

Compounding as a Word-Formational Process in Arabic with a Special Reference to Technical and Scientific Lexicons⁽¹⁾

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Abstract

Compounding is a common word-formational process in English and other languages. Talking about English and Arabic languages, it is found that this process does not seem to yield similar results in Arabic since the criteria that can be followed in identifying English compounds cannot be applied to Arabic. Indigenous Arab writers use the term "النحت naht" as an equivalent to 'compounding', in addition to other word-formational processes through which it renders English compounds.

This study proceeds from the assumption that English and Arabic differ in their word-formational processes especially in "compounding". Compounding in English and other European languages is one of two main processes of word-formation; the second process is derivation which implies the formation of new lexemes by affixation. On the basis of this fact, this study is devoted to discussing the differences between compounding in English and Arabic; and the compensating methods which Arabic uses in rendering non-Arabic compound terms with a special reference to technical and scientific lexicons.

Keywords: Compounding, naht, word-formation, technical and scientific lexicons.

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التركيب كعملية تشكيل الكلمات في اللغة العربية مع مرجع خاص للمعجمين التقني والعلمي

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المستخلص

التركيب هو عملية شائعة لتشكيل الكلمات في اللغة الإنكليزية ولغات أخرى. وفيما يخص اللغتين الإنكليزية والعربية , لوحظ إن المعايير المستخدمة لتعريف المركبات الإنكليزية لا يمكن تطبيقها في اللغة العربية . ويستخدم الكتاب العرب الأصليين مصطلح " النحت naht " مكافئا " للتركيب compounding " , بالإضافة إلى عمليات أخرى لتشكيل الكلمات لنقل المركبات الإنكليزية إلى اللغة العربية .

تنبثق هذه الدراسة من فرضية مفادها اختلاف اللغتين الإنكليزية والعربية في عمليات تشكيل الكلمات وخصوصا في " التركيب compounding " . فعملية التركيب في اللغة الإنكليزية واللغات الأوربية الأخرى هي واحدة من عمليتين أساسيتين لتشكيل الكلمات ؛ والعملية الثانية هي الاشتقاق الذي يتضمن تشكيل وحدات المفردات الأساسية الجديدة بواسطة إضافة اللواحق , واستنادا إلى هذه الحقيقة تم تخصيص هذه الدراسة لمناقشة الفروقات بين اللغتين الإنكليزية والعربية فيما يخص عملية " التركيب compounding " ؛ والطرق التعويضية التي تستخدمها اللغة العربية لنقل المصطلحات المركبة غير العربية مع مرجع خاص للمعجمين التقني والعلمي.

كلمات مفتاحية: التركيب, النحت, تشكيل الكلمات, المعجمين التقني والعلمي .

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Introduction

English and Arabic differ in their word-formational processes especially in 'compounding'. The criteria that can be followed in identifying English compounds are formal, semantic and grammatical which do not seem to yield similar results in Arabic. Consequently, while English uses this process in the formation of compound terms, Arabic resorts to other methods, i.e. "النحت naht", "الإضافة the construct state", and "المصطلحات المتعددة الأجزاء" multi-componental terms".

1. What Is Compounding?

In simple terms, compounding in English as well as other European languages, implies the use of words themselves as raw material for the formation of new words [1]. In other words, it means the combination of two or more bases 'roots' (root + root) to form a new word or stem. These bases are combined together without using derivational affixes [2] and [3]. Consequently, it can be considered as a common and, as Liles [4] states, "the most prolific" process of word-formation in English.

Generally, compounds are classified into two categories, i.e. primary and secondary. The first means that two bases which are derivationally bound forms are joined together. The second, which is also called stem- compound, implies that both or all parts of the compound are stems, i.e. free forms [5]. Bauer [6] affirms that the vast majority of compounds in English are nominal compounds. Adams[7], Selkirk [8] and Bauer [6]state that these compounds are sub-classified into other kinds. The most common are the following :

- **Noun + noun : eyeball ,**
- **Noun + verb : axle drive ,**
- **Verb + noun : draw – nail ,**
- **Adjective + noun : plastic material ,**
- **Particle + noun : afterglow ,**
- **Adverb + noun : quickly – made ,**
- **Verb + particle : push-down ,**
- **Verb (-ing) – noun : fastening screw ,**
- **Verb (neutral) – noun : drift pin , and**
- **Verb (nominalization) – noun : reception vibrator**

Allerton and French (qtd in [9]) differentiate between compounding and affixation in the following fact: " Compounding differs from inflection and derivation in that it does not involve affixes at all, but simply the adding together of any two roots or stems". It is worth mentioning that Arabic differs from English in its word-formational processes especially in compounding. Such a fact leads us to shed light on Arabic word structure before discussing these processes.

2. Arabic Word Structure

The morphological system predominant in Arabic as well as most members of the Semitic language family presents the most difficult feature for word-formation theories [10]. The reason is that, unlike the familiar concatenative⁽²⁾ morphology [11] of the Indo-European languages where morphological structures are frequently presented as a sequence of segments in which prefixes or suffixes are attached to an independent form, Arabic exhibits a different variation of purely morphological alterations internal to the root [10]. Consequently, the following Arabic forms are morphologically related to one another although they do not share isolable strings of segments forming concatenated morphemes:

| | |
|--------|-------------------|
| صهر | '(he) melted' |
| انصهار | 'melting' |
| صاهر | 'melter' |
| مصهار | 'melting machine' |
| etc. | |

It is clear then, that the Arabic morphological system contains the 'roots' which are characterized by a sequence of typically three, frequently four, and rarely two consonants, as bases implied by this system. Besides, the derivatives of these, i.e. sets of related words containing the three consonants, have some semantic elements in common as in the examples above. Moreover, it is found that in addition to the 'root', the Arabic word consists of a combination of vowels inserted at various places within the root and may also consist of certain prefixes, infixes, and suffixes" [10].

3. Review of Literature

Word-formation processes play an important role in languages. They are different from one language to another depending on which words are formed in a language. Crystal [12] says that word-formation is a whole process of morphological variation in the constitution of words. Such a variation implies two main divisions of inflection and derivation.

Many studies have been stated to deal with English as compared with other languages as far as word-formational processes are concerned. So, in a study concerning a comparison between English and Chinese word-formational processes, Hang [13] uses the theory of prototypes to compare the rules of word-derivation and inflection in those languages. He affirms that the particular way of word-formation in Chinese-specific features plus basic level terms is a kind of the application of the prototype theory. Accordingly, the Chinese words are marked with the semantic category feature which the English words do not have. The reason that lies behind that is the cognition of the basic level of category of the two nations in word-formation.

In a study dealing with the differences and similarities between compounding in English and Russian languages, Perkles [14] scrutinizes such a process in these languages through the emphasis on two items, i.e. lexemes and roots. He agrees with Bauer [6] who affirms that the vast majority of compounds in English are nominal compounds especially those containing nouns as second constituents.

Talking about such processes in English and Arabic reveals that they are eleven in the first and nine in the second. The first implies compounding, conversion, derivation, backformation, clipping, antonomasia, folk etymology, borrowing, acronym, coinage, and folk etymology [15] and [16]. The second implies compounding, conversion, derivation, backformation, clipping, antonomasia, folk etymology, borrowing, and acronym [17].

As regards "النحت naht" as a word-formational process in Arabic, Arab writers consider it one of three morphological procedures of Arabic word-formation beside "الاشتقاق derivation", "التعريب Arabization" [18].

It is observed that compounding is not a popular method of word-formation in Arabic. For practical term-formational purposes, Arab codifiers propose the formation through "النحت naht" procedure where other word-formational procedures, notably "الاشتقاق derivation", "التعريب Arabization" have failed. Furthermore, it is maintained that the majority of early and modern Arab philologists, and even some linguists [19] advocate that "النحت naht" is considered as the fourth kind of "الاشتقاق derivation" by the name of "الاشتقاق الأصغر" . "الاشتقاق الأصغر" the smaller derivation", "الاشتقاق الأكبر" the bigger derivation", and "الاشتقاق الكبير" the big derivation" [20].

Generally speaking, Arab writers' views concerning the role and value of "النحت naht" falls into two types [21]. The first type or category advocates that "النحت naht" is no longer necessary now since it causes the loss of words by losing some of their constituents which, in turn, causes the remoteness of the noun from its origin and mixes it with other nouns which loses its intentional benefit [22]. To the contrary, the opinion put forward by the second category implies that "النحت naht" is permissible and advantageous since it produces economical terms instead of long and varied constructions.

Arab language academies specify a number of features as being characteristics of "النحت naht" process. For example, مجلة مجمع اللغة العربية [23] proposed the following points:

- (1). The underlying constituents of "المنحوت" need not inevitably all be represented in it.
- (2). The first word in the underlying construction need not be retained in its original shape in "المنحوت" .

(3). The "short vowels حركات" and "zero-vowels سكنات" of the letters constituting the underlying elements need not be observed in " المنحوت the blended word".

However, this academy states that "النحت naht" is permissible only when necessitated by scientific need[19]. Besides, it, i.e. the academy, stipulates that the blended words are supposed to keep within the limits of "comprehensibility" for the native hearer / reader [23].

Other language academies take "the Arabic taste" into consideration[19]. In مجلة المجمع العربي العلمي[24] for example, it is stated that "النحت naht" must essentially be capable of sensing whether the new form is compatible with "the Arabic taste" or not.

It is clear then that in simple terms, Arabic language academies have been conservative with regard to the employment of "النحت naht" as a word-formational procedure in Arabic.

As regards the equivalent Arabic word-formational processes that to compounding in English, it is found that they are three. The following section is devoted to stating them.

4. The Parallel Arabic Word-Formational Processes to Compounding in English

As it has been mentioned, compounding is one of word-formation processes in English and other languages. It is seen that such a process is not found in Arabic since the application of the linguistic criteria that judge the process of word-formation reveal that such a process is inactive in Arabic. It is observed that there are three equivalent Arabic word-formation processes for this process. These processes will be stated in the following sections:

4.1. النحت "naht"

Arab and some non-Arab writers use the term 'compounding' to refer to a word-formational process linguistically called "النحت naht" in Arabic. According to Arab grammarians, "النحت naht" is used to denote the principle of lexical creation through which we get one word out of other two. Thus, it is a sort of abbreviation through which one or more radical consonants of more than one root take part in the formation of a single lexical item [19] and [25]. The terms "the blended word المنحوت" and "of the blended word المنحوت منه", respectively, denote the resultant form of the underlying elements involved in the process.

It is worth mentioning that the items resulting "النحت naht" process by their role are to be identified in many cases with various types of etymological contamination of two or more roots within one quadri – or quiniue – literal root. Such a root has four types. Let us state these types :

4.1.1. Kinds of 'النحت naht – words'

Arab writers state four types of "منحوتات the blended words", i.e. items resulting from "النحت naht" process[26]. These types are :

4.1.1.1. 'Verbal naht' النحت الفعلي

In such a type of "النحت naht", a new single verb, mostly a quadrilateral root, is formed from several elements which constitute its underlying construction, e.g. :

برقش [ب-ر-ق-ش] برق ونقش

To say : mottled

[17]

حررمن الغاز [ح-ر-غ-ز] حررغز

To say : "to degas"

[19]

أزال الهيدروجين من (هـ) [ز-ه-ر-ج] زهـج

To say: to remove the hydrogen from a compound, "chemical compound".

[27]

etc.

4.1.1.2. 'Adjectival naht' النحت الوصفي

This type implies that a new single word, quadrilateral or quinque-literal root, is formed from two independent words based on trilateral roots. The new single word refers to a description implied by the meaning of the two independent words or stronger than their meaning, e.g. :

الشديد الحافر [ص-ل-د-م] صلدم +
To say : "hard-hoofed" : "صلدم" [ص-ل-د] "strong" +
"collision" [ص-د-م] "صلدم"

[28]

الشديد من الأصوات [ص-ه-ل-ق] صهلق
To say : "rough scream" : "صهلق" [ص-ه-ل] "rough or horse voice" +
"to scream" [ص-ل-ق] "صلق"

[28]

etc.

4.1.1.3. 'Attributive naht' النحت النسبي

In such a type, a single relative adjective is formed from a bi- componental (sometimes multi-componental) noun, where the first noun is in the construct state governing the second in the genitive, e.g. :

طفـل مركـزي طفـل مركـزي

To say : "infancy centrism"

[28]

بشركزي

بشركزي

To say : " anthropocentrism"

[28]

etc.

4.1.1.4. النحت الاسمي 'Nominal naht'

This type implies that a new single noun is formed from two independent words. It is found that the constituents of " المنحوت the blended word" are sometimes the same as the constituents of " المنحوت منه" of the blended word" and the effect of " النحت naht" will not be in the content, but in the shape and formula, e.g. :

جلمود جلد "to be frozen" + جلد "to scourge"

[29]

زمكان مكان "place" + زمان "time"

[29]

It is clear that the above types of " النحت naht" are a sort of symbolic abbreviation rather than an etymological blend- formation⁽³⁾. However, there is no consistent formal criterion as to provide a clear-cut border line between both of them.

Clearly enough , it is found that Arab writers' definition of " النحت naht " –type compounds implies an important fact of substantial importance when explicitly postulating the omission of some root constituting consonants from one or both of the underlying components " لفظ pronunciation" , upon which the " النحت naht " fashioned compound is based. This fact makes it apparently impossible to consider the previous constructions " المنحوتات the blended words" as compounds in the real sense of 'compounding' . So, as it has been mentioned, compounding generally means a combination of two or more roots to form a new word or stem. Consequently, " النحت naht " , 'the so-called compounding' in Arabic does not imply the real meaning of compounding as a word-formational process in English and other languages. However, it may be said that terms like " رأسمال capital", " ماء ورد" rose water" and " رد فعل reaction" in Arabic can be considered compounds since they keep the same number of foot constituting consonants in the process of compounding. The comment in such a statement is that these constructions (there may be one or two other than these in Arabic; they are limited in number) cannot be considered compound terms according to the following criteria :

(a). One-wordness

As regards this criterion, it is observed that on one hand, the one- wordness of English compound terms concerning what is called productivity can be seen in the way the expressions are put morphologically. They tend to fill a single grammatical place in a sentence (e.g. that of a

verb, a noun, or an adjective), and to be inflected as single words are-on the end. On the other hand, the one-wordness of Arabic ' the so-called' compounds can be seen in the lack of separability of single constituents of the bi-componental constructional units. Besides, it is seen that each more-than-one-root construction is considered equaling a one-word unit provided that the latter can potentially be considered a basis for producing further derivatives. From this point of view, "رأسمال capital", for example, will be considered a one-word unit because of possible "رأسمال(ي) capitalist" , etc. While, for example, "رأس المال capital" , "رؤوس (ال)أموال Capital" , etc. will be recognized as constituting such units because further derivatives cannot be produced from them. Consequently, in comparing "رأسمال capital" with, for example, mill stone, green horn, etc. (English compound terms), it has been found that it cannot be said : *mill stoner and *green horner.

(b). **Structural Criterion**

It is evident that there is no single 'so-called' compound in Arabic fully identifiable, let us say, with the English compound terms mill stone, green horn, etc. as to its internal structure. As it has been mentioned, the root, as far as the formation parts of a word segmentable into a root and a pattern (both constituting a stem) are concerned, never occurs independently of non-root⁽⁴⁾ related to it. The non-roots, by their role, co-occurring with respective roots, are to be identified with the whole of structural features constituting a pattern or a pattern complex. This fact implies two senses , i.e. in a minimum sense, with particular sets of inter-radical vocalic morphemes related to roots (in the case of pattern) and, in the maximum sense, with those vocalic morphemes occurring in combination with particular extra-root features , the latter being represented by one or more affixes (in the case of pattern complexes). Consequently, if "رأسمال capital" and mill stone are compared, many differences of internal structure implicit in these compounds can be stated as in the following table (Table -1-):

Table -1-

Differences of Internal Structure of an Arabic Compound vs. an English Compound

| | | |
|---|-----------|------------|
| Compound Words | رأس مال | mill-stone |
| Roots | *رأس م ول | mill stone |
| Nonroots (in the case of Arabic identifiable, in a minimum sense, with patterns) : | -a- -aa- | - - |
| The minimum structural unit of single constituents of the construction at pre- compound level : | S S | R R |
| The intermediate structural unit of constituents of | | S S |

| | | |
|---|-----|-----|
| the construction at pre- compound level : | | |
| The maximum structural unit of single constituents of the construction at pre- compound level : | W W | W W |
| The minimum structural unit of the compound construction : | S | S |
| The maximum structural unit of the compound construction : | W | W |

(Where : R= root ; S=stem (i.e., R+P) ; P= pattern ; W=word)

4.2. الإضافة " the Construct State "

The term الإضافة " the construct state" in Arabic, is a linguistic method through which English compounds are transferred into Arabic. Wright [30] states that Arab Grammarians speak of the construct in terms of one noun being determined or defined by another. These nouns are directly or indirectly connected by the existence of annexation which is usually one of the prepositions (من "from, of", حتى "to, until, till", عن "about", على "on, above", في "in, on", ب "by, in, with", ل "for, to", ك "as", رب " maybe " و "and", and "ت "by") [31] ; [32] .

4.2.1. Kinds of Constructs : Adjectival vs. Nominal

Generally, the construct phrase implies two types, i.e. adjectival and nominal. The distinctions between these types are formally achieved by the following two points :

A. The nominal element in an adjectival construct must take the definite article, e.g.:

سريعة الارتداد "quick-return"
متوازي اللوحين " parallel plate "
etc.

To the contrary, the final noun of a nominal construct may be definite or indefinite . If definite, it may be concerned with either the article or a pronominal suffix, e.g. :

طبيعة تفاعل " the nature of reaction"
طبيعة تفاعله " the nature of its reaction "
etc.

B. Despite the fact that the nominal element of an adjectival construct is always marked as definite, it is not a condition for the phrase to be totally defined. Consequently, constructs like سريعة الارتداد, متوازي اللوحين, and راحية التعرّيق may be used to modify the indefinite nominal as in :

حركة سريعة الارتداد " a quick –return motion"

[33]

مكثف متوازي اللوحين " parallel plate condenser"

[34]

ورقة راحية التعرّق

" palmate-veined leaf "

[34]

etc.

4.2.2. Relationships Implicit in Construct

It is found that the classes of the construct phrases in Arabic imply the following relationships:

4.2.2.1. The Relationship Implicit in "الإضافة المعنوية"

It is clear that "الإضافة المعنوية" is composed of two immediately adjacent nouns. However, the first word of "الإضافة المعنوية" may be a verbal noun as well as a common or adjacent noun[35]. The following construct illustrates the fact that the first word is a 'verbal noun':

إبادة الحشرات " (the) killing (of) the insects" = "insects' killing"

It is evident that the relationship between the constituents of this example is ambiguous. So, "إبادة الحشرات (the) killing (of) the insects" may mean either that 'someone or something (cide) killed the insects' (action-goal), or that "the insects killed or ate something (plant, etc.)" (actor-action). Nevertheless, the implied relationship in such a kind of construct can be specified by expanding it in different ways. Thus, the above example can be analyzed as the following :

إبادة الحشرات " (the) killing (of) the insects" :

The following example implies that the second noun "الحشرات the insects" does the action:

(a). "إبادة الحشرات للنبات (the) eating (of) the insects of the plant" "the insects' eating of the plant", whereas in the following example, "the insects" undergo the action:

(b). "إبادة الحشرات من قبل المبيد (the) killing (of) the insects by the cide"

etc.

4.2.2.2. The Relationship Implicit in "الإضافة اللفظية"

It is found that the relationship between the constituents of "الإضافة اللفظية" depends on the form of the first word of the construct [35]. The following points clarify the three kinds of this class of construct along with the semantic relationship indicated by each kind:

(a). Intransitive Active Participle + Noun

In "مُذيب المطاط solvent (of) the rubber" 'the rubber's solvent', "ضاغط الغاز compressor (of) the gas" 'the gas's compressor', etc.; the second words the objects of the active participles, i.e. 'المطاط the rubber' and 'الغاز the gas' are the objects 'goals' and 'مُذيب solvent' and 'ضاغط compressor' are the subjects 'scores'.

(b). Passive Participle + Noun

In " مؤيّن الطاقة " (something) diluted (by) the solubility " , " مخفف الذوبان (something) ionized (by) the energy " the second words ' الذوبان the solubility' and ' الطاقة the energy' are the subject 'actors'.

(c). Adjective ' assimilated adjective' + Noun

In the constructs " سريع الارتداد " quick- return " , " دقيق السحب " fine drawing " , the first words, i.e. " سريع quick " and " دقيق fine " modify " الارتداد return " and " السحب drawing " respectively.

Having stated the classes of the construct phrase in Arabic and the relationships implicit by each class, it is found necessary to state a table including a statistical account of these classes and their relationships to see the percentages of the transferred terms from compounds in English into " الإضافة the construct phrases " in Arabic. The statistical account will be mainly concerned with five dictionaries of technical and scientific terms :

Table-2-

Some Statistics about the Classes of " الإضافة the Construct Phrase "

(A). The Relationships Implicit in " الإضافة المعنوية "

| Ambiguous (Action-Goal) or (Actor- Action) | Action- Actor | Action-Goal | Possess or Possessed | Classified r- Classified | N- Material | N- Place | N-Time |
|--|---|---------------------------------------|------------------------------|----------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|
| " إبادة الحشرات " insect killing " | " انخفاض الحرارة " temperature lowering " | " قطع التيار " current cessation " | " جدار الجسم " body wall " | " حرارة إشعاع " radiation heat " | " خلية زلالية " albuminous cell " | " أعشاب البحار " sea weeds " | " إنقلاب الشتاء " winter solstice " |
| " قتل السموم " dots killing " | " انقسام الخلية " Cell division " | " صب السبائك " alloy casting " | " نخاع العظم " bone marrow " | " منطقة ارتكاز " staging area " | " حبيبة أليرونية " aleurone grain " | " إصلاّد السطح " surface hardening " | " برق الصيف " summer lightning " |
| " تحليل السائل " liquid decomposition " | " انحراف الأساس " base deflection " | " نقل الضغط " pressure transmission " | " دهن العظم " bone fat " | etc. | etc. | etc. | etc. |
| etc. | etc. | etc. | etc. | | | | |

Table -2- (A) (cont.)

| Dictionary by Author(s) | The Total Number of Words in the Dictionary | The Total Number of "الإضافة المعنوية" (All Relationships in the Dictionary) | Percentage |
|-------------------------|---|--|------------|
| الخطيب | 60 000 | 18 568 | 0.309 |
| محمود وآخرون | 34 740 | 7 206 | 0.207 |
| السعران | 30 000 | 5 020 | 0.167 |
| URA | 35 000 | 7 166 | 0.204 |
| عسكري وآخرون | 54 150 | 13 709 | 0.235 |

Table-2-

(B). The Relationships Implicit in "الإضافة اللفظية"

| Actor-Goal | Goal-Actor | Adjective – Noun | Dictionary | The Total Number of Words in the Dictionary | The Total Number of "الإضافة اللفظية" (All Relationships in the Dictionary) | Percentage |
|------------------------------|--------------------------------------|------------------------------|--------------|---|---|------------|
| "مذيب المطاط rubber solvent" | "مخفف الذوبان diluted by solubility" | "سريع الارتداد quick return" | الخطيب | 60 000 | 5 201 | 0.866 |
| "ضاغط الغاز gas compressor" | "مؤين الطاقة ionized by energy" | "دقيق السحب fine drawing" | محمود وآخرون | 34 740 | 2 002 | 0.057 |
| "مبيد الحشرات insecticide" | "مغمور الجليد bound by ice" | etc. | السعران | 30 000 | 1 203 | 0.040 |
| | | | URA | 35 000 | 2 013 | 0.057 |
| etc. | etc. | | عسكري وآخرون | 54 150 | 3 070 | 0.056 |

4.3. Multi-componental Terms

"Multi-componental terms المصطلحات المتعددة الأجزاء" - constitute the second linguistic means through which English compounds are transferred into Arabic. There are three kinds of multi-componental terms in Arabic technical and scientific lexicons.

4.3.1. Attributive Constructions

It is seen that attributive constructions, in contradistinction of those produced by means of the construct state, establish the limited dependence between their single components by using some formal features the most important of them being "agreement" [36]. Agreement, in the case of these constructions, i.e. "attributive constructions", covers all the grammatical categories subject to agreement as gender, number, case and grammatical state:

| | |
|------------------|------------------------|
| كرات دموية | " blood corpuscles" |
| | [37] |
| القوى الداخلية | " the internal forces" |
| | [38] |
| سمك بلطي أبيض | " Tilapia Nilotica" |
| | [39] |
| قوة طاردة مركزية | " centrifugal force" |
| | [40] ⁽⁵⁾ |

etc.

4.3.2. Constructions Formed by Non- or Partly Agreeing Components Partly Identifiable with "Constructs"

In the bi-componental terms, the second component of the construction stands in the grammatically determined or undetermined genitive while the first component is deprived of an explicitly expressed grammatical determination. In longer componental terms, the last component of the construction stands in the grammatically determined or undetermined genitive while all the preceding components are deprived of an explicitly expressed grammatical determination:

| | |
|--------------------|--|
| مسعر التفجير | " bomb calorimeter" |
| | [38] |
| نسبة تحليل المحلول | " (the) solution concentrating proportion" |
| | [40] |
| التأمين من الحريق | " fire-insurance" |
| | [33] |

etc.

4.3.3. Mixed Constructions

In simple terms, mixed constructions are those constructions that include the agreeing components of the attributive constructions and non- or partly agreeing components of the construct state :

| | | |
|-------------------------------|---|---|
| (ال) قذيفة عابرة القارات | : | |
| (ال) قذيفة (ال) عابرة للقارات | | " transcontinental missile" [34] |
| البلورات الثنائية التلوين | | " diachronic crystals " [33] |
| المصل المضاد للمكورات الرئوية | | " anti-pneumococcal serum" [39] |
| دقائق عديمة التكهرب | | " electrically neutral particles" [34] |
| الذباب شعري الأجنحة | | " caddis flies" [34] |
| قطع غيار قابلة التبديل | | " interchangeable spare parts" [33] |

etc.

Having stated the three types of multi-componental terms in Arabic, it is found necessary to state these constructions, i.e. multi-componental terms in a table including a statistical account of these constructions to see the percentages of the transferred terms from compounds in English into "multi-componental terms المصطلحات المتعددة الأجزاء" in Arabic which constitutes the second method, after "الإضافة the construct phrase", through which English technical and scientific compound terms are transferred into Arabic. The statistical account will be concerned with the same dictionaries used in the statistical account of the relationships implicit in the two kinds of "الإضافة the construct phrase":

Table -3-

Some Statistics about the Kinds of "المصطلحات المتعددة الأجزاء" Multi-componental terms"

(A). Attributive Constructions

| Kind | Dictionary | The Number of Words in the Dictionary | Total of the Attributive Constructions in the Dictionary | Percentage |
|------------------|------------|---------------------------------------|--|------------|
| (A). Attributive | الخطيب | 60 000 | 7 061 | 0.117 |

| | | | | |
|---------------|--------------|--------|-------|-------|
| Constructions | محمود وآخرون | 34 740 | 5 109 | 0.147 |
| | السعران | 30 000 | 4 050 | 0.135 |
| | URA | 35 000 | 5 630 | 0.106 |
| | عسكري وآخرون | 54 150 | 6 033 | 0.111 |

(B). Constructions Formed by Non- or Partly Agreeing Components Partly Identifiable with Constructs

| Kind | Dictionary | The Total Number of Words in the Dictionary | The Total Number of Constructions Formed by Non- or Partly Agreeing Components Partly Identifiable with Constructs | Percentage |
|---|--------------|---|--|------------|
| (B). Constructions Formed by Non- or Partly Agreeing Components Partly Identifiable with Constructs | الخطيب | 60 000 | 11 602 | 0.193 |
| | محمود وآخرون | 34 740 | 5 022 | 0.144 |
| | السعران | 30 000 | 4 010 | 0.133 |
| | URA | 35 000 | 5 200 | 0.148 |
| | عسكري وآخرون | 54 150 | 5 980 | 0.110 |

(C). Mixed Constructions

| Kind | Dictionary | The Total Number of Words in the Dictionary | The Total Number of Mixed Constructions in the Dictionary | Percentage |
|--------------------------|--------------|---|---|------------|
| (C). Mixed Constructions | الخطيب | 60 000 | 3 300 | 0.055 |
| | محمود وآخرون | 34 740 | 2 801 | 0.080 |
| | السعران | 30 000 | 1 950 | 0.065 |
| | URA | 35 000 | 3 342 | 0.095 |
| | عسكري وآخرون | 54 150 | 2 718 | 0.050 |

The preceding sections show certain morpho-lexical issues of compounding as a word-formational process in Arabic with a special reference to technical and scientific lexicons. Certain conclusions can be drawn throughout these sections. The following shows these conclusions:

Conclusions

1. English and Arabic differ in their word-formational processes especially in 'compounding'. The criteria that can be followed in identifying English compounds are formal, semantic and grammatical which do not seem to yield similar results in Arabic. Consequently, while English uses this process in the formation of compound terms, Arabic resorts to other methods, i.e. "النحت naht", "الإضافة the construct state", and "المصطلحات المتعددة الأجزاء multi-componental terms".

2. Most indigenous Arab writers use the term "النحت blending" as an equivalent to 'compounding'. This term, "النحت naht", is a sort of abbreviation through which one or more radical consonants of more than one root take part in the formation of a single lexical item. This means that "النحت naht" cannot be taken as the natural equivalent for 'compounding' as is realized in English. Consequently, Arab researchers should approach the linguistic phenomenon termed 'compounding' in a new framework when applied to Arabic.

3. Arabic word-structure is different from that of English. The criteria used in identifying English compounds cannot be applied to Arabic. Compounding is realized in English as is realized in other languages; but it does not seem to be realized in Arabic by applying the criteria, structural, functional, and distributional.

3.1. On one hand, the one-wordiness of English compounds can be seen in the way the expressions are put morphologically. The one-wordiness of Arabic 'so-called' compounds, on the other hand, can be seen in the lack of separability of single constituents of the bi-componental structural units.

3.2. The internal structuring of Arabic words imposes some special features that are not included within the system of English words.

3.3. The meaning of Arabic compounds is always immediately derivable from the meaning of their constituents. The meaning of English compounds, however, is not always the sum of the meaning of their constituents. The English compound may have a unitary meaning which is not immediately derivable from its parts.

4. In Arabic, "الإضافة the construct state" is a linguistic method through which English technical and scientific compound terms are transferred into Arabic.

4.1. In general, there are two kinds of constructs, i.e. adjectival and nominal.

4.2. Two classes of constructs can be distinguished, "الإضافة المعنوية construct related to meaning" and "الإضافة اللفظية construct related to pronunciation".

4.3. The percentage of English technical and scientific compound terms that are transferred into "الإضافة المعنوية" construct related to meaning" in Arabic is higher than those transferred into "الإضافة اللفظية" construct related to pronunciation".

5. " Multi-componental terms المصطلحات المتعددة الأجزاء " in Arabic is the second linguistic method through which English technical and scientific compound terms are transferred into Arabic.

5.1." Multi-componental terms المصطلحات المتعددة الأجزاء " include three kinds of constructions, i.e. attributive constructions, construct constructions backed up by the so-called construct state pattern and mixed constructions built up by means of the simultaneous occurrence of some special features of the agreeing components of the attributive constructions and non- or partly agreeing components of the construct state.

5.1.1. Attributive constructions, in contradistinction to those produced by means of the construct state, establish the limited dependence between their single components by using some formal features the most important of them being 'agreement' .

5.1.2. In constructions that are formed by non- or partly agreeing components, which are partly identifiable with constructs, their last components stand in the grammatically determined or undetermined genitive while all the preceding components are derived of an explicitly expressed grammatical determination.

5.1.3.. Mixed constructions are those ones that include the agreeing components of the attributive constructions and non-or partly agreeing components of the construct state.

5.2. The percentage of English technical and scientific compound terms that are transferred into constructions formed by non-or partly agreeing components which are partly identifiable with constructs is higher than the percentage of those transferred into attributive constructions. The latter by its role is higher than the percentage of those transferred into mixed constructions.

Notes

(1). This study is based, to some extent, on the researcher's M.A. thesis, entitled "A Study of the Formal Processes of Transferring English Compound Technical and Scientific Terms into Arabic"/1994.

(2). Concatenation refers to the notion of 'changing together'.

(3). The notion " blend-formation " means the fusion of two words into one, usually " the first part of one word with the last part of another"[41].

(4). Non-roots are defined as " all distributional types of morphemes other than roots." For more details, see [42].

(5). UAR is an abbreviation for United Arab Republic as regards the references in Bibliography.

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