

**LEXICAL-SEMANTIC TRANSFORMATION OF INFORMATION TECHNOLOGY
TERMINOLOGY IN MULTIMODAL CONTEXTS: A COMPARATIVE STUDY OF
ENGLISH AND UZBEK**

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Abstract. This study investigates the lexical-semantic transformation of information technology terminology in multimodal contexts, with a particular focus on English and Uzbek. In the context of globalization and the rapid development of digital technologies, IT terms are increasingly transferred across languages, often undergoing semantic shifts that affect their interpretation and use. The research is based on a qualitative analysis of twenty contemporary IT terms selected from digital platforms and technical discourse. Using comparative, semantic, and discourse-analytical methods, the study examines how denotative, connotative, and pragmatic components of meaning are modified in cross-linguistic adaptation. The findings reveal that while the core referential meaning of terms is generally preserved, significant reductions and reinterpretations occur at the connotative and cognitive levels. The study also highlights the role of multimodal discourse in compensating for semantic loss. Visual elements such as icons and interface structures contribute to meaning construction and enhance user comprehension. From an anthropocentric perspective, the effectiveness of terminology is closely linked to user perception and cognitive accessibility. The paper proposes an integrative approach to IT terminology adaptation that combines linguistic, cultural, and multimodal factors, offering a more comprehensive framework for understanding terminology in contemporary digital communication. The results contribute to the development of more effective strategies for cross-linguistic terminology adaptation in digital communication.

Key words. Information technology terminology; lexical-semantic transformation; multimodal discourse; linguocultural analysis; cognitive linguistics; cross-linguistic adaptation; Uzbek language; semantic shift

Introduction. In the era of rapid technological development and globalization, information technology terminology has become an integral part of everyday communication across languages and cultures. The dominance of English as the primary language of technological innovation has led to the widespread dissemination of IT terms into other languages, including Uzbek. However, this process is not merely a matter of direct translation; rather, it involves complex processes of lexical-semantic transformation shaped by linguistic, cultural, and cognitive factors. One of the key challenges in this context is the phenomenon of semantic loss and misunderstanding that occurs when IT terminology is adapted into another language. While the denotative meaning of terms is often preserved, their connotative and pragmatic components tend to be reduced or altered. As a result, users may develop incomplete or inaccurate interpretations of technological concepts. This issue becomes particularly evident in cases where metaphorical terms such as *cloud computing* or *data mining* are translated literally, leading to potential confusion and misinterpretation. The problem is further complicated by the emergence of multimodal discourse, where meaning is constructed not only through verbal language but also through visual, graphical, and interactive elements. In such environments, IT terminology functions within a complex semiotic system, where icons, interface design, and contextual cues play a crucial role in shaping user understanding. Despite this, many studies still focus primarily on textual analysis, overlooking the impact of multimodality on lexical-semantic adaptation. Therefore, the relevance of this study lies in its attempt to explore IT terminology beyond traditional linguistic frameworks by integrating multimodal, cognitive, and linguocultural

perspectives. Understanding how technological terms are interpreted and adapted in real communicative contexts is essential for improving clarity, usability, and cross-cultural communication in digital environments. The aim of this study is to analyze the lexical-semantic transformation of information technology terminology in multimodal contexts, with particular reference to English and Uzbek. The research seeks to identify patterns of semantic change, examine the role of multimodal elements in meaning construction, and highlight the challenges and implications of cross-linguistic adaptation.

Literature review. The relationship between language and culture has been extensively explored in modern linguistics, particularly within the framework of linguocultural studies. Scholars argue that lexical units are not merely carriers of denotative meaning but also encode cultural, conceptual, and evaluative information. From this perspective, meaning is viewed as a multi-layered construct, encompassing not only referential but also connotative and pragmatic dimensions. Linguocultural approaches emphasize that the interpretation of lexical items is deeply influenced by culturally specific knowledge and cognitive models. This is particularly relevant in the case of metaphor-based terminology, where meaning is grounded in culturally embedded conceptual structures. As a result, when such terms are transferred across languages, their semantic integrity may be affected due to differences in cultural perception and conceptualization.

Terminology as a field of study has traditionally focused on the standardization, classification, and functional properties of specialized vocabulary. Classical approaches to terminology view terms as precise and stable units designed to ensure unambiguous communication within specific domains. However, more recent perspectives challenge this view by highlighting the dynamic and context-dependent nature of terminological meaning. Contemporary terminological research recognizes that terms are subject to variation, adaptation, and reinterpretation, especially when they are used outside their original domain or transferred into another linguistic system. In this regard, the process of lexical-semantic adaptation becomes central, as it reflects how specialized concepts are restructured in response to linguistic and communicative constraints. This is particularly evident in rapidly evolving fields such as information technology, where new terms emerge continuously and are disseminated globally.

The concept of multimodal discourse has gained increasing attention in recent years, reflecting the growing importance of non-verbal modes of communication in digital environments. Multimodality refers to the integration of multiple semiotic resources—such as language, images, symbols, and interface design—in the construction of meaning. Research in multimodal discourse analysis suggests that meaning is not confined to verbal language but is distributed across different modes that interact with each other. In digital contexts, visual elements such as icons, layout, and interactive features play a crucial role in shaping user interpretation. This has significant implications for terminology, as the understanding of technical terms is often supported or modified by accompanying visual cues. Despite these developments, the interaction between terminology and multimodal discourse remains underexplored, particularly in cross-linguistic contexts. Most studies focus either on linguistic aspects of terminology or on multimodal communication independently, without fully addressing their intersection. Although previous studies have contributed to the understanding of terminology, linguocultural factors, and multimodal communication, there is still a lack of integrated research that examines how information technology terminology undergoes lexical-semantic transformation within multimodal environments across different languages. In particular, the combined impact of linguistic, cultural, cognitive, and multimodal factors on term adaptation has not been sufficiently addressed.

Methods. This study adopts a qualitative research design to investigate the lexical-semantic transformation of information technology terminology in multimodal contexts, with a particular focus on English and Uzbek languages. The dataset consists of twenty contemporary information technology terms selected from widely used digital environments, including software interfaces, online platforms, and technical documentation. The selection criteria were based on (1) the frequency of use in modern technological discourse, (2) the presence of metaphorical or abstract semantic structures, and (3) the likelihood of semantic variation or adaptation in cross-linguistic contexts. Terms such as *cloud computing*, *data mining*, *framework*, and *latency* were chosen as representative units due to their conceptual complexity and widespread usage. The analysis is conducted through a combination of comparative, semantic, and discourse-analytical methods. The comparative method is employed to identify differences and similarities between English source terms and their Uzbek equivalents. The semantic analysis focuses on identifying shifts in denotative, connotative, and pragmatic meaning components during the process of adaptation. In addition, elements of discourse analysis are applied to examine how these terms function within multimodal environments, including their interaction with visual elements such as icons, interface structures, and contextual usage. Furthermore, the study incorporates a linguocultural and cognitive perspective to interpret how users perceive and understand adapted terminology. This allows for the identification of semantic reduction, metaphorical reinterpretation, and pragmatic shifts in meaning. Overall, the methodological framework enables a systematic examination of how information technology terminology undergoes lexical-semantic transformation across languages within multimodal discourse.

Results/Analysis.

Table 1. Lexical-Semantic Transformation of Selected IT Terms

#	Term	English Meaning	Uzbek Equivalent	Lexical-Semantic Issue
1	cloud computing	on-demand remote computing services	bulutli hisoblash	Metaphorical meaning is not fully understood
2	edge computing	data processing near data source	chekka hisoblash	The semantics of “edge” is unclear
3	data mining	extracting patterns from data	ma'lumotlarni qazib olish	Literal translation leads to incorrect associations
4	machine learning	systems learning from data	mashinaviy o'rganish	“Learning” is confused with a human cognitive process
5	deep learning	multi-layer neural networks	chuqur o'rganish	The metaphor “deep” is abstract and vague
6	neural network	brain-inspired computing model	neyron tarmoq	Strong biological associations are evoked
7	data warehouse	centralized data storage system	ma'lumotlar ombori	The term “warehouse” triggers a physical interpretation
8	pipeline	data processing workflow	ma'lumotlar oqimi tizimi	Technical meaning is partially lost
9	framework	reusable software structure	freymvork / dasturiy asos	Inconsistency between transliteration and translation
10	backend	server-side processing	orqa qism / backend	Semantic ambiguity
11	frontend	user interface side	foydalanuvchi interfeysi	Partially adequate translation

12	deployment	releasing software to users	joylashtirish	Technical meaning is narrowed
13	scalability	system ability to grow	masshtablanuvchanlik	Terminological complexity
14	latency	delay in system response	kechikish	Lack of technical precision
15	throughput	amount of processed data	o'tkazuvchanlik	Overgeneralized translation
16	containerization	packaging software environments	konteynerlash	Metaphorical concept is not transparent
17	orchestration	automated system coordination	orkestratsiya	Musical metaphor causes misinterpretation
18	virtualization	creating virtual systems	virtualizatsiya	Concept is only partially understood
19	tokenization	breaking data into tokens	tokenlash	Newly introduced term lacking familiarity
20	fine-tuning	adjusting model performance	nozik sozlash	Metaphorical extension of meaning

As shown in Table 1, the selected IT terms demonstrate different types of lexical-semantic transformation. The analysis of selected information technology terms demonstrates that lexical-semantic transformation in multilingual contexts is characterized by systematic shifts across semantic, connotative, and pragmatic dimensions. While denotative meanings are generally preserved, significant distortions occur at deeper interpretative levels. For instance, the term *data mining* is translated into Uzbek as *ma'lumotlarni qazib olish*, which introduces a strong physical metaphor that may mislead users by associating digital processes with manual extraction. Similarly, *cloud computing* rendered as *bulutli hisoblash* retains the metaphorical structure but often fails to convey the abstract technological concept to non-expert users. In addition, terms such as *framework* and *backend* reveal inconsistency in adaptation strategies, alternating between transliteration and partial translation. This results in semantic ambiguity and uneven comprehension among users. Moreover, highly specialized terms like *scalability* and *latency* undergo simplification, leading to loss of technical precision. Multimodal environments partially compensate for these semantic gaps. For example, visual icons and interface structures help users interpret terms like *cloud* or *frontend* more effectively, even when linguistic understanding is limited. Overall, the findings indicate that lexical-semantic transformation of IT terminology involves not only translation but also reinterpretation shaped by linguistic, cultural, and cognitive factors.

Discussion. The findings of the present study confirm that the lexical-semantic transformation of information technology terminology in multilingual contexts is not a linear process of translation, but rather a complex, multi-layered phenomenon shaped by linguistic, cognitive, and multimodal factors. The analysis demonstrates that while the denotative component of IT terms tends to remain relatively stable, their connotative and pragmatic dimensions frequently undergo reduction, reinterpretation, or partial loss. This observation is consistent with previous research in linguocultural and cognitive linguistics, which emphasizes that meaning is not fixed but dynamically constructed within specific cultural and communicative contexts. In particular, the findings support the view that metaphor-based terminology, such as *cloud computing* or *data mining*, is especially vulnerable to semantic distortion when transferred across languages. As cognitive linguistics suggests, metaphors are

grounded in culturally specific conceptualizations, and their interpretation depends on shared experiential knowledge. When such shared frameworks are absent or differ significantly, semantic misalignment occurs. Furthermore, the results reveal that inconsistencies in adaptation strategies—such as the coexistence of transliteration (*framework*, *backend*) and literal translation (*data warehouse*, *pipeline*)—lead to uneven levels of comprehension among users. This supports the argument put forward in terminological studies that the lack of standardized equivalents can result in fragmentation of meaning and communicative inefficiency. A particularly significant contribution of this study lies in highlighting the role of multimodal discourse as a compensatory mechanism in lexical-semantic adaptation. The data indicate that visual elements, including icons and interface structures, play a crucial role in mitigating semantic loss. For example, the use of a cloud-shaped icon alongside the term *cloud storage* facilitates user understanding even when the linguistic representation is ambiguous. This finding aligns with multimodal discourse theory, which posits that meaning is distributed across multiple semiotic modes rather than confined to verbal language alone. At the same time, the study adopts an anthropocentric perspective, emphasizing that the effectiveness of terminology is ultimately determined by user perception and cognitive processing. From this viewpoint, successful adaptation is not merely a matter of semantic equivalence but of communicative adequacy—whether the term enables accurate and efficient understanding within a given context. This perspective shifts the focus from language systems to language users, reinforcing the importance of cognitive accessibility in terminological practice. Based on these findings, the study proposes an integrative approach to the adaptation of IT terminology in multimodal environments. Such an approach should account for (1) the preservation of core denotative meaning, (2) the reconstruction of connotative and cultural associations, and (3) the strategic use of multimodal elements to enhance comprehension. In this sense, lexical-semantic transformation should be viewed not as a deficiency, but as a dynamic process of meaning negotiation across languages and modes.

Conclusion. The present study has examined the lexical-semantic transformation of information technology terminology in multimodal contexts, focusing on English and Uzbek. The findings demonstrate that the adaptation of IT terms across languages involves not only the transfer of denotative meaning but also significant shifts in connotative and pragmatic dimensions.

The analysis revealed that metaphor-based and conceptually complex terms are particularly prone to semantic reduction and reinterpretation in cross-linguistic contexts. Inconsistent adaptation strategies, including the use of both transliteration and literal translation, further contribute to ambiguity and uneven comprehension among users. At the same time, the study highlights the important role of multimodal discourse in compensating for semantic gaps. Visual elements such as icons and interface structures support user understanding and partially mitigate the loss of meaning. This confirms that meaning in digital environments is constructed through the interaction of multiple semiotic modes rather than language alone. Overall, the study emphasizes that the effectiveness of IT terminology should be evaluated from an anthropocentric perspective, taking into account user perception and cognitive accessibility. In this regard, the proposed integrative approach, combining linguistic, cultural, and multimodal factors, provides a more comprehensive framework for understanding and improving terminological adaptation in multilingual digital communication.

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