Exploring the Connections between Cognitive Linguistics and Scientific Technical Translation

Saman Samanmanesh[1]

1- Master student of English Language Literature, Zanjan University, Zanjan, Iran.

Article Information	Abstract
	This dissertation aims at investigating the interface between scientific and technical translation (STT) and cognitive linguistics (CL), placing particular emphasis on the translationally relevant phenomena of explicitation and implicitation. The two concepts are regarded as potential indicators of translational text-context interaction, which may be of specific importance in the knowledge-intense field of STT and which can be modelled within the CL framework. In doing so, the researcher selected An Introduction to Theories of Learning, by Olson and Hergenhan (2009) .This book was later translated into Persian by Ali Akbar Seyf (2016). The researcher started from the linguistic classification of explicitation and implicitation shifts developed by Klaudy/Károly (2005) and tried out exploring the cognition by identification of target texts in ST (in humanities and pure science), finding the available translations in Persian, analyzing the STs according to the framework, analyzing the TTs according to the framework, comparing and contrasting the results discussing the findings. The analysis of the scientific-technical corpus and the discussion of results showed that explicitation and implicitation are indeed well-suited concepts for illustrating the interface between text and context in STT. The quantitative investigation showed that explicitation shifts occur relative less frequently in the translation of STT. Also, the Cognitive Linguistic framework also proved useful in describing the sometimes fuzzy transition zone between explicitation and implicitation and their adjacent concepts on the expansion-explicitation-addition continuum and the reduction-implicitation-omission continuum.

Introduction

Language and translation are inseparable entities. Certainly, translation can be considered as one the most mentally challenging tasks a human can do. To do so, it is vital that a translator grasp the knowledge of stylistics, which is the basic discipline forming the cornerstone of information about a particular style, and is necessary for a translator's mission. According to the available theoretical discourse on scientific or technical translation, this field of translation is interwoven with both societal considerations; that is, encouraging scientific and technical progress through the distribution of information across cultural and linguistic borders, as stated by Byrne (2012)and Krein-Kühle (2003), and professional considerations, that is, the missions of the translators often generating a significant volume of their earnings from translating scientific and technical works (Byrne, 2012; Schmitt, 1999). Meanwhile, researchers who are interested in the realm of translation and are also concerned with scientific or technical translation, often notice a sharp distinction between the great professional and societal relevance of scientific or technical translation on one hand and the shortage of research carried out in this field of translation (Byrne, 2006; Krein-Kühle, 2003; Salama-Carr, 2013), leading a number of scholars such as Salama-Carr (2009) to argue that scientific or technical translation "remains relatively unchartered territory within the discipline and is deemed a less prestigious test case for translation models" (p. 43). The translator, according to cognitive linguistics, is not viewed as a "language expert" who must be faithful to source text, but he has to adapt the source text to both the target language and audience, from both conceptual and linguistic aspects. Translation studies, as an independent field of study, on the other hand, provides a multifarious description of language function which states that there are two processes, decoding and recoding, in different languages. Accordingly, it can be claimed that this field provides a more demanding field for checking if the norms of cognitive linguistics work. For example, one of the issues may be how a translator chooses what is to be decoded from source text and how it has to be recorded in target text. The answers may be given by cognitive linguistics after studying cognitive process, decision making, embodiment, and motivation as well. However, other questions might be responded by the experts of translation studies, who inform us about a wide range of factors, for instance, genre characteristics and text types as well as particular individual factors such as the translators' choices. In addition, cognitive linguistics might provide a bunch of methodological procedures and instruments that allow the experts of translation studies to further analyze a set of traditional translation phenomena in a more rigorous and systematic manner. This is extremely knotty, because explicitation, in its wider conception, is both a feature which is tangibly analyzable via establishing absence or presence of cohesive markers in a target text, and feature which, according to Klaudy and Károly (2005, p. 5) manifests itself in vaguer margins, for example, as a more sophisticated characteristics of target language words or the delivery of novel "meaningful elements" in a target text without the existence of an palpable triggering constituent in the equivalent source text (Steiner, 2005, p. 17). The latter argument is of special importance, and concisely exemplifies the possible glitches existing in research on explicitation/implicitation and the existing gap concerning a sound theoretical foundation for these two concepts. Introducing fresh meaningful components into a target text or deletion of meaningful elements of a source text when rendering it into a target text, leads to two vital borders often neglected in research explicitation/implicitation. According to Kamenická (2007) these flaws are (1) the difference between addition and explicitation and (2) the distinction between implicitation and omission. The problems associated with these discrepancies are intrinsically associated with the correspondingly problematical concept of implicitness. Furthermore, the latter difference between explicitation and addition, is preoccupied with the level at which novel material presented in a translatedtext is judiciously found to be hidden in the corresponding original text. On the other hand, the implicitation/omission distinction is related to the degree to which the content that is coded explicitly in the original text but not in the corresponding translated text. Accordingly, as long as a certain part of information which is expressed in a target text does not exist in the source text and is not believed to be implicitly embedded in it, a case of addition is occurred. these research questions were investigated:

1 .How applicable is cognitive linguistic as a framework for evaluating of scientific and technical translation؟

2 .What pattern of text context interaction is observed between explicitation and implicitation under cognitive linguistic framework for evaluating of scientific and technical translation؟

3 .What connections can be between textual and extra-textual aspects of scientific technical translation under cognitive linguistic framework؟

4 .What dimension of scientific technical translation (i.e. function of the text, subject of confidence of discourse, and technicality) are more in accord with cognitive linguistic framework؟

Considering the above-mentioned debate on implicitation from cognitive linguistic view, this study invested on the potentials of the links sought by other researchers between cognitive linguistics and translation studies so far to trace it and its counterpart, explicitation, in the scientific and technical texts translated into Persian. The epistemic drive of present dissertation may best be described as conducting a corpus-based examination of scientific-technical translation in terms of explicitation/implicitation which concentrates on the boundary between context and text during this sort of translation. This study attempted to illustrate how translators handle this context-text interaction in scientific-technical translation. In accordance with this general purpose, the minor objective is to explore the configurations of context-text interaction in terms of explicitation/implicitation with reference to existing interrelated factors (e.g. the direction or technicality of translation). In addition, this study attempted to observe the border between scientific-technical translation and cognitive linguistics through differentiating different pertinent features of scientific and technical translation in

the light of cognitive linguistic conception. Moreover, this dissertation aimed at exploring explicitation and implicitation as definitely established and broadly researched notions in translation, based on cognitive linguistic to shed light on relevant topics in explicitation/implicitation inquiry and support a rational interaction among the fields. Finally, through empirical analysis, this study tried to illustrate the validity of cognitive linguistics framework by identifying explicitation and implicitation in actual translational phenomena.

Methodology

In the design stage, it was essential to build a parallel translation corpus, which paves the way for the comparison of ST-TT properties. Adoption of corpus-based approach allows investigating features of translations based on original and target texts since it focuses on formal properties of both translated and original texts (Laviosa 2002, p. 63); however, they ignore translation process a holistic evaluation of translation (Becher 2011,p.14). Designing a corpus, however, according to House (1997, p. 29) the reflective perspective to ST and a prospective view to TT readers.

The corpus of the study contains the ST, An Introduction to Theories of Learning, by Olson and Hergenhan (2009) .This book was later translated into Persian By Ali Akbar Seyf (2016). The details of these two texts are as follows:

Table۱ : Specifications of the source material

Source Text				
Book title	Authors	Year of publication	Publisher	pages
An Introduction to Theories of Learning	M. Olson B. R. Hergenhan	2009	Psychology Press	492
Target Text				
Book title	Translator	Year of publication	Publisher	640
مقدمه ای بر نظریه های یادگیری	دکتر علی اکبر سیف	1395	نشر دوران	

The source text which contained 492 pages which were considered as the population in this research. The researcher used Kerjcie & Morgan's table (1970) to choose the reliable sample of the study. So, according to mentioned table, she selected 215 pages by applying a systematic random sampling. then she selected the corpus of the study from the paragraphs of the source text and their equivalents in the target text as the unit of analysis based on the pragmatic characteristics of the text which ended to the selection of 86 paragraphs available in appendix one.

The need for conducting research in different disciplines has caused a need for a method for determining an appropriate sample size. Morgan and Krejcie (1970) designed a formula for calculating the sample size, according to which the number of sentences were determined in this study.

In order to investigate the connection between cognitive linguistics and translation the aforementioned research questions were posed after consulting various related sources. Then, at the beginning of the practical phase of the study, a corpus of scientific or technical texts was developed in both humanities and pure sciences which includes both English texts and their translations in Persian. In order to trace the cognitive aspect of the text, this is to trace how the type of the text can be in charge of any fluctuations made in the texts as well as their translations. It is worth mentioning that there was only one translation for each source English text. This was due to two rationales; first, the researcher was not going to adopt a comparative perspective to the issue; and second, including two or more translations of a single English source text could make the manageability and practicality of much more difficult to control and handle.

The following steps were going to be taken for doing this study:

1- identification of target texts in ST (in humanities and pure science)

2- finding the available translations in Persian

3- analyzing the STs according to the framework

4- analyzing the TTs according to the framework

5- comparing and contrasting the results discussing the findings

In the following sections, a linguistic classification of possible explicitation/implicitation shifts which served as a yardstick in this study are presented. The researcher relied on the linguistic taxonomu of explicitation/implicitation shifts (Klaudy & Károly, 2005, p. 15), and revised it based on a cognitive linguistic orientation. Accordingly, shifts of explicitation are linguistically identified as follows:

Lexical addition: new meaningful elements are introduced in the TT

Lexical specification: an ST unit with a more general meaning is replaced by a TT unit with a more specific meaning

Lexical division: the meaning of an ST unit is distributed over several units in the TT

Grammatical addition: not further specified

Grammatical specification: an ST sentence is divided into two or more TT sentences

Grammatical elevation (raising): ST phrases are "raised" to clause level in the TT The classification of implicitation shifts mirrors that of explicitation shifts.

According to Klaudy/Károly (2005), implicitation shifts can be realized as follows:

Lexical omission: meaningful elements of the ST are dropped in the TT

Lexical generalization: ST unit with a more specific meaning is replaced by a TT unit with a more general meaning

Lexical contraction: the meaning of several ST units is combined in one TT unit

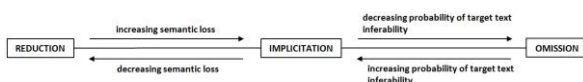*Grammatical omission:* not further specified

Grammatical generalization: two or more ST sentences are conjoined into one TT sentence *grammatical lowering (downgrading):* ST clauses are reduced to phrases in the TT

Since lexical addition/omission include prototypical examples of explicitation/implicitation, they are considered uncontroversial if the elements with relevant meaning are inferable contextually or, from cognitive linguistic view, are salient in the given discourse space. However, they may not be fortunate choices here since they refer to concepts which may be distinct from explicitation. Accordingly, in this study lexical insertion and lexical deletion are investigated.

lexical specification and lexical generalization are also included under examples of explicitation/implicitation. However, from cognitive linguistic point of view, lexical generalization was replaced by lexical schematization. Accordingly, Lexical specification/schematization would be instances of Langacker's analysis of specificity/schematicity. Thus explicitation is situated between the adjacent notions of addition and expansion. The difference between explicitation and the other two concepts may be vague and a matter of degree.

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                    increasing semantic contribution              decreasing probability of source text
                                                                  inferability
EXPANSION  ─────────────────────────────▶  EXPLICITATION  ─────────────────────────────▶  ADDITION
                    decreasing semantic contribution              increasing probability of source text
                                                                  inferability
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Implicitation, similar to explicitation, is also located between omission and reduction. The difference may also be vague and gradual.

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                    increasing semantic loss                      decreasing probability of target text
                                                                  inferability
REDUCTION  ─────────────────────────────▶  IMPLICITATION  ─────────────────────────────▶  OMISSION
                    decreasing semantic loss                      increasing probability of target text
                                                                  inferability
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Operationally, textual and extra-textual cognitive strategies investigated in this study include the following items:

(1) visibility change defined as a strategy that increases the "presence" of either the author of the source text or its translator (e.g. footnotes that are added by the translator);

(2) interpersonal change which is used to affect the whole style of the text to make it more or less informed, technical etc.;

(3) coherence change concerns changing the ST in a higher textual level (i.e. combining different paragraphs to each other in a way different from the source text);

(4) partial translation that refers to translating a part of a text, not the entire text;

(5) Illocutionary change refers to the use of rhetorical questions and exclamations in text.

This study was considered a corpus-based survey which was underwent to find the specific cognitive elements according to a predetermined framework of analysis. This study was also considered to be qualitative in nature, considering the type of data.

This study was considered a corpus-based survey which was underwent to find the specific cognitive elements according to a predetermined framework of analysis. This study was also considered to be qualitative in nature, considering the type of data.An exploratory-descriptive approach was taken to analyze the data from the corpus. First the instances were identified as evidence for each category, as mentioned in the research questions. Then, they were grouped and interpreted according to the framework and previous studies done so far. Finally, a conclusion was drawn for each research question, separately.

Results and Discussion

The parts represents the findings of parallel corpus analysis of "*An Introduction to theories of learning*" written by Olson and Hergenhan (2009) and its Persian translation by Ali Akbar Seyf (2016a randomized sample of the courses has been extracted by the researcher from the above mentioned books and compared and contrasted with Its Persian translation). The parallel paragraphs of their Persian counterparts, were put into separate tables presented in the following section, and the strategies applied to translation were mentioned in the table. Further discussion of the results is also conducted to answer the research questions:

The researcher represented the results of the qualitative findings based on the content analysis of the text. A sample of the findings of the qualitative results and their analysis are displayed first for the applied cognitive and semantic strategies. The detailed representation of these strategies is presented along with the discussion of each strategy in the extended table of the results.

The most applied semantic strategies that realized by the researcher in this study were respectively: synonymy, emphasis change, paraphrase and antonymy while the most applied pragmatic strategies were explicitness change, information change and trans-editing. In the following section examples of each one selected from the appendix of the research which contains a full detail of applied strategies and the critical assessment of their translation, would be presented.

ST: The adaptive value of classical conditioning is further demonstrate the fact that it typically takes several pairings between a CS and a US before conditioning is established

TT: ارزش بقای شرطی شدن کلاسیک بیشتر با این واقعیت مشخص می شود که نوعا چندین بار همراهی محرک شرطی با محرک غیر شرطی لازم است تا شرایط شرطی شدن صورت پذیرد.

Critical analysis: Synonymy: Takes is translated into "صورت پذیرد" in TT and the translator is used "لازم است" instead of "established". These changes may also be discussed under the term visibility change which depicts the active role of the translator in changing the TT.

This strategy increases, decreases or changes the emphasis of thematic focus of the translated text in comparison to the original.

ST: It is not uncommon for stimuli such as a mild acid solution or electric shock to be used as unconditioned stimuli.

TT: در پژوهش های پاولف استفاده از اسید یا شوک برقی به عنوان محرک غیر شرطی امری کاملا عادی بوده است

Critical analysis: The translator removed the adjective mild to make it more natural in Persian. It is an example of handling emphasis change. This change may be discussed under the term interpersonal change made in the text to make it less technical.

According to the overall meaning of the source text, this strategy creates a liberal approximate translation, some lexical items may be ignored in this sort of strategy.

ST: these events and their effects may come and go rapidly, whereas learning lingers until forgetting takes place over time or until new learning displaces old learning.

TT: این رویداد ها و آثار آنها به سرعت می آیند و می روند در حالی که یادگیری دوام می یابد تا اینکه با گذشت زمان دستخوش فراموشی شودیا یادگیری تازه ای جای آن را بگیرد

Critical analysis: Paraphrase strategy:" take place" is translated into "دستخوش فراموشی می شود". There is also an instance of omitting a modal verb. The translator ignored the modal "may" in the original text so that there is no trace of it in the target text. In the same line, the expression "old learning" in the source text was rendered into a pronoun "it" or "آن" . In addition, it has to be mentioned that there are instances of the omission or ignoring of words such as' may' and substitution of 'old learning' with a pronoun while rendering the original English text. it seems that the translator decided to present a sort of free translation of the original text so that he can render the original meaning and intention of the writer while escaping the linguistic complexities he may face in either the original text or the translated text. However, adoption of such a strategy may be due to lack of translation competence of the translator considering the fact that the translator is a proficient English speaker expert in educational psychology with minimum familiarity with technical translation theoretical knowledge.

ST:

Gagné believes that these eight types of learning are arranged in a hierarchy, with one sort being a prerequisite to the next.

TT:

گانیه معتقد است که این هشت نوع یادگیری خاصیت سلسله مراتبی دارند که هر یک از آنها برای نوع بعدی پیش نیاز به حساب می آیند.

This example shows how the voice of the verb "are arranged" in the ST was changed into an active voice in the ST. it seems that the translator has changed the voice in order to make the subject-verb relationship clearer in Persian for the students and decrease the cognitive load of the translated text.

In this strategy, the translator uses a word with opposite meaning. This word mostly combines with a negation.

ST: Nor could an organism survive long if it could not learn environmental objects were safe and which were dangerous

TT: همچنین اگر یک موجود زنده نتواند بیاموزد که کدلم اشیای محیطی بی خطر و کدام خطرناک اند به زودی از میان خواهد رفت

Critical analysis: Antonymy: The translator used the opposite verb "ازمیان خواهد رفت" in TT instead of the original verb "survive". However, this could not be considered as a manipulation. In addition, the position of the pronoun and its reference in the conditional sentence were reversely replaced. That is, instead of "it" in the ST "organism" was used and instead of "organism" in the ST the pronoun "it" was used.

In this strategy, some information of the source text maybe added; or deleted to make the text more or less explicit.

ST: In general, it is through classical conditioning that we learn which objects are conducive to survival and which are not, and it is through in or operant conditioning that we learn how to acquire or avoid desirable or undesirable objects.

TT: به طور کلی ما از طریق شرطی شدن کلاسیک می آموزیم که کدام چیزهای محیطی برای بقا مفید و کدام مضر اند و از طریق شرطی شدن وسیله ای یا شرطی شدن کنشگر یا و وسیله ای یاد می گیریم که چگونه چیزهای مطلوب را به دست آوریم و از چیزهای نامطلوب دوری گزینیم

Critical analysis: Explicitness change" کدام مضرند " is added to improve the translation and add to its explicitness. This can be also discussed on the expansion-explicitation-addition continuum which emphasizes the active role of the translator in adding to the text to expand it so that the audience could infer the text better.

In this strategy, the changed information is NOT implicit in the source language text:

ST: Although there may be a potential to act differently, this potential to act may not be translated into behavior until a later time.

TT: اگرچه در نتیجه یادگیری یادگیرنده توانایی بالقوه متفاوت عمل کردن ایجاد می شود توانایی ممکن است بلافاصله در رفتار او ظاهر نگردد

Critical analysis: The translator added information to the original text to make it more understandable. This is an example of information change strategy. This change is also explainable in terms of expansion-explicitation-addition. It seems that the translator, due to his technical mastery, could adopt an interpersonal strategy and changes the text so that the TT would be more comprehensible and natural for the reader.

It refers to extensive editing of the original text when necessary (i.e. changing the organization of the source text information, wording or etc.).

ST: In this text we acknowledge these concerns and do not equate the terms reward and reinforcement. Except where the term reward is appropriate as it is defined in

Skinner's remarks in the preceding quotation, the terms reinforcer and reinforcement are used exclusively. (p.2)

TT: ما در این کتاب ملاحظات بالا را ارج خواهیم نهاد، یعنی اصطلاحات پاداش و تقویت را هم معنا بکار نخواهیم برد و در سراسر متن حاضر منحصرا از اصطلاحات تقویت کننده و تقویت استفاده خواهیم کرد، مگر در مواردی که کاربرد اصطلاح پاداش، با در نظر گرفتن اظهارات اسکینر در نقل قول بالا، مجاز باشد

Critical analysis: Trans editing: TT didn't reflect the authors' intention. This is also interpretable in terms of the reduction-implicitness-omission continuum based on which the translator removes some part of the text which is thought to be inappropriate for the confidence of the discourse participants of the TT which in this case are the undergraduate students studying in the fields of psychology or education. In addition, this change is viewed in terms of coherence change strategies through which the overall arrangement of the ST is change so that the TT would be more natural for the confidence of the discourse participants. This is also an instance of interpersonal change through which the translator makes necessary changes in the ST to adapt it to the technical knowledge of the possible readers. The last but not the least, this example may be interpreted as the partial translation strategy through which the translator does not feel to be committed to the translation of the whole ST.

In this section the untranslated parts are described as omitted parts of the ST translation and as examples of intense implicitation as discussed earlier in chapter 3 bout implicitation continuum.

ST:

The blaring of an automobile horn just as we bump our head or we bite into a tasty sandwich would result in a learned answer to every automobile horn and copious salivation during thunderstorm would consist of random and useless reflexive responses.

TT:

Not translated (Omission)

ST:

Consider what might happen if learning occurred after only one CS.

TT:

Not translated (Omission)

ST:

Our environment is filled with stimuli, but few of them are consisting of painful or of pleasurable events, and, as we will see, classical co depends on a meaningful relationship between CS and US.

TT:

Not translated (Omission)

These parts are not translated and they can be a good examples of manipulation and omission of the text. This can also be discussed under the visibility of the translator in the text where he decides what part of the ST is necessary or a must-know for the students.

In this section, the frequency of strategies used by the translator for all the applied cognitive changes would be presented in the following tables.

Table 2. *The frequency and percentage of the applied manipulation in the corpus of the study*

Manipulation	Frequency	Percentage
Yes	26	30.23
No	54	62.79
Not translated	6	6.98
Total	86	100.00

Table 2 shows the distribution of the overall cognitive changes occurred in the target text after being translated into Persian. As shown in the table above, from the overall 86 instances analyzed in this study, 26 instances in the sample underwent cognitive changes while 54 instances (62.79%) remained unchanged. Accordingly, it has to be mentioned that 6 instances in the corpus (6.98%) were not translated into the target text. Based on the overall findings, as reported in Table 4.1, it can be argued that the cognitive changes are almost frequent and routine changes in English-Persian translation of the scientific texts. According to the findings of this table it can be seen that the cognitive framework of the study was applicable to the translation of the scientific text and further investigations are plausible and possible within this framework as shown in the following table and sections.

In order to answer the research questions and to find out the most frequent strategies, the following statistical analyses were provided.

Table 3. *The frequency and percentage of the applied explicit and implicit changes*

Cognitive changes			percentage
Explicit	Synonymy	24	36.92
	Antonymy	4	6.15
	Hyponymy	1	1.54
Implicit	Converse	1	1.54
	Emphasis change	24	36.92
	Paraphrase	11	16.92
	Total	6	100.00

As it is evident in Table 4, the frequencies of the implicit cognitive changes are dominant in the sample extracted from the English-Persian translation of the target text. A second glance at the table shows that the emphasis change is the dominant implicit change (n = 24) and paraphrase is

in the second rank (n = 11). Both of these changes in the source text are due to the cognitive processes of the translator's mind as he attempts to switch the text into a mode which is appropriate for the Iranian students at the graduate level in special. With regard to explicit change, synonymy (n= 24) was the most dominant and antonymy was in the second ranl (n= 4). This may be justified with regard to the cognitive processes undertaken for making the target Persian text more comprehensible for the undergraduate students. It is worth to define hyponymy as the case where the meaning of one word is, so to speak, included within the meaning of another word. Furthermore, the term converse is mostly known to a limited circle of specialists but not to the public at large. Converse translation is defined in a similar way to antonymic translation. It is a translation mode whereby one member of a converse pair used in the ST is replaced by the other member of the pair in the TT (Louw, 2006; Chesterman, 1997).

It can be concluded that regarding the second research question of the study: "What pattern of text context interaction is observed between explicitation and implicitation under cognitive linguistic framework for evaluating of scientific and technical translation?" it can be argued that implicitation is the absolute dominant cognitive change that occurred in the translation of the scientific text in this study. With regard to the results reported in Table 4.2, it can be argued that emphasis change is the most dominant implicitation in the translation of the scientific changes and synonymy is the most dominant explicitation occurred which the cognitive framework of the study.

Table 4. *The frequency and percentage of the textual and extra-textual cognitive changes*

Changes		Frequency	Percentage
Textual	Explicitness Change	15	57.69
	Visibility Change	1	3.85
	Interpersonal change	1	3.85
	Illocutionary change	0	0.00
	Coherence change	1	3.85
	Partial Translation	0	0.00
Extra-textual	Information change	5	19.23
	Cultural Filtering	0	0.00
	Trans-editing	3	11.54
		26	100.00

The frequency and percentage of cognitive changes occurred with regard to textual and extra-textual factors used by the translator are shown in

Table 4.3. These changes are classified in terms of (1) visibility change defined as a strategy that increases the "presence" of either the author of the source text or its translator (e.g. footnotes that are added by the translator); (2) interpersonal change which is used to affect the whole style of the text to make it more or less informed, technical etc.; (3) coherence change concerns changing the ST in a higher textual level (i.e. combining different paragraphs to each other in a way different from the source text); (4) partial translation that refers to translating a part of a text, not the entire text; and (5) Illocutionary change refers to the use of rhetorical questions and exclamations in text.

As shown in Table 4, it can be concluded that the among the 26 instances of the cognitive changes occurred in the translation of scientific text in this study, most of the changes were at the textual level and about one third of the changes observed in this study was at extra-textual level. As it is shown in the table, explicitness change was the most dominant textual change (n= 15) and was followed by interpersonal change, visibility change and coherence change, each of which with one example. The interesting point was that instances of illocutionary change and partial translation were absent. With regard to extra-textual changes, informational change (n= 5) and trans-editing (n=3), were less dominant in the text in comparison to textual changes. This is partly justified with the translator's lack of familiarity and education in the field of translation studies. Also, in a full translation, the entire text is submitted to the translation process, that is very part of the ST is replaced by the TT material. In a partial translation, some part or parts of the ST are left untranslated: they are simply transferred to and incorporated in the TT (Catford, 1965). In this regard, the researcher did not found any partial one. Accordingly, with regard to the third research question of the study, "What connections can be between textual and extra-textual aspects of scientific technical translation under cognitive linguistic framework?" it can be concluded that the textual changes were the dominant cognitive changes occurred in the English-Persian translation of the scientific text. According to the Table 4.3, it can be argued that the explicitness change is the dominant textual change that occurred in the translation.

Moreover, the concept of a cultural filter is the core of covert translation in which the translator re-creates a new context in order to achieve the true functional equivalence aiming at giving the target reader the impression that the text is an original and not a translation at all. With the use of this filter, the translator can make systematic allowances for culture specificity accommodating for differences in sociocultural norms and differences in conventions of text production and communicative preferences (House, 1997).

In order to answer the fourth research question of the study stating " What dimension of scientific technical translation (i.e. text function, subject matter of confidence of discourse, and the degree of technicality) are more in accord with cognitive linguistic framework?" the researcher focused on the aspects of objectivism and subjectivism as the borderline between STT and cognitive linguistics. In order to do this the researcher starting from the highest level of abstraction, and surveyed the philosophy of embodied realism as the first potential point of contact between STT and cognitive linguistics. Embodied realism attempts to steer a middle path between the two opposing paradigms of subjectivism and objectivism and suggests a

dialectal relationship between the human mind and the world in the emergence of human conceptual systems.

It was argued that embodied realism, together with its more specific manifestation embodied in scientific realism, could also serve as an epistemological basis for STT, which is assumed to operate on stable frames of reference but which seems, at the same time, to be at odds with subjectivist accounts of translation because it is questioning the possibility of stable frames of reference. However, considering the embodied scientific realism which offers a high-level explanation for the relatively stable epistemological basis of science and technology from a human point of view the present thesis focused on text function, subject matter of confidence of discourse, and the degree of technicality in order to measure the dimensions of STT. Among the 26 instances of the cognitive changes occurred in the STT in this study, the following distribution was observed with regard to the operational taxonomy in this study.
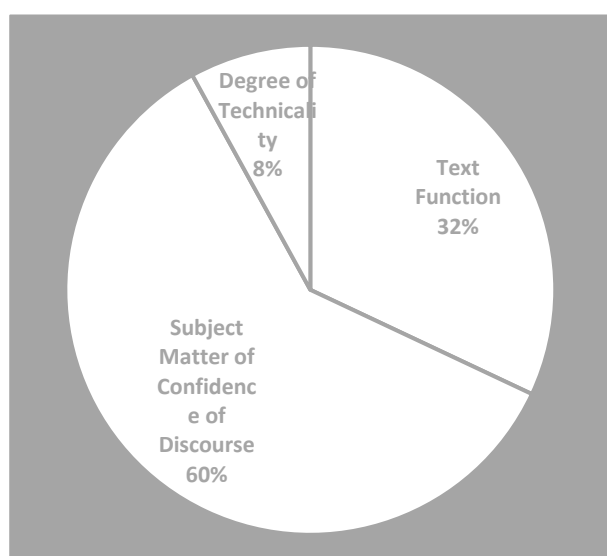

Figure 1. Distribution of the observed dimensions of the cognitive changes in the TT

As shown in the figure, it can be concluded that the subject matter participants discourse confidence and values of the translated text underwent the severe changes due to the fact that translation was exposed to severe change of practical applications in the target society in Iran. As it was mentioned by the translator himself in his introduction to the translation, this book was mainly translated because he was interested to provide a sound textbook for teaching the theories of learning for the students of psychology and other related fields such as education and counselling. That is, the discourse of the text underwent the most severe changes due to the fact that the translated text changed from a mere scientific and technical text into a scientific-didactic text.It seems that the other changes such as the changes in the function and the degree of technicality experienced minor shifts due to the same fact.

Discussion

The present study was an attempt to take a look at scientific text translation from English to Persian. To do so, a cognitive linguistic perspective was adopted and the changes occurred in the target Persian text, in comparison to its source English text was studied from dimensions adopted from cognitive linguistic, especially, explicitation and implicitation. However, in order to be more specific, different aspects of cognitive changes in terms of cognitive processes and strategies such as synonymy, abstract changes and distribution changes, etc. and cognitive-textual aspects such as coherence, visibility, etc. were taken into account. The general finding of the study was that implicitation was more dominant than explicitation; however, the difference was not very large and eye-catching. In addition, the results showed that textual changes were more visible and dominant than extra-textual ones.

While the link between embodied realism and STT is both abstract and tentative, that is, it is still difficult to study aspects of STT, this research may is surely an initial step toward altering the current relativist epistemology governing translation evaluation (Halverson, 2013, p. 62).

From a critical point of view, it can be argued cognitive linguistics offers different tools to the benefit of STT. Generally, cognitive linguistics encourages a usage-based approach to the study of TT and ST which may make STT or translation evaluation a perfect opportunity to test cognitive linguistic tools as well. Simultaneously, cognitive linguistics can provide a basis which is unique for studying linguistic meaning. This gives us a chance to have a more coherent account of STT, and makes it possible to compare the findings of cognitive linguistic account with those of other approaches.

Linguistic relativity which is inherent in cognitive linguistics is practical for and compatible with STT evaluation, since it simultaneously subscribes to the possible stability of meaning b confronts with various linguistic and conceptual irregularities exist in ST and TT. Cognitive linguistic holds that language can facilitate, but not determine, the conceptualizations of domain-related realities. It also asserts that each language may have its unique means of encoding these conceptualizations.

This study specified some practical components of cognitive linguistics which were related to STT. Firstly, the notion of linguistic explicitation/implicitation (Croft & Cruse, 2004; Langacker, 2008) were discussed, and it was argued the cognitive operations discussed under these terms are relevant to certain linguistic aspects of translation and explicitation/implicitation dichotomy is applicable to the study of STT. It was shown that Clark's (1996) concept of common ground is suitable for modeling the shared knowledge of a given discourse communities, which is communicatively valuable in as expert-to-expert, expert-to semi-expert and expert-to-layperson communication through STT.

The joint of the technical or specialized knowledge contexts of participants and linguistic means of a text established a common ground for describing specificity/schematicity and theoretically sound basis for discussing the domain of knowledge required to make a link between the social and the conceptual aspects of knowledge in STT. The cognitive semantic tools can actually organize the knowledge in STT. The knowledge needed to digest specific lexical units was also found to be organized in cognitive linguistic domains. Accordingly, a modification of a certain aspect of this knowledge leads to contextual load in the related STT. The significance of situational, discourse and knowledge context is essential for cognitive linguistic

approach to discourse space, found to a very helpful in the discussion of explicitation/implicitation in STT.

Conclusion

This researched explored the interface between STT and CL, emphasizing explicitation/implicitation as a possible indicators of text-context interaction in STT. Having formulated the research question, the researcher first rigorously reviewed the studies done on STT and the application of cognitive linguistic in translation. The study investigated the complexities of STT, through the analysis of the contextual and textual aspects of the corpus.

It was shown that explicitation/implicitation can work as potential indicators of the interaction between text and context in translation and are well testified within the cognitive linguistic framework. In other words, both of them contribute to STT; however, implicitation seems to be relatively more important. Different aspects of this framework were shown to be of great use for modelling the implicitation in technocal communication and for re-conceptualizing explicitation/implicitation as cross-linguistic means of STT operations. The relationship between explicitation/implicitation and cognitive plausibility was shown to be compatibile with the basics of cognitive linguistics as a sound basis for evaluating STT. This interconnection also provides the theoretical common ground for presenting a cognitive linguistic continuum of explicitation/implicitation that serves as basis for the discussion of STT features.

The analysis of STT showed that explicitation/implicitation continuum is a well-suited basis for illustrating the interaction between context and text in STT. The results showed that explicitation shifts are generally less frequent than implicatation shifts in STT. A clear trend was found with reference to the level of technicality STT, where more explicit shifts were seen in the expert-to-non-expert STT considering the fact that the translator was to provide a university textbook for BA students. The results included various shift types and different types of translational moves (e.g. cohesive, coherence and omission).

Additionally, cognitive linguistic framework found to be a sound basis for discussing explicitation/implicitation shifts in STT, especially, in terms of the fuzzy transition zones on explicitation/implicitation, expansion-explicitation-addition and reduction-implicitation-omission continuums. The analysis of the STT showed that explicitation/implicitation well justifies the interaction between context and text in STT and a clear trend is visible according to the level of technicality of the STT, where expert-to-non-expert STT entails more implicitation shifts.

This study showed the interaction between STT and cognitive linguistics is very promising and that cognitive linguistics is fruitful field offering interesting tools to evaluate STT, a limited number of which were included in the theoretical framework of this research and further empirical investigations can offer more practical implications. Generally, the link between scientific realism and STT seen as an epistemological bais for the stability of the domains of reference underlying STT could be further elaborated in translation teaching courses and discussed more comprehensively in theoretical textbooks and courses and also discussed wherever relevant in practical courses.

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