THE TERM INFORMATION SYSTEM IN ENGLISH AND ITS CROATIAN EQUIVALENTS

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Apart from being used in its own right, the term information system in English readily combines with other linguistic items to form new compound terms and free syntactic phrases. These constructions belong to three basic types: (1) information system is used as a head element premodified by adjectives or nouns; (2) it is used, in both the singular and the plural, to premodify other simple or complex heads; and (3) it is frequently used in postmodification, after the preposition of. So far, these constructions have not received much attention in terminological literature.

Based on examples taken from contemporary computing and information science publications, the paper surveys the main features of these constructions and analyses them from the point of view of their translation into Croatian.

Keywords: compound term, information system, translation, English, Croatian.

1.

1.1. The term information system is widely used in computing and information science literature. It is included as a separate entry in most contemporary dictionaries of computing [6, p. 221], information technology [4, p. 149] and communications [12, p. 448]. General English dictionaries, however, very rarely contain this term, although, according to the OEDS [9] (s.v. information), its first recorded appearance in print dates back as far as 1953. Today, it generally refers to a computer-based system, which, in this sense, may be defined as a “collection of people, procedures, and equipment designed, built, operated, and maintained to collect, record, process, store, retrieve, and display information” [11, p. 657], but the term is also used in a broader sense, “to include many noncomputer-based systems” [6, p. 221].

1.2. Although the term is written separately, as two orthographic words, linguistically it has established itself as a compound, “functioning both grammatically and semantically as a single word” [10, p. 1567]. It has what is called a compound accent (the primary accent on the first element, viz. information system), though this is not a reliable criterion of compound status [3, p. 136], and does not allow intervening words
to be freely inserted between its elements, e.g. *information nationwide system. Of course, the unacceptability of this insertion is also due to the violation of word-order rules in the structure of premodification, but there exist compound terms in which the words information and system are separated by intervening elements, e.g. information retrieval system or information processing system. In such cases, however, it is the word system that is modified by the preceding compound, so that these compound terms should be analysed as information retrieval system and information processing system.

1.3. Apart from being used as an independent linguistic item, the term information system enters as a constituent into larger nominal constructions to form new compound terms or free syntactic phrases. Since the distinction between these two types of structure is not easy to draw [5, p. 259; 3, pp. 136-137], we shall generally use the expression ‘compound term’ notwithstanding the fact that some of the constructions so labelled may not as yet have attained compound status. The compound terms containing information system as their constituent may be divided into two broad types: the constructions in which information system functions as a head, and the constructions in which it is used attributively, as a premodifying item, to modify other heads. Related to the latter type is also the use of information system in postmodifying position, after the preposition of. Since compound terms containing information system as their constituent are rarely, if ever, included in specialist dictionaries, the data on them is lacking. It is the purpose of this paper, therefore, to provide essential data on the use of the term information system in English, both as an independent linguistic item and as a constituent of larger nominal constructions, and to highlight selected semantic features of such constructions from the point of view of their translation into Croatian. The discussion, which is highly selective and limited in scope, is based on examples collected from computing and information science literature in both English and Croatian.

2.  
2.1. By its form, the term information system belongs to English noun + noun compounds, in which the second noun is a head element modified by the first [7, VI, pp. 142-143]. This is one of the most productive patterns of compound formation in English [2, p. 204] so that its widespread use in the formation of computing and information science terms conforms to this general trend. Since the noun information in this compound is used adjectively, the term is rendered into Croatian as informacijski sustav or obavijesni sustav. In addition, the word sustav is replaceable by the classical borrowing sistem, but, in current Croatian usage, there is a definite preference for the word sustav. Although obavijesni sustav would be preferred on the grounds of purity, the more generally accepted term, in Croatian computing and information science literature anyway, is informacijski sustav. As the Croatian term is built on the pattern adjective + noun, there might be a tendency on the part of some Croatian speakers, mainly those not acquainted with the English term, which is not
very likely, to look for an English adjective when translating the term informacijski sustav into English, thus producing *informational system* rather than the normal *information system*. The collocation *informational system* has not been attested in our material, although the meaning of the English adjective *informational* corresponds to that of the Croatian adjective *informacijski* or *obavijesni*, being glossed in the *OED* [8] as ‘of or pertaining to information; conveying information’. This adjective, however, seems to be relatively rarely used in information-processing contexts, being mostly confined to such collocations as *informational element / message / value*.

2.2. Since the information system, in the sense of a computer-based system, is a man-made structure, there appear to be three basic groups of activities connected with it: its development, its use and its analysis. Accordingly, on a linguistic level, *information system* as a grammatical object collocates with a number of transitive verbs expressing, in a broad sense, these concepts. Thus, the verbs *build, construct, create, design* (l), *develop, establish, implement, install, plan, produce, simulate* and *specify* refer to its development; the verbs *abuse, access, apply, employ, expand, improve, maintain, modify, operate, optimize, protect, run, test, update, use and utilize* are concerned with its use; and the verbs *analyse, assess, categorize, classify, compare, consider, define, distinguish, explore, identify* and *study* have to do with its analysis. Of course, when used with these verbs, *information system* may appear in the singular or the plural and may be preceded by the indefinite (l a) or the definite (l b) article in the singular, and the zero article (l c) or the definite article (l d) in the plural. However, the uses in (l a) and (l c) are the most common, those in (l d) are extremely rare.

(1) a. We can design an *information system* using a top-down approach.
   b. We can design the *information system* using a top-down approach.
   c. We can design *information systems* using a top-down approach.
   d. We can design the *information systems* using a top-down approach.

These verb + *information system* collocations stand in close correspondence with the compound nominal constructions in which *information system(s)* premodifies (cf. 4.2, 4.3, 4.4) or postmodifies (cf. 4.5) nominal heads which are formally and semantically related to these verbs.

2.3. Apart from the verbs listed in 2.2, there are a number of other verbs that also frequently collocate with *information system*, mostly in constructions in which it performs the function of a grammatical subject (2). These, again, are mostly transitive verbs (2 a, c), though there are some that are intransitive or may be used intransitively (2 b). Two groups of such verbs and verbal expressions may be distinguished: those that refer to various activities performed by information systems, e.g. *carry out* (2 a), *display, fulfil, function, generate, handle, maintain, manage, operate* (2 b), *perform, produce, present, process, provide, run, serve, share, store, supply, use, utilize, etc.*, and those referring to its structure or contents, e.g. *be composed of, be made up of, consist of, comprise, contain, have, include* (2 c), *involve and incorporate*.
S. Vojvoda. *The term information system in English and its Croatian equivalents*

(2) a. A few information systems may *carry out* all these functions.
   b. This assumes that the information system *operates* according to predetermined rules.
   c. Information systems usually *include* large and complex databases.

It should be noted that the verbs in the first group are related to those verbs in 2.2 which refer to information system uses (some are, indeed, listed in both groups) and are thus, in their intransitive uses, also potentially relevant for the nominal constructions in 4.2 - 4.5, though to a lesser extent, while the second group of verbs is rarely involved in such a relationship. Compare *The information system performs well with information system performance (6 e)* and *the performance of the information system.*

3.

3.1. When used as a head element in a compound term, *information system* may be premodified by adjectives (3), including participles (3 a, e), or nouns (4), occasionally in the possessive case (4 j).

<table>
<thead>
<tr>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>a. an automated information system</td>
<td>a. an accounting information system</td>
</tr>
<tr>
<td>b. an automatic information system</td>
<td>b. a business information system</td>
</tr>
<tr>
<td>c. a bibliographic information system</td>
<td>c. a health information system</td>
</tr>
<tr>
<td>d. a chemical information system</td>
<td>d. a home information system</td>
</tr>
<tr>
<td>e. a computerized information system</td>
<td>e. a hospital information system</td>
</tr>
<tr>
<td>f. a geographic(al) information system</td>
<td>f. a management information system</td>
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<td>g. an intelligent information system</td>
<td>g. a manufacturing information system</td>
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<tr>
<td>h. a manual information system</td>
<td>h. a marketing information system</td>
</tr>
<tr>
<td>i. a natural information system</td>
<td>i. an office information system</td>
</tr>
<tr>
<td>j. a new information system</td>
<td>j. an organization's information system</td>
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<td>k. a paperless information system</td>
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<tr>
<td>l. a public information system</td>
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<tr>
<td>m. a scientific information system</td>
<td></td>
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<tr>
<td>n. a strategic information system</td>
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</table>

- automatizirani informacijski sustav
- automatinski informacijski sustav
- bibliografski informacijski sustav
- kemijski informacijski sustav
- kompjutorizirani informacijski sustav
- zemljopisni (geografski) informacijski sustav
- inteligentni informacijski sustav
- ručni informacijski sustav
- prirodni informacijski sustav
- novi informacijski sustav
- bespapirni informacijski sustav
- javni informacijski sustav
- informacijski sustav znanosti (znanstveni informacijski sustav)
- strateški informacijski sustav
- računovodstveni informacijski sustav
- poslovni informacijski sustav
- zdravstveni informacijski sustav
- kučni informacijski sustav
- bolnički informacijski sustav
- upravljački informacijski sustav
- informacijski sustav proizvodnje
- marketinški informacijski sustav
- uredski informacijski sustav
- informacijski sustav organizacije
In all these terms the premodifying element restricts the meaning of information system: nouns mainly to specify the application area of the system, adjectives either to refer to its features (3 b) or application area (3 c). In the vast majority of such terms, as shown in (3) and (4), information system is preceded by a single adjective or noun, but two or more adjectives (5 a, b) or nouns (5 c), or their combinations (5 d), are by no means uncommon. Indeed, these premodifying items may be compounds in their own right (5 f) and may be combined (5 g) as well.

(5) a. a typical geographic information system - tipični zemljopisni (geografski) informacijski sustav
b. a general national scientific and technical information system - opći nacionalni znanstveno-tehnički informacijski sustav
c. a business computer information system - poslovni računalni informacijski sustav
d. a modern management information system - moderni upravljački informacijski sustav
e. a criminal justice information system - informacijski sustav kaznenog pravosuda
f. a well-designed information system - dobro oblikovani (projektirani) informacijski sustav
g. a well-designed computer-based information system - dobro oblikovani (projektirani) računalni informacijski sustav

3.2. The English pattern adjective + information system parallels the Croatian construction so that its translation into Croatian, as evidenced by the Croatian examples supplied in (3), is straightforward: adjective + informacijski sustav. This is also the case when two or more adjectives precede information system (5a, b). In some cases, however, the adjective construction may be ambiguous, so that a construction with a postmodifying genitive may be more appropriate. Thus in (3 m), the possible Croatian translation equivalent znanstveni informacijski sustav might be interpreted as ‘an information system based on science’ rather than ‘an information system belonging to science’, whereas informacijski sustav znanosti is unequivocal, having only the latter interpretation (cf. also 4 g, j). The pattern noun + information system (4) is also generally translated by the same construction, viz. adjective + informacijski sustav, because the Croatian language usually requires an adjective in the premodifying position. Thus, this relationship can be represented schematically as:

English

adjective + information system

noun + information system

Croatian

adjective + informacijski sustav
In some cases, though, where an adjectival construction is potentially ambiguous, as in (4 g, j), the construction with a postmodifying genitive is preferred. In a similar manner, with complex premodifying items, such as in (5 e), it may be impossible to find an appropriate adjective in Croatian so that a postmodifying construction practically remains the only choice available. It should be noted, however, that the examples in (3), (4) and (5), as well as in other cases where countable heads are used, are given with the indefinite article, although in actual usage they may also be preceded by the definite article, in the singular, and the zero article or, less frequently, by the definite article, in the plural. This article usage, although semantically of considerable relevance, is usually not formally represented in the Croatian translation equivalents, which leave that component of meaning to be inferred from the context. Thus, both a bibliographic information system (3 c) and the bibliographic information system are normally translated into Croatian as bibliografski informacijski sustav; bibliographic information systems and the bibliographic information systems as bibliografski informacijski sustavi. This is not to say that Croatian, being an articleless language, has no means of expressing the concepts of indefiniteness and definiteness. It may, of course, use such words as neki, pojedini, bilo koji, jadan, etc., for the former, and taj, ovaj, određeni, etc., for the latter concept, but this seems to occur relatively infrequently, at least in Croatian computing and information science literature dealing with information systems.

4.

4.1. When used attributively, in front of a noun or a nominal compound, the term information system is common in both its singular and plural form. Such constructions may be synonymous with the noun + of + information system(s) constructions discussed in 4.5, and are also transformationally and semantically related to the collocations verb + information system surveyed in 2.2.

4.2. The noun heads modified by information system generally denote activities (6), constituent parts (7) and persons (8), though some noun heads may not fit in any of these groups (9). The compound terms in (6) and (9), which mainly contain uncountable head nouns, are generally used with the zero article; those in (7) and (8), which have countable head nouns, are preceded by a/an or the in the singular, and the zero article or, less commonly, by the in the plural. It should be added, however, that some of the uncountable head nouns in (6) and (9) can also have countable uses, e. g. (6 a, b) and (9 a, c), and may, accordingly, also take the indefinite article in the singular, e. g. an information system design (‘projekt informacijskog sustava’), or appear in the plural, e. g. information system designs (‘projekti informacijskog sustava’ or ‘projekti informacijskih sustava’), though such uses appear to be quite rare.
As has already been pointed out in the literature [7, II, p. 185], an English singular noun in premodifying position may refer to either a singular or a plural concept, or, as Adams [1, p. 58] puts it, it is “grammatically neutral rather than singular”. Accordingly, in some of the examples listed above, especially those in (6), information
S. Vojvoda. The term information system in English and its Croatian equivalents

system may be interpreted to refer to either a singular or a plural entity and thus may have two possible translation equivalents in Croatian, as shown in (6a - f), (8 d, f) and (9a, b). In other cases, however, either a singular, as in (7a, b), or a plural interpretation, as in (8c, e) and (9 c), is the natural choice. Thus, depending on the context, information system development (6c) can be paraphrased as 'the development of an information system' or 'the development of information systems' (cf. 16), while an information system component (7a) usually corresponds to 'a component of an information system' (18a); an information system designer (8a), on the other hand, is normally taken to mean 'a designer of information systems' (19c) and information system theory (9c) is interpreted as 'the theory of information systems' (21a). Thus the English construction information system + noun regularly corresponds, with minor exceptions (8c, e), to the Croatian construction noun + informacijski sustav(i) in the genitive case, but the choice between singular and plural must be made in each particular case, which means that, for example, information system design (6b) must be translated as either projektiranje (oblikovanje) informacijskog sustava or projektiranje (oblikovanje) informacijskih sustava.

4.3. Of course, information system is not confined to modifying simple heads only; heads which are themselves compounds are also used (10). Similarly, compound terms in which information system modifies simple heads can function as premodifying items to other simple heads (11), although, again, there are cases where this distinction may not be easy to draw.

(10) a. an information system data structure - struktura (ustroj) podataka informacijskog sustava
    b. information system quality control - nadzor kakvoće (kontrola kvalitete) informacijskog sustava

(11) a. an information system development methodology - metodologija razvoja informacijskog sustava

The examples in (10) are normally analysed as information system | data structure, the example in (11) as information system development | methodology.

4.4. The use of the plural form of information system in premodifying position is quite common in computing and information science literature in both British and American English; no difference between British and American usage [cf. 10, pp. 1333 - 1334] has been observed in this respect. The heads modified by information systems are similar to those in 4.2, i.e. they usually denote activities (12) and persons (13), but there are a number of other noun heads that do not belong to either of these groups (14). Again, the compound terms in (12), which generally contain uncountable heads (cf. 6), are normally used with the zero article; those in (13), (14) and (15) that have countable nouns as their heads are preceded by a/an or the in the singular, and by the zero article or, occasionally, the in the plural.
Of course, in a similar way as in (10) and (11), some of the terms listed in (12 - 14) may be used as premodifying items to other heads, forming new compound terms (15).

(15) a. information systems development strategy - strategija razvoja informacijskih sustava
b. information systems planning methodology - metodologija planiranja informacijskih sustava

In contrast to the constructions in which the singular form of *information system* is used in premodification (4.2, 4.3), in these terms, apparently, there seems to be no doubt as to the meaning of the premodifying items, which is, generally, plural. Thus, *information systems design*, for instance, is normally interpreted as ‘the design of information systems’, which means that, on the one hand, it is synonymous with *information system design* (6 b), when it conveys the idea of plurality, and with *the design of information systems* (16 c), on the other. It should be added, however, that this relationship is not as straightforward as it might appear at first sight. There is no
S. Vojvoda. The term information system in English and its Croatian equivalents

doubt that in some of these terms the plural form of *information system* in premodifying position may also refer to singular concepts. This is, indeed, corroborated by such statements as, for example, that of Wiseman [13, p. 76], who points out that *information systems planning*, narrowly defined, signifies “the planning required to develop a single computer application”, or, more commonly, “the planning undertaken by an organization when it seeks to determine its information systems requirements”. This use of *information systems* in premodifying position to refer to singular concepts seems to be related to the degree of institutionalization of such expressions, but the extent of this use is difficult to assess without further research based on a more comprehensive set of data. Singular interpretation, therefore, is not taken into account when providing Croatian translation equivalents for these terms, although, at least in some instances, such an interpretation cannot be ruled out. These equivalents, as seen from the examples in (12 - 15), usually have the structure noun + *informacijski sustavi* in the genitive case or noun + *za informacijski sustavi* in the accusative case, as in (13 a, d) and (14 c), but other prepositional constructions, as in (13 c) and (14 b), are also available.

4.5. Apart from the compound terms containing *information system(s)* in premodifying position, the English of computing and information science makes frequent use of the construction noun + *of* + *information system(s)*, which is, in many cases, synonymous with the premodifying construction. These *of*-constructions are more explicit [10, p. 1330] and avoid the ambiguity of the premodifying structure. As they are considered free syntactic phrases, such constructions are never included in specialist dictionaries in spite of their widespread use. The position of the head is mostly filled by nouns, frequently deverbal nouns, denoting activities related to the verbs discussed in 2.2. Similar heads are also found after *information system(s)* used in premodifying position (cf. 4.2, 4.4). Among these belong *analysis, assessment, classification, construction, design* (16), *development, evaluation, improvement, installation, implementation, maintenance, management, modification, operation, performance, protection, specification, use, utilization*, etc. Other heads denote properties, e. g. *aspect, capability, characteristic, class, effectiveness* (17), *feature, importance, kind, limitation, potential, quality, type*, etc., constituent parts, e. g. *component* (18), *element and part*, persons, e. g. *designer* (19), *developer, manager and user*, with a number of heads that do not belong to any of these groups, e. g. *aim, economics, example, model, network, objective* (20), *purpose, role, version, theory* (21), *typology*, etc. In these constructions, especially when the noun head denotes activities (16), the singular form of *information system* is preceded by the indefinite (16 a) or the definite article (16 b), whereas the plural form is generally used with the zero article (16 c), occasionally with the definite article (16 d). The definite article generally, though not invariably (18, 19 c, 21 b), precedes the whole phrase (16, 17, 19, 20).
| (16) a. the design of an information system | - projektiranje (oblikovanje) informacijskog sustava |
| b. the design of the information system | - projektiranje (oblikovanje) informacijskog sustava |
| c. the design of information systems | - projektiranje (oblikovanje) informacijskih sustava |
| d. the design of the information systems | - projektiranje (oblikovanje) informacijskih sustava |

| (17) a. the effectiveness of an information system | - učinkovitost informacijskog sustava |
| b. the effectiveness of the information system | - učinkovitost informacijskog sustava |
| c. the effectiveness of information systems | - učinkovitost informacijskih sustava |
| d. the effectiveness of the information systems | - učinkovitost informacijskih sustava |

| (18) a. a component of an information system | - sastavni dio (komponenta) informacijskog sustava |
| b. a component of the information system | - sastavni dio (komponenta) informacijskog sustava |
| c. a component of information systems | - sastavni dio (komponenta) informacijskih sustava |
| d. a component of the information systems | - sastavni dio (komponenta) informacijskih sustava |

| (19) a. the designer of an information system | - projektant (oblikovatelj) informacijskog sustava |
| b. the designer of the information system | - projektant (oblikovatelj) informacijskog sustava |
| c. a designer of information systems | - projektant (oblikovatelj) informacijskih sustava |
| d. the designer of the information systems | - projektant (oblikovatelj) informacijskih sustava |

| (20) a. the objective of an information system | - cilj informacijskog sustava |
| b. the objective of the information system | - cilj informacijskog sustava |
| c. the objective of information systems | - cilj informacijskih sustava |
| d. the objective of the information systems | - cilj informacijskih sustava |

As has already been said, the head noun in these constructions is usually preceded by the definite article, but there are cases where the indefinite article appears to be more normal (18), or is available as an alternative (21 b) that expresses a different meaning.
5. Apart from being used as an independent linguistic item, the term *information system* enters as a constituent into larger nominal constructions forming numerous compound terms and free syntactic phrases. These constructions belong to two basic types: (1) *information system* is used as a head element premodified by adjectives (including participles) and nouns (type: bibliographic *information system*, office *information system*) and their combinations (type: modern management *information system*), and (2) *information system* is used to premodify other heads (type: *information system* design). This second type is also common with the plural form of *information system* (type: *information systems* design). The heads most frequently found in these terms are related to the transitive verbs which collocate with *information system* as their object. When used in premodifying position, *information system* may refer to either a singular or a plural concept, whereas its plural form usually, though not invariably, denotes a plural concept. These compound terms, in turn, can also serve as premodifying items to form other compound terms (type: *information system* development methodology).

5.2. English terms with the structure adjective/noun + *information system* are normally translated into Croatian by the construction adjective + *informacijski sustav*. Those in which *information system(s)* is used in premodifying position are translated by the construction noun + *informacijski sustav(i)* in the genitive case, occasionally by the construction noun + *za* + *informacijski sustav(i)* in the accusative case or another, similar prepositional construction.

5.3. As an alternative to the construction *information system(s)* + noun, the English of computing and information science frequently uses the more explicit construction noun + *of* + *information system(s)*, which is considered a free syntactic phrase and is never included as a term in specialist dictionaries. This construction, too, is regularly translated into Croatian by the construction noun + *informacijski sustav(i)* in the genitive case. Thus, if the process of translation is reversed, such Croatian terms as *planiranje informacijskih sustava* may be translated into English as *information system planning*, *information systems planning* and the *planning of information systems*.

<table>
<thead>
<tr>
<th>English</th>
<th>Croatian</th>
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<tbody>
<tr>
<td>a. the theory of information systems</td>
<td>teorija informacijskih sustava</td>
</tr>
<tr>
<td>b. a theory of information systems</td>
<td>pojedina teorija informacijskih sustava</td>
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The translation of such constructions into Croatian presents no difficulty. The usual equivalent is noun + *informacijski sustav(i)* in the genitive case.
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NAZIV INFORMACIJSKI SUSTAV U ENGLESKOM JEZIKU I NJEGOVE HRVATSKHE ISTOVRIJEDNICE

Sažetak

Osim što se upotrebljava kao samostalna jezična jedinica, naziv informacijski sustav u engleskom jeziku često se pojavljuje s drugim jezičnim elementima s kojima tvori složene nazive ili slobodne sintaktičke spojeve. Takve konstrukcije pripadaju trima osnovnim tipovima: (1) informacijski sustav upotrebljava se kao jezgra složenoga naziva ispred koje se kao atributi pojavljuju pridjevi ili imenice, (2) on se upotrebljava, i u jednini i u množini, kao atribut ispred drugih imeničkih jezgri i (3) on se često pojavljuje s prijedlogom of iza imenica ili imeničkih skupova koje takav sklop pobliže određuje. Ove tri vrste konstrukcija, kao i kolokacije naziva informacijski sustav s glagolima, potanje su razmotrone u članku sa stajališta njihova prevođenja na hrvatski jezik.

Ključne riječi: složeni naziv, informacijski sustav, prijevod, engleski, hrvatski.