

ASSIMILATION OF SCIENTIFIC AND TECHNICAL TERMS IN ARABIC: A COMPARATIVE ANALYSIS OF DIRECT AND INDIRECT METHODS**Khojiakbar Nuriddinov**

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Abstract

This article addresses the challenges of shaping modern scientific and technical terminology in Arabic under conditions of globalization and technological progress. The study provides an in-depth analysis of two main directions of terminological enrichment—internal derivation (الاشتقاق – al-ishtiqāq) and external adoption (التعريب – al-ta'rib). It also examines the conceptual differences between the notions of “word” and “term,” issues of scientific precision in translation, and the role of language academies in this process. The results indicate that, in order to meet the demands of contemporary science and the standards of international indexed publications (Scopus, ISI), Arabic should apply pragmatic adoption methods more broadly than a purist approach and adhere to the principle of “conceptual translation.”

Keywords

Arabic terminology, borrowed terms (التعريب), derivation (الاشتقاق), conceptual translation, scientific term.

In the 21st century, the Arab world has expanded its economic, scientific, and technological ties with Western civilization more strongly than ever before. The most noticeable consequences of this process are observed in the language system, especially in the scientific and technical terminology of Modern Standard Arabic (MSA) [4], [5]. English's dominant status as the global language of science and innovation has accelerated the influx of new words, expressions, and discourse-specific stylistic models into MSA [8], [10].

This process has sparked principled debates among Arab linguists and those engaged in language planning: the problem is to determine, on a scientific basis, the boundary between the modernization of the language (adaptation to contemporary needs) and its westernization (the normative dominance of foreign units and models) [8], [2]. On the one hand, there is a purist position that strives to protect normative “purity”; on the other hand, proponents of a pragmatic approach interpret the adoption of terms, under conditions of scientific progress, as a communicative necessity [10], [5]. Therefore, shaping scientific terms today is viewed not only as a linguistic technique, but also as a matter of strategic balance between national identity and international scientific integration [2], [8].

Before analyzing methods of expanding Arabic vocabulary, it is necessary to conceptually distinguish the notions of “word” (كلمة) and “term” (مصطلح). As Alfaifi notes, this distinction serves as a methodological “key” to eliminating ambiguities in the terminological system and ensuring consistency in scientific discourse [1].

A word (كلمة) is a unit belonging to the general lexicon and is widely used in everyday communication; translating such units or creating equivalents based on internal resources is relatively easier [1].

A term (مصطلح) is a specialized unit that denotes an object, process, or concept within a particular field; it is strictly delimited and conceptually precise, and it occupies a specific functional place within the knowledge system [1], [10]. The problem is that when a foreign-language term (for example, phoneme, software) enters MSA, it is not always possible to

find, “from the root,” a directly derived equivalent while fully preserving its semantic load [10], [9]. If a term is artificially translated word-for-word and its conceptual content becomes blurred, it becomes functionally unusable in scientific communication. Al Mubarak specifically emphasizes this issue in term translation—namely that a literal approach can lead to scientific errors [3].

Arabic’s root-and-pattern system provides significant opportunities for term formation; in traditional terminological practice this process is explained under the name *ishtiqāq* (الاشتقاق) and is often regarded as the most acceptable way to preserve normativity [5], [7]. When creating terms using internal resources, the following main mechanisms are distinguished:

Templatic derivation— forming a new unit on the basis of existing patterns/weights (for example, models such as *مفعول/فاعل*) [9], [5].

Affixation and abstraction — forming abstract nouns, adjectives, or relational forms from a root (for example, *روحانية* → *روح*) [7].

Analogy (*القياس* – *al-qiyās*) — creating a new derivative or assigning a new functional meaning by analogy with existing units [5].

Composition and “*naḥt*” (*النحت/التركيب*) — creating a new term by combining two (or more) units and/or by abbreviation (for example, *لاسلكي*) [1], [10].

However, terminological practice shows that limiting oneself only to *ishtiqāq* makes it difficult to fully cover the rapidly renewing nomenclature of modern technology and industry. In particular, in narrowly specialized fields (computer science, telecommunications, biotechnology), developing quick and unified internally derived equivalents for thousands of units does not always yield effective results [8], [10]. For this reason, alongside internal derivation, direct adoption also functions as a parallel mechanism [10].

One of the most active pathways in modern Arabic terminology is *ta’rīb* (التعريب), i.e., the direct acceptance of foreign terms into MSA [10], [1]. This method usually appears in two forms:

Full transfer — accepting a term with minimal change (for example, global units such as Internet, iPhone) [10].

Phonological adaptation — arabizing a term by adjusting it to Arabic phonetic norms (for example, “gas” → *غاز*; “college” → *كلية*) [9], [10].

Supporters of *ta’rīb* view the language as a dynamic system and interpret lexical renewal as a natural process. This position is also reinforced by historical evidence: classical Arabic contains borrowings from Persian, Greek, and Latin, some of which later became fully integrated into the language system [6], [5]. Nevertheless, proponents of a purist approach treat adoption cautiously due to the potential weakening of normativity, identity, and the symbolic-religious layer; this also shows the ideological character of decisions within language policy [2], [8].

In the modern scientific space—especially in indexed publications and international academic communication—the precise and stable use of terminology is of decisive importance [10]. Al Mubarak stresses that term translation is not merely “replacing words,” but rather finding a conceptual equivalent (*المكافئ المفاهيمي*) that preserves the term’s semantic role within the discipline [3]. From this perspective, literal (word-for-word) translation can often strengthen incorrect associations and distort scientific interpretation [3]. The difference between the conceptual approach and the literal approach can be explained through the following examples:

Correct approach: In methodological terms such as construct validity, the translation must preserve the scientific content of the notion “construct”; otherwise the term will be interpreted incorrectly in semantic terms [3]. Incorrect approach: Interpreting regression analysis through a literal rendering such as “backward/return analysis” distorts the term’s statistical-model meaning; within the field, an equivalent consistent with the concept must be selected [3].

Technological precision: In units such as machine learning, the automated nature of the process and the terminological norms within the discipline should be taken into account, and a conceptually stable equivalent should be chosen [3], [10]. In modern MSA terminology, it is

common for several variants (borrowed and derived) to be used in parallel for a single concept; this sharpens the problem of terminological uniformity and standardization [1], [10]. The following examples (illustrative in nature) show the competitive mechanism in term formation:

| English term | Direct borrowing (ta'rib) | Indirect / derived (translation) | Brief note |
|----------------------------|---------------------------|----------------------------------|---|
| Phoneme | فونيم(Fūnīm) | صوتم(Ṣawtum) / صوت(Ṣuwayt) | The ta'rib form is quickly recognized in international contexts, whereas derived options seek internal modelling [10], [9]. |
| Morpheme | مورفيم(Mūrfīm) | صيغم(Ṣaygham) / عنصر دال | Derived options may require semantic explanation, which can complicate use [10]. |
| Phobia | فوبيا(Fūbiyā) | رهاب(Ruhāb) / هلع | Variation emerges between clinical precision and popular comprehensibility [10]. |
| Complementary distribution | — | توزيع تكاملي | Sometimes direct borrowing is impractical, and calquing or conceptual translation becomes preferable [3], [10]. |

Language academies and terminological institutes have historically approached ta'rib cautiously and encouraged internal derivational mechanisms [8], [10]. However, practical acceptance is often determined by the real needs of the scientific community, the term's brevity, clarity, and communicative convenience [10]. Therefore, the effectiveness of standardization should be measured not by how "Arabic" a term is, but by its conceptual precision and consistency of use [3], [10].

The analysis shows that the development of Arabic scientific and technical terminology is not limited to a single mechanism: it is formed through the coordinated application of ishtiqāq, ta'rib, and conceptual translation strategies [1], [3], [10]. In concepts that quickly enter everyday life, using internal resources strengthens normativity and naturalness [1], [5]. However, for international scientific terms with strict meanings and rapid renewal, ta'rib is often a pragmatic solution, facilitating Arabic's integration into global scientific communication [8], [10]. In translation, the criterion of conceptual equivalence that preserves a term's scientific essence should take precedence over a literal approach [3].

In conclusion, conceptually distinguishing "word" (الكلمة) and "term" (المصطلح) is crucial in the process of term creation: while it is easier to find equivalents for everyday lexicon, scientific terms require strict meaning and standards, making their adaptation more complex. At this point, ishtiqāq, relying on internal resources, serves to preserve the language's naturalness and systemic coherence, but it is not always sufficient to fully cover the rapidly renewing nomenclature of technology and innovations. Therefore, in practice, ta'rib (adoption) is widely used to ensure compatibility with international scientific communication and speed, yet the resulting increase in variation also raises the need for standardization.

In translation practice, the main requirement is to find a "conceptual equivalent" rather than to follow a word-for-word approach: if a term's scientific content is not preserved, it may lead to misinterpretation and methodological errors in scientific communication. Hence, for the stable development of MSA terminology, it is necessary to apply ishtiqāq, ta'rib, and conceptual translation in a balanced way and to unify terms on the basis of the needs of the scientific community and standardization criteria.

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