exemplifies this phenomenon. Terms such as "firewall," "phishing," "malware," and "cryptography" have entered global discourse and often appear in their original English form, even in languages with rich terminological traditions. This widespread adoption underscores both the dominance of English in technical domains and the urgency of developing effective translation strategies to ensure clarity, accessibility, and cultural adaptation (Israilova, Israilova, & Gatsieva, 2023; Li, Cheng, Huang, Chen, & Niu, 2021).

Scientific and technical translation differs from literary or general translation in that it demands extreme precision and functional accuracy. Unlike literary texts, where stylistic freedom allows for interpretive creativity, technical texts require the translator to convey exact meanings. A mistranslated cybersecurity term may not only distort understanding but also cause practical consequences in legal, educational, and professional contexts. For example, misinterpreting "encryption key" as a literal "key" rather than as a digital code could confuse end users or policymakers. Thus, translation in this field requires a balance between linguistic fidelity, terminological consistency, and pragmatic applicability. One of the central challenges lies in the linguistic properties of cybersecurity terminology itself. Abbreviations and acronyms, such as "VPN" (Virtual Private Network), "DDoS" (Distributed Denial of Service), or "IoT" (Internet of Things), pose difficulties because their expanded forms may not be directly translatable or may sound cumbersome in the target language. Furthermore, many cybersecurity terms are hybrids, borrowing from multiple domains. For instance, "honeypot" combines metaphorical imagery with a technical function, while "Trojan horse" refers to a classical cultural reference adapted into computer science. Translating such terms requires not only technical knowledge but also cultural awareness to preserve semantic nuance and communicative effect (Bakhromovna, 2025; Tavares, Tallone, Oliveira, & Ribeiro, 2023).

Another issue arises from syntactic patterns. English, with its flexibility and preference for compound nouns, often produces compact terminological units such as "cloud storage security" or "data breach management." Translating these directly into languages with different syntactic structures may result in awkward or excessively long constructions. Translators must therefore employ strategies such as reordering, nominalization, or adaptation to align with the grammar of the target language while maintaining accuracy. Stylistic dimensions also play a role in translation. Certain terms carry stylistic or metaphorical meaning that reinforces their function. For example, "black hat" and "white hat" hackers are metaphorical expressions that classify hackers by intent and ethics. Rendering these literally into another language may cause confusion or loss of nuance. In such cases, translators face a dilemma: whether to preserve the metaphor, risking incomprehension, or replace it with a culturally adapted equivalent that conveys the intended distinction (Bolduc, 2022; Deilen, Lapshinova-Koltunski, & Carl, 2023).

The global expansion of cybersecurity has also led to the cross-fertilization of terminologies from related fields. Terms from military science, criminology, law, and even psychology increasingly appear in cybersecurity discourse. Words like "attack," "defense," "threat," and "vulnerability" are borrowed from security studies, while "identity theft" combines legal and sociological dimensions. These hybrid usages broaden the semantic scope of cybersecurity terms but also complicate translation because the same word may carry distinct connotations in different contexts. Translators must therefore exercise heightened awareness of interdisciplinary overlaps and avoid oversimplification. Beyond purely linguistic challenges, the cultural and institutional context of translation must be considered. Languages differ in their openness to borrowing foreign terms. For example, French traditionally favors the creation of equivalents (e.g., "logiciel" for "software"), while many other languages readily adopt English loanwords. In the Uzbek context, the influx of English IT

terms has enriched the lexicon but also created inconsistencies in usage. Some terms are borrowed wholesale, others are adapted phonetically, and still others are translated semantically. This variability reflects the dynamic negotiation between linguistic identity and global technological integration (Alaa & Al Sawi, 2023; Ramirez & Choucri, 2020).

Cybersecurity adds another layer of urgency because it intersects with national security, personal privacy, and international law. Governments, institutions, and educational systems require terminological consistency to draft legislation, train professionals, and educate the public. Inconsistent or inaccurate translations could undermine cybersecurity policies or hinder international cooperation. For example, if "cyber resilience" is translated differently across documents, stakeholders may misunderstand its scope, leading to gaps in preparedness. Thus, translation in this field is not merely an academic exercise but a matter of societal importance. With the rise of machine translation and AI-driven language technologies, new opportunities and challenges also emerge. Automated systems can provide rapid translations of technical texts, but they often fail to capture specialized terminology or cultural nuance. For instance, machine translation engines may mistranslate "worm" as the literal biological creature rather than as a type of malware. This highlights the continuing need for human expertise in scientific and technical translation. Nevertheless, AI tools can support translators by offering initial drafts, concordances, or term databases, provided they are supplemented with human judgment (Martínez, Robles, El Oualidi Charchmi, Estévez, & DeCastro-García, 2025; Rivera et al., 2019).

The pedagogy of translation also deserves attention. Training future translators in cybersecurity terminology requires interdisciplinary curricula that combine linguistics, computer science, and cultural studies. Students must not only master translation strategies but also understand the underlying technological concepts. Without this knowledge, they risk producing translations that are linguistically accurate but technically misleading. Educational programs must therefore emphasize practical exercises, case studies, and collaboration with IT professionals to build competence. Scholars of translation studies propose various strategies for handling specialized terms. Vinay and Darbelnet's classical techniques—borrowing, calque, literal translation, transposition, modulation, equivalence, and adaptation—remain relevant but must be applied judiciously. In cybersecurity translation, borrowing is often the simplest choice (e.g., "phishing"), but overuse can lead to alienation of target readers unfamiliar with English. Calques may preserve structure but risk awkwardness, while adaptation requires creativity to find culturally resonant equivalents. Translators must evaluate each term individually and consider factors such as audience, function, and text type (Martínez et al., 2025).

Research in this area has begun to document patterns of term transfer across languages. For example, studies in Russian, Chinese, and Arabic show similar trends of borrowing from English, though with differing degrees of adaptation. Comparative research can illuminate how linguistic systems respond differently to global technological change. For Uzbek, where translation traditions are still developing in this domain, documenting these patterns is especially important for building standardized terminologies. In conclusion, the translation of cybersecurity terms represents a complex intersection of language, technology, and culture. It is shaped by global scientific developments, linguistic structures, cultural norms, and pedagogical strategies. Addressing the challenges requires an integrative approach that draws on linguistics, information technology, and translation studies. As societies become increasingly digitalized, the ability to translate cybersecurity concepts accurately and effectively will play a vital role in safeguarding communication, ensuring inclusivity, and supporting international cooperation.

2. Literature Review

2.1. Translation Theory and Scientific-Technical Terminology

Translation has long been recognized as a complex process that goes beyond linguistic substitution. Scholars such as K. Musaev define translation as a creative act of re-expressing meaning from one language into another while preserving semantic and structural unity. Similarly, I. Gafurov emphasizes the importance of pragmatic and linguocultural aspects in ensuring equivalence between

source and target texts . Theories from P. Newmark also highlight translation as the accurate transfer of intended meaning, stressing the translator's responsibility in maintaining precision in specialized domains. Scientific and technical translation differs from literary translation in its demand for functional accuracy and terminological consistency. As noted in the article, mistranslation in technical fields such as cybersecurity can result in misunderstandings with significant legal, educational, and professional consequences. This aligns with the view of scholars like R. Pronina, who underline the challenges posed by neologisms and polysemous common words frequently embedded in technical texts (Tiimub et al., 2023).

2.2. Cybersecurity Terminology: Nature and Challenges

Cybersecurity terminology occupies a unique place within the information technology terminological system. Unlike terms in other sciences, cybersecurity terms are characterized by internationality of form, stylistic neutrality, polymorphism, and multifunctionality. They often emerge through borrowing, metaphorical transfer, or hybridization with concepts from other disciplines such as law, criminology, and psychology. For example, terms like *firewall*, *Trojan horse*, and *identity theft* demonstrate both metaphorical and interdisciplinary origins. A major challenge in translating these terms is the prevalence of acronyms and abbreviations (e.g., VPN, DDoS, IoT), which may not have natural equivalents in the target language. Moreover, syntactic and stylistic features of English—particularly its compound noun structures—lead to difficulties when rendering terms into languages with different grammatical rules, such as Uzbek (Awadh & Shafiull, 2020; Gou, 2023; Putra, Ahadiyat, & Keumalahayati, 2023).

2.3. Problems of Translating Cybersecurity Terms

Scholars including V. Karaban and E.F. Skorokhodko emphasize that synonymy, neologisms, and technical polysemy present significant hurdles in translation. Cybersecurity translation inherits these challenges, given its reliance on rapidly evolving vocabularies. According to D.V. Tabanakova, the absence of stable equivalents in recipient languages requires translators to adopt flexible strategies, often resorting to descriptive definitions or borrowing. R.O. Sindega also notes the metaphorical and emotional nature of computer terminology, where terms like *mouse* or *Windows* rely on imagery familiar to everyday users. This metaphorical layer adds to the semantic load, demanding cultural as well as linguistic sensitivity during translation (Endi, Fanggidae, & Ndoen, 2023; Latunusa, Timuneno, & Fanggidae, 2023).

2.4. Methods and Transformations in Translation

The article synthesizes classical frameworks in translation studies Molina and Hurtado Albir (2002). Scholars such as L. Barkhudarov and V. Komissarov classify translation transformations into lexical, grammatical, and lexico-grammatical categories. These include transcription, transliteration, calque, modulation, and grammatical substitution. Other scholars, such as Molina and Hurtado Albir, propose the term *translation transformations* to highlight dynamic processes in adapting text fragments .
Common techniques applied in cybersecurity translation include:

a. Borrowing (*accreditation → akreditatsiya*),
b. Calque (*active threat → faol tahdid*),
c. Descriptive equivalence (*botnet → botni masofadan boshqarish dasturi*),
d. Notes and additions to clarify complex terms (*crack* or *dialler*) .

These strategies reflect the need for translators to balance functional precision with semantic clarity, often requiring context-sensitive decisions (Rahu, Neolaka, & Djaha, 2023).

2.5. Functional-Semantic Considerations

The functional-semantic approach underscores that translation is not only about lexical substitution but also about preserving pragmatic and contextual meaning. For instance, metaphorical terms such as *black hat* and *white hat* hackers cannot be rendered literally without losing their ethical connotations. Functional equivalence, therefore, becomes essential to ensure the term carries the same conceptual weight in the target language (Bolduc, 2022; Mohamed, 2022).

2.6. Cross-Linguistic and Cultural Dimensions

Cross-cultural studies reveal variation in how languages adapt IT and cybersecurity terms. While French institutions prefer coining native equivalents, languages such as Uzbek frequently borrow English terms directly. This creates inconsistencies, as some terms remain untranslated while others are adapted phonetically or semantically. The article emphasizes the importance of standardized practices to avoid fragmentation in national terminological systems.

3. Research Methodology

A number of countries have taken measures to protect the spelling and pronunciation of foreign words from appearing in the national language. For example, in China, all borrowed words are translated into Chinese or replaced by their predecessors (Molina & Hurtado Albir, 2002). Translators play an important role in this process. The fact that the Presidential Decree No. UF-5850 of 21 October 2019 'On measures to radically raise the prestige and status of the Uzbek language as the state language' specifically outlines the issue of 'introducing scientifically sound new words and terms, creating Uzbek alternatives to modern terms and ensuring their uniform use, controlling and coordinating the naming of geographical and other toponymic objects in accordance with regulatory and legal acts' means that there is a lot of work to be done to find and The development of the field of translation studies is of great importance in the realisation of such reforms.

Theoretical foundations of the translation concept. As we know, translation is one of the important spheres of social life. Translation is a bridge between two people and two languages. Through translation, people speaking different languages communicate with each other. Information about new objects or subjects created in science and technology is transmitted to other people through translation. According to K.Musaev, translation, a complex form of human activity, is a creative process that consists in recreating a verbal utterance (text) created in one language by means of another language while preserving the unity of its form and content (Molina & Hurtado Albir, 2002). Indeed, translation is a creative process. The creation of a creative product in one language in another language is the creative product of the creator. I. Gafurov emphasises that 'translation is a process of transforming or transferring the speaker's speech, author's work, various documents and information from one language to another and making them understandable in another language'(Molina & Hurtado Albir, 2002). Here I. Gafurov and K. Summarising Musaev's views on translation, translation can be defined as the transformation of a written or spoken text from one language into another, taking into account its semantic, linguocultural, pragmatic, and linguistic features (Newmark, 1988).

A. According to Rohee, 'the process of translation between two languages is the transformation by the translator of a written text in one source language into a written text in the target language and an oral text in one source language into an oral text in the other target language'[1](Newmark, 1988). According to P. Newmark, 'in rare cases, translation is the transfer of the meaning of a text into another language in the way the author intended it to be translated'(Pym, 2007). Therefore, when translating, it is necessary to pay attention to the equivalence of languages, taking into account syntactic, semantic, stylistic, pragmatic, and linguocultural features of the source and target languages. We can also see these characteristics of translation in J. Nord's definition of translation. He emphasises that 'translation is a learning process aimed at replacing the source language text with the best equivalent in the target language text, and this requires understanding the syntax, semantics and pragmatics of the target language, as well as analysing this process'(Lopez, 2009).

If we refer to the descriptions and definitions given to translation by scholars, translation can be explained as follows: translation is the process of transferring any words, phrases, texts, etc. in oral or written form from the source text to the target language, taking into account linguistic: syntactic, semantic, stylistic features of the source and target languages, as well as extra-linguistic: linguocultural, pragmatic and cognitive features. *Theoretical foundations of cybersecurity terminology.* When translating terms in any field, it is important to first of all pay attention to the main

characteristics of terminology in the given field, i.e., derivational, semantic, methodological and cultural aspects of the terms. The study of cybersecurity terminology is important for all branches of the state and society, and its study is of interest not only to information technology specialists, but also to all spheres of social life.

Cybersecurity terminology occupies an important terminological layer in the terminological system of the information technology sector. A term is considered a lexical unit of language and is a nomenclature of words and word combinations related to a certain field. Any term in any field has the properties of unambiguity, clarity, expressiveness, nominativeness, and systematicity. In the structure of cybersecurity terminology, three main layers of terms are distinguished by the degree of importance: electronic scientific and educational publications, manuals, reference books, technical instructions, coded terms used in electronic dictionaries, terms borrowed from the common language with their new content and additions based on metaphorical and metonymic transfers (inter-network and inter-system assignments) from other areas of scientific knowledge, as well as general technical terms that serve to create terms of information technologies and information technology. The cybersecurity terminosystem is a set or corpus of terminological units that provide the naming of concepts in the field of information technology knowledge, linked by logical, semantic, and other relations.

In terms of logical and semantic structure, cybersecurity terms are divided into terms denoting objects, processes, volumes of information, or their units. Cybersecurity terms are divided into semantic groups such as computer device, software, commands, Internet communication, multimedia, types of personal computers, subject of interaction, and units. The terminological system of this field is divided into domain terms, termoids, and prefixes, and their meanings are more fluid and dynamic than those of terms in other fields, including chemistry or physics. They can easily transition to new situations. The systemic characteristics of cybersecurity terms differ from terminology in other fields in that they have inherent characteristics such as internationality of external form, thematic focus, stylistic neutrality in the terminological field, polymorphism, and multifunctionality. International terms are also of particular importance in cybersecurity terminology because they form a significant part of the industry's terminology. The weighting of allocations in the cybersecurity terminology system is also unique. Typically, absorption rates are determined by:

- The tendency to eliminate polysemy and homonymy of the source word in the recipient language;
- the need for a detailed explanation of the concept;
- the expression of positive/negative connotative meanings in the target language;
- tendency to form words similar to those of the target language to be understood;
- nomination of a new thing, concept, or phenomenon;
- the absence of a corresponding concept in the recipient language;
- stylistic impact of the borrowed word on the principle of expressiveness.

The following typology of difficulties related to the practical application of cybersecurity terminology, in particular appropriation terminology, consists of the following:

- Lack of knowledge and skills in this area among ordinary citizens;
- spelling errors in terms directly and indirectly borrowed from the English language;
- errors in the pronunciation of familiar cybersecurity terms;
- the user of the term remains unaware of the basic meaning associated with the borrowed term;
- the occurrence and practical non-reflection of cases of narrowing and broadening of meanings of acquired terms over time;
- there are cases when borrowed terms do not have a neutral meaning, but acquire a stylistically mobile meaning, expressing positive or negative connotations.

Problems of translating cybersecurity terms. According to V. Karaban, ‘one of the most difficult processes in translation is the selection of one lexical unit from several synonyms. It is also necessary to take into account the semantic and stylistic peculiarities of synonyms, which the translator should know well and be able to choose the right variant. In turn, the Ukrainian philologist E.F. Skorokhodko in her work ‘Problems of translating technical literature into English’ emphasises that ‘a large number

of special terms in the text, especially newly appearing (neologisms), creates serious difficulties in the practice of translation'. A. Weiss, N. Kireev, I. K. Mironchikov also emphasise that special attention should be paid to neologisms, which cause great difficulties when working with texts related to industrial sources, since most of them are not found in dictionaries[2]. The differences in translation noted above also directly apply to cybersecurity terminology. This is because most cybersecurity terms belong to the field of information technology.

It is possible to study the opinions of many researchers regarding the translation of information technology terminology. Most of them discuss translation problems related to neologisms when translating information technology terms. R. Pronina notes that 'despite the large number of specialised terms in their field, the language of scientific and technical literature contains a large number of commonly used words and expressions, and most commonly used words are polysemous'(L.S, 1975). Cybersecurity terms are also considered to be terminology of scientific and technical texts, and the translation of such terms can be particularly challenging. According to D.V. Tabanakova, 'the reason for the difficulty of translating texts, especially those related to information technology, is the translator's use of a large number of information technology terms'. Because word combinations that have no equivalents in information technology texts have no permanent correspondences in Russian (except for descriptive entries in dictionaries) (Gafurov, 2008). The use of special terms in Russian-language texts on information technologies can also be found in the Uzbek language. As is known, many terms of information technologies in the Uzbek language came into our language directly from English or indirectly from Russian.

R.O. Sindega expresses the following thoughts about information technology terms and their translations: 'A distinctive feature of computer terminology is its metaphorical meaning and emotional appeal, because for the creators and users of the term, it emphasises that the field of computer technology is intellectual. For example, the term 'mouse', which refers to the device that controls the movement of the cursor, resembles the creature 'mouse' in appearance. Also, the name of the programme 'Windows' is based on the similarity of the principle of presenting information in the form of Windows on the computer screen. They are used in everyday life not only by computer professionals, but also by people of all ages and professions. 'These features will have to be taken into account in translation (Komissarov, 1990)' Therefore, similar features and problems of translation apply to the translation of cybersecurity terms. Having analysed the opinions and comments expressed regarding the translation of cybersecurity terms, we felt it necessary to focus on the following important aspects:

First, to correctly define the words represented by a term, it is necessary to know the field of science and technology to which the term refers. Secondly, although a term is associated with a well-defined concept, a specific meaning, and is described, it cannot be considered as a separate semantic unit, as there may be several terms with a specific technical meaning. Their spiritual content must vary according to the field in which they are used. Finally, to properly understand and translate terms, it is also necessary to know the morphological structure of terms, the semantics that distinguish them from commonly used words, the main types of expressions, and the peculiarities of their structure and usage. *Methods of translation of cybersecurity terms.* In translation studies, the methods used to translate small text fragments are described by the terms 'translation methods', 'translation tools', 'translation procedures', and 'translation transformations'. In particular, Vigner and Darbelnier and P. Newmark treat these concepts as translation processes, while E. Aznaurova, L. Barkhudarov, V. Komissarov, and N. Kambarov argue that they are translation transformations. Molina, Urtardo Albir, and M. Ordudar use the term 'translational transformations' to refer to these concepts. Based on the ideas of E. Aznaurova, L. Barkhudarov, V. Komissarov, and N. Kambarov, we have applied the term 'translational transformations' to translation methods aimed at transforming small units of the text.

L. Barkhudarov subdivides the transformations used in the translation process into four

types[3](Tulkinovna) : 1) change of location; 2) exchange of words; 3) addition of words; 4) omission of a word. V. Komissarov divides translation transformations into three main types: lexical, grammatical, and lexico-grammatical (Xiangdong, 2002). Lexical transformations: 1. Transcriptional and transliteration transformations. 2. Calculative transformation. 3. Lexico-semantic exchange (refinement, generalisation, modulation), transformation. Grammatical transformations: 1. Transformation by syntactic analogy (literal translation). 2. A transformation that changes the structure of a sentence (splitting or combining sentences). 3. Grammatical substitutions (replacing a word-form, part of speech or parts of speech). Complex lexico-grammatical transformations: 1. Antonymic translation transformation. 2. Explication (explanation of the content) of the transformation. 3. Compensatory transformation.

4. Result and Discussion

Translation studies actively use the following translation techniques when translating lexical units of the text, in particular terms:

- word borrowing. In this process, a word is directly transferred from one language to another.
- calque. A foreign word or phrase is translated into another language and becomes part of that language. In this case, a word-for-word translation is performed to create an equivalent word in the target language using the unique features of the lexical unit in the source language.
- transposition. This involves changing the word order, i.e., the verb is changed to a noun and the noun to a preposition (Pronina, 1989) In the process of translation, a verb in the source language may change to a noun in the target language. This process also involves grammatical changes of the source language in the target language. Including (1) changing the singular to plural, (2) the need for conversion if a certain structure of the source language does not exist in the target language, (3) a verb in the source language is changed to a noun in the target language, a noun that was originally plural is changed to singular, and so on...;
- modulation. A change of a lexical unit in terms of comprehension (cognitive transformation). Transposition occurs when grammatical categories are changed, whereas modulation occurs when cognitive categories are changed. It occurs when information from the source text is reproduced in the target language text according to the current standards of the target language, since the terms in the source and target languages may not coincide. Vigneault and Darbelnier proposed eleven types of modulation: change from concept to precision, cause to effect, transformation to result, parts to whole, geographical change, and others. The change from Chinese carcass to Indian carcass is an example of geographical change[4].
- Intrawai and Scavi studied this process in detail and concluded that it was a more effective procedure than others. In their opinion, other processes should be included here;
- equivalence. This is when a completely different alternative expression is used for the same situation, such as lexical units, terms, proverbs, or idiomatic expressions.
- cultural equivalence. In this case, the translator replaces a cultural word in the source language with a cultural word in the target language.
- descriptive equivalence. In this transformation, the meaning of a word denoting a lexical unit is explained in several words.
- functional equivalence. In this case, a word in the lexicon of the target language is replaced by a word that fulfils the same function in the lexicon of the source language and corresponds to the style of the text.
- formal equivalence or linguistic equivalence. In this case, each word is translated separately.
- adaptation. In this type of conversion, changes are usually made to the term to create a text that is more appropriate for a particular audience or the translator's specific goals. In this case, the translator adapts the text to the reading audience.
- compensating for an omitted word. A lexical unit or stylistic effect of information in the source text is not exactly in its place in the translated text, but is recreated and figuratively expressed elsewhere in the text.

- concentration. This transformation involves expressing a concept in the source language with a concept in the target language that has a more general meaning.
- dissolution. This involves expressing a concept in the source language with a concept in the target language that has a broader meaning.
- amplification. This is the use of more meaningful concepts to fill syntactic and lexical gaps in the target language.
- narrowing (economy). This transformation is close to the concept of linguistic economy in linguistics and is designed to explain expression with fewer lexical units.
- reinforcement. This transformation is a variant of expansion.
- condensation. This transformation is a variant of the tapering transformation.
- explanation of meaning. In this case, the original lexical unit is replaced in the translated text by a fuller explanation or a word combination with a clarifying meaning.
- implicit meaning (implication). Implicit truth is the use of context to convey hidden meaning to clarify explicit information in the text. This transformation is the main criterion of the pragmatic side of translation.
- generalisation. It consists of replacing a word with a narrow meaning in the original with a broad, generalising word in the target language (Sirojiddinov Sh., 2011);
- concretisation. Replacing a word or phrase that has a broad meaning in the original translation with a word that has a more specific meaning;
- Changing the word order (inversion). This involves moving a word or phrase out of a sentence or paragraph and interpreting it in the target language as if it were in the original.
- antonymous translation. In this case, an affirmative thought in the original is expressed in a negative form in the target language or vice versa.
- transcription. In transcription, the word of the source language is reproduced in the target language according to its direct pronunciation.
- transliteration. In this case, the word of the source language is recreated in the target language according to its graphical form;
- Addition of words (Addition). This transformation is used when grammatical and semantic components are not formally expressed in the source textual language.
- Omission. This transformation is applied when grammatical reduction of certain forms of two languages is required.
- Adaptation of word status to the features of another language (naturalisation). In this transformation, there is a process of assimilation of new words in the language, that is, the translator adapts the source word first according to its usual pronunciation and then according to the usual morphology of the target language. This transformation can be considered synonymous with transcriptional and translational transformations.
- Paraphrase. It explains the meaning of a word with cultural connotations. In this transformation, the explanation is broader and more detailed than descriptive equivalence.
- Harmony of Transformations (Couplets). In this case, the translator uses two or more different transformations simultaneously in the translation process.
- Notes. Notes are mainly concerned with lexical units that have no equivalents, national realities, and lacunas and are provided in translations at the bottom of a page, at the end of a chapter, or in the last pages of a book to provide the target language reader with more complete information.

The translation techniques highlighted above are used to reflect the functional-semantic features of translating English cybersecurity terms into Uzbek. It is reasonable to translate the following cybersecurity terms from English into Uzbek according to their meaning (see Table 1).

Table 1.

Term	Meaning	Uzbek translation	Method used
Adware	An advertising application that shows the user unsolicited advertising. Often, it acquires information about behaviour. Note: the application may be installed without user knowledge or consent, or may be pushed to the user under licensing conditions of other	Reklama dasturi	Creative equivalence

	software		
Active threat	Any threat of an intentional change in the state of a data processing system or computer network. Threat, which would result in message modification, the inclusion of false messages, false representation, or service denial.	Faol tahdid	calque
Accreditation	The official management decision of a competent representative of an organisation, to authorise the operation of the information system and the explicit acceptance of risks (including the strategic, economic or reputational ones) that ensue to the organisation from the agreed security measures.	Akreditatsiya	borrowing
Normal operation	An operation where the entire set of algorithms, security functions, services, or processes is available or configurable.	Me'toriy operatsiya	Semi-calque
Botnet	Software for the remote control of bots, which run on infected computers. The software ensures that the cracker can access the computing power of many machines simultaneously.	Botni masofadan boshqarish dasturi	Descriptive equivalence
Crack	Unauthorised infringement of programme or system security protection, its integrity or the system of its registration/activation.	Dastur xavsizligi yoki uning yaxlitligini ruxsatsiz buzilishi	Notes
Dialler	The harmful programme that connects the computer or smartphone of the user to the Internet via a wired line using a very expensive service provider	Zararli dastur	addition

5. Conclusion

5.1 Conclusion

Today, the penetration of cybersecurity terminology into all aspects of public life necessitates extensive research on this terminology, its theoretical foundations, and its practical significance. Studying terminology in this field from linguistic, translational, and cultural perspectives provides significant assistance in understanding and correctly interpreting terms in this area. Thus, the key parameters in the translation process are not only selecting the appropriate option to convey the meaning of the source text but also the ability to align knowledge, logic, context, and understanding when choosing a synonym. When translating English cybersecurity terms into Uzbek, various translation techniques are actively employed, such as equivalence, paraphrasing, word borrowing, semi-paraphrasing, figurative equivalents, notes, and word additions. The translation of term combinations allows for identifying the logical connection between these symbols through detailed semantic analysis of individual term elements, taking into account the content of the source text. To determine the meaning correctly, it is advisable to refer to the context and additional literature in the original language, search for an equivalent in the target language, and consult dictionaries and supplementary literature in the target language.

5.2 Suggestion

1. For Translators:
    a. Gunakan pendekatan kontekstual dalam menerjemahkan istilah siber, tidak hanya mengandalkan terjemahan literal.

b. Terapkan teknik beragam (equivalence, paraphrasing, borrowing, figurative equivalents, notes, additions) sesuai dengan kebutuhan teks dan audiens.
c. Selalu rujuk pada kamus khusus, literatur tambahan, dan sumber asli bahasa Inggris untuk memastikan ketepatan makna.

2. For Linguists and Researchers:
a. Lakukan penelitian lanjutan mengenai aspek fungsional-semantik istilah keamanan siber dalam bahasa Uzbek, khususnya mengenai metafora dan hibridisasi istilah.
b. Kembangkan basis data terminologi siber bilingual (Inggris–Uzbek) untuk mendukung konsistensi penerjemahan.
c. Analisis lebih dalam hubungan logis antar unsur istilah majemuk melalui pendekatan semantik-komparatif.

3. For Educators and Institutions:
a. Integrasikan materi penerjemahan istilah teknis dan siber dalam kurikulum studi linguistik dan penerjemahan.
b. Latih calon penerjemah menggunakan studi kasus nyata agar mereka terbiasa menghadapi konteks multidisipliner.
c. Fasilitasi lokakarya atau seminar kolaboratif antara pakar IT dan linguis agar pemahaman terminologi semakin akurat.

4. For Policy Makers and Standardization Bodies:
a. Dorong penyusunan standar nasional terminologi keamanan siber dalam bahasa Uzbek untuk menghindari variasi tidak konsisten.
b. Bangun kolaborasi dengan lembaga internasional agar istilah yang digunakan tetap sinkron dengan perkembangan global.

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