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Investigating Translation of Cultural Elements in Scientific-Technical Texts

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Abstract
Nowadays, a major amount of translation work being done all over the world is scientific-technical translation. It has been estimated that technical translation accounts for some 90% of the world's total translation output each year (Kingscott, 2002). Scientific-technical translation is mostly considered a straight forward process depending solely on a competent knowledge of subject matter and terminology. In other words, it is referred as acultural (free from cultural features). The main aim of the present study is to show that cultural elements do exist in scientific-technical texts and needs attention. The focus is on English and Persian and the researcher refers to Stolze (2009) who discusses culture in scientific-technical translation under five headings: terminology, language form, syntax, text structure and pragmatics. The researcher also refers to another place where cultural differences can be traced, .i.e., stylistic differences. Out of the author's experience, stylistic and syntactic cultural differences (at least in English and Persian pair languages) can be called the most deceiving parts for scientific-technical translation. Findings of this study can also be alert to unwitting scientific-technical translators not to render strange terms and structures into Persian.
Keywords: culture, language, scientific-technical texts, cultural elements, stylistic differences.

INTRODUCTION

It is widely acknowledged that translation has played a major role in the dissemination of knowledge during the ages. Jianzhong (2005,) declares that scientific and technical translation includes all the practical fields but literary translation. Williams and Chesterman (2002) hold that scientific and technical translation covers the translation of many kinds of specialized texts in science and technology, and also in other disciplines such as economics and medicine. Scientific and technical translation, like any other type of translation, requires a high level of competence of both languages and knowing the differences which may be cultural or non-cultural. According to Stolze

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(2009), cultural elements cannot be reduced to strange objects that would be unknown elsewhere but they are implicitly present in texts. Notice the following:

Taking into account more recent theories of culture – i.e., culture as a group's learned set of habits and the values accompanying these habits – we have a basis for arguing against what still seems be to a generally accepted idea, namely the culturelessness of technical culture. Or rather, the notion that technical domains are devoid of cultural influences is due to the fact that the laws of the sciences from which technical domains stem, namely the laws of physical sciences, are above the constraints of any one national culture. That, of course, is true. But this doesn't mean that sciences are acultural, they are artifacts of a professional culture (Kastberg, 2007, p.104).

Following Hartmann and Mittelstrass (2000, p.1), "science and culture are not antithetical. It is far more the case that science is culture by its very nature. Attempting to sever the ties between science and culture would itself be a de-civilizing phenomenon, i.e. an expression of lack of culture."

Kastberg (2007, p.104) discusses "the importance of prioritizing cultural competence in technical translation." He emphasizes how cultural issues are an inherent part in technical text and should not be overlooked. Kastberg (2009) adds a fifth competence to the previously proposed competences for a skilled technical translator: cultural competence. According to Kastberg, therefore, the five competences required for a technical translator can be listed as follows:

1. General language competence L1 + L2
2. LSP competence L1 + L2
3. Knowledge of the relevant domain
4. LSP translation competence L1 + L2
5. Cultural competence L1 + L2

Stolze (2009) believes that culture determines how people speak, write ,and perceive each other. Consequently, cultural elements must be present implicitly in texts, but as a background feature they are implicit. This becomes crucial in translation, when a translator from a different culture may not be able to adequately interpret the implicit cultural traces, or even misinterpret them. She declares culture is the background of every human communication and absolutely this is true of technical and scientific text. She (p.124) proposes that "cultural elements appear in the text on all levels-from the concept and form of words, to the sentence and text structure, to pragmatics."

"Language and Culture" or "Language in Culture"?

First, Kroeber (1964) used this title. It is taken as a given that language is the principal mode of communication for human beings. For more information about the interrelation of language and culture it is necessary to resort to some other relevant fields such as ethnology and anthropology. According to Nida (1945, as cited in Kroeber, 1964, p.90), the linguist and ethnologist are more or less conscious of the relationship between their respective fields of research. "Almost all would recognize that language is

best described as a part of culture." "Ethnoscience refers to a method of studying parts of a culture primarily on the basis of how they are lexically encoded by native speakers. The assumption is that as a rule what is culturally discriminable is also lexically differentiated." (Salzmann, 2006, p.69)

According to Newmark (1988, P.94); culture is "the way of life and its manifestations that are peculiar to a community that uses a particular language as its means of expression." Kroeber (1964, p. xviii) holds that linguists have an informal and nonprofessional way of saying that "lexicon is merely culture." Following Goodenough (1957, as cited in Kroeber (1964, p.36)), the relation of language and culture is that of part to whole. Theory and method applicable to one must have implications for the other. In 1957, he (in Salzmann, 2006, p.69) wrote: "we learn much of a culture when we learn the system of meanings for which its linguistic forms stand."

Hoijer (1948, as cited in Kroeber 1964, pp.455-456) believes that the interrelation of language and other aspects of culture is so close that no part of the culture of a particular group can properly be studied without reference to the linguistic symbol in use. He believes that changes in language, since language is an important part of the cultural pattern, must take place, at least, in response to cultural changes in general. Salzmann (2006, p.57) states when one talks about a culture, however, the explicit mention of language is, strictly speaking, redundant because any particular language is a form of learned behavior and therefore a part of the culture."

How Culture Embraces Scientific and Technical Knowledge?

Where culture is an inseparable part of language, it cannot be separated from any of its instances in use (Hosseinimanesh, 2011). Horton & Hunt (1972) state culture may be divided into material and nonmaterial culture. Nonmaterial culture consists of the words people use, the ideas, customs, and beliefs they hold, and the habits they follow. Material culture consists of man-made objects such as tools, furniture, automobiles, buildings, cultivated farms, roads, bridges, and in fact, any physical substance which has been changed and used by man. Such manmade objects are called artifacts. The material culture is always the outgrowth of the nonmaterial culture and is meaningless without it.

Salzmann (2006, p.57) divided culture into:

> (a) Mental culture (for example, worldview or value orientations)
>
> (b) Behavioral culture (for example, wiping one's feet before entering a house or performing a heart transplant)
>
> (c) Material culture, that is, the material products of behavior (for example, a pull-open beer can or a radio telescope).

As can be seen, both the knowledge and the material products of human beings are labeled as the cultural considerations of a specific society. Taking into account the main

function and application of scientific and technical text, we can say that this kind of language use must possess some cultural features.

CULTURAL ELEMENTS IN TEXTS

Texts, as the means of oral and written communication among persons, are carriers of messages. Following (Stolze, 2009 & Karimnia & Afghari, 2010), when we accept that texts function within cultures, there must also be some cultural features discernable in those texts. A key question is what are cultural elements and how are they visible in texts? Stolze (2009) holds that cultural elements cannot be reduced to strange objects that would be unknown elsewhere.

Stolze (2009) directs attentions to the fact that the translator must constantly be aware of his or her own 'hermeneutic approach'. She (p.125) believes that understanding is "never a matter of fact but requires interpretation as the process of searching for meaningfulness." Culture will be present in texts, even in technical ones. And "culturally based conventions of text construction may even constitute a major translation problem for scientific communication. Detecting cultural elements in texts therefore is decisive for translation." Following Stolze (2009), Cultural traces in texts certainly have a specific linguistic form. Hence it is useful to present an overview of various linguistic manifestations of culture in texts. This ranges from the "word level and syntactic structures to the style on the text level, and its pragmatic social function":

a) *Culture in terminological concepts*
b) *Culture in the language form*
c) *Culture in syntax*
d) *Culture in the text structure*
e) *Culture in pragmatics*

2.1. Various Linguistic Manifestation of Culture in Scientific-Technical Texts

Culture in Terminological Concepts

One might say that since in the realm of science and technology, a set of standard terminology with predefined equivalents exists; there is no problem at the terminological level in translating scientific technical texts. However, International standardized terminology is very much in the minority (Stolze, 2009). The reason is that new technical concepts are being made every day. Many dictionaries suggested meanings for technical concepts are not equivalent to the original because of different cultural implications and backgrounds. Notice the following quotation:

> Two things stand in the way of total uniformity, or total cultural oneness. First of all, the number of technical concepts seems to grow exponentially. Secondly, the number of technical (sub) disciplines seems to be ever increasing (Kastberg, 2007, p. 2).

Consider the following examples:

In English there are the words “screws” and “bolts” whereas in Persian there is only “پیچ”. Sometimes two words cannot come together. In English “defect amplification” is quite an acceptable term whereas “اشکال تقویت” is not acceptable in Persian, because in Persian a positive verb is not used with a negative noun (Hosseinimanesh, 2011). The word “library” is generally used in technical context to show a reservoir of anything like “DLL library” in computer science or “DNA library” in biology. Immediately, it is translated as "کتابخانه" in most texts whereas in Persian culture it is only related to "کتاب” and “DLL کتابخانه” sounds somehow paradoxical. “Software tool” is another example which is wrongly translated as "ابزار نرم افزاری."

Culture in Language Form

Languages are the main expression of culture. According to Stolze (2009), terminology in nouns and adjectives combined with a few tenses are characteristics of the functional style of communication for specific purposes. In English, it is natural to use two adjectives before a noun whereas in Persian using more than one adjective although not wrong linguistically, is not preferred. And because “preferring” has got to do with culture, the trace of culture is clearly seen in technical texts (Hosseinimanesh, 2011). Consider the following examples:

In the field of software engineering there is “common process framework” which is translated as “زمینه فرایند مشترک کاری” and “چارچوب فرایند مشترک”. Here, the English phrase sounds natural whereas the Persian ones sound so much unusual. They do not look beautiful and more importantly even not meaningful. However, the Persian phrases are not wrong according to linguistic rules. More examples are:

“Permanently installed disk” دیسک نصب شده دائمی

“Defect removal efficiency” بازدهی رفع نقص

Culture in Syntax

Syntax can be called the most deceiving part of a text for translation. The translator starts translating without even knowing that s/he is talking the target language with another language’s rules and regulations. For a better understanding of the relationship between the syntax of a language and culture, notice the following:

> Syntactic forms concern the way in which the elements in a sentence are combined idiomatically… If the target language structure is different, the translator will have to apply shifts in order to enhance intelligibility… We call these phenomena cultural aspects because they are inherent to the idiomatic usage of language, and this should not be omitted in technical communication (Stolze, 2009, p.129).

But most of the time these shifts are missing. For example, English language has a tendency to express “detailed semantic variations” with more words whereas in Persian they can be expressed by means of only one word. Look at the following:

To alter or modify تغییر دادن

Function and performance عملکرد

Costs, charges, and expenses هزینه ها

Another difference between English and Persian syntax can be seen in the number of verbs in a single sentence. In other words, English uses many verbs in a single sentence whereas Persian prefers to use abstract nouns instead. Consider the following example:

● As global population increases and more countries become industrialized, the world demand for mineral and energy resources will continue to grow.

همان طور که جمعیت جهانی افزایش یافته و بیشتر کشورها صنعتی می شوند؛ تقاضای جهانی برای منافع معدنی و انرژی با روند رو به رشدی ادامه خواهد داشت.

A more natural translation could be as follows:

با افزایش جمعیت جهان و صنعتی شدن بیشتر کشورها، تقاضا برای منبع معدنی و انرژی نیز افزایش می یابد.

Also, notice the following example:

● The most widely felt earthquakes ever to strike the United States…

زلزله هایی با بیشترین وسعت دریافت(احساس) به ایالات متحده ضربه زده اند.

Whereas a more natural translation in Persian could be as follows:

بزرگترین زمین لرزه هایی که تاکنون در ایالات متحده رخ داده اند.....

Culture in the Text Structure

Following Stolze (2009), different cultural norms rule the structure of certain texts in different countries. Different text types and genres are the product of cultural historical situations. These lead to different types of writing. Let's Borrow an example from Stolze (2009) to make the point more clear:

Court sentences in Germany show first the substance of the judgment in a sentence followed by a statement of facts and the presentation of the reasons for the decision, quasi as a justification of the sentence. Court sentences in France begin with the statement of facts followed by the reasons for the decision based on a listing of relevant articles from the code, which finally leads to the substance of the sentence. In addition, In British or American court sentences we find the accumulation of relative sentences as a typical feature of this text genre. Example: The court finds that… and that… - In German text such long lists are unusual.

As another example, consider the manner of referencing in English and Persian. In English the year of producing the work is situated immediately after the author's name (according to APA) while in Persian it is situated at the end of the information (Roohani Rankoohi, 2008).

Byrne, J. (2006). *Technical translation: Usability strategies for translating technical documentation.* Springer, Netherland, pp.1-46.

روحانی رانکوهی، سید محمد تقی، شیوه ارائه مطالب علمی-فنی، ویراست سوم، چاپ بیست و نهم، تهران، جلوه، 1388.

Culture in Pragmatics

According to (Stolze, 2009; Karimnia & Afghari, 2011), pragmatics refers to senders and receivers of a text message and, therefore, is also part of the text itself. In other words, pragmatics is where culture has the most important role. It is particularly in this respect that we find traces of the cultural background which is implicitly mentioned (Stolze, 2009). Regarding pragmatics, cultural differences include varying ideas of politeness, stereotypes of foreign people, special images of a society in another area, different social procedures for organizing social life, different legal structures, etc. Such features tend to reflect on the text level and any literal translation will sound strange in the target culture.

Moreover, following Stolze (2009), scientific language is also a group language, a sociolect. Consequently, pragmatic aspects of user preferences have to be observed in translation. She adds that values of a society are almost always different from one another, and this again will have traces in texts.

One Additional Source of Cultural Differences

In analyzing the corpus of scientific-technical texts for this study, the researcher encountered some cases in the source language which were unnatural in the target language. This source of cultural differences was not included in the Stolze's headings. The researcher named this category as "Stylistic" cultural differences. Stylistic cultural differences were seen at the level of personal and demonstrative pronouns.

It is observed that in English scientific-technical texts, using the personal and demonstrative pronouns such as "we", "you", "this" etc. is acceptable whereas; using their equivalents in Persian scientific-technical texts is not acceptable. However, using personal and demonstrative pronouns in Persian scientific and academic texts does not violate any grammatical rules and regulations. This is just a matter of preference and has to be observed in translation.

Consider the following examples:

'We' use the term chip to refer to any… . از اصطلاح تراشه برای اشاره به..... استفاده می شود.

'We' describe monitors as… مانیتورها عبارتند از

…not only let 'you' integrate images… .... نه تنها امکان یکپارچگی تصاویر را فراهم می اورد بلکه

'This' Dynamic Earth: the story of plate tectonic… زمین پویا: سناریوی زمین ساخت صفحه ای

METHODOLOGY

Materials

In this study, the data were gathered from two instances of scientific and technical books. They were: a scientific book in Geology and a technical book in Computer Software Engineering. Through systematic random sampling 20 paragraphs were selected from each of the sources. (Ary et al., 2006)

Data Analysis Procedure

In order to increase the reliability of the work, the researcher employed two ways of rating: Intra-rating and Inter-rating. After each step, chi-square test was carried to see whether the differences were significant or not. For the Intra-rating reliability, the researcher analyzed the data two times. In this step, the researcher analyzed the data for the second time by himself to ensure the reliability of the first coding process. These two processes were performed after a period of one week, under the same experimental circumstances. Afterward, their results were compared to each other. In order to increase the reliability of the study, the process of coding was performed by two other individuals besides the researcher himself. In this way, two other experienced raters did the coding process. Due to the interrelation of the subject to both linguistics and translation, each rater was chosen from one major.

Step 1: Intra-rating

In this step, the researcher analyzed the data two times. Considering the first coding as the previously established (expected) distribution; chi-square was used to test the differences between the first coding and the second one. Results of the calculation are shown in Table 1.

Table 1. Categorization of Data Based on Five Headings and Chi-Square Test for Step 1 (Intra-rating)

Maxims	First Coding	Second Coding	Chi-Square
Terminology	5	4	0.2
Language Form	4	4	0
Syntax	14	12	.28
Text Structure	3	3	0
Pragmatics	0	0	0

Based on the calculations in Table 1, there was no statistically significant difference, that is, the findings at the first and second time were equal. Hence the first coding can be considered reliable.

Step 2: Inter-rating

The two raters coded the data independently for the third time. It is predicted that there must be some discrepancies in the inter-rating process. Table 2 shows the results of inter-rating coding. As Table 2 demonstrates, there isn't a marked difference between

the two raters' categorization. The chi-square test between the raters' findings as the actual (observed) samples and the researcher's first coding as the hypothetical (expected) distribution is also shown in Table 2.

Table 2. The Two Raters' Coding and the Chi-Square Test for Step 2 (Inter-rating)

Maxims	First Coding	Rater 1	Chi-Square	Rater 2	Chi-Square
Terminology	5	4	0.2	4	.02
Language Form	4	4	0	4	0
Syntax	14	12	.28	13	.07
Text Structure	3	3	0	3	0
Pragmatics	0	0	0	0	0

As is seen in Table 2, the coding done by the researcher and that of the raters are all equal; therefore, they are reliable.

Step 3: Data analysis for Stylistic Cultural Differences

In Tables 3 and 4, the results of Intra-rating and Inter-rating in company with Chi-square test for this heading are provided, respectively.

Table 3 Intra-rating Coding and Chi-Square Test Results for Stylistic Cultural Differences

Maxim	First Coding	Second Coding	Chi-Square
Stylistic	15	13	0.26

The calculation in Table 3 shows that the first coding can be regarded as reliable.

Table 4. Inter-rating Coding and Chi-Square Test Results for Stylistic Cultural Differences

Maxim	First Coding	Rater 1	Chi-Square	Rater 2	Chi-Square
Stylistic	15	13	0.26	15	0.0

The Chi-Square test between the raters' findings as the actual (observed) samples and the researcher's as the hypothetical (expected) distribution is shown in Table 4. According to Table 4, the coding done by the researcher and that of the raters are in concert. In other words, the differences are not significant. Therefore, they are reliable.

DISCUSSION

The main aim of this study was to see whether scientific-technical texts as an instance of language use possess some cultural features or not. In order to have professional scientific-technical translators, it is important to take a closer look at various linguistic manifestations of culture in scientific-technical texts. It is a false notion to think that literal translation is an adequate approach to translating scientific and technical texts. Unconsciously, this belief is prevalent among translation scholars and consequently among translation students. Different languages use different instruments and different ways for conveying information. These differences are rooted in the linguistic culture of their users and all of them have traces in a text. They can result in comprehension

problems for a translator unacquainted with these unique features. So, a transparent translation is needed that can give presence to the new text and make intelligible the cultural differences which nonetheless are implicit in the message. (Stolze, 2009)

After analyzing the selected texts, the researcher identifies some linguistic manifestation as the cultural differences between English and Persian. However, the determined differences cannot be regarded comprehensive and all-inclusive. In other words, it is possible to add some other cases of cultural differences to each heading. Regarding cultural implication in Pragmatics the researcher could not find hints of differences. However, following Stolze (2009), pragmatics refers to sender and receiver of a text massage and, therefore, is also part of the text itself. In pragmatics traces of cultural differences can be found implicitly. Examples of this kind of differences can be found more in texts dealing with social procedures, legal structures, etc.

CONCLUSION

As instances of language use and human activities, scientific and technical texts are not culture free (acultural). The presence of culture is traceable in the elements of the texts. Thus, scientific and technical translation, like any other type of translation, requires a high level of competence of both languages (SL and TL) and knowing the differences which may be cultural or non-cultural. For a scientific and technical translator to be successful it is better to pay enough attention to cultural differences between languages and make shifts where necessary. Cultural differences in scientific and technical texts may be found in technical terminology where the meaning dimensions may be distant. At the level of grammatical structures, cultural differences show themselves in preferences between different structures although word for word (literal) translation may not be wrong. More importantly, the overall text structure is different in different countries and ignorance of this would at least reduce the effectiveness of translation or have negative side-effects. Misunderstanding would be the first negative result of such ignorance and this is dangerous since the intention of scientific and technical prose is mainly informing the user (or reader) about facts.

In addition to the proposed headings of Stolze (2009), another place where cultural differences can be traced (at least in the pair languages of English-Persian) is differences in ways of conveying information: personal and demonstrative pronouns are usually avoided in Persian scientific and technical texts. The researcher called this heading “Stylistic” cultural difference. Stylistic cultural difference occurs at the level of use and frequency of personal and demonstrative pronouns. English tends to use more personal and demonstrative pronouns in scientific and technical prose whereas obsessive use of personal and demonstrative pronoun is prohibited in Persian academic and scientific prose, though it is not violating any grammatical rules and regulations. This is just a matter of preference and has to be observed in translation. Further research would show whether differences of this kind exist in other language pairs or not. At least this is one other type of cultural difference between English and Persian in scientific prose.

Out of the researcher experience, syntactic and stylistic cultural differences could be called the most deceiving parts of a text for translation. They have the most frequency among others. Each of them accounts for about 35% of differences between English and Persian. Each of the three other maxims of Terminology, Language Form, and Text structure accounts for about 10% of differences between the two languages. Further examination of differences between original texts and their translations as well as comparing original scientific-technical texts in different languages would shed more light on cultural differences in scientific-technical translation.

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