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Translation Strategies for Cultural Contents of Scientific and Technical Texts

Abstract

This empirical research seeks to study the strategies used in translating cultural contents of scientific and technical texts. Taking a social-cultural approach, the study applies and develops the cultural categories and sub-categories of Newmark, which are widely drawn upon by translation scholars, and examines 40 English texts along with their Mandarin Chinese translation texts in order to identify the source cultural contents and their corresponding translation strategies. Among these, 20 English texts were selected from the website of Financial Times, and 20 English texts were selected from the website of Shell, a global group of energy and petrochemicals companies, both having a large readership. It is found that cultural contents happen both in texts that report science and technology and in texts that are aimed at the end users of technological products. It is also found that FT translators and Shell translators have some in common in their strategies used to translate relevant cultural contents, but at the same time also show differences. The implications of these findings are then discussed in specific relation to the training of scientific and technical translators, and in general relation to the field of scientific and technical translation. [1]

1. Introduction

Unlike other texts such as literary ones, it remains a topic of debate whether or not scientific and technical texts are culturally flavoured. This possibly explains why scholars of scientific and technical translation often start their work by explicitly contending that scientific and technical texts are cultural. Kastberg, for example, states that "we have a basis for arguing against what still seems be to a generally accepted idea, namely the culturelessness of technical culture" (2007, p.104). He further proposes to prioritise cultural competence in technical translation by showing that "cultural issues are not merely a curiosity of certain

[1] An earlier version of this paper was presented at the European Academic Colloquium on Technical Communication Studies, held on 28 April 2017 at the University of Leuven, Campus Sint-Andries, Antwerp, Belgium, and later at the research seminar held on 24 May 2017 at the author's department. The author is grateful for the comments received at both events and the paper is revised accordingly. All errors remain the author's.

technical genres, but in fact inherent to technical communication as a whole" (p.104). More recently, Byrne (2014) echoes this view by saying that "[w]hile the common view of scientific writing is that it is dry, highly objective and impartial, with all traces of style and linguistic creativity chased from the discourse like a fox from a chicken coop, the reality is quite different" (pp.2-3). Citing Locke (1992), who "dismantles" the idea that in scientific discourse there is no place for cultural elements such as metaphors, Byrne makes the call that "[t]he implication of this for translators, then, is that they must be able to recognize and negotiate culture-bound metaphors in much the same way as literary translators must" (p.3).

In line with the above as well as other studies such as Wright & Wright (1993), Montalt & González Davies (2014), Szal (2014), Karimnia (2015), Olohan (2016), the current research seeks to provide further evidence that scientific and technical texts contain cultural elements. Additionally, the research studies how cultural elements, if existent, are translated by professional scientific/technical translators.

The author holds the view that the study is important also because currently "a major amount of translation work being done all over the world is scientific-technical translation" and "[i]t has been estimated that technical translation accounts for some 90%" (Karimnia, 2015, p.28). And according to Byrne (2014, p.3):

> In today's information age, the role of scientific and technical translation is more important than ever. It has facilitated some of the most significant scientific and technological advances of recent decades. These advances have transformed our daily lives to the extent that the world around us is virtually unrecognizable from fifty, or even twenty, years ago. Virtually every aspect of our lives from education and work to entertainment, shopping and travel has been swept along by a seemingly unstoppable wave of new inventions and technological advances. What many people do not realize is that these inventions and advances are accompanied at almost every step of the way by translation in its capacity as a vehicle for disseminating scientific and technical knowledge.

2. A brief review of literature

2.1 The concept of culture

There are two approaches in literature to cultural issues in translation. One takes the concept of culture for granted and one starts with defining it. The former approach is represented by Baker (2011) and Olohan (2016). With an implicit approach, Baker for example discusses in great detail culture-specific non-equivalence issues and the strategies used by professional translators. Olohan on the other hand dots in her book examples for cultural issues, such as brand names, interpersonal references, rhetorical strategies, humour, and makes the following point to scientific and technical translators:

> Translation, as communication, is inherently social and intercultural, thus also requiring you to acquire knowledge, understanding and skills to communicate and act as an intercultural specialist (p.15)

Scholars in the latter approach mentioned above are in the majority. Taking the perspective that "defining [culture] delimits how it is perceived and taught", Katan reviews various definitions of the concept (2004, p.25), and reveals that by 1952, there were 164 definitions and from then on the number has been growing without a single definition agreed upon between scholars. Among these definitions, some are very long, such as that by Goodenough (1964, cited in Snell-Hornby, 1995) and some are very short, such as that by Newmark (1988), both reproduced below:

> As I see it, a society's culture consists of whatever it is one has to know or believe in order to operate in a manner acceptable to its members, and do so in any role that they accept for any one of themselves. Culture, being what people have to learn as distinct from their biological heritage, must consist of the end product of learning: knowledge, in a most general, if relative, sense of the term. By this definition, we should note that culture is not a material phenomenon; it does not consist of things, people, behaviour or emotions. It is rather an organisation of these things. It is the forms of things that people have in mind, their models for perceiving, relating, and otherwise interpreting them. As such, the things people say and do, their social arrangements and events, are products of by-products of their culture as they apply it to the task of perceiving and dealing with their circumstances. To one who knows their culture, these things and events are also signs signifying the cultural forms or models of which they are material representations (Goodenough 1964, cited in Snell-Hornby 1995, pp.39-40).
>
> I define culture as the way of life and its manifestations that are peculiar to a community that uses a particular language as its means of expression. More

> specifically, I distinguish “cultural” from “universal” and “personal” language. (Newmark (1988, p.94).

While the definitions of culture are varied on the surface level as can be seen from the above two, a lot of definitions share the core meanings of the concept: culture is social, not universal, and belongs to a group or community, not individuals. These meanings are either implied or explicated by the scholars cited above, and are also represented in one of the definitions in the 21st century, as below:

> We think of culture as made up of the diverse repertoires of practices, values, and beliefs that individuals use to engage and make sense of the world to accomplish purposes valued by them and the communities in which they participate (Medin & Bang, 2014, p.13622).

In the current research, the author also takes this social perspective and in particular adopts Newmark’s definition of culture, for two reasons. Firstly, despite his rather short definition, Newmark has proposed sub-categories of culture (See Section 2.2) and these sub-categories provide great operational ease for the author to identify the cultural contents in scientific and technical texts. Secondly, Newmark’s cultural categories are also drawn upon by scholars of scientific and technical translation. For instance, Montalt and González Davies (2014) denote the following as cultural contents of medical texts:

> Any kind of expression (textual, verbal, non-verbal or audiovisual) denoting any material, ecological, social, religious, linguistic or emotional manifestation that can be attributed to a particular community (geographic, socio-economic, professional, linguistic, religious, bilingual, etc.) and would be admitted as a trait of that community by those who consider themselves to be members of it. Such an expression may, on occasions, create a comprehension or a translation problem (p.177).

Of note is that some scholars doing similar research (e.g. Szal, 2014, Karimnia, 2015) use Stolze’s (2009) model of cultural categories. In this model, culture refers to the culture unique to the community of science and technology people and is sub-divided into culture of word use, syntax, text and pragmatics, though Karimnia (2015) has added to it style as a new category. This approach consequently leads us to recognise scientific and technical texts as examples of language for specific purposes, which results in genre studies that distinguish scientific and technical texts from texts on other subjects. The current research takes a

different perspective. It sees scientific and technical texts as texts in a big pool at the macro social level and examines whether or not the kind of cultural issues generally common to texts on other subjects are also observable in texts on science and technology and how professional scientific and technical translators are dealing with them thereafter. As such, the current research excludes "terminologies" from data, unlike Byrne (2014), Kastberg (2007), Szal (2014), or Karimnia (2015). However, if a word used in a scientific or technical text involves elements of common social culture, then it will be part of the data for examination. To illustrate, Kastberg (2007) mentions the word "soldar", which is a specialised terminology and yet is used in overlapping but different technical senses in English, German and Danish, which poses a translation problem. The current research does not study specialised terminologies like this as used by specialists in a specialised field. On the other hand, for the word "notorious", for example, since it carries with it social connotations, it would be regarded as a cultural word for social culture in Newmark's categories, and be included in the current research for how it is translated into Chinese if it is used in scientific or technical texts that are studied.

2.2 sub-categories of culture

As mentioned earlier, Newmark's (ibid.) sub-categories of culture are useful for identifying the cultural contents of a text. There are five such sub-categories, as below.

(1) Ecology: Flora, fauna, winds, plains, hills. This kind of cultural information present in a text includes ecological features, typically geographic ones. In the current research, names of people, places and countries all belong to this category.

(2) Material culture (artefacts): food, clothes, houses/towns, transport. The identification of such cultural contents is straightforward, but the translation of such contents is not. In the current research, brand names are put under this category, as they represent technological products, such as clothing fabric.

(3) Social culture: work and leisure. Cultural words or expressions that fall into this category are those that have social or political connotations, such as "the proletariat", "the masses". Newmark also includes in this category archaisms that are used ironically or humorously in a text, and are therefore often put in inverted commas. As mentioned earlier, the word "notorious" for instance is a cultural word in the category of social culture due to its connotations.

(4) Organisations, customs, activities, procedures, concepts: political and administrative terms (including institutional terms such as the head of state, political parties, public bodies, local governments and posts), international terms, religious terms, artistic terms.
(5) Gestures and habits. Gestures and habits are attached with different meanings in different culture, such as spitting as a blessing, nodding to dissent or shaking one's head to assent.

In the current research, the author ventures to add to its data "figures of speech" as a new sub-category of cultural contents. This is because figures of speech are often cultural, as noted by Newmark (ibid.), Byrne (ibid.), Montalt & González Davies (ibid.), etc., though interestingly none of them include this in their discussions of culture.

2.3 Translation strategies

Cultural contents pose translation problems (e.g. Montalt & González Davies, 2014; Baker, 2011; Katan, 2004; Newmark 1988), and this calls for the ways to deal with them. Newmark (ibid.) uses the term "translation procedure" in referring to them whereas Baker (2011) and Katan (2004) both use "translation strategy". The current research follows Baker and Katan, and uses "translation strategy" to refer to the ways to resolve translation problems, particularly because in Chinese the word "strategy" suggests a method whereas the word "procedure" has more to do with a step in a process of doing things.

Scholars have recommended various ways for resolving translation problems, with different or similar labels. These roughly fall into the fifteen main translation strategies discussed in Newmark (ibid.) under the label "translation procedures", as follows.

(1) Literal translation. This a basic strategy from which all translation starts until there is a problem for doing so, which will lead to a translation not making sense. It operates at the word level, the sentence level and the textual level.

(2) Transference. This refers to the use of a transference word or transcript in a translation text. Typical cases where transference is recommended are names of all living and most dead people, geographical and topographical names, names of periodicals and newspapers, titles of as yet untranslated literary works, plays, films, etc., names of private companies and institutions, names of public or national institution unless they have recognised translation, street names, addresses.

(3) Naturalisation. This strategy succeeds transference and adapts a source word to the normal pronunciation, then to the normal morphology of a target language.

(4) Cultural equivalent. This is an approximate translation where a source language cultural word is translated by a target language cultural word, if an equivalent is existent.

(5) Functional equivalent. According to Newmark (ibid.), this strategy applies to cases where a source language cultural word does not have an equivalent and as a result a culture-free word is used in translation. As such, this strategy neutralises or deculturalises the source word. In the current research, the word "neutralisation" is used for this strategy.

(6) Descriptive equivalent. At the term itself suggests, this translation describes what the referent of a source word is like as well as its function(s) sometimes.

(7) Synonym. In this strategy, a near target language equivalent to a source language word is used. But some connotations may be lost as a result.

(8) Through translation. This strategy is often used for translating the names of organisation. Though by nature literal translation, it does not look after collocation issues like the strategy of literal translation.

(9) Shifts or transposition. This strategy involves the change of parts of speech of a source language word.

(10) Modulation. In this strategy, there is a change of viewpoint or perspective and very often a category of thought. Typical changes are part for the whole, abstract for concrete, cause for effect, one part for another, active for the passive, space for time, change of symbols.

(11) Recognised translation. According to Newmark (ibid. p89), "you should normally use the official or the generally recognised translation of any institutional term. If appropriate, you can gloss it and in doing so, indirectly show your disagreement with this official version".

(12) Compensation. "This is said to occur when loss of meaning, sound-effect, metaphor or pragmatic effect in one part of a sentence is compensated in another part, or in a contiguous sentence" (ibid. p.91).

(13) Reduction and expansion. As the terms suggest, they are imprecise translation strategies.

(14) Paraphrase. In this strategy, the translation is an amplification or explanation of the meaning of a segment of a source text.

(15) Notes. This strategy supplies additional information in a translation. “The additional information a translator may have to add to his version is normally cultural (accounting for difference between SL and TL culture), technical (relating to the topic) or linguistic (explaining wayward use of words), and is dependent on the requirement of his, as opposed to the original, readership” (ibid. p.91). Notes can be in a translation text, at the bottom of a page, at the end of a chapter or at the end of a book.

It is worth noting that a translator may combine more than one strategy when trying to resolve a translation problem. Depending on the number of translation strategies combined, the new strategy is called a couplet, triplet, quadruplet, etc. by Newmark (ibid.).

To summarise section 2, the current research draws upon Newmark and has developed six cultural categories in order to identify the cultural contents in the scientific and technical texts studied. In order to examine how these cultural contents are translated, the research generally follows Newmark’s categorisation of different ways of translating, but uses a different umbrella term “translation strategy” and uses “neutralisation” to replace “functional equivalence” in Newmark’s terminologies.

3. Methodology

According to Olohan (ibid. pp.4-5), scientific and technical texts “for which translations are likely to be commissioned” generally have two focuses. The first is on “the communication of scientific knowledge”, e.g. specialised scientific research, popular science reporting. The second pertains to “the design, delivery and use of technical products […] aimed at end users”, e.g. instruction manuals, patent specifications. The current research has chosen texts that respectively represent these two focuses of aim, with the view to examining translation strategies for cultural contents.

Also according to Olohan (ibid.), there are five types of scientific and technical texts or genres: technical instructions, technical data sheets and technical brochures, patents, scientific research articles and abstracts, and finally popular science. The current research chooses the last category, i.e. popular science, for the reason that this genre of scientific and technical texts has a very large readership and if such texts contain cultural contents, then relevant findings will be more meaningful for the research purposes.

3.1Data sources

The newspaper Financial Times (FT) is chosen to represent texts intended to communicate scientific knowledge, whereas the official website of Shell is chosen to represent texts aimed at end users. Both sources are chosen for research because they both operate internationally aimed at the general public and both have a full Chinese version, thus allow more random selections of source and target texts for study.

"The Financial Times (FT) is one of the world's leading news organisations, recognised globally for its authority, integrity and accuracy. The FT provides a broad range of essential services, including news, comment, data and analysis, to a growing audience of internationally minded professionals" (FT, 2017; accessed on 19 May 2017). The researcher believes the study of the translation of cultural contents, if existent, in its news reports of science and technology will be significant.

Similarly, Shell is "a global group of energy and petrochemicals companies" and "aims to meet the world's growing demand for energy in ways that are economically, environmentally and socially responsible" (Shell 2017; accessed on 19 May 2017). The website information is mainly for users of its products, and also reports its own technological innovations to its end users. Olohan (ibid.) recommends the website of international scientific and technical companies as a good data source for those studying the translation of technical texts and mentions JCB (www.jcb.com), which is a manufacturer of construction equipment. Shell was chosen over JCB because the researcher believes the former's products reach more customers and thus research findings may be more representative.

3.2 The data: size of sample and coding

In total, 20 English texts were randomly selected respectively from the websites of Financial Times (https://www.ft.com/?edition=uk) and Shell (http://www.shell.co.uk/). They were then read against their respective Chinese translations. Typically, a source text from Financial Times is over 900 words and a source text from Shell is around 300 words.

All cultural contents are identified and their translations extracted. Both were then transferred into an Excel spreadsheet. The spreadsheet pages were set up according to the cultural categories, and sub-categories if applicable, set in Section 2.2. The translation strategy for each case of cultural contents was manually coded and counted.

Frequency of use of a particular translation strategy was calculated within each of the cultural categories, or a sub-category if this applies. Repeating cases of cultural contents were counted only once unless a different translation strategy is used at different occurrences of cases.

4. Data: analysis and results

In all, 7 types of cultural contents are identified in the 40 texts studied. This result is presented in the table below:

Table 1: types of cultural contents in scientific and technical texts

Types of cultural contents	**Number of cases from FT**	**Number of cases from Shell**
1. Ecology	92	34
2. Material culture	35	18
3. Social culture	10	38
4. Political/administrative institutional terms	92	49
5. Figures of speech	131	41
6. Historical terms	2	1
7. Terms for international institutions	0	6
Total number of cases of cultural contents	362	187

As can be seen, there are overall 362 cases of cultural contents in the Financial Times texts and 187 cases in the Shell texts. On the surface, it looks that cultural contents happen less frequently in the Shell texts. This is probably because the Shell texts are much shorter than those from Financial Times. As aforementioned (See Section 3.2 above), a Shell text is typically around 300 words, approximately one third of the length of a Financial Times text. The researcher believes that if the Shell texts were as long as the Financial Times texts, then cultural information might happen as frequently.

It is clear that among the seven types of cultural contents identified, five types happen very frequently in both the Shell texts and the Financial Times texts: ecology, material culture, social culture, political/administrative institutional terms and figures of speech. As such, the data analysis of both cultural categories and translation strategies will focus on these five types. In a similar vein, the research will only discuss most frequently used

translation strategies for a specific type of cultural contents. Where examples are self-evident, discussions will be brief or omitted.

4.1 ecological items and their translation strategies

In both Shell texts and FT texts, two kinds of ecological items are identified, as presented in Table 2 below. With regard to the translation strategies used, although the general tendency is the same for both Shell and FT translators, there are some variations.

Table 2: Type 1 cultural content and its translation strategy

Number of cases	**Number of cases of sub-categories**	**Translation strategies for subcategories (percentage = frequency of use)**
FT: 92	People's names: 53	53 (100/%): transliteration followed by ST in brackets.
	Geographical items: 39	36 (92.3%): recognised translation without ST
		3 (7.7%): translation followed by ST in brackets
Shell: 34	People's names: 13	8 (61.5%): transliteration followed by ST in brackets.
		5 (38.5%): transference
	Geographical terms: 21	20 (95.2%): recognised translation without ST
		1 (4.8%): transference

FT translators use one strategy to translate all people's names. Scholars in English-Chinese translation generally recommend that recognised translation according to official sources such as China's Xinhua news agency be used to translate well known people such as heads of states, prime ministers without the need to bracket their names in a SL immediately afterwards as is the case of ordinary people's names. In the current research, while this principle is generally followed, the researcher finds that the name "David Cameron", that of a former UK prime minister, is treated in the same way as when ordinary people's names are translated. That is, his name is translated and his English name is bracketed following the Chinese translation, even though the translation uses the accepted or established version.

For Shell translators, on the other hand, a large proportion (38.5%) of people's names is transferred, rather than being transliterated.

Regarding geographical items, these are found to be the names for countries, cities, towns, etc. in the current research. As Table 2 shows, FT translators translate all of them but more often without bracketing the ST afterwards, whereas Shell translators either translate

these terms without bracketing the ST afterwards like FT translators, or consort to the strategy transference.

Below are examples respectively for the strategies frequently used for translating names of people or places.

[1] Transliteration with SL bracketed afterwards

ST: *David Cameron* is among those who argue that the advent of the internet should not upset that apparent balance between security and privacy.

TT: 一些人辩称，互联网的问世不应扰乱安全和隐私之间的明显平衡，*英国首相戴维•卡梅伦 (David Cameron)* 就是其中之一。

Strictly speaking, two translation strategies are used in the above example for translating "David Cameron", one is transliteration and the other is expansion or amplification because the translator here amplifies the meaning of "David Cameron" by noting who the person is, represented by 英国首相 (Britain's prime minister).

[2] Recognised translation without ST

ST: Our deep-water activities extend from *the Gulf of Mexico* to *the China Sea*, from the *Norwegian continental shelf* to the waters off *Nigeria*"s coast.

TT: 我们的深水活动从*墨西哥湾*延伸至*中国海*，从*挪威大陆架*延伸至*尼日利亚*近海。

4.2 material culture items and their translation strategies

In both Shell and FT texts, the most often presented material culture items are brand names, or names of technological products. FT and Shell translators both use the strategy transference more often than other strategies, as in Table 3 below. Wang (2010, cited in Olohan ibid. pp.83-74) states that "it is not uncommon for brand names to be transliterated in Chinese, preserving the sound of the original". Nonetheless, it appears that most FT and Shell translators did not use this strategy.

Table 3: Type 2 cultural content and its translation strategy

Number of cases	**Number of cases of sub-categories**	**Translation strategies for subcategories (percentage = frequency of use)**
FT: 35	Brand names: 29	25 (86%): transference
		3 (10%): back translation
		1 (3%): recognised translation with ST in brackets

	Book/article titles: 6	6 (100%): through translation with ST in brackets
Shell: 18	Brand names: 17	10 (59%): transference
		5 (29%): transliteration without ST in brackets
		1 (6%): literal translation
		1 (6%): through translation
	Book/article titles: 1	1(100%): through translation without ST in brackets

Below is an example for the transference strategy.

[3] transference

ST: A new DNA cut-and-paste tool known as *Crispr* has made the process unexpectedly simple.

TT: 名为 *Crispr* 的新的基因剪切与粘贴工具让这个过程变得意外地简单。

4.3 social culture items and their translation strategies

As in Table 4 below, half of the social culture contents found in FT texts are translated by using the strategy “cultural equivalent”. In Shell texts, by contrast, the strategy “literal translation” is used slightly more often than “cultural equivalent”, though both are used fairly frequently.

Table 4: Type 3 culture content and its translation strategy

Number of cases	**Translation strategies for subcategories (percentage = frequency of use)**
FT: 10	5 (50%): cultural equivalent
	2 (20%): neutralisation
	1 (10%): through translation
	1 (10%): synonym
	1 (10%): transliteration without ST in brackets
Shell: 38	15 (39.5%): cultural equivalent
	17 (44.7%): literal translation
	2 (5.30%): through translation
	2 (5.30%): neutralisation
	1 (2.60%): synonym
	1 (2.60%): reduction

Below are examples respectively for the strategies of “cultural equivalent” and “literal translation”.

[4] cultural equivalent
ST: So *keep* **y**our boot and back seat *clear of* unnecessary items that can add weight to your vehicle (e.g. golf clubs).
TT: 因此*请清理*您的汽车行李箱和后车座，移除那些徒增汽车重量的不必要物品（例如高尔夫球杆）。

[5] literal translation
ST: *We* are using *our* know-how, technology and innovation to deliver more, cleaner energy to help meet the world’s growing needs, and find ways to use energy more efficiently. *We* also work with partners, communities, governments and others to do this in environmentally and socially responsible ways.

TT: *我们*将利用*我们的*专业知识、技术和创新成果，提供更多、更清洁的能源，帮助满足世界不断增加的能源需求，并寻找能源的更高效利用方式。*我们*还与合作伙伴、社区、政府和其他方合作，努力以对环境和社会负责任的方式实现这一目标。

Example [4] is an example for translating imperatives, which occur frequently in technical instructions and are represented in some Shell texts advising drivers on how to drive safely or economically. While occasionally using literal translation, Shell translators more often use the strategy “cultural equivalent” to soften the commanding/demanding tone of such structures, which is illustrated by the Chinese character “请” (*qing;* please) in the above, or controversially by the phrase “应该” (*ying gai*; should) elsewhere. This way of translation echoes what Katan (ibid.) states on the differences between a high context and a low context culture. The Chinese culture is a high context culture compared to the British culture. The use of 请” or “应该” in translating English imperatives in some contexts serves to reduce the flavour of aggression or rudeness felt in the Chinese imperatives.

Another note is the use of personal pronouns “we”, “us” and “our” in Shell texts to refer to the company itself, as illustrated in Example [5] above. In parallel Chinese texts, a company would avoid these personal pronouns, and instead use “本公司” (*ben gongsi*; this company), and rarely “我们的” (*women de*; our). In this research, however, Shell translators have translated these pronouns all literally. This way of translating personal pronouns appears in line with Olohan (ibid.), but does not resonate well with the Chinese cultural practice.

4.4 Political/administrative items and their translation strategies

Two sub-categories are found in Shell and FT texts as presented below in Table 5.

Table 5: Type 4 culture content and its translation strategy

Number of cases	Number of cases of sub-categories	Translation strategies for subcategories (percentage = frequency of use)
FT: 92	Institutional names: 89	60 (67.4%): transliteration with ST in brackets
		27 (30.3%): transference
		2 (2.2%): back translation
	Currencies and measurements: 3	3 (100%): through translation (not always helpful for TL readership)
Shell: 49	Institutional names: 41	21 (51.2%): through translation without ST in brackets
		10 (24.4%): transference
		8 (19.5%): transliteration with ST in brackets
		2 (4.9%): back translation
	Currencies and measurements: 8	8:through translation (not always helpful for TL readership)

As evident, FT translators and Shell translators use different strategies in translating institutional names, but they use the same strategy when dealing with currencies and measurements.

For institutional terms, the most frequently used translation strategy in FT translation is transliteration *with* their ST bracketed afterwards, whereas in Shell translation, the corresponding strategy is through translation *without* their ST bracketed afterwards. Although transliteration and through translation are both literal, the difference between them being used by FT and Shell translators is whether or not source terms are bracketed afterwards in the translation text. Arguably, bracketing a source term is more helpful for readers who would like to track the institutions, as also recommended in translation literature (e.g. Newmark ibid.). Additionally, FT translators also quite often transfer a source political/administrative terms to a translation text, using the strategy transference.

With regard to the translation of currencies and other measurements, it is striking that both FT translators and Shell translators do through translation. This is different from what the researcher has experienced in the translation industry, where the general principle is to use international units of measurements or use what Olohan (ibid. p.86) calls dual-labelling (international metric units used together with customary units).

Examples of the above discussed translation strategies are given below.

[6] Institutional names: transliteration with ST in brackets
ST: The treatment is similar to cancer therapies in development using modified T-cells from companies including *Novartis* of Switzerland and Juno and Kite of the US.
TT: 该疗法类似于瑞士的*诺华制药 (Novartis)* 以及美国的 Juno 和 Kite 等公司开发的使用修饰T细胞治疗癌症的办法。

[7] Institutional names: through translation without ST in brackets
ST: When *the Royal Dutch Petroleum Company* and *Shell Transport and Trading* merged in 1907, the latter's brand name and symbol (Shell and the pecten) became the short-form name and emblem of the new Royal Dutch Shell Group. And so it has remained ever since.
TT: *荷兰皇家石油公司*和*壳牌运输和贸易公司*于 1907 年合并时，后者的品牌名称和标志（壳牌和贝壳）成为新成立的荷兰皇家壳牌集团 (Royal Dutch Shell Group) 的简明名称和标志。此后一直保持至今。

[8] Institutional names: transference
ST: "[…] I would like to see Kering register as a B Corporation [a business certified by the non-profit *B Lab* to meet rigorous standards of social and environmental performance], which would be the best way for them to demonstrate their integrity."

TT: "[…]我希望看到开云成为 B 类认证企业（即由非赢利机构 *B Lab* 认证的企业，满足严格的社会责任与环保指标），这将是时尚巨擎们展现自己对环保言而有信的最佳方式。"

[9] Currencies: through translation
ST: Quest was built on behalf of the Athabasca Oil Sands Project joint-venture owners Shell Canada Energy (60 per cent), Chevron Canada Limited (20 per cent) and Marathon Oil Canada Corporation (20 per cent), and was made possible through strong support from the governments of Alberta and Canada who provided *C$865 million* in funding.

TT: 奎斯特项目由阿萨巴斯卡油砂项目（Athabasca Oil Sands Project）的合资伙伴建设完成，包括壳牌加拿大能源公司（60%）、雪佛龙加拿大有限公司（20%）和马拉松石油加拿大公司（20%）。同时，阿尔伯塔省政府和加拿大联邦政府也给予该项目不可或缺的有力支持和 *8.65 亿加元*的资金投入。

[10] Measurements: through translation
ST: And even better, the road was a whole *five yards* away, since the Auerhahn Auerhahn sits right at the start of the *37 miles* of the B500 which climbs south all the way to the market town of Freudenstadt.
TT: 更妙的是，这里距离公路只有*五码*，而且 Auerhahn 酒店就坐落在 *37 英里*长的B500的开始处，它会一路蜿蜒到佛罗伊登施塔特集镇。

4.5 Figures of speech and their translation strategies

As shown in Table 6 below, figures of speech have several sub-categories found in FT and Shell texts. For their sub-categories, metaphors (including similes) are found to be the most

frequent type in both FT and Shell texts. The strategies used by FT and Shell translators in translating metaphors are similar in terms of the frequency of use. There are three strategies: cultural equivalent, neutralisation and literal translation, respectively illustrated following Table 6. Both Montalt & González Davies (ibid.) and Byrne (ibid.) state that metaphors (and similes) are valuable in scientific texts, with Byrne specifying that they "are an incredibly useful tool for writers of both scientific and, to a slightly lesser extent, technical texts" (ibid. p.50). The findings presented in Table 6 support this view and reflect the translation strategies mentioned by Montalt & González Davies (ibid.), who use different terms for the strategies in question though do not specify the order of frequency of their use.

Table 6: Type 5 culture content and its translation strategies

Number of cases	**Number of cases of sub-categories**	**Translation strategies for subcategories (percentage = frequency of use)**
FT: 131	Metaphor: 113	39 (34.5%): cultural equivalent
		37 (32.7%): neutralisation
		32 (28.3%): literal translation
		3 (2.7%): through translation
		2 (1.8%): reduction
	Personification: 13	8 (61.5%): literal translation
		4 (30.8%): neutralisation
		1 (7.7%): modulation
	Pun: 3	1 (33.3%): literal translation
		1(33.3%): through translation
		1(33.3%): literal translation
	Humour: 2	2 (100%): literal translation
Shell: 41	Metaphor: 35	14 (40%): cultural equivalent
		10 (28.6%): neutralisation
		10 (28.6%): literal translation
		1 (2.9%): reduction
	Personification: 2	2 (100%): literal translation
	Pun: 1	1 (100%): cultural equivalent
	Humour: 1	1 (100%): literal translation
	Alliteration: 1	1 (100%): neutralisation
	End rhyme: 1	1 (100%): neutralisation

[11] cultural equivalent

ST: Many consumers see the great divide between luxury and fast fashion *as black and white, good and bad*.

TT: 很多消费者认为奢侈品与快时尚（Fast Fashion，零售商将 T 台上最时尚的设计以最快速度制造并铺货到卖场的一种销售模式）之间*泾渭分明*。

“泾渭分明” (*jing wei fen ming;* as clearly distinguishable as *Jing* and *Wei*) is a Chinese idiom where literally “泾” and “渭”respectively refer to two rivers that meet but are easy to tell apart due to the amount of sand carried in their flowing water and thus the colour of the water.

[12] neutralisation

ST: *Giving the brain an extra jolt of juice* — whether chemical or electrical — is one thing.

TT: *给大脑加上额外的助力*——不论是化学的还是电子的——是一回事，[...]

“给大脑加上额外的助力” means “add extra help to the brain”.

[13] literal translation

ST: Innovation is *in our DNA*

TT: 创新已深植于我们的基因

4.6 Summary of data analysis results

Two major findings can be made out of the above data analysis, as follows:

(1) Most of the cultural categories discussed in literature are found in scientific and technical texts, which include ecological items, geographical items, material culture, social culture, political/administrative items, and figures of speech.

(2) There are preferred translation strategies for each type of cultural contents. Some of them follow what scholars or the industry has recommended, but some of them do not. Typical examples include the translation of people” names, brand names, currencies and other measures.

5. Conclusion and discussion

The findings from this research provide strong evidence that scientific and technical texts are cultural. An immediate implication is therefore that scientific and technical translators need to be trained to translate cultural contents, a competence that has already been called for by Kastberg (ibid.).

Nonetheless, the findings also raise new issues regarding translator training. Firstly, as the data analysis shows, both FT and Shell translators seem to be free with the ways of translating some cultural contents, instead of following the generally recommended principles. For example, for the names of people and places, Shell translators sometimes transfer them into their translation texts (see Table 2). This seems to contradict with what English-Chinese scholars have recommended, and contradict with the general principle stipulated in the Law of the People's Republic of China on the Standard Spoken and Written Chinese Language (2000), which is that foreign names and places should be translated by using Chinese characters. While not suggesting that translators who do not follow this principle should be prosecuted, the researcher believes that the relevant research finding makes translator training complicated. Hence, the current practice will need to be reviewed.

Secondly, it would be interesting to find out the underlying theoretic approach that guides FT or Shell translators, or more generally professional scientific and technical translators. Byrne (ibid., p.8) points to the current worrying situation where "[o]ne of the most difficult aspects of translation theory is that scientific and technical translation have traditionally been neglected by scholars and none of the mainstream theories really addresses scientific and technical translation specifically". He then states that "there is still a lot to be done before we can comfortably apply a theoretical model to scientific and technical translation". The researcher takes the stance that a departure point along this line would be to survey professional scientific and technical translators regarding what they aim to achieve in translating a source text for its target readership. Olohan (ibid., pp.16-17) says "translators often aim to translate a text in such a way that it will be accepted by the target discourse community as recognizably belonging to a genre, conforming to the rules and conventions of the genre, fulfilling identifiable communicative purposes". This does not seem to be observed in the current research all the time in that while FT translators generally convey the messages of cultural contents, Shell translators appear to take a freer approach, which makes it difficult to judge whether or not their translation is recognisable/acceptable to their target community of readers. A case in point is the way Shell translators translate social cultural contents. While a large proportion of cultural contents are translated in such a way that that they make sense to the target readership, some are not dealt with this way. For instance, the sentence "B is for biking" is translated as "B 代表骑摩托车" (back translation: B represents riding a motorcycle). This translation hardly makes sense to the target reader, because the native speaker of Chinese would not be able to see the connection between "B" and "riding a

motorcycle". The researcher believes that a survey study among professional translators would be necessary in order to find out the underlying translation principle, which ultimately would be particularly helpful in the efforts to establish a suitable theoretical model for scientific and technical translation.

Finally, while we try to find out what professional translators think what scientific and technical translation needs to achieve, it would also be important to find out the points of view of translation users and/or clients. As a matter of fact, professional translation always serves a readership. Hence, studies of reader experience of scientific and technical translation regarding cultural contents would be fruitful.

A limitation of the current research is it only studies popular scientific and technical texts. Relevant findings should not be used to generalise scientific and technical translation. It would be ideal that all text types or genres covering science and technology were studied, such as scientific research articles and abstracts, patents, technical instructions or brochures (Olohan, ibid.). This would take several additional research projects. That aside, the current research has provided evidence that scientific and technical texts are cultural, by looking into popular scientific and technical texts that have a very large readership and that have been commissioned to professional translators. It is hoped that the current research will serve as a start-point of research along similar lines and will contribute to the training of scientific and technical translators.

References

Baker, Mona, 2011. In Other Words: A Coursebook on Translation. Routledge Ltd - M.U.A.

Byrne, Jody, 2014. *Scientific and Technical Translation Explained: a Buts and Bolts Guide for Beginners*. Routledge and Taylor & Francis Group: London and New York.

Chantler, Ashley, and Carla Dente, 2009. (ed.s) *Translation Practices: through Language to Culture*. Rodopi B.V. Amsterdam - New York.

Financial Times, 2017. Accessed from: https://www.ft.com/?edition=uk

Hervey, Sandor, Ian Higgins and Louise Haywood, 1995. *Thinking Spanish Translation*. London and New York: Routledge.

Hoft, Nancy, 1995. *International Technical Communication*. New York: Wiley.

Karimnia, Amin, 2015. Investigating Translation of Cultural Elements in Scientific-Technical Texts. *Journal of Applied Linguistics and Language Research*. *Volume 2, Issue 6*, pp. 28-38 Available online at: www.jallr.ir

Kastberg, Peter, 2007. Cultural Issues Facing the Technical Translator. *The Journal of Specialised Translation, Issue 8,* pp.104-109

Katan, David, 2004. *Translating Cultures: an Introduction for Translators, Interpreters and Mediators*. Manchster: St Jerome.

Medin, Douglas L. & Bang, Megan, 2014. The cultural side of science communication. *Proceedings of the National Academy of Sciences of the United States of America*. Accessed from: www.pnas.org/cgi/doi/10.1073/pnas.1317510111

Montalt Resurrecció, Vicent and Maria González Davies, 2007. *Medical Translation Step by Step: learning by Drafting*. Routledge.

Newmark, Peter, 1988. *A textbook of Translation*. Hemel Hempstead: Prentice-Hall International.

Olohan, Maeve, 2016. Scientific and technical translation. London: Routledge, Taylor & Francis Group

Snell-Hornby, Mary, 1995. Translation studies: an integrated approach. Amsterdam : John Benjamins Publishing Co.

Stolze, Radegundis, 2009. Dealing with cultural elements in technical texts for translation. *The Journal of Specialized Translation, 11*, 124-140

Szal, Mateusz 2014. Translating Cultural Elements in Specialised Texts. Accessed from: www.ur.edu.pl/file/72494/07.pdf

Toury, Gideon 1995. *Descriptive Translation Studies and Beyond*. Amsterdam/Philadelphia: John Benjamins.

Wright, Sue Ellen, and Leland D. Wright, Jr., 1993. *Scientific and Technical Translation.* John Benjamins Publishing Company: Amsterdam/Philadelphia.

中华人民共和国国家通用语言文字法 [the Law of the People's Republic of China on the Standard Spoken and Written Chinese Language], 2000. Accessed from: http://zwyxgf.cn/index.php/5/63