HOME AND CLOTHES: A CASE OF PROLIFIC METAPHOR CREATION IN ENGINEERING (SPANISH AND ENGLISH)

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Abstract

This paper aims to delve into figurative language productivity in engineering and on examples of lexicalization and meaning construction. Particularly we focus on the domain of objects associated to homes and clothes. We believe that this type of analysis can shed light into the study of knowledge representation and improve understanding of technical language. We argue that metaphorical correlations are established on the grounds of (1) resemblance, either perceptual or functional (Evans 2013) and (2) metonymic relations of PART/WHOLE, CAUSE/EFFECT. The Spanish and English cross-linguistic study proves that one-to-one metaphorical correspondences are rare. The results lead us to attribute a similar role to imaginative, experiential, cultural, and sociohistorical factors in the construction of meaning in engineering through metaphor and metonymy.

Keywords: Engineering metaphor and metonymy, multimodal aspects of metaphor, cross-linguistic cognitive analysis..

1. Introduction

The main aims of this paper are first to explore two prolific metaphoric mappings in engineering and their cognitive and metaphoric background as reflected in Spanish and then to contrast them with English. Engineering language tends to borrow from a variety of source domains that are related to everyday activities like cooking, eating, family relations, attire and familiar objects (household utensils and furniture), or linked to animals or trees. This point has been proved in broader research work that analyses metaphorical associations arising from a great diversity of domains such as the medical, zoomorphic, social or culinary ones at both conceptual and linguistic levels either in Spanish or English (Cuadrado et al, 2015, Roldán and Molina, 2013 and 2015). The two conceptual mappings analysed in this paper can be formulated as PARTS OF BUILT STRUCTURES ARE HOME OBJECTS and PARTS OF BUILT STRUCTURES ARE PARTS OF CLOTHING and they seem to be structured according to certain perceptual resemblance features projected across domains. The lexicalization of these mappings present language

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specific differences in English and Spanish that respond to cross-cultural reasons according to which each language finds its own way to construct meaning and hence would coin terms differently. Besides, metaphor can appear in various modalities, for example, verbally or in images or both fused together (Forceville, 2010).

In the next sections, Spanish civil engineering metaphors are examined and contrasted with their English counterparts. The metaphors included can be linguistic or visual and they pertain to the conceptual mappings mentioned above. Some linguistic examples along with their literal (non-technical) English meanings are quoted below:

(1) From the source domain *Home objects*, we have identified these examples: *silla* (chair), *asiento* (seat), *banqueta* (banquette), *tablero* (wooden board), *cuchara* (spoon), *rodillo* (roller), *relleno* (filling), *bandeja* (tray), *vaso* (cup), *zócalo* (skirting board), *cortina* (curtain), *lecho* (bed), *aguja* (needle), *cuenco* (bowl), *manta* (blanket). All of them have a technical meaning in civil engineering.

(2) From the source domain *Clothes/items of clothing*, our technical examples include: *capa* (cloak), *cordón* (lace), *faja* (girdle), *anillo* (ring), *tacón* (heel), *tirante* (braces), *correa* (belt), *abrigo* (coat), *calzón* (shorts), *camiseta* (vest), *cremallera* (zip), *abanico* (fan), *faldón* (tail, skirt).

2. Theoretical framework

Figure 1. *Ring* **"anillo" of a tunnel**

Conceptual mappings are distinguished from image mappings within Conceptual Metaphor Theory (CMT). The former "maps one conceptual domain onto another, often with many concepts in the source domain mapped onto many corresponding concepts in the target domain", whereas image metaphor "maps one image onto another image" (Lakoff, 1993:228). Both types of mappings are relevant in this work, since images pervade in engineering communication and are often represented in metaphorical ways (Roldán and Úbeda, 2013, Cuadrado et al, 2015). Some examples of image metaphor understood as perceptual correspondences across domains were singled out in this study. For example, *ring* which is conveyed in Spanish as "anillo". In civil engineering, a *ring* can be defined as a built element that serves to line a tunnel and is visually inferred from

perceptual features such as a circular surrounding metallic object. As illustrated in figure 1, the perceptual resemblance of these engineering elements with a familiar object of attire is metaphorically transposed.

On the other hand, we have also drawn from Evans's theory of Lexical Concepts and Cognitive Models (LCCM) (Evans, 2013:75) that argues for the role of discourse metaphor as distinct from conceptual metaphor in the study of figurative meaning. This author claims that evidence for metaphor should not be reduced to conceptual metaphor alone; instead other lexical aspects within the progression of discourse are to be taken into account. Evans (2013: 76) argues that linguistic context and its own dynamicity can create metaphorical meaning as "mental representations", which somehow completes the role of conceptual metaphor. In particular, this theory serves to point out the complementarity of the lexical and conceptual level in engineering metaphor since both of them are important to create meaning.

Moreover, in our analysis we have added the role of visuals, which very often serve to disambiguate meaning in cross-linguistic analysis. For example, as shown in figure 2, a container used for digging and moving earth that is attached to a machine is conveyed into Spanish *cuchara* "spoon", whereas in technical English the corresponding term is *bucket*. Interestingly, the visual illustration helps to clarify the different perceptual ways of conveying the linguistic metaphor.

Figure 1. *Cuchara* **"bucket" of an excavator**

3. Methodology

The engineering metaphors included in this paper were identified following Conceptual Metaphor Theory (Lakoff and Johnson, 1980; Lakoff, 1993), Conceptual Blending (Fauconnier and Turner, 2002) and Conceptual Cognitive Lexical Model (CCLM) (Evans, 2013) criteria. Possible metaphors were first extracted and identified manually from Spanish engineering journal articles corpora and specialised glossaries and dictionaries. Since this paper focuses on mapping structures referred to as home objects and parts of clothing in Spanish technical examples and their correspondences in English, we also carried out a cross-linguistic study. Technical cross-linguistic correspondences are shown in the next section and the linguistic metaphors analysed are listed below together with their literal non-technical English translations according to the mapping they represent:

(1) Examples from the mapping PARTS OF STRUCTURES ARE HOME OBJECTS:
silla (chair), *asiento* (seat), *banqueta* (banquette), *tablero* (board), *bandeja* (tray), *cajón* (drawer), *cubierta* (cover), *pala* (slice), *enrejado* (lattice), *pantalla* (screen), *lecho* (bed), *mortero* (mortar), *cuchara* (spoon), *cucharón* (ladle), *paleta* (fish slice), *rodillo* (roller), *relleno* (filling), *vaso* (cup), *zócalo* (skirting board), *cortina* (curtain), *cuenco* (bowl), *aguja* (needle), *almohadillado* (padding), *tapón* (cap).

(2) Examples from the mapping PARTS OF STRUCTURES ARE PARTS OF CLOTHING:
Capa (cloak), *túnica* (robe), *tirante* (suspenders), *tacón* (heel), *faja* (girdle), *cinta* (ribbon), *cinturón* (belt), *cremallera* (zip), *calzón* (pants), *camiseta* (shirt, vest), *abanico* (fan), *faldón* (skirt, long dress), *anillo* (ring), *cordón* (lace), *zapata* (boot), *manguito* (over-sleeve).

4. *Analysis and Results*

Following CCLM tenets on metaphor, we took into account the development of the lexical level in our analysis of figurative language. Accordingly, we have found that the Spanish linguistic examples that surface the underlying conceptual mappings could be arranged according to three categories:

(1) Perceptual resemblance. Engineering parts that resemble shape, colour, size or other visual prominent feature of the target domain get fused with features of the source domain. For example, the shape in *rodillo* (technical Eng.: *roller)*, a compacting machine for road construction that resembles the shape of the kitchen object (functional resemblance could be also inferred), or the resemblance in height inherent in *tacón* (technical Eng.: *heel*).

(2) Functional resemblance. For instance, engineering elements that integrate a similar function as correspondences in the source domain: e.g. *cajón* (technical Eng.: *box*) having the function to hold a certain quantity of concrete and so resembling the function of the home object, or *cuchara* (technical Eng.: *bucket*) a machine to dig and transport earth or other material.

(3) Metonymic relations. For example, engineering parts that take PART FOR WHOLE, CAUSE/EFFECT or PRODUCT FOR PRODUCER: *tirante* (technical Eng.: *stay*) cable to support a deck in cable-stayed and in suspension bridges, *pantalla* (technical Eng.: *wall*) type of barrier to strengthen the structure or retain a force, or *mortero* (technical Eng.: *mortar*) which primarily designates a receptacle to grind substances though in engineering it is a type of ground material or compound used for bonding bricks.

These three criteria have been applied in the examples included in tables 1, 2 and 3 along with their literal non-technical translation in English:

Table 1. Lexical metaphor based on visual /perceptual resemblance

Domain: Home objects	Domain: Parts of clothing
cajón (drawer), *enrejado* (lattice), *cuchara* (spoon), *cucharón* (ladle), *roller* (rodillo), *aguja* (needle), *pantalla* (screen), *almohadillado* (padding).	*anillo* (ring), *abanico* (fan), *cremallera* (zip).

The terms included in table 1 are perceptually (sight, touch) similar to objects that pertain to the domains of home objects or to parts of clothing, as illustrated in figure 3.

Figure 3 *Enrejado* **"lattice"**

The next category was established according to the preponderance of functional resemblance in the metaphors which are included in table 2.

Table 2. Metaphor based on functional resemblance

Domain: Home objects	Domain: Parts of clothing
silla (chair), *asiento* (seat), *tablero* (wooden board), *rodillo* (roller), *relleno* (filling), *vaso* (cup), *zócalo* (skirting board), *cortina* (curtain), *cuenco* (bowl), *cuchara* (spoon), *cajón* (drawer), *pantalla* (screen).	*zapata* (boot), *capa* (cloak), *tirante* (suspenders), *cremallera* (zip).

Some examples can be at the same time perceptually and functionally similar, for instance in the case of *rodillo* (roller) or *cremallera* (zip), illustrated in figure 4.
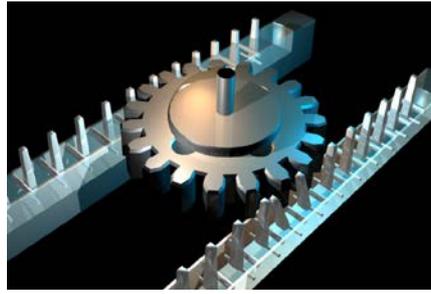
Figure 4. *Cremallera* **(zip)**

The third group consists of metaphorical mappings merged with metonymy; the interacting relations could be cause/effect or part/whole. Table 3 contains various lexical examples of this kind.

Table 3. Metaphor and metonymic relations

Domain: Home objects	Domain: Parts of clothing
mortero (mortar) (cause/effect), *silla* (chair) (part/whole), *pantalla* (screen) (cause/effect), *lecho* (bed) (cause/effect), *aguja* (needle) (part/whole).	*tacón* (heel) part/whole, *tirante* (suspenders) (cause/effect).

In the case of *tirante* (suspenders), illustrated in figure 5, two planes seem to be working: (1) the functional metaphor of cables that support the deck of a bridge resembling the elastic bands that support trousers, and (2) the metonymic relationship that associates the (pulling) action with the object.
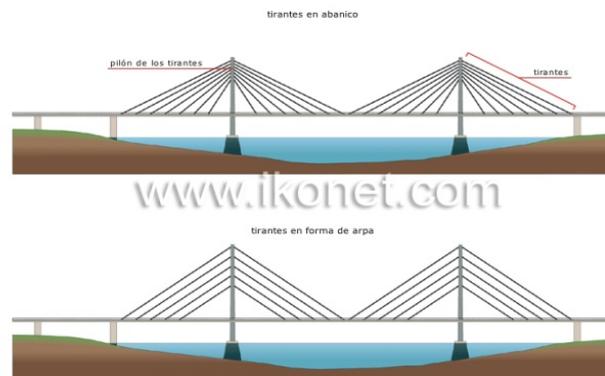

Figure 5. *Tirante* **"suspenders"**

To sum up, in some cases, examples can be integrated in more than one category like "cuchara" (spoon) where the resemblance can be understood perceptually and

functionally, and "aguja" (needle), a special beam that supports a load, which involves both a part/whole and cause/effect metonymic relation and also perceptual resemblance. "Pantalla" can be understood attending to perceptual, functional and metonymic patterns, since the constructed wall serves as a barrier (cause/effect). So far, our study has focused on two conceptual mappings and ensuing lexical metaphor in engineering used in Spanish. The next subsection deals with the contrastive study of the technical terms included in these mappings in Spanish and English.

Spanish-English cross-linguistic analysis

As Lakoff (1993: 246) points out conceptual mappings and also their linguistic manifestations are likely to be culture and language specific. Since the two metaphoric engineering mappings studied in this paper are enacted in Spanish it would make sense to see possible technical correspondences in English. So far we have used literal translations to make the Spanish metaphors understandable. The first two columns of table 4 include lexical correspondences between the engineering Spanish metaphors and English, the third column explains whether the Spanish linguistic metaphor is kept in English. The question of whether they share the same conceptual metaphors in the domains of home objects and parts of clothing is elucidated in column 4. Column 5 includes possible lexical correspondences in both languages.

The results show that with some exceptions it is not frequent to find one-to-one lexical correspondences between Spanish and English, 10 out of 35 (28.5%), shown in column 5 of table 4. However, this does not mean that in English the number of lexical metaphors is lower. In fact, the third column shows the existence of 75% English lexical metaphors although they do not exactly match a Spanish counterpart. The question at this point would be: Is there conceptual correspondence in these specific mappings in both languages? In other words, do the Spanish/English examples share the same conceptual metaphors? We can see in the fourth column that actually there is a remarkable matching in conceptual metaphors 16/35 (45.7%) with slightly more cases pertaining to the domain of home objects. On the other hand, the coincidental linguistic metaphors exemplified in column 3, such as *banquette, lattice, bed or roller*, seem to be based on perceptual resemblance features, something suitable to be culturally shared. However, although some examples are metaphoric and could be grouped under the same conceptual metaphor, they do not represent a lexical match, as in the case of *blanket, saddle* or *apron*, since their literal counterparts would be *cloak*, *chair* and *girdle*.

In far more cases, although the English counterpart is prone to be a linguistic metaphor (*saddle, settlement, deck, skip*), the conceptual metaphor is a different one. A few more examples (*needle beam, sleeve anchor*) that happen to be

collocates in English seem metaphor-doubtful as they partly evoke a metaphorical image (*needle, sleeve*) yet semantically the technical meaning prevails. Finally, *ring, belt, heel, footing, lacer, lattice,* or *bed,* are fully metaphoric counterparts.

Table 4. Engineering metaphoric correspondences (Spanish-English)

Engineering Spanish Metaphor	English equivalent	Linguistic metaphor in both	Sharing conceptual metaphor	One to one lexical correspondence
silla	*saddle*	Yes	No	No
asiento	*settlement*	Yes	No	No
banqueta	*banquette*	Yes	Yes (Home)	Yes
tablero	*deck*	Yes	No	No
bandeja	*skip*	Yes	No	No
cajón	*box, caisson*	Yes	No	No
cubierta	*roof*	No	No	No
cuenco	*basin*	Yes	Yes (Home)	Yes
enrejado	*lattice*	Yes	Yes (Home)	Yes
pantalla	*wall*	No	No	No
lecho	*bed*	Yes	Yes (Home)	Yes
mortero	*mortar*	Yes	Yes (Home)	Yes
cuchara	*bucket, scoop*	Yes	Yes (Home)	No
cucharón	*bucket grab*	Yes	No	No
paleta;	*float*	No	No	No
relleno	*fill*	Yes	Yes (Home)	Yes
rodillo	*roller*	Yes	Yes (Home)	No
cortina	*levee, contention*	No	No	No
aguja	*needle beam*	Partly	Partly (Home)	Partly
almohadillado	*backing*	No	No	No
capa	*layer*	Yes	No	No
capa impermeable	*blanket*	Yes	Yes (Home)	No
cordón	*lacer*	Yes	Yes (Clothing)	Yes
faja	*apron*	Yes	Yes (Clothing)	No
faldón	*hip, pitch*	Yes	No	No
anillo	*ring*	Yes	Yes (Clothing)	Yes
zapata	*footing*	Yes	No	No
manguito	*sleeve anchor*	Partly	?	Partly
tacón	*heel*	Yes	Yes (Clothing)	Yes
tirante	*stay, tie*	Yes	No	No
correa	*purlin*	No	No	No
túnica	*coat, envelope*	Yes	Yes (Clothing)	No
cinturón	*belt*	Yes	Yes (Clothing)	Yes
calzón	*wye branch*	No	No	No
cremallera	*rack, gear rack*	Yes	Yes (Home)	No

All in all, the main findings of our analysis can be summed up as follows:

a) Linguistic metaphors are mainly governed by resemblance, contiguity (metonymic) and functional relations and are situated at a lexical and

semantic level. They are influenced by context and act dynamically according to context conditions by reinforcing each other. For instance: (1) *zapata* (boot) reinforces *tacón* (heel) since both are related to footwear; (2) *silla* (saddle), *asiento* (seat) and *banqueta* (banquette) seem to be lexical inferences; (3) *cinta* (ribbon) is linked to *cinturón* (belt), and (4) *cuenco* (basin) reinforces *vaso* (cup) through semantic affinity.

b) Although conceptual metaphor can give a kind of consistency to the mappings it could also restrain semantically the type of lexical metaphor, thus in Spanish some engineering mappings are linked to home and clothing objects, and not to plants or cars. Despite this, meaning is able to emerge in different ways, for example through image analogy or resemblance. In addition, whereas lexical choice tends to be language specific, meanings are visually alike.

5.   *Conclusions*

This paper has examined the conceptual mappings PARTS OF BUILT STRUCTURES ARE DOMESTIC OBJECTS and PARTS OF BUILT STRUCTURES ARE PARTS OF CLOTHING and their articulation in Spanish to create meaning. We have seen that besides conceptual metaphor it is important to consider linguistic metaphors and the lexical and semantic interrelations that govern them, due to perceptual, functional and metonymic resemblance. In engineering, images which are perceptually entrenched through background knowledge can also be metaphoric and have proved to play an important role. For example, a tunneling *ring* can evoke the familiar object as to its shape and encircling function. The Spanish and English cross-linguistic study proves that one-to-one metaphorical correspondences are uncommon, due to cross-cultural reasons according to which each language finds its own way to construct meaning and hence would coin terms differently. However, it would be interesting to study coincidental patterns. Further research on the interplay of conceptual and linguistic metaphor in meaning construction and establishing the role of images to understand engineering communication as a whole could prove useful. The conclusions lead us to attribute a similar role to imaginative, experiential, social, interpersonal and cultural factors in the construction of meaning through metaphor and metonymy in engineering. We believe that this type of analysis can shed light into the study of knowledge representation and improve understanding of technical language.

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