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THE PHENOMENON OF SYNONYMY IN THE TERMINOLOGY FROM THE DOMAIN OF BIOMEDICAL ENGINEERING

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This paper aims at examining the notion of synonymy in the specialized languages, and how it is perceived in relation with the principle of univocity of designation and concept, fundamental for the study of terminology. The analysis of the provided examples is intended to illustrate the occurrence and distribution of synonyms in the terminology from the domain of biomedical engineering and the role of the phenomenon in the specialized communication in this particular domain.

Keywords: *terminology, term, specialized language, synonymy, equivalence, designation, concept.*

FENOMENUL SINONIMIEI ÎN TERMINOLOGIA DIN DOMENIUL BIOINGINERIEI MEDICALE

În lucrare ne propunem să examinăm noțiunea de sinonimie în limbajele specializate și modul în care este percepută în raport cu principiul univocității dintre desemnare și concept, principiu fundamental pentru studiul terminologiei. Analiza exemplurilor furnizate are scopul de a ilustra manifestarea și distribuția sinonimelor în terminologia din domeniul bioingineriei medicale și rolul fenomenului în comunicarea specializată în acest domeniu.

Cuvinte-cheie: *terminologie, termen, limbaj specializat, sinonimie, echivalență, desemnare, concept.*

Introduction

As terminology represents a system of concepts and designations which correlate in a way that makes the structuring and organization of the specialized knowledge in a domain possible, there is no doubt that a particular role in that process is played by the specific semantic relations that allow us to understand the patterns and the regularities that create the working mechanisms of that system.

One of the semantic relations which exhibit special interest is synonymy. Although widely present and welcomed in the general language as a means of creating variety of expression and enriching the vocabulary, specialized languages generally regard synonymy as a problem that impedes specialized communication which strives for clarity, precision and univocity.

The present study aims to give an insight into the phenomenon of synonymy, and how it is regarded from the perspective of specialized languages as well as specifically in the terminology from the domain of biomedical engineering through examples of synonymous terms according the classification provided by Maria Teresa Cabré.

Synonymy in the Terminology from the Domain of Biomedical Engineering

The International Organization for Standardization (ISO) defines synonymy as relation between differing designations that designate the same concept, i.e., having the same intension, in a given language. Designations in a synonymous relation are called synonyms. Given the same level of language, synonyms are interchangeable [1, p.25].

Besides the intention, which represents the internal content of a notion or the sum of the attributes contained in it, Josef Filipec and František Čermák emphasize that one more aspect that should be considered in identifying the extent of sameness and similarity is the distribution of synonyms. Where synonyms are identical with respect to both intention and distribution, full (or "exact") synonymy occurs; there will be partial (or "loose") synonyms in all other cases [2, p.41].

In her work "Terms in Context" Jennifer Pearson also reflects several points of view that could help comprehend the concept of synonymy and its major role. First perspective is provided by Ronald Landheer who defines a synonymous relationship as a bilateral relationship, one where the left hand side and the right hand side are equivalent in meaning and where one side can be substituted for the other without loss of meaning. He makes a distinction between *synonymie absolue* and *synonymie approximative*. Although the difference is not stated explicitly, it is possible to infer that there is absolute synonymy when two words have the same

referent and are in a two way replacement relation whereas there is approximate synonymy when two words have the same referent but are not interchangeable [3, p.171].

Another definition is provided by Ronald Carter who states that synonymy is essentially a bilateral or symmetrical sense relation in which more than one linguistic form can be said to have the same conceptual or propositional meaning. This does not mean that the words should be totally interchangeable in all contexts; but where synonyms are substituted changes in the propositional meaning of the sentence as a whole do not occur.

The above definitions examine synonymy as a phenomenon from the perspective of general language. Jennifer Pearson argues that when dealing with terms whose usage does not depend on the context, the idea that synonyms are totally interchangeable is preferred [3, p.172].

Radek Vogel stresses the idea that, in theory, one of the principal properties of terminologies should be unambiguous character of their components, terms. This is the perspective supported by the traditional school of terminology. Each term is assumed to have a well-defined denotation, and a concept should be expressed by a single term so that potential confusion is avoided. The reality, however, proves that the phenomenon of synonymy is present within the specialized languages as well [4, p.91]. Maria Teresa Cabré even considers that the aim of absolute uniformity of scientific terms is an artificial process unlikely to achieve its goals [5, p.35].

As we can see, the views regarding whether synonymy represents a problem in terminology, and whether or not it should be accepted as a natural phenomenon in a domain which speaks about standardization as a way to facilitate communication among specialists, vary greatly. For example, sociocognitive terminology proposed by Rita Temmerman asserts that synonymy, along with polysemy, frequently occur in specialized language, and must be included in any realistic terminological analysis [6, p.117]. According to Teija Pihkala, the socioterminological approach focuses on the social and situational aspects of specialized language communication, which may affect expert communication and give rise to term variation. Socioterminologists say that standardization is a chimera since language is in constant change. Synonymy is inevitably present in terminology and specialized texts, and the use of one term instead of another can reflect the knowledge, social and professional status of a group of users, as well as the power relationships between speakers. Terminological variation also points to the fact that concept systems and definitions are not static. This is a reality that any theory that aspires to explanatory adequacy must deal with [6, p.113].

When it comes to biomedical engineering the precision of reference and lack of ambiguity in terminological designation and usage play a crucial role because the human health and life become the main priority where there is no place for cases of miscommunication and mistranslations. As the name suggests, biomedical engineering is the interaction of medicine and engineering. The aim of biomedical engineering is the application of methodology and technology of physical sciences and engineering to the problem of living systems with emphasis on diagnosis, treatment and prevention of diseases in man [7, p.33-34]. Although the ideal case would be a complete univocity of concepts and their designations, synonymy represents a phenomenon which still occurs. Further, we will present examples of terms from the domain of biomedical engineering using the classification of synonyms provided by Maria Teresa Cabré. Each term will be accompanied by its definition, in order to illustrate the ground on which the relation of synonymy between the terms was concluded.

According to Maria Teresa Cabré, synonymy exists between units of various levels:

a. between a designation and its definition:

- *defibrillation* – the correction of rapid irregular contraction of the heart;
- *myograph* – an apparatus for recording the effects of the muscular contraction;
- *radioisotope* – an isotope that is radioactive produced artificially from the basic element by the action of neutrons, protons, deuterons or alpha particles in cyclotron by chain reaction. These are used as tracer with stable element (labeled) by injecting in body to study the functioning of organs;
- *sphygmomanometer* – instrument for measuring blood pressure (arterial) [7, p.10-12];
- *piezoelectric crystals* – crystals in the transducer of an ultrasound device that vibrate when an electric signal is applied, emitting high- frequency sound pressure waves. The crystals are the crucial component of an ultrasound device both producing and detecting the ultrasound waves used to image structures inside of the body [8];

b. between a designation and an illustration of the same concept;

c. between equivalent terms in different languages (in order to illustrate this case of synonymy Romanian equivalents for terms from the English language were chosen):

- *pneumograph* – the recording of the thoracic movement or volume change during respiration [7, p.11];
pneumograf – instrument pentru înregistrarea mișcărilor respiratorii [9, p.736];
 - *biomaterial* – any matter, surface, or construct that interacts with biological systems. Biomaterials can be derived from nature or synthesized in the laboratory using metallic components, polymers, ceramics, or composite materials. Medical devices made of biomaterials are often used to replace or augment a natural function. Examples include heart valves, hip replacements, and materials used regularly in dentistry and surgery [8];
biomaterial – denumire generală a oricărei substanțe (material) utilizate pentru producerea (confecționarea, fabricarea) de proteze sau de organe artificiale, implantabile sau nu, de materiale (metale (aliaje), ceramică, polimeri, derivați de carbon) utilizate în explorări sau în laboratoare de analize [9, p.218];
 - *immunofluorescence* – a biological staining technique in which the fluorescent signaling molecule is bound to an antibody to a protein of interest. When the “fluorescently tagged” antibody binds to its target protein the site or distribution of that protein can be visualized with the appropriate imaging devices [8];
imunofluorescență – tehnică de vizualizare prin microscopie în ultraviolet a antigenilor sau anticorpilor localizați în celule sau țesuturi cu ajutorul anticorpilor fluorescenți [9, p.527];
 - *laparoscope* – a thin, lighted telescope-like viewing instrument that is inserted through a small incision or natural orifice to examine and operate on abdominal and pelvic structures. Similar technology is used in an endoscope [8];
laparoscop – endoscop adaptat pentru a permite examinarea cavității abdominale [9, p.564];
- d. between designations of different functional languages:
- *neuroimaging/ brain imaging/ brain scanning* – includes the use of a number of techniques to image the structure and function of the brain, spinal cord, and associated structures;
 - *ultrasonography/ ultrasound* – a procedure which provides real-time medical imaging image inside the body without exposure to ionizing radiation [8];
- e. between alternative designations in the same historical language:
- *computed tomography/ computed axial tomography/ computerized axial tomography/ computerized tomography* – a computerized X-ray imaging procedure in which a narrow beam of X-rays is aimed at a patient and quickly rotated around the body, producing signals that are processed by the machine’s computer to generate cross-sectional images – or “slices” – of the body. These slices are called tomographic images and contain more detailed information about the internal organs than conventional X-rays;
 - *angiography/ arteriography* – a diagnostic X-ray imaging procedure used to see how blood flows through the blood vessels and organs of the body. This is done by injecting special dyes, known as contrast agents, into the blood vessel and using X-ray techniques such as fluoroscopy to monitor blood flow [8].

Strictly speaking, terminology only considers synonyms to be semantically equivalent units that belong to the same historical language and to the same formal register.

Synonyms for a single concept, however, do not always correspond to absolute equivalents, but rather manifest a range of possible cases. Sometimes there is synonymy between two semantically equivalent units in which one form is derived from the other. This sort of relationship occurs between:

a. initialisms and their full form:

- *iPSC = Induced Pluripotent Stem Cell* – a stem cell that is formed by the introduction of stem-cell inducing factors into a differentiated cell of the body, typically a skin cell;
- *MRI = Magnetic Resonance Imaging* – a non-invasive imaging technology used to investigate anatomy and function of the body in both health and disease without the use of damaging ionizing radiation. It is often used for disease detection, diagnosis, and treatment monitoring. It is based on sophisticated technology that excites and detects changes in protons found in the water that makes up living tissues;

- *OCT = Optical Coherence Tomography* – a technique for obtaining sub-surface images such as diseased tissue just below the skin. For example, ophthalmologists use OCT to obtain detailed images from within the retina. Cardiologists also use it to help diagnose coronary artery disease;
 - *PET = Positron Emission Tomography* – PET scans use radiopharmaceuticals to create 3 dimensional images. The decay of the radiotracers used with PET scans produce small particles called positrons. When positrons react with electrons in the body they annihilate each other. This annihilation produces two photons that shoot off in opposite directions. The detectors in the PET scanner measure these photons and use this information to create images of internal organs [8];
- b. abbreviations or clippings and their full form:
- *gastroscopy = esophagogastroduodenoscopy* - a diagnostic endoscopic procedure that includes visualization of the oropharynx, esophagus, stomach, and proximal duodenum [10].

In other cases, two designations are synonymous only in a very narrow linguistic sense and are not synonymous in a pragmatic sense. There are many cases of two synonymous units that belong to two different registers of the same language, but this does not usually appear in a single specialized dictionary. This dissymmetry occurs in cases like the following:

- a. between a scientific name and its popular name;
- b. between a standard form and a dialectal form [11, p.109-110].

As terms from the domain of biomedical engineering have a high degree of specialization, the criterion of registry variation in terminological synonymy cannot be applied.

Conclusions

In conclusion we can say that although synonymy is considered to disrupt the fundamental principle of terminology and specialized languages, specifically the principle of univocity of designation and concept, it is a phenomenon that nonetheless occurs, proven by the examples provided above, even in such domains as biomedical engineering where the precision and clarity have a crucial role. However, we can observe that most of the synonymous terms from this domain are totally interchangeable, thus minimizing the negative effect of synonymy on the specialized communication.

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