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METHODOLOGICAL PROPOSAL INTEGRATING THE TRANSLATION PROCESS INTO THE STUDY OF COGNITIVE EFFORT

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Abstract: This paper presents a methodological proposal that integrates the translation process into studying the cognitive effort with the use of three instruments. Data triangulation accounts for such phenomena. Translation process research has used Translog to approach mental activities, such as cognitive effort. However, authors such as O'Brien (2006) suggest the use of complementary methods to have a comprehensive understanding of what occurs while translating. This paper aims to present a data collection model that includes the use of Translog as the main instrument to record the indicators of cognitive effort (time and typing pauses) during a translation process, a screen capture software that records the screen's output, as well as retrospective interview to obtain verbal information from its users. In order to establish a relationship between cognitive effort and the translation process, a triangulation data method was used with the information collected from the aforementioned instruments, alongside conducting a semantic content analysis.
Keywords: Translator Process; Cognitive Effort; Translog; Semantic content analysis; Triangulation

PROPOSTA METODOLÓGICA INTEGRANDO O PROCESSO DE TRADUÇÃO NO ESTUDO DO ESFORÇO COGNITIVO

Resumo: Este artigo apresenta uma proposta metodológica que integra o processo de tradução ao estudo do esforço cognitivo com a utilização de

três instrumentos cuja triangulação permite dar conta desse fenômeno. Em estudos de tradução como um processo, o Translog tem sido usado para tratar de atividades mentais, como o esforço cognitivo. No entanto, autores como O'Brien (2006) sugerem a utilização de métodos complementares que tenham uma visão abrangente do que ocorre durante a tradução. Este artigo tem como objetivo apresentar um modelo de coleta de dados que inclui a utilização do Translog como principal instrumento para registro dos indicadores de esforço cognitivo (tempo e pausa de digitação) durante um processo de tradução, software de captura de tela para registro de todos os movimentos na tela, como bem como uma entrevista retrospectiva para obter informações verbais dos participantes. Realizou-se uma triangulação dos dados coletados por meio dos referidos instrumentos e uma análise semântica de conteúdo para estabelecer a relação entre o esforço cognitivo e os processos dos tradutores.
Palavras-chave: Processo do tradutor; Esforço cognitivo; Translog; Análise de conteúdo semântica; Triangulação

Introduction

Translation theorists from a cognitive perspective, such as Gutt (1991), Bell (1991), Lörscher (1991), Kiraly (1995), Gile (1995), Wills (1996), Snell-Hornby (1988), Shreve & Koby (1997), Jakobsen (2002), Hurtado & Alves (2009), O'Brien (2006), and Alves *et al*. (2011), among others, consider translation to be a communicative act that involves cognitive, linguistic, and sociocultural aspects that allow translators to analyze and understand a message delivered in a source language and culture with the purpose of producing a target text (hereinafter TT) complying with conditions of production and reception.

Translation as a communicative act implies an in-depth understanding of the Source Text (hereinafter ST). This entails a comprehensive reading process such as, discursive conditions, sociocultural context, and linguistic and extralinguistic knowledge of the languages and cultures involved. As stated by Hurtado (2007, p. 40): "There are three traits that characterize translation: to be an act of communication, an operation between texts (and not between

languages), and a mental process." Therefore, translators must have knowledge in both the languages and the cultures involved and develop skills that aid them to produce an adequate TT.

Over the last four decades, studies on the translation process and on the translators' mental abilities have emerged and relied on different areas of knowledge of the cognitive sciences. Hvelplund (2011) states that the use of technologies and cognitive science concepts for studying the translation process may provide a solid basis for a comprehension of translators' cognitive processes. Subsequently, due to this statement, Think Aloud Protocols (TAPs) were first implemented, and although they provided valuable findings, further research showed that they were not sufficient when accounting for everything occurring in the translators' minds.

As a result, a combination of techniques such as Electroencephalography (EEG) (Kurz, 1996), *Eye-tracking* (O'Brien, 2006; Jakobsen & Jensen, 2008; Pavlović & Jensen, 2009; Chieh-Ying Chang, 2009; Alves, Pagano & Da Silva, 2011; Hvelplund, 2011; Sjørup, 2013; Dragsted & Carl, 2013; Balling, Hvelplund & Sjørup, 2014), and Event-related Potentials (ERPs) (Naranjo *et al.*, 2012) have provided important data from a neurophysiological perspective. These techniques appear to show cognitive phenomena that activate executive functions and mental operations during a TT production, such as cognitive effort, memory, attention, decision making, and problem solving, among others.

Additionally, Translog software (Jakobsen & Schou, 1999; Carl, 2012) has proven to be useful for studying the translation process, mainly, for the identification of the phases along with the time and typing pauses as cognitive effort indicators. This software registers the whole translation process and favors the understanding of how translators deal with the ST by the identification of time and typing pauses during the task. However, it does not ascertain what is happening in the translators' minds. Therefore, O'Brien (2006) and Pezza (2011) have suggested the use of complementary instruments for a more comprehensive understanding of this process.

This proposal is based on the latest methodological trends, which include the integration of several instruments for data collection with the purpose of studying a specific translation phenomenon through their data triangulation. Following the authors' suggestions on the use of Translog as a main tool, research has shown that its combination of a screen capture software and a retrospective interview may provide reliable data for the study of cognitive effort in a translation process.

Regarding the translation process, Wilss (1996) states that attempts have been made to clarify the interaction between the general concept of the translation process and a concrete manifestation in the form of empirically observable translation procedures. However, this is still an interest in translation studies from a cognitive perspective, due to the difficulty of clearly understanding all the cognitive processes in the translators' minds while translating. Toury (1985) initially proposed the translation process as a […]

> Series of operations in which actual translations are derived from actual source texts, though no doubt also empirical facts and as such a legitimate part of the object level of translation studies, are only indirectly available for study, as they are a kind of 'black box' whose internal structure can only be guessed, or tentatively reconstructed. […] Translated texts and their constitutive elements are observational facts, directly accessible to the eye. (Toury, 1985, p. 18).

Although studying the human mind is complex, translation as an outcome of a cognitive activity may provide useful information regarding the cognitive processes involved. In this regard, Hurtado (2011) embraces the "black box" concept by stating that the translation process is complex to analyze, since it involves different skills and knowledge, and non-observable cognitive processes. Hurtado also mentions the lack of validated measuring instruments within the translation field.

Despite the fact that there are complications in describing, analyzing and explaining the mental phenomena that are generated in all human activities, cognitive sciences, particularly cognitive linguistics and psycholinguistics, have contributed to studying the translation process. These scientific fields have also provided methods and instruments for developing experimental studies with the purpose of comprehensively addressing it. According to Hansen (2003), the authors assume the translation process as:

> Everything that happens from the moment the translator starts working on the source text until he/she finishes the target text. It is all encompassing, from every pencil movement and keystroke, to dictionary use, the use of the internet and the entire mental process that is involved in making a decision, solving a problem or making a correction – in short, everything a translator must do to transform the source text to the target text. (Hansen, 2003, p. 26).

Hansen (2003) states that a translation process involves two important aspects. First, a wide range of sub-tasks, such as each movement of the pen or keystroke, or online searches and queries. Second, a set of cognitive processes aiding in ST comprehension and, thus TT reformulation. Thus, an involvement of declarative and procedural knowledge. This perspective comprises external and internal aspects, which lead to performing an agile process within the sociocultural contexts. It also shows the interaction between different types of technological and human resources, making it a dynamic process. This is consistent with contemporary theories from the situated cognition paradigm that advocates the relationship between the mind and context during translation. This relationship, proposed by Risku (2004) as a situated translation, suggests translation is based on appropriate solutions within a context and, therefore, to situational problem solving.

Likewise, Mossop (1998) proposed that the translation process should be subdivided into three phases, a concept that was later adopted by Jakobsen (2002) (orientation phase, drafting phase, and revision and monitoring phases). From a methodological perspective, these phases lead to the collection and interpretation of the data gathered through Translog and a description of how translators approach an assignment as well as their performance during the task. The orientation phase begins with the translation assignment and finishes when executing the first keystroke to produce the text. The drafting phase begins immediately after the orientation phase, and finishes with the translation of the last sentence, which is indicated by the final punctuation mark. The final revision and monitoring phase begins immediately after the last punctuation mark and ends when translators decide that the translation is completed.

According to Jakobsen (2002), translators have different purposes for each one of the phases. The orientation phase aims at becoming familiar with the ST, which implies the translation task planning and the ST comprehension. The drafting phase entails the TT production while the final revision and monitoring phase comprises the TT final adjustments. Throughout each of these phases, translators comply with all the discursive conditions of text production and reception, as well as the sociocultural aspects.

In regard to cognitive effort, Bacic (2014), Cooper-Martin (1994), and Russo & Dosher (1983) define it the cognitive resources such as, perception, memory, and judgment, (among others) that are required to determine the performance of a translation task. From experimental psychology, Olive *et al*. (2009) define it as the cognitive resources dedicated to a particular activity, while Sherman & Brooks (2012) as the amount of limited capacity involved in central processing.

According to these definitions, cognitive effort in translation could be understood as the mental processing that translators may require to invest when carrying out a translation task in accordance

with its demand. According to Gile's effort proposal (1995), different types of effort may intervene in the translators' mental processing: reading and analysis effort, production effort and short-term memory effort.

Additionally, Alves (2007) indicates that cognitive effort is present in all activities that require mental processing and determines the production of the contextual effects[1] in a communicative situation. This approach highlights the relevance of the cognitive effort during a translation process, since it can influence the quality of the product and the effectiveness in the communication of the original message in the target culture and language.

Studies on cognitive effort (O'Brien, 2006; Alves, 2007; Cooper-Martin, 1994; Hvelplund, 2011) have been an object of interest and have considered internal or external factors that may positively or negatively influence TT. For example, a task's complexity, lack of terminology or an adequate understanding and management may increase cognitive effort, thus having a negative impact when decision-making under pressure. Studying each internal and external factor alongside the translation phases enables a better understanding of a translation process that complies with the communication conditions.

This paper aims to present a methodological proposal of a data collection model that includes the use of Translog as the main instrument to record the indicators of cognitive effort (time and typing pauses) during a translation process, screen capture software to record the screen's output, as well as a retrospective interview to obtain verbal information from the participants. This proposal derived from an exploratory case study design with a descriptive

[1] Contextual effects are changes in an individual's assumptions resulting from the processing of certain input. There are three types of effects: 1) derivation of a new assumption; 2) modification of the degree of strength of a previous assumption; 3) elimination of a previous assumption. According to Relevance Theory, an assumption is relevant in a context to the extent that its cognitive effects are large and the processing effort is small (Sperber & Wilson, 1994).

scope that was conducted within the framework of the Master in Translation[2] of the Universidad Autónoma de Manizales.

Methodological proposal

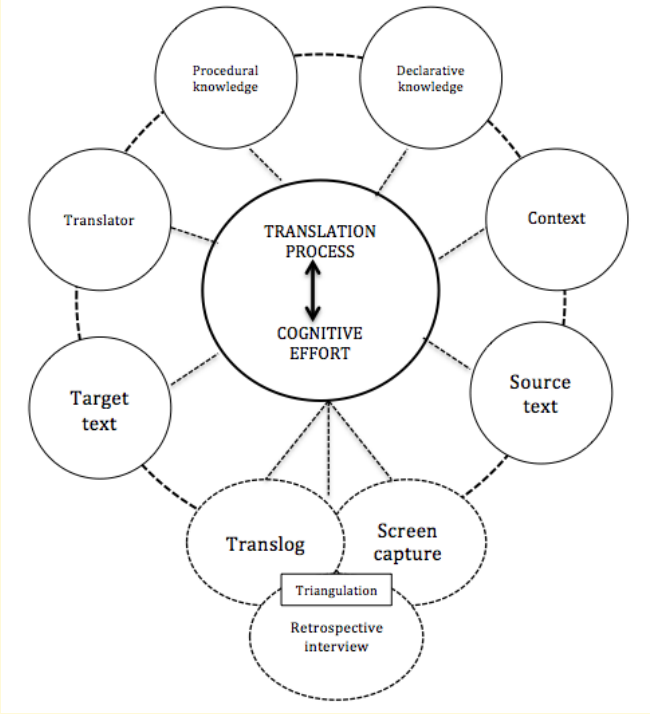
This proposal is suggested for studies whose purpose is to investigate cognitive effort in the translation process in favorable environments in which the participants can apply both their declarative and procedural knowledge (see Figure 1).

This also includes the use of Translog II software for the recording of keystrokes on the keyboard, the use of a screen capture software for recording the web searchers or actions made by the translators, and the application of a retrospective interview to collect more information about the cognitive effort of the translation process during the translation task.

The semantic content analysis becomes a basis to interpret the information provided by the screen capture software and the retrospective interview, then contrasted with the linear records of the Translog II. By analyzing the significance of the data recorded and data expressed by the participants, this analysis seeks to establish the relationship between cognitive effort and the translation process (see Figure 1).

[2] This Master Program (now, Master in Translation and Interpretation program) is supported by the Terminology Research Center (CITERM) of the Universidad Autónoma de Manizales.

Figure 1: Methodological Proposal



Source: Authors' Elaboration.

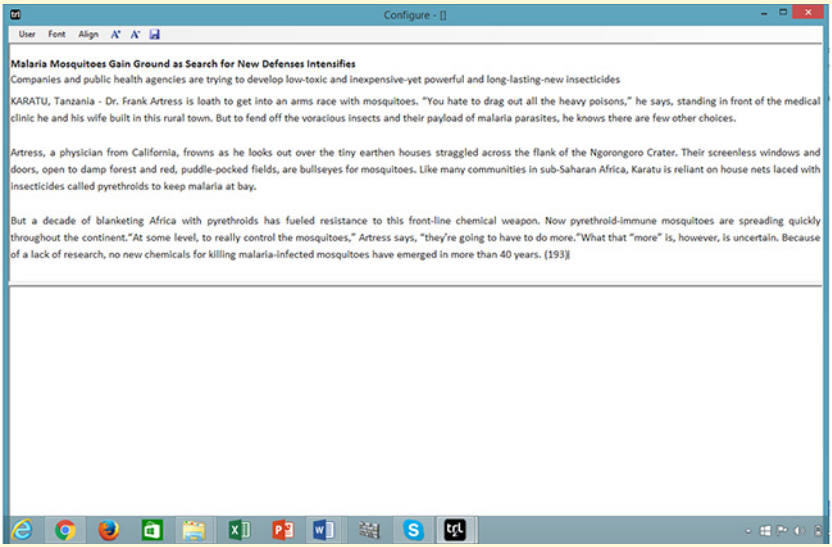
Instruments

Translog

Translog software is part of the keystroke logging technique. It was initially developed by Jakobsen & Schou (1999) to study the translation process for obtaining evidence of the keystrokes recorded on the keyboard, and the time and pauses during the different phases.

Translog-II consists of two main components: Translog-II Supervisor and Translog-II User, which allow for the creation of a project file, and for the recording of the whole process. As mentioned by Dragsted (2004), Translog-II Supervisor interface allows researchers to configure the experimental conditions and the analysis of the data collected relative to the time and pauses. These components may be determined by researchers in accordance with the research purpose (see Figure 2).

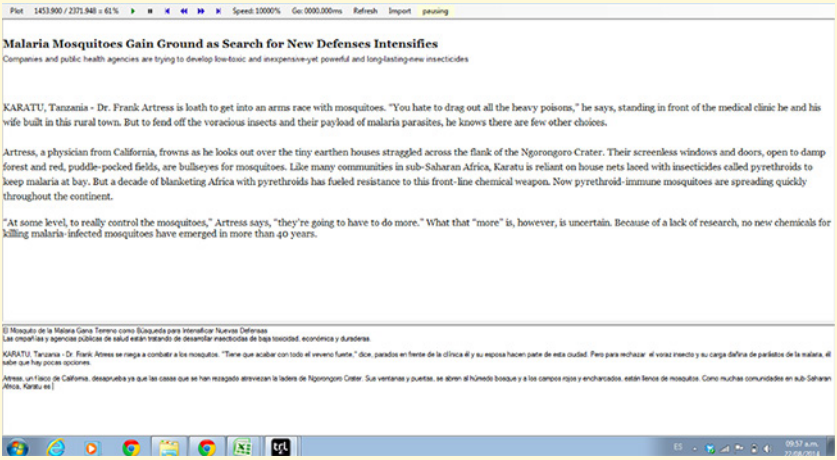
Figure 2: Display of the Text to be Translated in Translog II



Source: Authors' Elaboration.

Translog-II User interface allows translators to translate and record all keystrokes on the keyboard (see Figure 3).

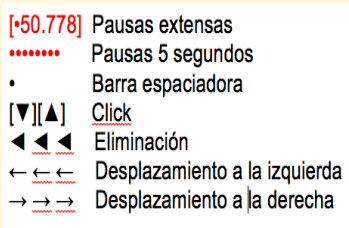
Figure 3: Visualization of Target Text Production

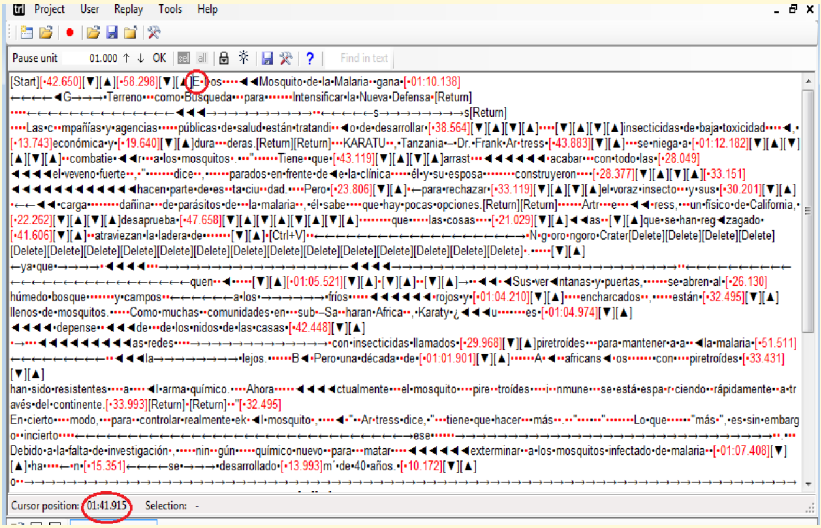


Source: Authors' Elaboration.

Translog-II Supervisor generates a log file that contains data about the activity of the translator in terms of reading, writing, and deleting information throughout the whole process (see Figure 4).

Figure 4: Translog II Linear Representation



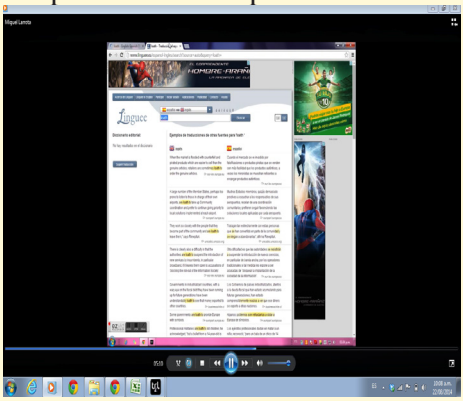


Source: Authors' Elaboration.

Screen capture software

O'Brien (2006) mentions that although pauses suggest a cognitive processing, complementary methods are required for studying the process comprehensively, therefore, the use of a screen capture software is recommended as an additional aid to record everything that occurs on the screen as shown in Figure 5 (database searches, online corpora, online terminological resources, among others). The type of searches and the resources used can provide insightful information on the translation process.

Figure 5: Example of Screen Capture in the Orientation Phase



Source: Authors' Elaboration.

Retrospective interview

A retrospective interview is a verbal data collection, which takes place directly after completing the task with the purpose of obtaining relevant information as a sound backing for the other instruments (Hvelplund, 2011). Depending on circumstance, the interviewer's questions can be general, contrasting, exemplificative, structural (Grinell; Williams & Unrau, 2009) and provocative (Mertens, 2010). All questions however, must be validated through an expert judgment and a pilot test.

In this particular case study, a series of questions related to the difficulties encountered and the cognitive effort invested in each of the phases were asked. This, once transcribed, was consolidated as the starting point for identifying the units of analysis, then the establishment of initial emergent categories were identified, and finally underlying meaning about the process was determined. These emergent categories were defined once they had been triangulated with the information of the screen capture analysis and the Translog data analysis (time and pauses).

Design of the translation task

Participants were informed they had to translate a specialized text from English to Spanish using the Translog II tool, with a time limit of 90 minutes. They were only allowed to use online tools so that all searches were performed on the computer and could be recorded by Ezvid. After the translation was completed, each participant answered the retrospective interview questions.

The text to be translated was a short text not exceeding 250 words. This criterion was based on the Translog II characteristics and following Dragsted (2004) suggestion. This prevents translators from having to perform pauses to move the screen and to ensure that the information collected was practicable for the analysis.

Additionally, a specialized text was selected following Chieh-Ying Chang's (2011) recommendation on advocating the continuation of investigations and research on the cognitive effort in the translation process. Concerning higher difficulty level texts, the suggestion is medium or high specialty. As for the field of specialization, a combination of languages and text directionality are determined by the research purpose. The text to be translated must also be validated by an expert judgment.

Data analysis proposal

Based on the information collected through the retrospective interview, the screen capture software and the linear view of the Translog II, a qualitative analysis is suggested. In this particular proposal, the content analysis technique served for describing the cognitive effort invested during the translation process. In this respect, Krippendorff (1997, p. 28) states "The content analysis is a research technique designed to formulate, based on certain data, reproducible and valid inferences that can be applied to its context."

To conduct a content analysis, researchers may consider: the

collected data, the purpose of the study, the emerging categories drawn from the data, the units of analysis, and finally validity. The following is an example of a translation student (TS) who participated in this study and is an example of how data could be addressed

Interview data

Example of one of the answers: "What did you need to start the translation?"

From the TS response, **"first I needed to read the text, very quickly and identify the very unknown words**." It can be inferred that this TS only scanned the text to identify the unknown words he mentioned, but he did not state having sought their meaning and understood them before starting the TT production. In this sense, this scanning method used by the TS would only correspond to a possible anticipation of issues that would need to be solved when producing the TT. This is mentioned by Shreve *et al*. (1993) and cited in Alves, Pagano & Da Silva (2011). This rapid reading and identification of unknown words implies that the TS may have made certain translation errors during the writing phase (Jakobsen, 2002). Such errors are derived from the lack of in-depth understanding of the ST therefore the reading and comprehension processes play a fundamental role in the translation process (Spolsky, 1994). From this response and considering it is a specialized text, the inference is that the TS did not make a clear differentiation between terms and words, and terminology management, in both ST and TT, is a must when dealing with a field of knowledge

Screen capture data

The following is an example of the screen capture description that allowed the data to be analyzed objectively.

The TS displayed the Translog window at 00:00.38 seconds, without any modification until minute 00:01.28. Then, he opened

the Wordreference and Linguee online resources. At minute 00:02.00, he searched for the term "*ground*" in Wordreference, took a quick look at the options and then continued searching for the word "*gain*." At minute 00:02.40, he searched for the expression "*gain ground*" in Linguee. At minute 00:03:01, he returned to the Translog window and started producing the TT.

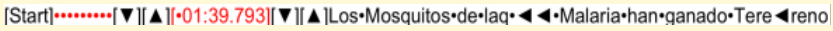
According to the screen recorder during the TS's orientation phase, it is evident that he kept the Translog window displayed for 50 seconds without typing any information. This may indicate that the TS dedicated this time to quickly reading the whole ST or only the first segments to be translated. After, he searched for the meaning of two words contained in the title in a monolingual dictionary and in a bilingual corpus database. The purpose of this may have been to find a way to re-express it in Spanish and start producing the TT.

The previous information indicates that the TS did not carry out a complete and adequate macro-planning process (Schilperoord, 1996). This finding shows that TS did not find any relevant information about the topic of the text, therefore he was not able to properly identify the semantic content and extra-textual elements of the ST discursive conditions. This also shows a lack of ST in-depth reading for understanding purposes. This lack of complete and adequate macro-planning process may generate different types of errors during the TT production.

Linear view (Translog-II)

Example of the linear view (Translog) description. This leads to verifying the participants' reported information in accordance with the description of the screen capture (see Figure 6).

Figure 6: Translog II Linear View.



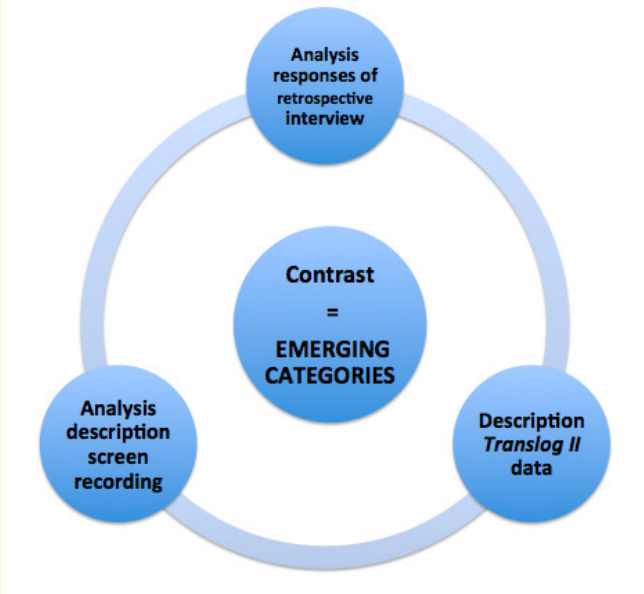
Source: Translog II Screen Capture.

In the response to the question "*What did you do before starting the translation task*", the TS stated that he had read the ST. However, the time (2:24.785) used in the orientation phase (Jakobsen, 2002) and the time in which the Translog window was displayed (00:00.50 seconds) before starting the typing indicated that he only scanned the text or perhaps only read the title and the first paragraph. When contrasting the description of the video and the linear view provided by the Translog, it was confirmed that 50 seconds were devoted to the reading of the ST and the remaining time of the orientation phase (ibid) was devoted to the search of two words contained in the title. In addition, the answer to Question 2 (*When did you search information about the topic of the text to be translated?*), the TS claimed to have made a quick search of the subject. Regardless of this, the description of the video contradicted the findings during the orientation phase.

Triangulation of the information

Once the semantic content analysis for both the screen capture software and the retrospective interview had been completed, triangulation is suggested with the linear view of the process obtained through Translog II. Therefore, the descriptions of the process of all participants were triangulated to identify emerging categories that allowed for establishing the relationship between the cognitive effort and the translation process in this particular case. (see Figure 7).

Figure 7: Data Triangulation



Source: Authors' Elaboration.

The study of the cognitive processes carried out by the translators can be conducted through the use of techniques that provide brain activation data such as ERPs, EEG or *eye-tracking*, with the use of the instruments proposed here. However, researchers have also been able to show that these can provide insightful data when it comes to understanding how translators face their task, as well as some cognitive aspects involved during the translation process. These include the time and pause of writing, which literature has associated with phenomena such as cognitive effort, memory, attention, among others.

The use of Translog and the complementary instruments such as screen recording and the retrospective interviews have allowed for a better understanding when observing how translation students approach a translation task. Specifically, the ST comprehension,

TT production, and final revision, as well as the cognitive effort that they invest in each one of these phases.

These instruments also show that each text portrayed different characteristics. As a result, the cognitive effort invested by translators in each of the phases and how they carry out the process of understanding, TT production, the use of resources and application of strategies may vary. However, a constant and crucial aspect of the translation process is to comply with the communicative purpose conveyed in a text.

Finally, from a qualitative perspective, using a combination of instruments to measure the study of cognitive effort in relation to the translation process or specific translation aspects proves to a useful methodology

Acknowledgments
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