PASAA
Volume 60
July - December 2020

Google Translate and Translation Quality: A Case of Translating Academic Abstracts from Thai to English

Angkana Tongpoon-Patanasorn*
Karl Griffith
Khon Kaen University, Khon Kaen 40002, Thailand
Email: angton@kku.ac.th

Abstract

Machine translation (MT), especially Google Translate (GT), is widely used by language learners and those who need help with translation. MT research, particularly that which examines the quality and usability of the translation produced by the MT, only makes up a handful of studies. Moreover, only a few of them have looked at translation quality and problems of translated texts from the user's first language to a second language, and none has been conducted to examine translations produced by the updated system of GT (i.e., the Neural Machine Translation System). The purposes of this study are to examine the quality of abstracts translated from Thai, the user's first language, to English, the target language, using GT by evaluating their comprehensibility and usability levels and to examine frequent error types. Fifty-four abstracts were selected from academic journals in eight disciplines of Humanities and Social Sciences. They were rated by two experts using coding schemes. The results revealed overall comprehensibility and usability were both at a moderate level. That means the quality of the abstracts translated by GT may not meet the language requirements needed for academic writing. The most frequent errors produced by GT were those of capitalization, punctuation, and fragmentation.

Key words: Google Translate; Machine Translation; Translation problems; Abstracts

Introduction and Rationale of the study

Machine translation (MT) was first developed in the mid-20th century. The main objective of MT development was to replace human translation due to the drawbacks of deliberate translating processes and possibly expensive translation costs. Statistical MT was first presented as a research project by IBM (Brown, Cocke, Pietra, Pietra, Jelinek, Lafferty, Mercer, & Rossin, 1990; Brown, Pietra, Pietra, & Mercer, 1993). The main aim of MT is to create and enhance automatic translation from one language to another. The main approach of MT employs a corpus-based method in which words or text of the input language are translated by comparing them with samples of languages collected in the database, or parallel corpus. The translations are selected based on a statistical method in order to reduce variables in the translation process and to improve the accuracy of the translation. This approach is very effective in translating words with multiple meanings. MT adopts various models such as the reordering model, word translation model, and phrase translation model. It has been so far accepted that the most successful method is phrase-based, by which the input text is translated in sequences (Och, 2002; Zens, Och, & Ney, 2002; Koehn, Och, & Marcu, 2003; Vogel, Zhang, Huang, Tribble, Venugopal, Zhao, & Wajbel, 2003; Tillmann, 2003). Even though the quality of translations produced by MT is improving, results have not yet been satisfactory nor accepted by users due to serious errors and mistakes, such as confusing pronouns and creating incorrect sentence structures (Sawatdhiwat Na Ayuthaya, 2005). Moreover, the translations may not be usable and/or may need to be polished by human translators (Tassin, 2012).

One MT program that is well known and widely used by second language learners and those who need help with translation and language learning is Google Translate (Gaspari, 2007). Google Translate is among the most popular MT applications because it is provided free of charge through a website interface and mobile apps for both Android and iOS. It is

convenient, user-friendly, and rapid. It currently supports over 100 languages.

Google Translate (GT), launched in 2006, is the most popular machine translation program because it relies on a huge database, resulting in a higher rate of translation accuracy compared to other machine translation applications (Anazawa, Ishikawa, Park, & Kiuchi, 2012; Groves & Mundt, 2015; Puangthong, 2015). Those applications, such as Bing Translator, Yandex Translate, or Gram Trans have much smaller databases and consequently a fewer number of documents in the output language to operate on and select from. The accuracy of GT constantly increases because new documents are uploaded every second worldwide, which further helps enlarge the database size of GT, and with the GT function of 'suggest an edit' from the user, the quality of the translation provided by GT may continue to improve.

GT is operated under a computer system that searches and matches the input language in the forms of texts, media, speech, images, and real-time video, with the output language available in millionths of a second. When the user types in a searchable term at either the word, phrase, or sentence level, GT searches for their patterns among millions of documents collected in the online databases of GT before it produces the translation that is most parallel to the searched terms. To select the most suitable term, GT adopts a statistical analysis to determine the best fit in terms of pattern. It operates by adopting a statistical machine translation method. Previously, GT adopted a phrase-based machine translation method, which matched the input and the output languages at a phrasal level. GT, however, does not directly translate from L1 to L2, but first translates L1 to English and then English to L2. In 2016, GT launched its updated version, which is operated under the Neural Machine Translation System. This system increases translation accuracy by matching the input language to output language at a sentential level. In other words, it translates one whole sentence at a time, not phrase by phrase. Also, it looks into broader contexts to help select the best fit for

the target translation. Under this system, GT's translation accuracy can reach up to approximately 55-85 percent (Le & Schuster, 2016).

Even though GT's accuracy is improving, it has been criticized for its incorrect translation (Anazawa, Isaikawa, Par, & Kiuchi, 2012; Kirchoff, Turner, Axelrod, & Saavedra, 2011; Costa-jussa, Farrus, & Pons, 2012; Groves & Mundt, 2015). According to Balk, Chung, Chen, Chang, and Trikalinos (2013), GT could produce possible English translation versions for data extraction in medicine texts. However, the quality of the translation was tremendously reliant on the languages of the original texts (i.e., orthography). European languages (i.e., French, German, and Spanish) seemed to reach a higher level of accuracy leading to higher degree of data extraction, while the accuracy was manifestly lower in the examined oriental languages (Japanese and Chinese). Also, the low level of accuracy may also be possibly because the translation process of MT is not programmed to operate in the same way as human translation, which requires a more advanced cognitive process. In human translation, a translator reads, analyzes, and interprets to understand the source text in the existing context before he/she translates it. To analyze and interpret the source text, the translator works to understand connotations, cultural messages, social values, norms, beliefs, and different ways of life, in addition to the understanding and knowledge of the linguistic behavior between two different languages (House, 2016). Moreover, it is well accepted that no two languages are identical. Even though there are similarities between them, there may be differences in vocabulary, word order, sentence structures, and word and sentence construction, as well as associated meanings (Akmajian, Demers, Farmer, & Harnish, 2010). As such, translation requires human translators as mediating agents between two different languages that have diverse syntactic structures, pragmatics and cultures (Katan, 2004). To translate successfully, the translator must be able to deliver messages with equivalent meaning, form, and style to the source text and translate them employing an

appropriate framework to provide thought and culture that may not exist in the target language (Nida, 1964).

Based on the review of previous studies, there are only a few that examine the quality of Machine Translation, especially Google Translate. Among the very limited number of studies, most have examined translation from English to other languages. Anazawa, Ishikawa, Park, and Kiuchi (2012) examined the use of MT for the translation of nursing abstracts from English to Japanese and Korean to Japanese using Google Translate. The quality of the translated abstracts was examined by 28 researchers and research assistants working at a nursing university in Japan. The participants were asked to rate the quality of the translated abstracts in two areas: understanding and usability of the translation. It was found that the level of the two assessment criteria for Korean to Japanese translation was acceptable. However, the quality of the English to Japanese translation was low. Even though most technical terms were appropriately translated, the low accuracy of the translation was at an unacceptable level, affecting the level of understanding in the meaning and message of the texts. Similary, Kirchoff, Turner, Axelrod, and Saavedra (2011) examined translation from Spanish to English using MT by using public health texts. It was found that the quality of the translation was at an acceptable level. However, the translation needed extensive editing by human translators. Sheppard (2011) examined the quality of Google Translation in translating medical texts. Sheppard mentioned that the strong point of GT was that it was free of charge compared to the high expenses needed to pay for human translators. However, the quality of the translation was low regarding its sentence structure, style, and writing identity. Sheppard's findings were in line with the study of Costa-jussa, Farrus, and Pons (2012) who examined the translation of medical texts using GT. They also found that the translation had low quality and was at an unacceptable level. They claimed that this may be due to the differences between Romance and Germanic languages. Ketpun and Sripetpun (2016) examined Thai university

students' attitudes and behavior in using GT to translate their class projects from English to Thai. They found that students used GT to help with the translation at all levels: word, phrase, and sentence. The students acknowledged the incorrect translation produced by GT and were aware they needed to edit the translation version, thereby employing other translation tools to help improve quality. However, based on the assessment of the quality of the translation projects, it was found that the use of GT did not help improve the quality of the students' work. Puangthong (2015) examined the quality of GT from English to Thai. In this study, Thai EFL learners were asked to use GT to translate English documentary texts and novels into Thai. The researcher gave feedback on the GT translations and asked the learners to polish them. The study revealed that GT supported different types of texts (both academic and non-academic). However, the meanings of words were not appropriate to the context of the source text. There were problems with the translation of expressions. The sentence structure of the translated version was different from that of the target language, which was Thai. However, it was found that after the revision by students, the quality of the translation improved.

Only studies by Groves and Mundt (2015) and Balk, Chung, Chen, Chang, and Trikalinos (2013) were found to examine the translation quality of academic texts using GT from other languages into English. Groves and Mundt examined the quality of translation using five academic texts written in Malaysian and Chinese by university students and translated into English. Different from previous studies that assess overall translation quality, Groves and Mundt examined translation errors at the sentence level. They found that GT produced higher translation quality when the input language was Malaysian compared to Chinese. They explained that the database for Malay may be larger than the Chinese database. The most frequently found errors produced by GT were word usage, sentence structure, and omission. Balk, Chung, Chen, Chang, and Trikalinos (2013), GT examined the quality of GT on the translation of medical texts

from five different languages, including, Spanish, French, German, Japanese, and Chinese. GT could produce possible English translation versions with adequate accuracy for data extraction in medical research articles. However, the accuracy of translations of European languages (i.e., Spanish, French, and Germen) was much higher compared to translations of Asian languages (i.e, Japanese and Chinese).

The gaps in the previous studies were that most of them examined the quality of GT from English to other languages (Aiken & Balan, 2011; Anazawa, Ishikawa, Park, & Kiuchi, 2012; Costa-jussa, Farrus, & Pons, 2012; Ketpun and Sripetpun (2016); Kirchoff, Turner, Axelrod, & Saavedra, 2011; Puangthong, 2015; Sheppard, 2011), and only two studies by Groves and Mundt (2015) and Balk, Chung, Chen, Chang, and Trikalinos (2013) that examined the quality of GT from other languages to English. More studies are needed to assess MT with English as the target language, especially from Asian languages, because their linguistic properties differ tremendously from that of European languages. GT seems to have specific problems translating Asian languages (Aiken & Balan, 2011; Groves & Mundt, 2015). Moreover, most previous studies have examined only the previous version of GT (i.e., phrasal based translation); none of the studies have heretofore been conducted to examine the quality of the updated version of GT, the Google Neural Machine Translation System, which was recently launched in September 2016. In particular, no studies have been conducted to examine the quality of Thai to English translation by Google Translate. The present study aims to fill in these gaps by examining the translation quality of GT from Thai to English by using research abstracts in the field of Humanities and Social Sciences as sample texts. Specifically, it aims to examine the quality of GT by assessing two different measures: comprehensibility and usability, and to analyze errors produced by GT. The current study is, therefore, guided by the following two objectives:

1) To examine the quality of abstract translations produced by Google Translate from Thai to English

2) To examine the usability of the abstract translations produced by Google Translate from Thai to English
3) To analyze errors produced by GT in abstract translations from Thai to English

Research methodology

Sample

The sample in this study comprised of 54 research abstracts from eight major disciplines of Humanities and Social Sciences (i.e., history, information studies, language, philosophy and religion, economics, management, tourism, and social studies). The abstracts were published between 2012 and 2016 in Q1 Thai academic journals indexed in the Thailand Citation Journal Index (TCI). Each abstract contained approximately 100-250 words.

Instruments

Three research instruments were employed in this study: two rating scales and a coding scheme for errors made by GT. The two rating schemes were used to assess the quality of the translations in two different aspects: comprehensibility and usability. The coding scheme was used to examine errors and types of errors made by GT.

Comprehensibility rating scale. The comprehensibility rating scale was adapted from a scale used in a study by Anazawa, Ishikawa, Park, and Kiuchi (2012). This scale contains five points, one to five, with five as the highest comprehensibility level. This scale was used to determine the level of comprehensibility of the translations from GT.

Table 1: Rating scale for comprehensibility

Level	Level of Comprehensibility
1	Not understandable
2	Partially understandable
3	Somewhat understandable with numerous unclear references
4	Mostly understandable with minimal lapses in clarity
5	Completely understandable

Usability rating scale. The usability rating scale was also adapted from Anazawa, Ishikawa, Park, and Kiuchi's (2012) usability scale. However, the purpose of the scale used in the study of Anazawa, Ishikawa, Park, and Kiuchi (2012) was slightly different from that in this study. In Anazawa, Ishikawa, Park, and Kiuchi's study, the scale was used to rate the usability of translations from the second language to the first language (i.e., English to Japanese) and to examine whether the translations helped enhance the understanding of the source texts. In this current study, however, it was used to examine the usability of the translation from the first language to the second language (i.e. Thai to English). Defining the usability criterion more specifically, the study sought to measure the relevance and validity of the translated text to real world applications. In other words, its aim was to examine to what extent the GT translation could be used as a final translated version for academic purposes.

Table 2: Rating scale for usability

Level	Level of Usability
1	Not usable at all
2	Limited usability
3	Partially usable (parts of the text are syntactically correct, while others are nonfunctional)
4	Mostly functional, but with limited viability
5	Minimal interference with overall functionality of the text

Coding scheme for errors. The second purpose of the present study was to examine errors and types of errors produced by GT. The coding scheme used in this study was adapted from a study by Ferris et.al. (2013). It contains twenty items (see Table 3). The coding scheme, however, was used only as a guideline for coding; more items could be added if not included in the list.

Table 3: Coding scheme for errors produced by GT

Code	Title	Example from translations
VT	Verb tense	*One that measured the level of ability in several ways*
VF	Verb phrase	*The individual who failed the exam ignored or looked down upon by society*
WF	Word form	*A student test detects only the ability to say yes or memory*
ART	Article	*Same way to learn the memorizing*
PL	Plural	*Examination, especially in Malaysia plays an important role*
AGR	Agreement	*Activities such as off-site is very dominant*
PREP	Preposition	*Abuse and misunderstanding among students on examinations should be eliminated.*
WO	Word order	*Students will focus on such topics only*
WW	Wrong word	*Support parents and teachers are required so that they can be overcome*
WC	Word choice	*Examination is considered something very high*
COM	Comma	*Learning aspects such as, music and art, can not be measured*
SP	Spelling	*How can the ideological principles Specifically implement them*
AP	Apostrophe	*Third, teachers and students too expect students exam results*
SS	Sentence structure	*This result is that parents do not ignore and less affection on them*
MW	Missing word	*First, the examination has been highly beneficial to students but also students to study a topic that will be tested only on the exam*
REF	Pronoun reference unclear	*And students will focus on such topics*

PRO	Pronoun incorrect	*Teachers will also place high expectations on him*
RO	Run on	*I believe that in order to test the ability of the method to detect the candidates more then good, in other words, the examination system is not a good way to test students' abilities*
FRAG	Fragment	*In addition, people who have a bias to the students who got poor marks from students who get higher scores.*
UNCLEAR	Unclear	*College entrance examination system for screening system, especially in the eyes of their talents*

Data collection

To achieve the total number of 54 abstracts, twelve research abstracts were collected from Thai academic journals indexed in Q1 of the TCI from the eight aforementioned areas of Humanities and Social Sciences in 2017. The abstracts were published between 2012 and 2016. Each of them was individually translated from the source text written in Thai to the target language, which is English, in October 2016 using the updated version of GT (i.e., the Neural Machine Translation System). Each translation was saved as an electronic file using the initial of each discipline and a number for the order of the abstract in the data set as the name of the file (e.g.,T1- tourism abstract No.1, L8 – language abstract No.8, and E52 – economy abstract No.52, and so on).

Data analysis

The translated versions of the abstracts were analyzed using the rating scales and the coding scheme by two raters who are also the authors of this research paper. The mean scores and the standard deviations of the two measures, comprehensibility and usability, were compared against the criteria presented in Tables 4 and 5 to determine the levels of comprehensibility and usability. The data from the coding scheme for errors were tallied

and sequenced in order of frequency to determine the types of errors most frequently produced by GT.

Table 4: Criteria for comprehensibility

Mean	Level of Comprehensibility
0.5-1.5	Not understandable
1.6-2.5	Partially understandable
2.6-3.5	Somewhat understandable with numerous unclear references
3.6-4.5	Mostly understandable with minimal lapses in clarity
4.6-5.0	Completely understandable

Table 5: Criteria for usability

Mean	Level of Usability
0.5-1.5	Not usable at all
1.6-2.5	Limited usability
2.6-3.5	Partially usable (parts of the text are syntactically correct, while others are nonfunctional)
3.6-4.5	Mostly functional, but with limited viability
4.6-5.0	Minimal interference with overall functionality of the text

To examine the inter-rater reliability, the two raters rated and coded the translations individually. Pearson's correlation revealed very strong reliability between the two raters: 0.93 and 0.94 for comprehensibility and usability respectively. The rate of agreement on error types was also high, standing at 0.89.

Results and Discussion

To answer the posted research questions, 54 academic abstracts written in Thai and translated into English using GT were measured for their overall intelligibility according to the two criteria of comprehensibility and usability. Both were employed as evaluation criteria of the Google Translated texts using a 5-point scale.

Level of comprehensibility and usability

The results reveal that comprehensibility is at a moderate level (*Mean* = 3.21, *SD* = 0.76). That means the translations produced by GT were somewhat understandable but they contained a number of unclear references (see Table 6). Also, it was found that the usability level of the GT translations was at a moderate level (*Mean* = 2.98, *SD* = 0.88). Based on the findings, the GT translations were partially usable. Some parts of the text were syntactically correct. However, most of them were nonfunctional (see Table 7).

Table 6: Level of comprehensibility

Scale	Level of Comprehensibility
0.5-1.5	Not understandable
1.6-2.5	Partially understandable
2.6-3.5	Somewhat understandable with numerous unclear references
3.6-4.5	Mostly understandable with minimal lapses in clarity
4.6-5.0	Completely understandable
Results: *Mean* = 3.21, *SD* = 0.76	

Table 7: Level of usability

Scale	Level of Usability
0.5-1.5	Not usable at all
1.6-2.5	Limited usability
2.6-3.5	Partially usable (parts of the text are syntactically correct, while others are nonfunctional)
3.6-4.5	Mostly functional, but with limited viability
4.6-5.0	Minimal interference with overall functionality of the text
Results: *Mean* = 2.98, *SD* = 0.88	

A few comparisons can be drawn from the findings of this study with that of Anazawa, Ishikawa, Park, & Kiuchi (2012). Both derived their results from academic abstracts written by tertiary scholars, either from their native language of Thai into English or from English into Japanese. Moreover, the quality of the translations was found to be unacceptable in both cases. This could be due to difficulties GT has in translating the source text to

the target language, particularly when one or the other is Eastern in origin (Aiken & Balan, 2011; Balk, Chung, Chen, Chang, & Trikalinos, 2013; EC Innovation, 2012; Europe, 2017; Freely, Hasler, & Gispert, 2019; Liu, 2018). These studies clearly indicate that MT programs, such as Google Translate cannot be a viable method on their own for an effective translation of academic texts written in the user's first language, especially Asian languages such as Thai, whether in regards to mechanical or semantic accuracy. However, as an initial step in the process of reaching a desired level of comprehensibility and with the involvement of a human editor, MT of Thai to English has some potential as a supplementary translation tool (Denkowski, 2015; Katan, 2004). Academic Thai texts translated with MT into English may demonstrate enough functionality for a human editor to interpret any gaps in clarity or accuracy to produce a text suitable for academic use, such as the publication of an article. A native English speaker with some general knowledge of Thai would be an ideal candidate for the task. However, even under these conditions, a completely accurate translation is still uncertain.

Errors produced by GT

To answer the third research question on the translation errors produced by GT, the 54 translated versions were coded using the following coding scheme. Table 8 below shows the types of errors encountered in the 54 academic abstracts translated from Thai to English by Google Translate. The three most frequent errors produced by GT were capitalization (Number of instances = 234, 20.58 percent), punctuation (Number of instances = 227, 19.96 percent), and fragmentation (Number of instances = 185, 16.27 percent). The preponderance of capitalization and punctuation errors demonstrates the difficulties MT has with interpreting these features (or lack thereof) in the Thai language.

Table 8: Error types with explanation and number of instances

Error type	Explanation	Number of instances	Percentage
Capitalization	Either missing or unsuitable capital letters	234	20.58
Punctuation	Missing or misplaced full stops, commas, semicolons, colons, or quotation marks	227	19.96
Fragment	Incomplete phrases or missing clauses, subjects, verbs or objects	185	16.27
Unclear	Incomprehensible meaning	91	8.00
Preposition	Missing or misuse of preposition or prepositional phrases	67	5.89
Wrong Word	Misuse of vocabulary to express a clear meaning	63	5.54
Reference	Isolated word or phrase with no connection to previous or subsequent ideas	49	4.31
Article	Missing or misuse of definite or indefinite articles	47	4.13
Repetition	Word or phrase repeated with no obvious purpose	42	3.69
Verb Form	Misuse of or unsuitable verb tense, voice or case	27	2.37
Agreement	Misaligned subject/verb, count/non-count noun, or plural agreements	24	2.11
Word form	Incorrect part of speech	23	2.02
Sentence Structure	Missing, incorrect, or non-sequential sentence components	22	1.93
Pronoun	Incorrect pronoun; misuse of or missing relative pronoun	21	1.85
Conjunction	Incorrect or missing conjunction	15	1.32
	Total	1137	100

As with Groves and Mundt's study (2015), common errors in the translations of this study were at the sentence level, including fragments (or omissions), word usage, and referencing. However, by far the most frequent errors discovered in the GT translations of this study were those of punctuation, especially capitalization, not seen as particularly noteworthy in the Groves and Mundt (2015) analysis. The Thai language, similar to other Asian languages, is a particular challenge for any translation to English because of its unique orthography, spacing, and lack of punctuation, especially capitalization (Charoenpornsawat & Sornlertlamvanich, 2001).

In analyzing these errors as they relate to the limits of MT, in particular those of punctuation, at least a passing familiarity with written Thai is essential. Specific Thai symbols are used for various functions, such as repetition, silent pronunciation, and abbreviation (Karoonboonyanan, 1998). However, English punctuation such as commas, full stops and question marks, have mostly either been borrowed by the Thai language and not used in exactly the same ways, or not used at all (Wathabunditkul, 2013). As for spacing, words and sentences are not generally separated in written Thai as they are in English (Kohsom & Gobet, 1997). These differences could account for the high number of errors involving punctuation, and specifically missing or misplaced capital letters, found in the English translations of Thai texts from Google Translate.

Specific Error Sample Analysis

Based on the post-hoc analysis, there were many major translation errors from Thai to English that were attributed to Machine translation, in this case, Google translate.

I. Punctuation and capitalization

Figure 1 below illustrates an example of multiple punctuation errors from one of the Thai abstracts translated by GT on the topic of Information Science. Three specific errors involving capitalization are in bold and italics.

This research aims to study the relationship between expectations in performance, expectations in effort**.** ***A***nd the influence of society ***W***ith the use of personnel information systems**.** ***W***orkers in central agencies

Figure 1: Example of multiple punctuation errors

The first error could be the result of a failure by the MT to recognize the last item of a list, which should be separated by a comma rather than a full stop, which Google Translate denotes as the end of a sentence, hence the misplaced capital letter at the beginning of the next sentence. The second error involves the omission by the MT of a comma preceding a prepositional phrase and another misplaced capital letter. The final example is a fragment, presumably meant to connect with the previous idea, but using a full stop instead of a comma, and adding another misplaced capital letter.

II. Errors of Reference

Another error type of interest, which is not normally associated with MT but detected in this study, is that of referencing. In this type of error, a word (often a pronoun) or phrase appears in the text with no apparent antecedent to a previous or subsequent idea (Aroonmanakun, 2003). Although not as frequent an error as punctuation or fragment, reference gaps occurred commonly enough in the translated texts to be analyzed. Linguistically, reference errors may be due to an issue of pragmatics in the Thai language. Thoughts and ideas are often segmented in Thai contextually (Supnithi, Kosawat, Boriboon, & Sornlertlamvanich, 2014), rather than in a linear fashion as they generally are in English. In Figure 2 below, the excerpt contains instances of isolated references (denoted in bold and italics).

This article aims to present the concept of human resource management in the Information Age, the concept of future organization management, the role and importance of human resource management, the attributes of human resources expected by the organization to help the organization. ***Achieve your goals effectively and efficiently. It*** consists of six attributes:

Figure 2: Example of isolated references

The phrase in bold and italics has no clear bearing on either the preceding thoughts or subsequent list of attributes, but seems to be an isolated imperative. The 3rd person pronoun ***It*** in the next sentence presumably relates to ***the attributes of human resources***, but the reference is not clearly expressed in a logical sequence. Whether this is due only to the MT interpretation or a choice on the part of the original writer could be debated. The only way to be certain of the intention would be a consultation with the Thai writer, perhaps involving the assistance of a bilingual speaker as well. This does not support the notion of MT as a more efficient or convenient method of translation.

III. Subject Content

Another important factor in consideration of MT's viability for the translation of academic Thai texts is subject content. In this study, nine topic areas, each comprising of six academic abstracts were chosen as a representative sample. Table 9 below indicates the number of errors found in the MT translated texts within each topic area.

Table 9: Number of errors according to abstract topic (6 abstracts per topic, 9 topics, 54 abstracts)

Topic of Abstract	Number of Errors
Tourism	104
Religion	90
Linguistics	147
Information Science	117
Social Science	117
Thai History	159
Fine Arts	169
Economics	146
Business Administration	146

The topic areas containing the most errors, Thai History and Fine Arts, are primarily concerned with local traditions and culture. In the former, the abstracts deal with issues such as the monarchy or status of the political elite and how they have developed over long periods of time. Concepts in these texts often depend on information and knowledge with which readers of Thai are assumed to be familiar (Vanijdee, 2015). This could account in part for the difficulties MT has in translating them. The excerpt in Figure 3 below exemplifies this point.

History, with ethnicity and ethnicity, is the final explanation of psychological concepts. With the study of pounding In ancient history, the present concept of ancient history has grown, but is still lacking in application. Evidence of archaeological history is numerous. The theoretical concepts presented in this article are a preliminary guideline to future in-depth studies.

Figure 3: Example of information and knowledge closely related to culture and of the input language

The text appears to target an established schema on the part of its readers (Rumelhart, 1980). The repeated concepts of ethnicity and ancient history do not include references to specific support, which would benefit readers of the translated text who do not possess prior knowledge of Thai history. The intent of this strategy on the part of the original writer may not be translatable by MT.

In the case of Fine Arts, the majority of the texts examined for this study provide details about performance practice in Thai music and theater, including terminology describing instruments, stage props/directions, and song tempo specific only to the Thai lexicon. The words/phrases highlighted in bold and italics in Figure 4 below illustrate this.

The research found that the overlay is a musical instrument in the group of ***Goblet drum*** in the south to play the game. The shadow play used to play a shadow play has ***2 cards called over the unit and overlap***. The physical characteristics of the overlap are two parts: the front and the

back. In practice, there are five overlaying sounds, namely, ***puffing, puffing, meringue and mushy***. The group is a rhythm. Rhythmic pattern and ***rhythm chapters***. Perform rhythms by repetition and rhythmic variations.

Figure 4: Example of information and knowledge closely related to culture of the input language

The translated items of note clearly fail to express the meaning of the Thai words accurately. The result forces the reader to guess at the intended explanation. Without an advanced competence in the Thai language, or at least some exposure to the practice of shadow play in Thailand, the abstract as translated is ineffective.

The two topic areas containing the least number of detected errors in the MT translated abstracts were Tourism and Religion. As one of the most important sources of export revenue in Thailand, the tourist industry seeks to effectively communicate its goals to the outside world (Srisattarat & Chancharoensuk, 2016). Academic scholars in this field (perhaps more than in others) have endeavored to write articles and papers with an eye towards the international community. It is interesting that MT translated abstracts in the topic category of Religion are also relatively more accurate. The reason could derive from the vast database of Thai documents on Buddhism already translated into English (Borup, 2016).

It may be possible to conclude from these results that the success of MT from Thai to English is topic dependent. In addition, experience and knowledge related to the topic on the part of the target audience would appear to be necessary for the practicality of the translation. However, there is some promise for the application of MT as an intermediary step in a process which includes a human editor, and leads to an academically feasible result (Costa-jussa, Farrus, & Pons, 2012; Katan, 2004; Sheppard, 2011; Tassin, 2012). This solution could be attractive to Thai writers with the goal of publishing their texts in English.

An Editing Model

Of benefit to this study would be a model to demonstrate the editing process. An abstract from the original data with among the fewest errors after translation has been chosen in order to attempt the best possible outcome. Figures 4a and 4b and 4c below contain respectively the original Thai text, the Google Translated text, and finally an edited text by a native speaker of English. Errors in the Google Translated text (Fig. 4b) are corrected (Fig. 4c) and both highlighted in bold and italics.

บทคัดย่อ

สิ่งแวดล้อมตามธรรมชาติในแหล่งท่องเที่ยวเป็นปัจจัยสำคัญยิ่งที่ดึงดูดนักท่องเที่ยวให้ไป เยือน งานธุรกิจรีสอร์ทจึงขึ้นอยู่กับสิ่งแวดล้อมตามธรรมชาติของท้องถิ่นค่อนข้างมาก เมื่อธุรกิจรีสอร์ท ได้รับประโยชน์จากทรัพยากรธรรมชาติของท้องถิ่น จึงควรร่วมรับผิดชอบ ขณะนี้ยังมีรีสอร์ทจำนวนหนึ่ง ยังไม่ตระหนักถึงความสำคัญของสิ่งแวดล้อมตามธรรมชาติที่มีต่อความสำเร็จและความยั่งยืนของธุรกิจ แม้ว่าธุรกิจรีสอร์ทจำนวนมากมีกิจกรรมที่แสดงความรับผิดชอบต่อสิ่งแวดล้อมกำหนดอยู่ในนโยบายของ องค์กร แต่ส่วนใหญ่ยังเป็นไปเพื่อประโยชน์ในเชิงธุรกิจ เช่น การทำกิจกรรมการประหยัดพลังงานแล้วนำมาทำการตลาด บทความนี้ประสงค์ที่จะชี้ให้เห็นความสำคัญของสิ่งแวดล้อมและทรัพยากรธรรมชาติ ของท้องถิ่นที่รีสอร์ทนำมาใช้เพื่อการตลาดและการบริหารจัดการ ทั้งนี้เพื่อให้เกิดการตระหนักในภาระ ผูกพันที่รีสอร์ทควรร่วมรับผิดชอบต่อสิ่งแวดล้อมของท้องถิ่น อีกทั้งควรกำหนดเป็นประเด็นในนโยบาย ด้านความรับผิดชอบต่อสังคมขององค์กร

คำสำคัญการท่องเที่ยว ความรับผิดชอบต่อสิ่งแวดล้อม รีสอร์ท ความรับผิดชอบต่อสังคม สิ่งแวดล้อม : ของท้องถิ่น

Figure 4a:. Original Thai text

The natural environment in tourist attractions is an important factor that attracts tourists to ***go***. The resort business is based on ***a very*** local natural environment. When resort business ***B***enefit from local natural resources. ***S***hould be responsible. There are now a number of resorts. ***N***ot yet aware of the importance of the natural environment to business success and sustainability. Although many resorts have environmental ***responsibility*** activities**,** they are part of corporate policy, ***but*** most are for business purposes, such as energy-saving activities and marketing. This article intends to point to the importance of the local environment and natural resources used by the resorts for marketing and management. In order to realize the burden. ***Commitment*** to the resort ***should be responsible for*** the local environment. It should be defined as a policy ***issue. C***orporate social responsibility

Figure 4b: Google Translated text

The natural environment in tourist attractions is an important factor that attracts tourists to ***travel***. The resort business is ***primarily*** based on ***the*** local natural environment. When ***a*** resort business ***b***enefit***s*** from local natural resources, ***it s***hould be responsible. There are now a number of resorts ***n***ot yet aware of the importance of the natural environment for business success and sustainability. Although many resorts have ***responsible*** environmental activities ***which*** are part of corporate policy, most are for business purposes, such as energy saving activities and marketing. This article intends to point out the importance of the local environment and natural resources used by the resorts for marketing and management. In order to realize the burden, the resort should be ***committed to*** and responsible for the local environment. It should be defined as a policy ***of c***orporate social responsibility.

Figure 4c: Human edited text

The effort made here by the human editor, who is the co-author of this paper, (see Figure 4c) is to ensure that the original intent of the Thai writer's message is maintained while providing both syntactic and semantic corrections to the MT translated text. In the above excerpt (4c), the changes from the translated text (4b) are mostly to mechanical errors and do not add or omit any meaning to or from the content of the Thai text. There are three cases of vocabulary changes made by the human editor which sought to bring a more academically consistent language to the text. First, the word ***go*** was replaced with ***travel***. Second, the adverb ***very*** was replaced with ***primarily***. Finally, one word, ***issue***, was deemed unnecessary and cut from the translated excerpt. None of these edits altered the intent of the original composition, nor required any consultation with the Thai writer.

The steps outlined above bode well for the use of MT as a stopgap for translating academic Thai texts into English. As a result, Thai scholars who intend to translate their work may soon find more opportunities for publication in other languages. For the time being, however, the process still requires the intercession of a conventional editor. Looking toward the future, with the continued development of heuristics (Vilar, Stein, Ney, 2008), an

expanded database of functional translations (Chancharoen, Tannin, & Sirinaovakul, 1999), and more sophisticated algorithms (Nusai, Suzuki, & Yamazaki, 2008), it is easy to envision a time when the need for a human translator will be diminished. At the same time, with these improvements to machine translation being made so quickly, the effect on the English language classroom will become increasingly important. As teachers and students grow more dependent on cloud-based technologies, guidance in the use of tools such as MT for developing language skills is crucial. Educators must be aware of both the benefits and limitations of these tools and convey the need for discretion to their students.

In sum, based on the findings of the present study, it seems that the overall quality of translations from an L1 user writing in a source language such as Thai to a second language as a target language (i.e., English) produced by the updated version of GT, i.e., the Neural Machine Translation System, is still only somewhat acceptable. The accuracy of the translations is relatively low and still needs editing and polishing from human translators. The degree of human interference may depend on the similarities or differences between the source and target languages.

Conclusion

The main purposes of this study have been to examine the quality of translations produced by the updated version of GT, which is operated under the Neural Machine Translation System. The results reveal that with discretion and caution, there is some potential for GT as an ancillary tool for academic translation. The findings of this study remain useful for language learners as well as language users to be informed about the quality of GT translations and to help them make better decisions about editing with this or any MT application. Moreover, it will help ESL/EFL teachers make more informed decisions about whether they should include MT as part of their teaching activities and prepare themselves for when giving feedback on learners' homework suspected of including MT. Even though this study has examined

only one academic discipline (i.e, humanities and social sciences), it also sheds light onto the translation quality of the new version of GT as well as types of errors produced by GT. However, investigation of GT translations in other disciplines such as science and technology, and medicine, as well as the evaluation of GT translations by actual users and evaluators, such as thesis supervisors and academic journal editors will help extend knowledge in this area. We are now in an era of technological advancements, and we cannot reject them. We need to learn how to use new applications efficiently for the purposes of both language learning and language communication.

Acknowledgement

We would like to thank Faculty of Humanities and Social Sciences for granting this research project.

The Authors

Angkana Tongpoon-Patanasorn, the corresponding author, is an assistant professor at the Faculty of Humanities and Social Sciences, Khon Kaen University, Khon Kaen, Thailand. Her current research interests cover discourse analysis, Second Language Acquisition, translation, corpus linguistics, and English language teaching. Her e-mail address is angton@kku.ac.th.

Karl Griffith is a lecturer of the Faculty of Humanities and Social Sciences, Khon Kaen University in Thailand. His research interests include written production error analysis, curriculum design, ELT methodology, and sociolinguistics. His email address is karlgr@kku.ac.th.

References

Aiken, M., & Balan, S. (2011). An analysis of Google Translate accuracy. *Translation Journal, 16(2).* Retrieved from http://www.bokorlang.com/journal/ 56google.htm on December 05, 2016.

Akmajian, A., Demers, R., Farmer, A., & Harnish, R. (2010). *Linguistics: An introduction to language and communication*. Cambridge: The MIT Press.

Aluísio, S., Barcelos, I., Sampaio, J., & Oliveira Jr., O. (2001). How to learn the many unwritten "rules of the game" of the academic discourse: A hybrid approach based on critiques and cases. *Proceedings of the IEEE International Conference on Advanced Learning Technologies*, pp. 257-260.

Anazawa, R., Ishikawa, H., Park, M., & Kiuchi, T. (2012). Preliminary study of online machine translation use of nursing literature: Quality evaluation and perceived usability. *BMC Research*, *5*, 635. Retrieved from http://www.biomedcentral.com/1756-0500/5/635

Aroonmanakun, W. (2003). *Zero pronoun resolution in Thai: A centering approach (Interdisciplinary approaches to language processing)* pp. 127-145. Bangkok: Chulalangkorn University Printing House. Retrieved from https://pdfs.semanticscholar.org/6d54 on April 10, 2018.

Balk, E.M., Chung, M., Chen, M.L., Chang L., & Trikalinos, T. (2013). Data extraction from machine-translated versus original language randomized trial reports: A comparative study. Syst Rev 2, 97. https://doi.org/10.1186/2046-4053-2-97

Borup, J. (2016). Branding Buddha – mediatized and commodified Buddhism as cultural narrative. *Journal of Global Buddhism*, *16*, 41-55.

Brown, P., Cocke, J., Pietra, S. A. D., Pietra, V. J. D., Jelinek, F., Lafferty, J. D., Mercer, R.

L., and Rossin, P. (1990). A statistical approach to machine translation. *Computational Linguistics*, *16*(2), pp. 76–85.

Brown, P. F., Pietra, S. A. D., Pietra, V. J. D., and Mercer, R. L. (1993). The mathematics of statistical machine translation. *Computational Linguistics*, *19*(2), pp. 263– 313.

Chancharoen, K., Tannin, N. & Sirinaovakul, B. (1999). *Pattern-based machine translation for English-Thai*. Artificial Intelligence Center, King Mongkut's University of

Technology Thonburi Retrieved from http://www.aclweb.org/anthology/Y99-1036 on April 10, 2018.

Charoenpornsawat, P. & Sornlertlamvanich, V. (2001). *Automatic sentence break disambiguation for Thai*. National Electronics and Computer Technology Center, Bankgok. Retrieved from http://www.cs.cmu.edu/~paisarn/papers/iccpol2001.pdf on April 14, 2018.

Costa-jussá, M., Farrús, M., & Pons, J. (2012). *Machine translation in medicine: A quality analysis of statistical machine translation in the medical domain*. Advanced Research in Scientific Areas. Retrieved from www.arsa-conf.com on December 8, 2016.

Denkowski, M. (2015). *Machine translation for human translators* (Unpublished Doctoral Thesis, Carnegie Mellon University, Language Technologies Institute, School of Computer Science). Retrieved from https://lti.cs.cmu.edu on April 15, 2018.

Development Agency, Ministry of Science Technology and Environment, Thailand. Retrieved from https://www.nectec.or.th/it-standards/thaistd.pdf on April 15, 2018.

EC Innovation. (2012). The influence of Machine Translation for Asian languages. Retrieved from https://www.ecinnovations.com/blog/the-influence-of-machine-translation-for-asian-languages/ on January 17, 2020.

Europe, Y. (2017). Tackling the Challenges of Asian Machine Translation. *Language Machine Translation,* Bratislava, Slovakia. Retrieved from https://www.yamagata-europe.com/en-gb/blog/tackling-the-challenges-of-asian-machine-translation on May 31, 2018.

Freely, W., Hasler, E., & Gispert, A. (2019). *Controlling Japanese Honorifics in English-to-Japanese Neural Machine Translation*. Proceedings of the 6th Workshop on Asian

Translation, pages 45–53, Hong Kong, China, November 4, 2019

Gaspari, F. (2007). *The role of online MT in webpage translation*. Doctoral dissertation, the University of Manchester. [online]. Retrieved from www.localisation.ie

Groves, M., & Mundt, K. (2015). Friend or foe? Google translate in language for academic purposes. *English for Specific Purposes*, *37*, 112-121.

Halliday, M. A. K. & Hasan, R. (1976). *Cohesion in English*. London: Longman.

House, J. (2016). *Translation as Communication across Languages and Cultures*. New York: Routledge.

Karoonboonyanan, T. (1998). *Standardization and implementations of Thai language*. National Electronics and Computer Technology Center, National Science and Technology

Katan, D. (2004). *Translating cultures*. Manchester: St.Jerome.

Ketpun, K., & Sripetpun, W. (2016). English major students' attitude, behavior, and problems in using Google Translate. *Journal of Liberal Arts, Prince of Songkla University, Hat Yai Campus*, *9*(2), 79-96.

Kirchoff, K., Turner, M., Axelrod, A., & Saavedra, F. (2011). Application of statistical machine translation to public health information: A feasibility study. *Journal of the American Informatics Association*, *18*, 473-478. Also available online at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3128406/.

Koehn, P., Och, F. J., and Marcu, D. (2003). Statistical phrase based translation. In Proceedings of HLT-NAACL (pp. 48-54), Edmonton, May-June, 2003.

Kohsom, C., Gobet, F. (1997). *Adding spaces to Thai and English: Effects on reading*. Proceedings of the 19th Annual Meeting of the Cognitive Sciences Society. ESRC Centre for Research in Development Instruction and Training, Department of Psychology, University of Nottingham, UK. Retrieved from http://www.chrest.info on April 15, 2018.

Kooman, P. (1997). *How to write an abstract*. Retrieved from https://users.ece.cmu.edu/~koopman/essays/abstract.html on December 2016.

Le, Q. V., & Schuster, M. (2016). *A Neural Network for Machine Translation, at Production Scale*. Retrieved from https://research.googleblog.com on December 15, 2016.

Liu, W. Xiao, L., Jiang, S., & Wang, L. (2018). *Language resource extension for Indonesian-Chinese Machine Translation*. Paper presented at the International conference on Asian Language Processing, Bandung Indonesia (November 15-18, 2018).

Mackey, A. & Gass, S. (2016). *Second language research*. NK: Routledge.

Nida, E. A. (1964). *Toward a science of translating*. Keiden: E.J. Brill.

Nusai, C., Suzuki, Y., Yamazaki, H. (2008). Estimating Word Translation Probabilities for Thai – English Machine Translation using EM Algorithm. *World Academy of Science, Engineering and Technology International Journal of Computer and Information Engineering*, *2*(6). Retrieved from https://waset.org on April 15, 2018.

Puangthong, J. (2015). *Effects of Google Translate on English-Thai Translation in Students majoring in International Communication (English Program), Faculty of Arts, Rajamangala University of Technology Suvarnabhumi*. Full research report, Rajamangala University of Technology Suvarnabhumi, Nonthaburi, Thailand.

Rumelhart, D.E. (1978). *Schemata: The building blocks of cognition*. Volume 79 of Technical report (University of California, San Diego. Center for Human Information Processing). Retrieved from https://www.colorado.edu on April 15, 2018.

Och, F. J. (2003). Minimum error rate training for statistical machine translation. *Proceedings of the 41st Annual Meeting on Association for Computational Linguistics (pp. 160-167),* Sapporo, Japan, July 7-21, 2003.

Sawatdhiwat Na Ayuthaya, M. (2005). *Translation, principles, and analysis*. Bangkok: Chulalongkorn University Printing.

Sheppard, F. (2011). Medical writing in English: The problem with Google Translate. *La Presse Médicale*, *40(6)*, 565-566. Also available online at http://www.em-consulte.com/en/article/293595.

Srisattarat, S., Chancharoensuk, P. (2016). Communication strategy for tourism in ASEAN. *Apheit Journal*, *5*(1), 14-21.

Supnithi, T., Kosawat, K., Boriboon, M. & Sonlertlamvanich, V. (2004). Language Sense and Ambiguity in Thai. *Proceedings of the Information Research and Development Division*, NECTEC, Thailand Science Park, Thai Computational Linguistics Laboratory, National Institute of Information and Communications Technology, NICT ASIA RESEARCH CENTER, Pathumthani, Thailand. Retrieved from https://www.researchgate.net/publication/228748013 on April 14, 2018.

Swales, J. 1990. *Genre analysis: English in academic and research settings*. Cambridge University Press, Cambridge.

Tassini, A. (2012). *The translator training textbook*. [Kindle version]" Retrieved from Amezon.com

Tillmann, C. (2003). A projection extension algorithm for statistical machine translation. In Collins, M. and Steedman, M., editors, *Proceedings of EMNLP* (pp.1–8).

Toral, A. (2019). Post-editese: An exacerbated translatinese. Computer and Languages,

Vogel, S., Zhang, Y., Huang, F., Tribble, A., Venugopal, A., Zhao, B., & Waibel, A. (2003). The CMU statistical machine translation system. In *Proceedings of MT Summit IX*

Vanijdee, A. (2015). Translating Thai cultural information into language learning activities: The case of English for local museum personnel. *AJE*, *1*(1), 53-68.

Vilar, D., Stein, D. & Ney, H. (2008). Analysing soft syntax features and heuristics for hierarchical phrase based machine Translation. *Proceedings of IWSLT 2008*, Hawaii –

USA. Retrieved from https://pdfs.semanticscholar.org on April 12, 2018.

Wathabunditkul, S. (2003). *Spacing in the Thai language*. Retrieved from http://www.thai-language.com on April 10, 2018.

Zens, R., Och, F. J., & Ney, H. (2002). Phrase based statistical machine translation. In *Proceedings of the German Conference on Artificial Intelligence* (pp. 18-32), London, September 16-20, 2002.