

Collaboration between Machine Translation and Human Translation for Higher Quality and More Production in Translation

Nehad ElBeheri

Assistant Professor, Faculty of Education,
Damanhour University, Egypt

Abstract

The present study aims at creating a level of collaboration between MT and HT in order to obtain more production in translation projects and save time, money and effort for translators, businessmen and any other non-specialist MT users. This can be carried out by applying both pre-editing and post-editing on the ST before entering to MT, in a specific way. Hence, the present study is based on approaching the techniques in which MT runs and to what extent we can make it more effective and more productive. MT users should understand that MT includes two types; direct and indirect. Direct type works on the word level while indirect types work on higher levels (i.e. phrase, sentence levels). On the other hand, indirect levels are divided into two approaches; transfer approach which is language -dependent and interlingua approach which is non-

linguistic specific. Indirect approaches are capable of translating better than direct approach. A MT user should pay heed to the fact that these approaches run better because they are based on ST analysis and then TT generation. In order to benefit more from MT, facilitate translation process, and make the TT seem as natural as possible, each MT user should pay heed to the fact that the more he simplifies the analysis process, the more he gets more natural translation. A MT user can achieve this simplicity in the analysis process by means of pre-editing ST before submitting it to MT. In fact, pre-editing cannot be performed randomly. Hence, the present study encourages MT users to use the rules of controlling language to simplify and adjust STs according to their business requirements. This, in turn, alleviates the load on post-editing because the ST to be entered to MT becomes easy enough to be understood by MT.

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1. Introduction:

In this study, the researcher describes the nature of MT for its users and for those who wish to benefit from such technology to get its advantages and avoid its disadvantages. The study starts by comparing human translation (HT) and machine translation (MT) to consider the advantages and disadvantages of each of them. This explains the underlying reasons that make MT important for translators and businessmen.

The researcher then clarifies how MT functions and the ideal way to employ it by describing the types and approaches to MT and hence, recommends pre-editing by applying controlling rules that improve text before translation and then post-editing to get the translation (MT) especially when the original text is written for the purpose of translation and when there are no specialized translators available. The role of post-editors is recommended after MT to get the final translation draft. MT is also proved to be important for gisting to get a rough idea of ST whether accurate translation is required or not. Finally, the researcher submits some important results and recommendations for more benefit from MT as a modern technology.

2. Theoretical background

The following section summarizes what the researcher wish to deliver to any MT user about MT. It starts with describing both advantages and disadvantages of MT and HT. Then it recommends a way of collaboration

between MT and HT by benefitting MT advantages and HT advantages together with avoiding the disadvantages and drawbacks of each of them. Then it introduces the types and approaches to MT to allow users understand them and select the type and approach appropriate to his/her business. Finally it suggests pre-editing and post-editing to achieve more quality in translation. The researcher suggests applying language controlling rules on the ST before entering to MT to facilitate MT process. It also suggests writing the document that is designed to be translated in a way that follows the controlling rules. The researcher also refers to the importance of simplifying the analysis process of ST in order to get higher quality generation (i.e. MT). Finally post-editing is to be applied for obtaining final translation.

2.1. Advantages of MT

2.1.1. MT saves time and effort

MT users appreciate such privilege of MT. A full translation of a huge number of pages can be carried out in seconds by means of one click on the icon of *translate* after selecting the ST and TT languages that represent the language pair required. This can be seen on trying Google translation at any time for rendering any number of pages in seconds. Translation can also be carried out for any domain; literary, legal, scientific, medical...etc. This saves time especially in business when users need only to obtain the gist or the main idea of a piece of writing apart from the details. Moreover, LISA & Mike Dillinger (2004:31) state that,

“Applications of MT and TTs in information kiosks for transportation centers or hospital waiting rooms can effectively reduce the burden on human support personnel to answer repetitive questions.”

2.1.2. MT and a Rough Idea about the ST

LISA & Mike Dillinger (2004:8) refer to the benefit of MT to gather information from foreign-language documents in such situations “where the content creators do not provide a translation”. Thus, gisting is the aim in such situations where MT is used to “gather a rough idea of the information content of foreign-language texts.” In gisting, “users do not expect a perfect translation. It is often used to locate information to decide whether or not to have a human translator to provide a publication-quality translation.” (ibid.). This is useful in saving time, effort, money and, sometimes the life of many people. A translator can also consider the MT product as the first draft of translation especially for literary and legal texts that require employing a specialized human translator.

2.1.3. MT is useful in understanding the content of foreign texts:

MT users benefit from this advantage in machine translation when they are encountered by foreign texts such as Chinese, Japanese, Indian ...etc. This can be seen in companies that sometimes receive urgent business faxes and emails. The problem lies in the unavailability of the translators of such uncommon foreign languages. MT constitutes a good solution to such urgent problem. An example of a translation of one of such texts is illustrated in the following example:

ST

-- यह निःशुल्क सॉफ्टवेयर, परम्परागतIME के अलावा भारतीय लिपियों के लिए गेसी फॉण्ट को यूनिकोड में बदलता है, भारतीय लिपियों का परस्पर परिवर्तन करता है और इन परिवर्तनों को कर ले समय फॉर्मेटिंग को भी बनाये रखता है। (विण्डोज के लिए उपलब्ध)

TT 1 English

- This free software, in addition to conventional IMEs, replaces legacy font of Indian scripts in Unicode, inter alters Indian scripts and maintains formatting while doing these changes. (Available for Windows

TT 2 Arabic

التقليدية IMEs - هذا البرنامج المجاني ، بالإضافة إلى ، يحل محل الخط القديم للنصوص الهندية في ، يغير بين البرامج النصية الهندية ويحافظ Unicode على التنسيق أثناء إجراء هذه التغييرات. (متوفر لنظام التشغيل Windows

2.1.4. MT Is Less Expensive:

Compared to MT, human translation is extremely expensive. The translator receives his payment for the translation according to the number of words he translates. LISA & Mike Dillinger (2004:31) assert that “An MT system can take these automatically generated sentences and provide the same information in a range of languages within seconds” (ibid.) which saves time and effort especially for “financial and weather information that already exist as data feeds can be offered to additional, foreign-language markets quickly and inexpensively.” (ibid.)

2.1.5 MT Enjoys Universality:

Lisa & Mike Dillinger (2004:8) assert the importance of MT to the dissemination of information; by means of localization process since it can be “used to deliver information that is generated in one language to speakers of other languages.

This is the case of traditional localization processes and computer-aided translation. MT enables other forms of high-volume translation that are particularly suitable for routine, recurrent publication.”

2.1.6. MT Enjoys Confidentiality

In specific missions or majors, confidentiality is essential, such as the business of police, legal business in investigating the issues relevant to a murder, a robbery or private details. According to LISA & Mike Dillinger (2004:9), MT can be useful in enabling such situations in “environments where it would be impossible or impractical to keep qualified interpreters on call. MT in such cases replaces human interpreters for routine communication, and allows them to focus on mission-critical tasks.”

2.1.7. MT Is Available 24/7

LISA & Mike Dillinger (2004:8) assert that, “Human translators cannot provide translation of content produced dynamically from databases in real time—even if delays for translation are acceptable” because

“...the cost to provide such translation using humans is prohibitive for high-volume scenarios. MT can handle such tasks very well since data structures of dynamic data are known in advance, and MT systems can be reliably “tuned” to the sentence structures that will be generated.” (ibid)

2.1.8. MT Is Capable of Translating Webpage Contents

LISA & Mike Dillinger (2004:4) determine four users of MT, who always have giant projects like webpages and the like as follow:

1. Government agencies use MT for gathering information published in other languages.

2. Translation agencies use MT to provide their translators with draft translations. They find that this increases terminological consistency and makes translation faster.
3. Web portals use MT to offer on-the-fly translations of foreign-language web sites and messages
4. Companies that deal with multilingual markets and workforces use MT for corporate communication, user documentation, technical support and sales support in foreign-language markets.

2.2. Disadvantages of Machine Translation

2.2.1. Machine Translation Product Suffers from Lack of Exactness

MT users working in all domains should pay heed to the fact that MT cannot be compared to human translation in quality and that such lack of accuracy or exactness is predictable. This point is stated clearly on <http://www.dilmanc.az/en/technology/mtadvantages> that “You can’t entrust Machine translation system if you need superior exact translation of the official documents, agreements and so on” and hence it is recommended that you revise the documents and edit them for exactness. Hence, a machine translation cannot be blamed for such inaccuracy. The error probability is extremely high as explained above and therefore MT should be revised carefully by proficient translators for accuracy especially for documents of high importance.

2.2.2. Machine Translation Suffers from Lack of Quality as Well as Ambiguity

Because machine translation is based upon definite programs with systematic rules or imitation of prior translations, (i.e. rule-based systems and statistical

systems), it cannot go beyond these rules and examples or think about solutions to interpreting ambiguous words or underlying meaning of any expressions. According to (Hutchins, 1994:2), “The major obstacles to translating by computer are, as they have always been not computational but linguistic. They are the problems of lexical ambiguity, of syntactic complexity, of vocabulary differences between languages”. Hence, this characteristic is highly probable and it is clear that machine, which is incapable of evaluating a context or select an appropriate synonym for a specific context, to be inferior to human translator in that.

2.2.3. Machine Translation Is Incapable of Interpretation

A machine translation user should be well aware of the true capacities of machine translation. Although such machine translation engines enjoy high quality because of the level of training they have, they still suffer from limited quality in certain domains especially such domains that require creative thinking or analysis. Great literature for example, is full of *metaphors, similes, puns*, as well as *ambiguous expressions* that require paraphrasing and careful explanation. Therefore, we should be aware of the fact that a machine translation system is not designed for such purposes that require a great deal of interpretation by a human translator who also loves literature.

2.2.4. Machine Translation Is Incapable of Translating Cultural Items.

Another example that shows the limited capacities of machine translation is the translation of cultural items such as *proverbs* and *sayings* for example. It is predictable that MT cannot translate proverbs or sayings because it cannot guess the underlying wisdom or story

beyond the proverb or saying. Such cultural items therefore can only be translated by a human translator.

2.2.5. Machine Translation Threatens the Job of a Translator

Threatening the job of a translator is considered one of the strong claims against machine translation. A group of MT users thinks that they can fulfill all their business automatically without any help from the side of human translators. On the other hand, various MT companies are launched, including Trados (1984), which is the first to develop and market translation memory technology (1989). Hence, the collaboration between HT and MT is concerned.

3. The Origins of Machine Translation

This paper aims also at submitting a more comprehensive and deeper understanding of the limitations of machine translation and its true capacities in order to avoid undesired outcomes in addition to achieving a collaboration between MT and HT. This can be fulfilled by understanding that the origins of MT are included in *artificial intelligence* and *computational linguistics*. We can look at them as the parents of machine translation.

3.1. Artificial Intelligence (AI)

Artificial intelligence is simply defined by Trujillo (1999:6) as “the field concerned with software and hardware systems which display intelligent behavior, where intelligence is judged subjectively by humans observing the system”. He also asserts the benefits of Mt and MAT (Machine Aided Translation) that it has other benefits to its users which may save time and effort as well as achieving more quality in a variety of fields that “MAT and MT can offer benefits in terms of speed, cost, quality and availability of translation. These

benefits are the result of work in many areas over the last years, culminating in the present range of MAT tools and translation engines available over the Web (ibid:7). Bobrow, (1994:16) also refers to the early hopes of AI that they are “centered around the discovery of general techniques that would ‘solve’ the intelligence problem”.

As for the relationship between artificial intelligence and machine translation, Steiner (1975: 48) claims that “a human being performs an act of translation, in the full sense of the word, when receiving a speech-message from any other human being” which shows to what extent all actions and communications of humans are acts of understanding and interpretation. Wilks (2007: 15) refers to the issue that “Unconscious tasks remain the heart of AI” as some were busy in investigating machine performance of tasks such as chess playing. He considers that machine translation is a form of artificial intelligence. He refers to a specific type of relationship between artificial intelligence and machine translation in the possibility of inventing systems containing ‘processes’ capable of using the knowledge. In other words, artificial intelligence requires inventing systems that are capable of carrying out tasks without being programmed like traditional systems. They are rather intelligent systems which can understand and they “should be stated in a symbol-processing manner” (ibid.) unlike most linguistic theories.

3.2. Computational Linguistics

Computational linguistics, according to the meaning of its title, includes a level of correlation between linguistics and computer science. Trujillo (1999:85) considers computational linguistics as employed and “taken to mean the battery

of algorithms and data structures that have been developed to process natural languages in a motivated and scientific manner”. This refers to the use of computers for linguistic research and applications. Trujillo determined also the areas interacting in computational linguistics to achieve a higher quality translation that they are “morphology, syntax and semantics. In addition, natural language generation (NLG) has become a subfield in its own right, dealing with the construction of natural language sentences from meaning representations” (ibid.). Computational linguistics, hence, constitutes an important inseparable part of machine translation. Therefore, it is useful to summarize important issues and techniques of computational linguistics; data and algorithm, computational morphology and the two-level model (i.e. analyzing and generation), syntactic analysis, parsing and generation.

3.2.1. The relationship between data and algorithm

Trujillo (1999:85) considers computational linguistics as “the battery of algorithms and data structures that have been developed to process natural languages in a motivated and a scientific manner.” Hutchins (1992: 48) makes a clear distinction between data and algorithm and describes the relationship between both. By data, he means the software that includes the programs that tell the computer what to do (i.e. to read data, to perform some calculations...etc.). By algorithm, he means the very program, which is a component of the data. An algorithm is “essentially a set of instruction saying how to solve some problem or achieve some goals” (ibid.). He adds that such programs or algorithms are written in programming languages that “enable the human programmer to write instructions clearly and concisely without

worrying too much about the details of how the computer will actually go about implementing the instructions.” Such programming languages can be high-level programming languages (i.e. requires fewer steps to be carried out and aims at a greater facilitation of specific tasks) and low-level programming languages (i.e. require more steps and aim at facilitating a selection of tasks). The problem in low-level programming languages is their difficulty.

3.2.2. The importance of Separation between Data and Algorithm

Hutchins (1992) claims that the best programs “express these solutions in the most general terms” (ibid.). In other words, a program, which is capable of solving many similar problems in the same way, is better than a limited program, which can solve one problem. For example, a program, which is capable of multiplying three and four only, is a useful program but is limited while a program that is designed to multiply any two numbers is more useful because it can solve similar programs. It is useful in saving the effort of inventing a huge number of programs for each calculation.

3.2.3. Computational Morphology and the Two-level Model.

Trujillo (1999:85-86) claims that *analysis* and *generation* are essential steps in NLP (Natural Language Processing) because the discrete words in a sentence are inflected because of certain relationships among them. Therefore, constituting a linguistic database is required to determine such relationships by determining their syntactic and semantic properties. Either of two linguistic techniques can carry this out; the first technique is to store all the inflectional forms of a word and the second is merely storing the root of the

word that will be inflected later in different ways, by means of morphological rules, depending on the relationship with the surrounding words in the sentence.

3.2.3.1. Syntactic Analysis

According to Trujillo (1999:99), the main concern of syntactic analysis is “the study of order and structure in a sentence and of the various relationships that words establish among themselves”. It deserves mentioning that syntax has a certain status in both the fields of CL (computational linguistics) and MT both linguistically “in terms of formalizing linguistic descriptions of sentences” (ibid.) as well as in computational terms “in devising algorithms and frameworks with which to represent and process linguistic knowledge” (ibid.)

3.2.3.2. Parsing

Parsing in computational linguistics refers to using an algorithm (a program) to derive a syntactic and semantic analysis according to grammar. Such analysis is useful in problem solving. Its general framework employs “a memorization technique and a dynamic programming procedure in order to construct all possible partial solutions to a particular problem” (ibid.). In other words, parsing includes “a process that has as input a string of words and as output a syntactic analysis of the input” (Trujillo, (1999:109). In this type of relationship the parser applies both grammar and lexicon in order to ensure that the input is grammatical and hence to establish its structure.

3.2.3.3. Generation

According to Trujillo (1999:111), NL generation is “the process of deriving linguistic expressions whose meanings correspond to informational structure used as input.” In other words, an input such as certain digits or graphs can take several

forms of output (i.e. social, financial, economical...etc).

4. Types of Machine Translation Systems

According to Hutchins (1992), the types of machine translation systems can be classified out of two perspectives; the number of languages used and the direction of translation.

4.1. MT Types out of the number of languages used

A machine translation system can be either:

Bilingual: if two languages only are used in the system.

Multi-lingual: If more than two languages are used in the system.

4.2. MT Types Out of the direction of translation

A machine translation system can work in either of the following directions:

Unidirectional: If the translation in the system takes place in one direction only.

Bi-directional: If the translation process takes place from one direction into another and the reverse.

Therefore, types of machine translation systems can be distinguished in the following way:

- A unidirectional bilingual system:*
- A unidirectional multi-lingual system*
- A bi-directional bilingual system*
- A bi-directional multi-lingual system*

5. Approaches to Machine Translation

It is important to understand the way machine translation systems work (i.e. machine translation strategies). We should pay heed to the fact that machine translation systems run in a completely different way from a human translator's. According to Hutchins (1992), it may be difficult to believe that such systems depend mainly on probability and that it is linguistically blind, and hence it can translate. A lot of effort was devoted to let such translation engines work in the best quality. Therefore, it can be said that the outcome of such machine translation system is the result of collaboration between both linguists and computer scientists. We can also conclude that it is a form of collaboration between both artificial intelligence and computational linguistics. In fact, machine translation systems have three strategies or approaches; *direct* approach and *indirect* approach that include Interlingua and transfer approaches.

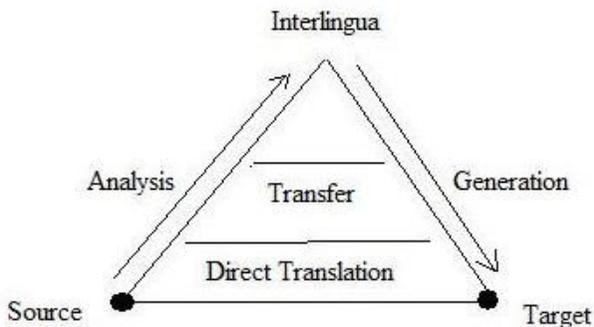


Fig. (1.1) Machine Translation Pyramid

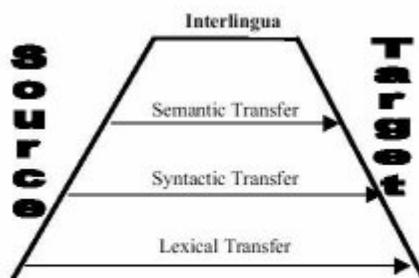


Figure 1 The Machine Translation Pyramid

Fig. (1.2) MT pyramid modified

5.1. Direct Approach

This approach to MT is simply designed to deal with one pair of languages in one direction only. It belongs to the first generation and it is rather limited. According to Trujillo (1999:5), “Direct systems involve extensive pattern matching, with some rearrangements of the target string for conformance to the TL word order”.

Hutchins and Somers (1992:72-73) explain the idea on which these primitive systems work. They claim that “The direct approach is an MT strategy which lacks any kinds of intermediate stages in translation processes; the processing of the source language input text leads ‘directly’ to the desired target language output text.” They add then that such systems belong to the first generation of computer. It was available in the late 1950s and they were primitive. At that time, computers depended only on assembly code and there were no high programming languages. These systems are also based upon the morphological analysis. Therefore, they do not work on the syntactic or semantic levels. When any kind of relationships between the components of the sentence is required, the translation will inevitably include errors.

5.2. Indirect Approaches

According to Horwood (1986), the most innovative systems have been based on ‘indirect’ approaches. Indirect approaches to MT appeared later because of the failure of the direct approach to produce a wide- variety of acceptable translations. Hutchins and Somers claim (1992: 73) that “the linguistic and computational naivety of this approach was quickly recognized.” The problem of the direct approach was the lack of depth in the analysis of the ST and hence in the generation of the TT. It has no intermediate levels of analysis to satisfy deeper levels of meaning and relationships between the components of a sentence.

5.2.1. Transfer Approach

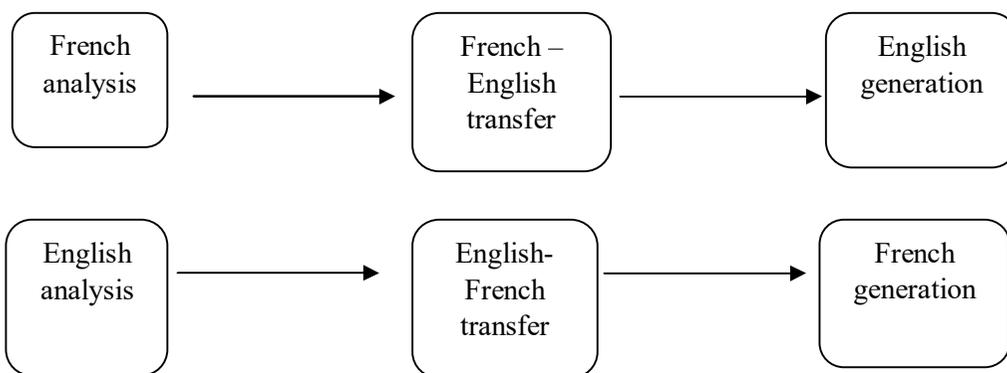
Harwood (1986) deducts that ‘Interlingua’ systems were perhaps too ambitious at the time; the more cautious ‘transfer’ approach was probably more realistic as well as being more flexible and adaptable in meeting the needs of different levels and ‘depths’ of syntactic and semantic analysis. In broad terms, the ‘transfer’ systems may be divided into those based on the MIT-type ‘syntactic transfer’ pattern and those in which syntactic analysis generally went further

than ‘surface’ structures and more semantic analysis was incorporated.

Therefore, the aim of the *transfer approach* is to facilitate translation process to the machine translation. This can be carried out by means of three steps; *the first* involves “analysis of the source input into a transfer structure which abstracts away from many of the grammatical details of the SL” Trujillo (1999:5). In other words, the ST is converted into abstract representations, abstracted from the ST grammar. *The second step* then is “after analysis, the SL structure is transferred into a corresponding TL structure which is then used to generate a TL sentence” (ibid.). In other words, such ST abstract representations are converted into abstract corresponding TL representations, which are also abstracted from the TL grammar. *The third step* can be summarized in generating the TL sentence from these abstract TL representations. These steps require both monolingual and bi-lingual dictionaries to carry out the transfer required. It deserves

mentioning that there are many types of transfer depending on the level at which transfer takes place and that “the more abstract the transfer representation, the easier is to build the appropriate transfer module” (ibid.)

According to Hutchins and Somers (1992:75) “the term ‘transfer method’ has been applied to systems which interpose bilingual modules between intermediate representations”. In other words, this approach is characterized by being language-dependent, unlike Interlingua approach, which is language-neutral. This entails the fact that “the result of analysis is an abstract representation of the ST, the input of generation is an abstract representation of the TT” (ibid.). They add that all translation processes involve ‘transfer’ and the function of bilingual transfer modules “is to convert source language ‘intermediate’ representations into target language ‘intermediate’ representations” (ibid.)



Transfer model

5.2.2. Interlingua Approach

In *Interlingua systems*, the ST is converted into the *Interlingua*, and then the TT is generated. Interlingua is an abstract intermediate language which can

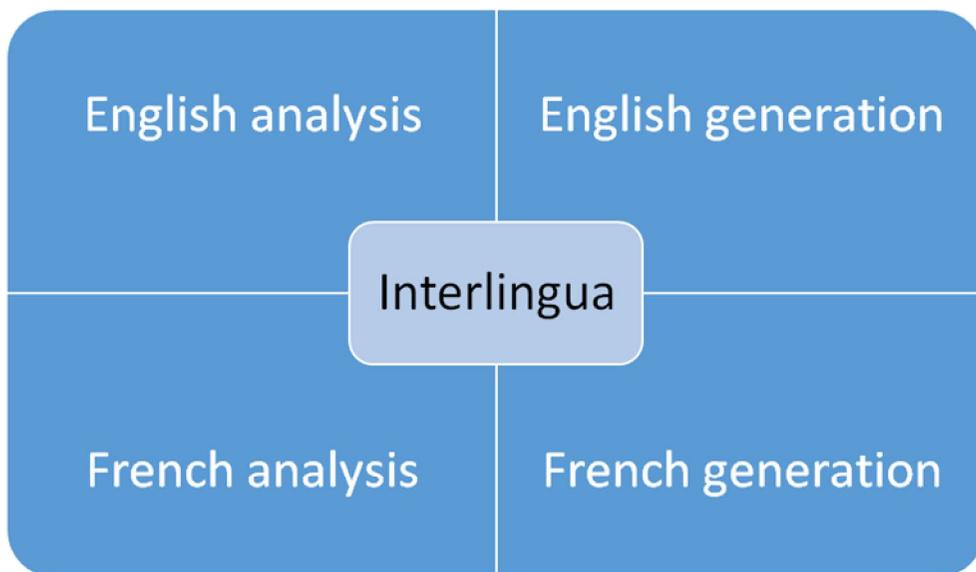
be described as being independent and language-neutral. It is independent from both the grammars of both ST and TT. In other words, it can be said that Interlingua Approach of MT is carried out by means of two steps; *the first step* involves

converting the ST into language – independent representations from which the TT sentence is generated in the *second step*.

This approach, as mentioned above entails intermediate representation which “includes all information necessary for the generation of the target text without ‘looking back’ to the original text”, Hutchins and Somers (1992:73). Then they add that this representation is thus, “...a projection from the source text and at the same time acts as the basis for the generation of the target text.” Therefore, it is mainly an abstract representation of the TT as well as a representation of the source text.

Interlingua approach is language-neutral and therefore, the linguists who developed it were so ambitious that it can work for any pair of natural languages. In other words, their hope was to develop it as a ‘universal’ MT approach. Nevertheless,

the present proved to be less ambitious as it works better as interlingual between one pair of languages. According to Hutchins and Somers (1992:73) this approach is more attractive for multilingual systems because “each analysis module can be independent, both of all other analysis modules and of all generation modules”. They also add that the aim of analysis in Interlingua MT system is “the derivation of an ‘interlingual’ representation” because “target languages have no effect on any processes of analysis”. In other words, any number of language pairs can be entered to this approach since the analysis of each system is independent. Therefore there is a considerable advantage of this approach which can be summarized in adding” just two analysis modules: “an analysis grammar and a generation grammar” for the language to be added.



Interlingua model

6. Hypothesis and Research Methodology

The methodology in the current paper is based on answering the research question by testing research hypothesis. The research question can be formulated as "What can we do to help translators, businessmen and any MT non-specialist users save time and effort in translation by collaborating MT and HT?". This research question can be answered better following to understanding the following facts about MT:

- 1- To understand the techniques in which MT runs.
- 2- To understand the difference between direct and indirect approaches of MT.
- 3- To understand that direct approach works on the word level only and incapable of translating phrases or sentences.
- 4- To understand that indirect MT approaches work on levels higher than the word level. They can rather work on the phrase and sentence levels and so they are more useful in translation.
- 5- Indirect approaches run by analyzing ST in a form appropriate to MT and then generated into the TT in the desired language.
- 6- To understand that indirect approaches are divided into transfer and interlingua approaches.
- 7- Transfer approach is language - dependent. In other words, it should contain the dictionaries of the language pairs of translation. Therefore, the ST is analyzed into simplified representations written in the SL and then transferred into a simple TT representations written in the target language. Finally the TT is generated from the TL representations.
- 8- Interlingua approach is different because it is language- independent. It is considered international because it

does not require dictionaries. It rather transforms the ST into the INTERLINGUA which is an intermediate language relevant to the computer languages. Finally, the TT is generated from the INTERLINGUA.

- 9- A translator or any user who needs translation in his business can benefit from MT by behaving towards simplifying the ST analysis process.
- 10- This simplification can be carried out by following controlling languages rules which will help in simplifying the ST as much as possible.
- 11- This behaviour in following controlling rules is called pre-editing.
- 12- To understand Pre-editing by use of controlling language rules is helpful in obtaining the best results in MT.

Hence, the research question can be answered by means of the hypothesis of trying pre-editing ST before translation and post-editing MT after translation. Hence it is useful to link *research question* which the research hopes to carry out, *hypothesis* which is the prediction statement to be tested (i.e. a better and more natural TT) and the *variables* by manipulating the independent variable (which is ST in this study) to affect the dependent variable (TT in this study). The researcher applies changes to ST and observes MT to get the best results in translation after generating the TT. Finally a translator or MT user evaluates the effort to be exerted in post-editing.

University of South California (May 18,2018) distinguished dependent and independent variables as follow:

- Dependent Variable

The variable that depends on other factors that are measured. These variables are expected to change as a result of an experimental manipulation of the

independent variable or variables. It is the presumed effect.

- Independent Variable

The variable that is stable and unaffected by the other variables you are trying to measure. It refers to the condition of an experiment that is systematically manipulated by the investigator. It is the presumed cause.

In this study, the variables are ST and TT which is translated by machine (MT). The ST is the independent variable which the investigator manipulates it by trying pre-editing and observes the difference in MT by comparing it to (MT1) which results without pre-editing. "The [independent variable] causes a change in [dependent variable] and it is not possible that [dependent variable] could cause a change in [independent variable]." (ibid.)

6.1. Improving MT Quality

At this point of study, application to benefit both businessmen and translators is based on our deep understanding of the nature of MT. A MT user is recommended then to adapt his ST according to his TT requirements. Therefore, s/he needs to go down with the language level to the base of MT triangle in order to get appropriate results for his business. In other words, he should not be too ambitious in his expectations towards MT results (i.e. He should not use it in translating metaphors or poetry) because some texts require

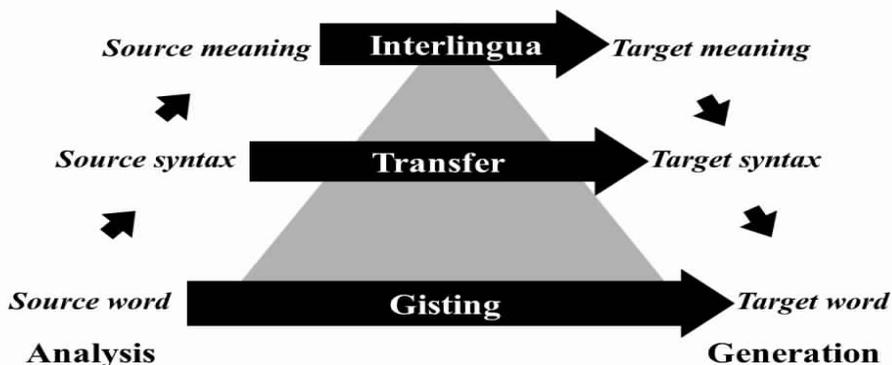
interpretations on the part of a human translator. To benefit from MT, the user may rather simplify specific texts in order to get the best of MT. The following triangle is useful to explain the levels of ST analysis in order to get the most appropriate TT generation.

Muegge (2009: 25) explains the function of controlled languages by their using "basis writing rules to simplify sentence structure.". He adds that a controlled language is a natural language that can be distinguished from a general language in two significant ways:

The grammar rules of a controlled language are typically more restrictive than those of the general language. The vocabulary of a controlled language typically contains only a fraction of the words that are permissible in the general language. (ibid.)

Muegge (2009: 26-27)) also explains the situations that require such controlled language and they can be summarized in four important situations such as; facilitating language learning, eliminating translation when you require the information without a translator, it is also important for streamlining translation within the localization industry and finally at enhancing comprehensibility specially in the domain of technical communication to improve the user experience of a specific product or service on the domestic market.

MT Approaches MT Pyramid



A MT user is recommended to pay heed to the fact that a machine has limited capacities and it works according to the tasks for which it is designed. In other words, MT can translate only within the limits of the software it was fed with. It can be predicted then that the machine translation level is enclosed only within the limits of literal to semantic translation area. It cannot exceed such limited area to a communicative or pragmatic translation. A MT user should have a general look on the ST before MT for determining such elements in the ST that require pre-editing to avoid probable MT errors and apply a kind of linguistic filtering for better MT results.

In the present study, controlled language can be employed efficiently to simplify ST in pre-editing stage in order to facilitate translation for MT. This in turn can benefit translators, businessmen as well as any MT users who need to understand any type of information written in a foreign language. In practice, we can determine specific solutions to benefit from MT and achieve the best results for businessmen and translators in the following way

6.2. Linguistic Solutions to Better Quality in Machine Translation

To achieve such good quality in machine translation, we need to carry out both pre-editing and post-editing procedures for the machine translation in order to achieve a human-like translation version. These solutions can lead to a level of mitigating the difficulties assigned to machine translation systems. Translation is considered a difficult art both for human and for machine as well. Therefore, the way to achieve a considerable level of facility to machine translation becomes available by opting for certain linguistic and pragmatic solutions.

Pre-editing Solutions are suggested by a group of linguists as a method to facilitate the load on MT, some of them suggested to control the language in which ST is written as well as to modify the ST and simplify it to be understood and processed better by MT. LISA & Mike Dillinger (2004:24) suggested two methods to improve quality in machine translation that “there are two ways to increase this kind of overlap and to make MT work more effectively (1) improve the MT system, and (2) adapt the authors’

writing style to produce more translatable output. Adapting an MT system to a user's needs is called *tuning* or *customization*, and it plays a key role in making MT work effectively.”

6.2.1. Formatting the Source Text

Translation may become easier for MT if the source text form is organized before translation. This can be carried out by clarifying the contents and parts of speech of the text by means of dividing the text into points with hyperlinks if required for example. Another way of formatting the text can be carried out also by cutting redundant details and highlighting the main ideas as well as dividing long sentences into shorter sentences, each containing one idea.

6.2.2. Simplifying the Source Text (ST)

Extracting dates, proper nouns, and statistics, to make the translation easier and more productive, can simplify a source text and then the translator adds them in the post-editing stage. Proper names may cause a considerable problem to the MT TTs if they have a semantic content in addition to their being proper nouns. For example, Arabic names such as (أميرة – إيمان- وردة – سمر – هدى – تقي – سعيد – رضوان ...etc) can be translated by MT as meaningful words and not as proper nouns. They are translated by Google as (Princess -faith-rose-Samar- Huda-Toka-Said Radwan... etc). Therefore, to solve such a problem, it is better to extract proper nouns as well as statistics in order to avoid MT errors and to simplify the ST as well. Then, the missing data can be added by MT users after machine translation takes place.

6.2.3. Managing Terminology

In fact, there is a high risk regarding the failure to manage terminologies. This creates inconsistency among translators

who depend on their background information, their culture, and encyclopedia or dictionary entries. Each of them will suggest a specific translation derived from his own knowledge and his own search and will be written in his own style. There is no problem in translating in a creative way in general translation but this creativity may be against submitting fixed terminology or jargon. According to LISA & Mike Dillinger (2004:28), MT is considered a practical solution for such problem because “Terminology management processes, then, help minimize the mismatch in vocabulary between authors and the MT system”. This also achieves an additional benefit to MT users since the “increase in terminological consistency increases readability for the end users and makes the documents easier for human translators, as well” (ibid.). As a result of terminology management by means of creating a term base to be used by all the translators in the same project, the load on post-editing will be alleviated and more effort will be saved.

The following table includes STs which include abbreviations. The solution to better translation for abbreviations is to write full words for these abbreviations. Google translates some abbreviations correctly without pre-editing because they already exist in Google database. These correct translations result from training the system on such acronyms and abbreviations, while others are translated as letters only because they are not saved in the database.

6.2.4. Writing Full Words for Acronyms and Abbreviations

The following table represents acronyms that cannot be translated correctly by MT in their acronym form logically because the system is not trained on them. They rather require being in full words to be translated correctly by machine translation.

Term	MT	Full words	Standard MT
CACFP	CACFP (untranslated)	Child and Adult Care Food Program	البرنامج الغذائي لرعاية الأطفال و الكبار
Aids	الأيدز	Acquired Immune Deficiency Syndrome	مرض نقص المناعة
WWW	WWW	World Wide Web	الشبكة العنكبوتية العالمية
GNI	الدخل القومي الإجمالي	Gross national income	إجمالي الدخل القومي
GDP	الناتج المحلي الإجمالي	Gross Domestic Product	الناتج المحلي الإجمالي
UNRAWA	UNRAWA (untranslated)	United Nations Relief and Works Agency	وكالة الأمم المتحدة للإغاثة والتشغيل
WMO	WMO (untranslated)	World Meteorological Organization	منظمة الأرصاد الجوية العالمية
ZPG	ZPG (untranslated)	Zero population growth	تزايد سكاني صفري - ثبات عدد السكان

6.2.5. Re-writing the meaning of idiomatic expressions in other words with a regular meaning (comparable ST)

Some idiomatic expressions are translated by giving its equivalent cultural expressions in the TC (target culture) because MT is already trained on them as in the following examples:

اعمل خيرا و القه في البحر	Source Arabic and MT translation into English
I work better and cast it into the sea (literal MT)	
Do good and cast it into the sea	English equivalent proverb
اتَّقِ شَرَّ مَنْ أَحْسَنَتْ إِلَيْهِ	Arabic proverb
Fear of the evil done well to (literal MT)	MT
Beware the man who has received charity from you	Equivalent

	English proverb
--	-----------------

الصدق عند الضيق	Arabic proverb
Friend in distress (literal MT)	MT
A friend in need is a friend indeed	English equivalent proverb

بعد الامتحان يكرم المرء أو يهان	Arabic Proverb
After the exam honors one or insulted	MT
After a test men are honored or disgraced	English equivalent proverb

6.2.6. Linguistic Filtering:

Venuti (1995) documents in greater detail how foreign texts would be ignored if they failed the fluency test that is if they proved to be too resistant to easy readability. This rule should be applied to both MT and human translation. Therefore, MT should also enjoy such recommended readability through pre-editing and post-editing. In the translation from English into Arabic, some pre-editing changes may be very useful. They are recommended for better MT product. LISA & Mike Dillinger (2004:29) refer to the importance of including a type of controlled language in the pre-editing stage for machine translation because "Writing to specific standards is sometimes called *controlled (language) authoring*. standards" (ibid).

Ten controlled language rules are developed by Uwe Muegge (2008) at

Muegge.cc to suggest a successful strategy for writers to submit more consistent texts that will be also consistent translations when rendered:

Controlled Language Rule 1:

Write sentences that are shorter than 25 words.

Controlled Language Rule 2:

Write sentences that express only one idea.

Controlled Language Rule 3:

Write the same sentence if you want to express the same content.

Controlled language rule 4:

Write sentences that are grammatically complete.

Controlled language rule 5:

Write sentences that have a simple grammatical structure.

Controlled language rule 6:

Write sentences in the active form.

Controlled language rule 7:

Write sentences that repeat the noun instead of using a pronoun.

Controlled language rule 8:

Write sentences that use articles to identify nouns.

Controlled language rule 9:

Write sentences that use words from a general dictionary.

Controlled language rule 10:

Write sentences that use only words with correct spelling.

More Applications on MT 8:

Tom is an eight-year old boy who goes to school in Philadelphia.

توم هو صبي في الثامنة من العمر ويذهب إلى المدرسة في فيلادلفيا.

Tom is a boy. He is eight years old. He goes to school in Philadelphia.

توم هو صبي. يبلغ من العمر ثماني سنوات. يذهب إلى المدرسة في فيلادلفيا.

Comment: In this sentence, linguistic filtering is useful in simplifying the ST before MT. Therefore, dividing the complex sentence into simpler short sentences is useful.

ST The pizza was eaten by the girls.

MT: أكلت البيتزا من قبل الفتيات .

Pre-editing: The girls ate the pizza.

MT الفتيات أكلوا البيتزا .

Post-editing: If the preceding sentence submits to post-editing, it will be:

الفتيات أكلن البيتزا

Comment: in the preceding example, changing the passive sentence into active voice is useful in obtaining a better MT product. Therefore, it is clear then that pre-editing solution is useful in alleviating the load on the post editing solution and the student can obtain better results from MT smoothly in case he tries pre-editing.

Examples on Avoiding Gerund. (Change gerund into present participle)

ST Since Ahmed was eight years old, swimming has been his passion.

MT أحمد منذ كان عمره ثماني سنوات، السباحة كانت شغفه.

Pre-editing: Ahmed swims since he was eight years old because it is his passion.

MT: يسبح أحمد منذ كان في الثامنة من عمره لأنها شغفه

Post-editing: Not required.

Examples on Replacing pseudo subject with a real one.

This one is the person who was invited.

MT: هذا واحد هو الشخص الذي كان مدعوا

Pre-editing: Ahmed is the one who was invited.

MT أحمد هو الذي كان مدعوا

Post-editing: Not required

Examples on Managing ambiguous and idiomatic expressions:

ST Be a pet and send me this letter.

MT يمكن للحيوانات الأليفة وأرسل لي هذه الرسالة

Pre-editing Be nice and send me this letter.

يكون لطيفا وأرسل لي هذه الرسالة

Post-editing: The final version of this sentence can easily be:

كن لطيفا وأرسل لي هذه الرسالة

ST She is the teacher's *pet*

MT هي الحيوانات الأليفة المعلم

Pre-editing She is the teacher's *favourite*

هي المفضلة لدى المعلم

Post-editing: Not required

Ahmad is the manager's blue-eyed boy.

أحمد المدير أزرق العينين الصبي.

Pre-editing: Blue-eyed boy means favourite.

Ahmad is the manager's *favourite*.

أحمد هو المفضل لدى المدير.

Post-editing: Not required

Comment: It is clear that MT is improving in case of replacing an uncommon meaning for a word with its direct meaning.

Examples on paraphrasing idiomatic expressions and phrasal verbs:

ST: You can always *bank on* your friend to help you.

MT يمكنك دائما البنك على صديقك لمساعدتك.

Pre-editing: To bank on means to depend on

You can always *depend on* your friend to help you

يمكنك دائما الاعتماد على صديقك لمساعدتك.

Comment: The post-edited MT version is acceptable and may not need any change.

When *the bubble finally burst*, hundreds of people lost their jobs.

فقدت مئات الأشخاص عندما انفجرت الفقاعة في نهاية المطاف، وظائفهم.

Hundreds of people lost their jobs when *the good circumstances ended*.

فقدت المئات من الناس وظائفهم عندما تكون الظروف جيدة انتهت

In the preceding sentence the load is alleviated on the post-editing process. So, it can be simply as follow:

فقدت المئات من الناس وظائفهم عندما انتهت الظروف الجيدة (الحسنة)

Comment: paraphrasing, by giving the real meaning of the idiomatic expression is useful in obtaining better MT results. Without such pre-editing option, MT results will be inaccurate and problematic.

Examples on writing direct meaning for phrasal verbs:

ST: She wandered the streets, *drinking in* the atmosphere.

MT: إنها تجولت في الشوارع ، والشرب في الغلاف الجوي

Drinking in means *looking at*

Pre-editing: She wandered the streets, *looking at* the atmosphere.

إنها تجولت في الشوارع، وتبحث في الغلاف الجوي

Post-editing لقد تجولت عبر الشوارع وتأملت في الطقس المحيط بها.

Comment: It is clear that the load on post editing process is alleviated so much by applying pre-editing.

ST The shopping mall is *covered over* with an enormous glass roof

MT وتغطي أكثر من مركز للتسوق مع السقف الزجاجي الهائل

Pre-editing

1-Covered over means *protected by covering it completely*

2-Avoid passive

An enormous glass roof is protecting the shopping mall and covering it completely.

MT: سقف زجاجي ضخم هو حماية للتسوق من خلال تغطية تماما

Post-editing: هناك سقف زجاجي ضخم يحمي مركز التسوق من خلال تغطيته تماما.

.....

ST: Police are *cracking down* hard on drug dealers.

MT: الشرطة مطاردة من الصعب على تجار المخدرات.

Pre-editing *Cracking down* means *dealing severely*

Police are *dealing severely* on drug dealers.

MT: الشرطة تتعامل بشدة على تجار المخدرات.

Post-editing: الشرطة تتعامل بشدة مع تجار المخدرات.

ST: The police are determined to *smoke out* the leaders of the gang

MT: مصممون على الشرطة لدخان خارج زعماء العصابة

Pre-editing: *Smoke out* means *to make a secret publicly known*

ST pre-edited

The police are determined to *make the secret of* the leaders of the gang *publicly known*.

MT: مصممون على جعل الشرطة السرية من زعماء العصابة معروفة علنا.

Post-editing صممت (أصرت) الشرطة على جعل سر زعماء العصابة معروفا علنا (للجمهور).

Comment: only word order was required to make the sentence correct.

ST: we had multiplication tables drilled into us at school.

MT: كان لدينا جداول الضرب ثقبه لنا في المدرسة.

Pre-editing: *Drilled into* means *learned by repeating it frequently*

we had multiplication tables *learned to us at school by repeating it frequently*.

MT: كان لدينا جداول الضرب المستفادة لنا في المدرسة من خلال تكراره في كثير من الأحيان.

Post-editing: تعلمنا جداول الضرب في المدرسة من خلال كثرة التكرار

Human translation لقد كانت جداول الضرب محفورة في أذهاننا في المدرسة بكثرة التكرار

Comment: a translator can make his translation more communicative following to obtaining the most correct MT version as in the preceding example.

Examples on writing full word for acronyms and abbreviations (formal and informal):

ST: His job was *OTT*

MT كان عمله أوت

Pre-editing *OTT* means *over the top*

His job was *over the top*

MT كان عمله على مدى عالي

Post-editing: كان عمله على مستوى عالي.

ST: He talks abt something important.

MT: هو تكلم ايت شي مهم.

abt is an abbreviation for (about)

He talks *about* something important

هو تكلم (تحدث) عن شيء مهم..

ST

Jeddah needs almostone million housing units over the next 20 years. This can be achieved through the construction of low-cost housing units, says a strategic plan prepared by the Jeddah municipality.

MT

جدة وحدة سكنية احتياجات ما يقرب من مليون دولار على مدى السنوات الـ ٢٠ المقبلة. ويمكن تحقيق ذلك من خلال بناء وحدات سكنية منخفضة التكلفة ، وتقول الخطة الإستراتيجية التي أعدتها بلدية جدة.

In this MT post-editing may be sufficient in obtaining a better TT. The student, therefore, should determine the types of errors in order to correct them. It is clear that the common error in this MT, which causes a problematic TT, is a *word order* problem. The post-edited version then can be a *semantic translation* in which the student focuses only on correcting the errors without being communicative or *pragmatic*. Later, s/he can add a more communicative perspective to a translation that is void of errors. In other words, a student can add a more beautiful style to his semantic version in order to obtain the final translation version that is called the human translation version. The semantic translation in which the errors are corrected are as follow:

Semantic Translation:

جدة تحتاج إلى ملايين البيوت في السنوات العشرين المقبلة. جدة تحتاج ما يقارب مليون وحدة سكنية على مدى السنوات العشرين المقبلة. هذا يمكن تحقيقه من خلال بناء وحدات سكنية منخفضة التكلفة كما تقول الخطة الإستراتيجية التي أعدتها بلدية جدة.

A student can follow the semantic translation version with a human translation version which is characterized with being communicative, beautiful and nearer to the common Arabic we listen and read everywhere in the Arab society. A translator or a student can employ the best strategies in producing the best Arabic style he can. This depends mainly on his level and culture regarding Arabic language. Such human or communicative translation version varies from a translator into another because it depends on each person's feeling about the language and

the way he expresses. On the other hand, in case of semantic translation, it is expected that all the students give similar versions because they depend only on correcting linguistic errors committed by MT. A human translation version for the same ST can be as follow:

Human translation:

تحتاج جدة إلى ما يقارب مليون وحدة سكنية على مدى السنوات العشرين المقبلة (القادمة – الآتية) فهذا (مما) يمكن تحقيقه من خلال بناء وحدة سكنية منخفضة التكلفة كما تقول (أفادت) الخطة الإستراتيجية التي أعدتها بلدية جدة.

In the preceding human translation version, the source of variation is assigned to the variety of synonyms of each vocabulary. A translator has a number of options to select. His option, as mentioned above, is based upon his style and his feeling regarding the Arabic language beauties.

In the preceding paragraph, the brackets shows communicative options of the underlined words. The selection of a synonym is similar to *intralingual translation* in which the translator tries to paraphrase or simplify the vocabulary by means of other words in the same language. On the other hand, we can apply also pre-editing on the same text by changing the structure of the final sentence in the following way:

Pre-edited ST

Jeddah needs almost one million housing units over the next 20 years. a strategic plan prepared by the Jeddah municipality says that this can be achieved through the construction of low-cost housing units.

MT

جدة وحدة سكنية احتياجات ما يقرب من مليون دولار على مدى السنوات الـ ٢٠ المقبلة. خطة استراتيجية أعدتها بلدية جدة يقول بأنه لا يمكن تحقيق ذلك من خلال بناء وحدات سكنية منخفضة التكاليف.

The preceding MT version following to pre-editing may require less effort than the raw ST. It ends also in the final human translation version obtained above. However, it may save the effort of correcting the second sentence.

8. Results and Recommendations

For businessmen and companies with abundant amounts of files and correspondence written in a foreign language, the present study is hopefully useful for understanding and satisfying their requirements (i.e. saving, time, money and effort, best quality for his business as well as understanding the content of foreign texts). It also suggests practical methods for such requirements such as gisting to get a rough idea of a business letter, an email or a business report. It also facilitates business and communication with foreign customers because it does not require a linguistic specialist to run. It can also benefit businessmen by understanding the content of a specific project until a specialist arrives and writes a business letter, an email or a report in an accurate language. This saves a lot of money, time and effort.

As for a translator, the present study is useful for understanding the requirements of a translator (i.e. saving time, effort, getting better payment and the utmost quality in translation). One of the essential benefits a translator can get from MT programs is to get the first draft before accurate translation. He is also capable of getting a rough idea about the topic of ST before translation. One more benefit is relevant to getting the terminology included in the ST in a consistent way. Later, he starts his human translation that requires a unique treatment on the semantic, pragmatic and cultural levels.

On the other hand, the present study is useful for MT users whether specialized or

not because it enables them to understand the way MT systems run (i.e. to distinguish direct and indirect MT approaches). This is useful as it lets MT users be selective regarding the STs they enter to be translated. In fact, some texts cannot be translated efficiently by MT because they contain cultural elements that require a human mind to interpret. Other texts cannot be translated by machine because they contain metaphoric or idiomatic expressions and also require a human mind to interpret.

On the other hand, the texts which are more suitable for MT are the texts that include terminology and facts. Such texts are not designed to be interpreted by its receivers in different ways. In fact, MT is more productive in translating large amounts of such texts as it achieves consistency of terminology even if the translation project is distributed on a group of translators. The same translation memory and term base files can be shared by those translators to secure unified terminology.

Although using pre-editing is useful in preparing the ST to MT to facilitate translation, it is considered a waste of time when the texts is mostly idiomatic or full of metaphors. Such texts are better translated by a human translator. Poetry and works of great literature as well as texts containing puns and similes are not appropriate for MT. Such texts are not designed for this purpose. They are designed to help their receivers enjoy and taste the beauties of the language. Hence, they should be also translated by a translator who enjoys them in order to transfer the same level of beauty to text receivers.

One of the misconceptions that can be dissipated by this study is the claim that MT may threaten HT's job and replace him. However, we proved above that some

texts cannot be translated by MT programs alone such as idioms, poetry, metaphors, cultural elements...etc. and they need a human translator to interpret and render to another human language. On the other hand, pragmatic texts such as medical, legal, economical, financial...etc. may also contain parts that require the unique experience of a human. In fact, both MT and human translators should collaborate to innovate in producing the most appropriate TT by means of simplifying ST. This facilitates ST analysis and hence TT generation.

Because MT has limited capacities and require a human mind to run better and to be more productive, we should benefit from the advantages of both of them. We can benefit from the speed, saving money and effort, confidentiality, availability and universality of MT to be added to preciseness and high quality of a human mind. Hence, a human translator can use his unique capacities in adapting ST according to the capacities of MT. This decision originates from his previous understanding of MT's limited capacities.

Accordingly, pre-editing comes as the core of this study which runs better when a translator decides to adapts texts according to MT capacities. Hence, a translator is recommended to benefit from MT capacities according to the nature of the ST to be translated. A translator should pay heed to the fact that MT is inappropriate for translating works of art or similar works with ambiguous or complex vocabulary and in order to benefit from MT, a translator is recommended to decrease the complexity level for ST entered for MT analysis in order to get TT generation easier. This can be carried out by means of pre-editing as mentioned above.

Therefore, a translator can achieve the ultimate benefit from MT by

understanding its nature and the way it runs. He should focus on the fact that the ST submits to *analysis* process which simplifies the ST to be transformed easier into the TT language by means of *generation* process. Hence, a translator or a businessman should know perfectly well that the more he decreases the level of depth in *ST analysis*, the easier the *TT generation* by means of pre-editing. Accordingly, MT for pre-edited STs supplies a translator with a first draft and it supplies a businessman with a rough idea of his business correspondence written in a foreign language. Moreover, applying pre-editing by using controlling language rules is important for both a businessman and a translator. It benefits a businessman specially if there is no available translator because it simplifies the ST and leads to an easier generation for the TT. It is also useful if the user requires only a rough idea about ST and he may decide later the parts of the documents that require precise translation and deserves payment and to save money, time and effort by disregarding unimportant parts of such documents.

A very interesting benefit for benefiting from MT is interacting with the controlling rules when the ST is designed according to the ten-controlling rules. Hence, sentences or instructions of companies or any business that are designed to be translated to any number of human languages are recommended to be written according to these controlling rules. For example, the language used in writing should be simple and clear. The writer should submit short sentences, with one idea in each sentence. He should not also use passive and he should avoid spelling and grammatical mistakes because they may affect the productivity of MT. A writer should also repeat nouns instead of using pronouns when he means the same thing. The writer should not also use

metaphors or any unclear expressions. This way, the ST becomes clear and may not need an effort in pre-editing. The effort of pre-editing can be exerted to the ready texts.

To conclude, we can say that the present study submits a solution for a translator, a businessman as well as any other MT user, who is not a specialist, to

run their variant types of business smoothly and easily. Pre-editing simplifies the ST to be easier for MT analysis. Moreover, it alleviates the load on a translator in post-editing as it supplies him with a better and higher quality generated TT. Finally, post-editing helps the translator get his final translation version in a satisfying way.

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