

A Study on the Accuracy of Human Translation Output and Post-Edited Google Translate Output as far as English and Sinhalese Language Pair is considered: With Special Reference to Selected Literary and Non-literary Documents

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Abstract: - With the rapid growth in global communication and commerce, the importance of translation has skyrocketed and the involvement of technology is determined as a necessity to make the workload in translation easier and cheaper. However, later it was proved that machines can not alone perform a faithful service in translation and consequently, translators offer their corporation as post-editors in Machine Translation (MT) (Post-Editing (PE)) to make the translation process as quick, accurate, and effective as possible. Focusing on this matter, this research investigated the fidelity of Machine-Aided Translation (MAT) measuring the accuracy of post-edited Google Translate (GT) output compared to the accuracy achieved in Human Translation (HT) from English into Sinhalese referring number of selected literary and non-literary texts. This study, therefore involves in finding which mode is most appropriate in producing an accurate translation while aiming at observing the barriers faced in HT and PE, advantages and disadvantages of HT and PE, and the importance of human assistance in machine translation. Primary data were collected by affiliating four professional translators and the collected data were analyzed under the dichotomy of Generative Grammar introduced by Noam Chomsky. The marking scale of the Canadian Translators, Terminologists, and Interpreters Council (CTTIC) is referred for measuring the accuracy of the target texts considering the error analysis. This study has finally identified that though both modes can produce accurate literary and non-literary translations, HT is the most appropriate method for literary translation in terms of creativity and PE for non-literary translation in terms of productivity which means that PE does not suit for all scenarios and proves machines are still helpless without human intervention in the field of translation.

Keywords: Accuracy, Creativity, Human Translation, Literary and Non-literary Translation, and Post-Editing

I. INTRODUCTION

The present study deals with the field of translation which is relatively a new academic area that has expanded explosively in recent years presenting many research problems for researchers. Though the history of translation traced back to the beginning of human civilization, it was started to study as a proper discipline only since 1980s.

Therefore, research on translation (Human Translation (HT)) is not as widely spread as other disciplines. Moreover, though studies on the technological intervention in this field namely Machine Translation (MT) is recently occupied in many countries, there is only a hand full of research that have been conducted in Sri Lanka subjecting indigenous languages (Sinhalese/Tamil).

The studies entitled *Developing Lexicon Databases for English to Sinhala Machine Translation* (2007)¹ and *varanāgīma A Theoretical basics for English to Sinhala Machine Translation* (2010)² by B. Hettige, *Sinhala-Tamil Machine Translation: Towards better Translation Quality* (2014)³ by Randil Pushpananda, Ruvan Weerasinghe and Mahesan Niranjan, *An Examination on Problems with 'Google Translation' with Special Reference to Translating from Sinhala to English and Vice Versa* (2015)⁴ by Dilini Ariyawansa, *Automatic Creation of a Sentence Aligned Sinhala-Tamil Parallel Corpus* (2016)⁵ by Riyafa Abdul Hameed, Nadeeshani Pathirenehelage, Anusha Ihalapathirana, Maryam Ziyad Mohamed, Surangika Ranathunga, Sanath Jayasena, Gihan Dias, Sandareka Fernando are some of such research that has been carried out in relation to the field of Machine Translation in Sri Lanka context. However, not many in this field have conducted research beyond the boundary of MT which is Machine-Aided Translation. It is the new advancement of MT. The research done by B. Hettige and A. S. Karunananda on *Using Human-Assisted Machine Translation to overcome Language Barrier in Sri Lanka* (2007)⁶ discusses more about the Machine translation field and introduced an intermediate editing stage which detects semantic issues before human intervention at the post-editing stage in English-Sinhalese Machine Translation. This system has been developed by using Prolog and Java to run on a standard PC. However, this study trends more on the technological development of the machine translation services. The study entitled *Quality of Machine Translation and the Role of Post-Editing* (2017)⁷ carried out by Jayamal De Silva veers on the quality of a translation

rather than the technological advancement in the translation process. It concludes that post-editing is important in improving the quality of Machine Translation outputs.

Therefore, being depart from the previous research this study is conducted to study both the technological involvement in this field and to investigate how far it is possible to produce an accurate translation in Machine-Aided Translation compared to the traditional manual translation. In achieving this main objective of this study, number of literary and non-literary documents in English (Source Texts) and their Human Translation outputs and post-edited output of Google Translate in Sinhalese (Target Texts) are referred.

Translation, Technology, and their Togetherness

“‘the transference of a nonphilosopheme into a philosopheme’ is what happens in every particle of every act of translation. The source text, a semiotic construct of indeterminate range, is negotiated by seizing on a feasible, tractable part of its range and imposing upon it a similar segment of another indeterminate construct in another language.”⁸.

Though Sukanta Chaudhuri defines the process of translation in complicated wording, he proclaims the same idea emphasises by the etymological explanation of the word *Translation*. Etymologically, the term translation derives from the Latin word *translatio* which consists of the two words, *trans* which means ‘across’ and *-latio* in turn coming from *latus*, the past participle form of *ferre* which means ‘to carry’ or ‘to bring’. Therefore, *translatio* means carrying across or bringing across and in this case, it is the carrying across a text from one language into another. While translation refers to the transposition of written information from one language into another, interpreting refers to the transposing of information orally or by using sign language. This fact is simply defined by J. C. Catford as,

‘the replacement of textual material in one language (SL) by equivalent textual material in another language (TL)’⁹.

The process of translation is performed totally as a human act (Human Translation (HT)) since its birth, but this was subjected to some changes in late 20th century with the rapid development of technology. People started to cooperate with technology in order to make the translation work easier, faster, and cheaper than traditional manual translation. This process is called as Machine Translation (MT) in which the translation process is undertaken by machine translation services. This can be defined as,

‘translation from one natural language (source language (SL)) to another language (target language (TL)) using computerized systems and, with or without human assistance’¹⁰.

Google Translate, AdaptiveMT, Systran’s Translation Program, Papago app from Naver are some of such developed Machine Translation services which are used for language

translation, second language teaching and for many other different purposes. Among those services Google Translate (GT) developed by Google in April 28, 2006 has gained a prominent role in MT field. Google Translate was first launched as a statistical Machine Translation (SMT) service. Rather than translating languages directly, it first translates text to English and then to the target language. During a translation, it looks for patterns in millions of documents to help decide on the best translation. On 15th November, 2016 Google announced that Google Translate would switch to a neural Machine Translation engine, namely Google Neural Machine Translation (GNMT), which translates whole sentences at a time, rather than just piece by piece. This new technological advancement in MT provides more advance outputs than the previous statistical Machine Translation services, which is comparatively more accurate. This revolution of the Google group supports over 100 languages and offers service to over 500 million people daily¹¹.

However, even after so many research on Machine translation to improve its quality, the target audience of translation could not satisfy by the raw Machine Translation output. Therefore, many translators and linguists believed that human involvement is still essential for a better output from a Machine Translation service rather than letting the Machine Translation services to do all the translation work. The translator Kim-Su-Yean stated that,

‘despite the rapid improvement of AI-based automatic translating technologies, I expect literary translation will be the last human territory to be dominated by Ai. I believe readers will still want human expressions and creativity rather than machine translation’

and Krik-Sung-hee emphasized that,

‘it is likely that the human translators and interpreters will become editors who supervise and post-edit translations that AI program created...’¹².

After exploring the reasons for such controversial ideas and the quality of the raw output of Google Translate with comparative to Human Translation output, many engaged in this field concluded by judging that even Google Translate which has been developed with high standard technology still need the involvement of human translators, who own the cognitive ability of managing language affairs and rhythm of understanding the language tricks or contrivances.

As a result, the concept of Post-Editing (PE) came into action in order to make human translators involve in the process of MT to get a better output in Machine Translation. The process of post-editing emphasizes the process of correcting texts that has been already translated by using a Machine Translation system¹³. According to ISO 17100:2015, post-editing means to “edit and correct machine translation output (ISO, 2015)”. This can be interpreted also as,

'tidying up the output, correcting mistakes, revising entire, or, in the worst case, retranslating entire section'¹⁴.

Therefore, with the involvement of human translators in the field of MT another branch of translation was invented namely, Machine-Aided Translation (MAT) or Computer-Aided Translation (CAT). Nevertheless, the fundamental task of using any of these three methods in translation should be to produce an accurate translation being faithful to what the original author is intended to express. The vital role of accuracy in translation as defined by Douglas Robinson is as follows.

'...accuracy is the only possible goal of translation; that the translator has no right to a personal opinion or interpretation; that the finished product, the translated text, is the only thing that matters'¹⁵.

According to Robinson, an accurate translation is the faithful conversion of a source text into another language without changing, adding, or omitting and information in the target text. As per Peter Newmark, there are two main aims of translation. They are *accuracy* and *economy*. He further, believes that among those two main purposes accuracy stand at the first and then comes the economy. Moreover, he states that,

'I am suggesting that some kind of accuracy must be the only criterion of a good translation in the future...'¹⁶.

This is exactly the same phenomenon mean by the terms 'fidelity', 'reliability', 'faithfulness', and 'equivalence' in translation. The importance of achieving a higher level of accuracy has been theoretically discussed by many translation theorists. This is clearly mentioned in Susan Bassnett's work named *Translation Studies* proclaiming ideas of different theorists. For instance, the French humanist Etienne Dolet who was one of the first writers to formulate a theory of translation and the first martyred translator exemplified five principles to be followed by a translator in order to produce a faithful translation in a short outline of translation principles, entitled *La manière de bien traduire d'une langue en aultre* (How to Translate Well from One Language into Another) in 1540. They are as follows,

1. The translator should understand the subject-matter of the original
2. The translator should be familiar with both languages involved
3. The translator should not translate word for word
4. The translator should follow common usage as much as possible
5. The translator should use a pleasing style

According to Dolet, in achieving the accuracy of translation, a translator should have a sound knowledge about the subject matter of the ST and the two languages involved in the translation process. The translator should not follow word-for-

word method but sense-for-sense by using an appropriate style along with the common usage of the language.

Further, the Scottish translation theorist Alexander Fraser Tytler (1747-1813) published a volume entitled *The Principles of Translation* which is the first systematic study in English of the translation process emphasizing three laws of translation, which are;

1. The translation should give a complete transcript of the ideas of the original work.
2. The style and manner of writing should be of the same character with that of the original.
3. The translation should have all the ease of the original composition¹⁷.

These theoretical norms clearly proclaim that accuracy is one of the most important qualities of a good translation. An accurate translation is not merely the conversion of a particular information word by word from one language into another, but a true copy of the source text (ST) which produced appropriate to the audience of the target text (TT).

Focusing on the above mentioned facts, this study is mainly conducted to verify whether the newly invented branch of translation, Machine-aided Translation (MAT) is supportive enough to achieve the expected objectives of the MAT developers which is to produce an accurate translation. This fact is tested by comparing the output of MAT or in this context the post-edited output of Google Translate together with output of Human Translation produces for the same source text. Therefore, the main objective of this study is to identify what is more accurate between Human Translation output and post-edited Google Translate output as far as English into Sinhalese translation is concerned and the specific objectives are to define the barriers faced by translators in both first hand Human Translation and post-editing (MAT), to determine advantages and disadvantages of both Human Translation and post-editing (MAT), to find out the most appropriate method in translation among Human Translation and Machine-Aided Translation, and to specify the importance of human translators and human involvement in Machine Translation.

II. METHODOLOGY

In this study, both primary and secondary data were collected. As primary data two Sinhalese text passages from each category of literary and non-literary documents were selected by using Stratified Sampling Technique and they were subjected to translate (HT) and post-edit (PE) into English by four professional translators. The respective source texts were provided for all translators and the raw outputs of GT were also given to those who undertook the post-editing process.

The two literary documents were selected covering both prose and verse. The selected poem is 'Riches' by Sara Teasdale which includes two stanzas each consisting of four lines (55 words). This particular poem was selected with the intention of testing how far it is possible to subject poem translation in

this context and to take the output in a short period of time for the analyzing process as it is a short poem with simple language usage. The other text was selected from the novel 'The Village in the Jungle' by Leonard Woolf (Chapter ii, from page number 17 line 5 up to page number 18 line 4 -380 words) to investigate the possibility of achieving high level of accuracy in translating cultural terminologies in indigenous literature.

The non-literary documents represent informative translation and legal translation. The first text is an article published on 3rd July 2016 in the Sunday Observer newspaper entitled 'Cometh the Man' written by the reporter Rukshana Rizwie (267 words). The second text was selected from the Budgetary Relief Allowance of Workers Act, No. 4 of 2016 of the Democratic Socialist Republic of Sri Lanka which was published as a supplement to part II of the Gazette of the Democratic Socialist Republic of Sri Lanka of March 24, 2016 (491 words). These particular texts were selected to research how far it is possible to subject industrial based translation in this context.

As secondary data books, journal articles (online and printed), reports, magazines, lecture notes, and previously published research papers were referred.

Content analysis method was used as the analytical approach in this study. Error analysis of the translations was done under the dichotomy proposed by Noam Chomsky (1957) which is the concept of surface (S-Structure) and deep structure (D-Structure) or the concept of Generative Grammar. Surface Structure is the syntactic form which takes as the actual sentences or forms of sentences as the resulted from modification or transformation and deep structure is the meaning that composed by the surface structure. This dichotomy is similar to the two categories introduced by Canadian Translators, Terminologists, and Interpreters Council (CTTIC) to measure the accuracy of a translation, which are language errors (expression – violation of grammatical and other rules of usage in the target language) and translation errors (comprehension – failure to render the meaning of the original text). Considering these categories all the major and minor errors have been identified and marks were given according to the marking scale of CTTIC. The procedure of giving marks to measure the quality of a translation is done by deducting marks from 100 as follows,

Translation (Comprehension)

- Major mistakes--shown in margin as (T) -10
e.g. serious misinterpretation denoting a definite lack of comprehension of the source language, nonsense, omission of a phrase or more
- Minor mistakes--shown in margin as T -5
e.g. mistranslation of a single word, omission/addition affecting meaning, lack of precision, wrong shade of meaning

Language (Expression)

- Major mistakes--shown in margin as (L) -10
e.g. gibberish, unacceptable structure
- Minor mistakes--shown in margin as L -5
e.g. syntax, grammar, ambiguity, unnecessary repetition, convoluted structure, non-idiomatic structure,
unacceptable loan translation
- Minor mistakes--shown in margin by l -3
e.g. breach of spelling, punctuation, typographical conventions

As per the CTTIC, the average mark of 70% is required for a pass and to judge that a particular text is an accurate translation¹⁸.

Hence, in this research, the language errors appeared in the Sinhalese target texts are identified and discussed under the following five criteria presented by Vimal G. Balagalle in his work entitled *bhaṣā adhayanaya hā siPhala vevahāraya* (1995)¹⁹. They are,

- Spelling
- Subject – Verb Agreement / Concord
- Word Formation
- Word Division
- Punctuations

Further, in favor of using standard and most accepted grammar rules for discussing the above mentioned five criteria, the following works written by well-known linguists who have a sound knowledge in Sinhalese language are used among numerous books available in relation to Sinhalese language grammar.

- Spelling

The fourth edition (2016) of the book entitled '*SiPhala akṣra vinyāsa akārādiya*' written by Sandagomi Coperahewa in 2000²⁰.

- Subject – Verb Agreement / Concord

The book entitled '*SiPhala lēkhana rīthiya*' (New Edition)' written by Okkampitiye Pagnnasara Thero and eight other Linguists and published by National Institute of Education in 2015²¹.

- Word Formation

The book entitled */samakālīna siPhalaya /* written by J. B. Dissanayake in 1973²² and the book entitled '*nivāradi siPhalaya*' written by J. B. Dissanayake in 2018²³.

- Word Division

Report of the Standard Sinhalese Committee of 1968 (Sammata *siPhalaya*- Sammata *siPhalakamituvē vārtāva* (1968))²⁴.

- Punctuations

The book entitled ‘*SiPhala lēkhana rīthiya*’ (New Edition)’ written by Okkampitiye Pagnnasara Thero and eight other Linguists and published by National Institute of Education in 2015.

Translation errors are mainly identified under the following criteria.

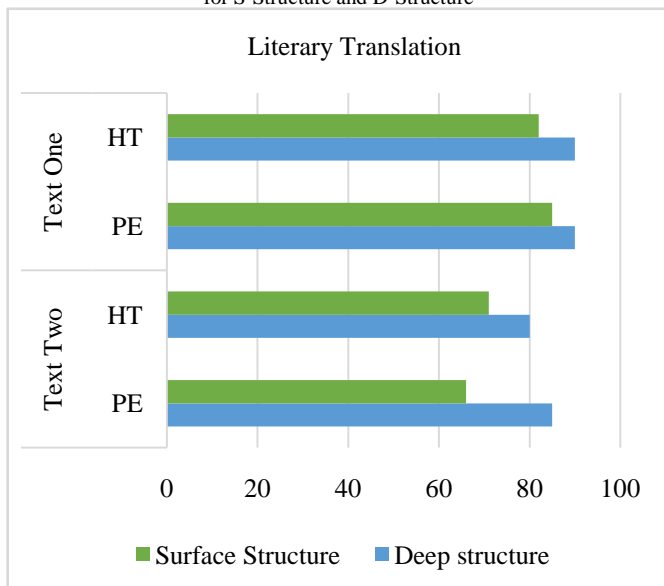
- Omission
- Addition
- Mistranslation

Under the criteria of *Omission*, the researcher investigates whether the translator has omitted any word, phrase, sentence, or any particular idea in the original text and under the criteria of *Addition*, the researcher looks whether the translator has added any particular detail which is not included in the original text. Moreover, the criterion of *Mistranslation* is to investigate whether the translators have inappropriately translated the ST.

III. RESULTS AND DISCUSSION

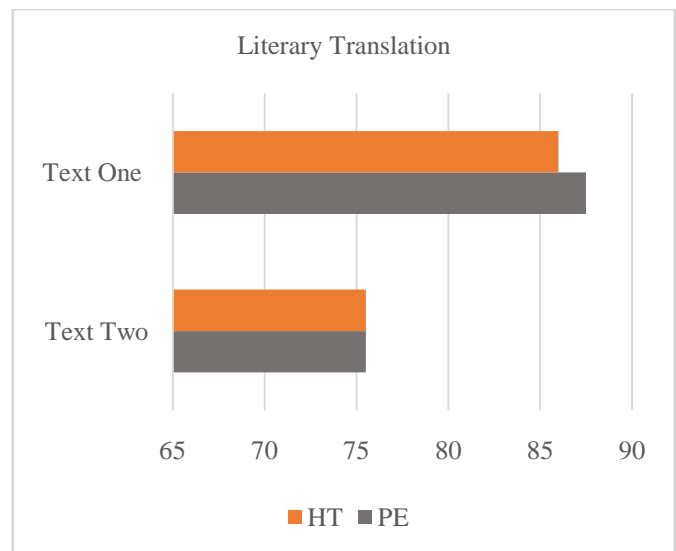
Using the content analysis approach language errors and translation errors of target texts are identified, classified and computed under the dichotomy of S-Structure and D-Structure. All the errors have been counted and analysed to find whether they have affected the accuracy of each translation. According to the computed data, points were given to each TT as per the marking scale of Canadian Translators, Terminologists, and Interpreters Council (CTTIC). The following bar charts are used to elaborate the marks given to each translated text under literary and non-literary translation considering the errors appeared in order to study the accuracy of the HT output and post-edited output of GT.

Figure 1: Marks given for the translated literary texts (HT and PE) separately for S-Structure and D-Structure



The aforementioned bar chart (figure 1) describes the marks gained by each translated text (HT and PE) under literary translation. The marks are given separately for both conversion of surface structure and deep structure in order to produce an accurate translation. This bar chart clearly accentuates that both the translator and the post-editor have achieved considerable marks for their works. Comparing the marks achieved for transposing the surface structure with the marks achieved for transposing the deep structure, it elucidates that less marks have been deducted for the translation errors than for the language errors in both HT and PE. It means that the language errors have not been directly or strongly affect in transposing the meaning of the text. The marks achieved place in between the mark range of 75-90, which is a good range of mark to consider a translation as an accurate translation according to CTTIC.

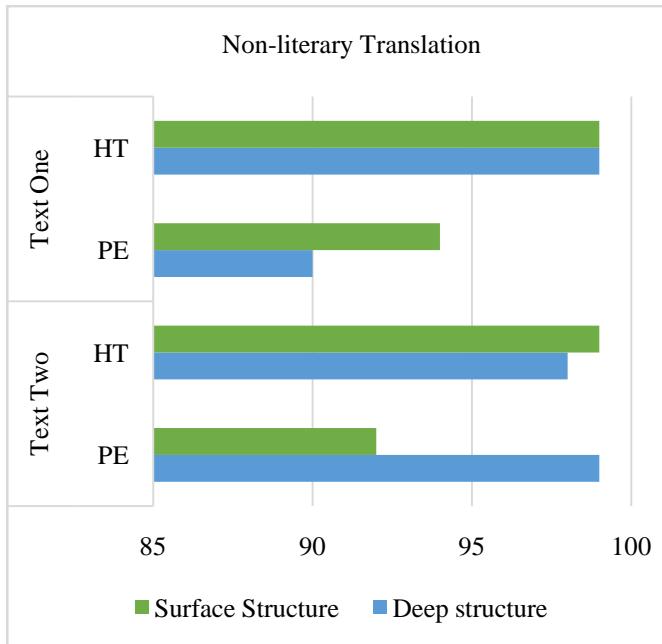
Figure 2: Overall marks given for the translated literary texts (HT and PE)



In considering the overall marks gained by each translated text (HT and PE) of the selected STs (text one and text two) as shown in the figure 2, it proclaims that both HT and PE have achieved a considerable level of accuracy in which the first post-edited text has gained few marks higher than its HT and an equal level of accuracy have been achieved by both HT and PE for the second text. However, the difference between the marks gained by HT and PE in the Text One is 1.5 which does not make a much difference between the two texts. Both HT and PE of the text two have gained same marks and it is considerably lesser that of marks gained for the text one. Nevertheless, the total marks of each translation shows that all translations have reached the pass mark of CTTIC.

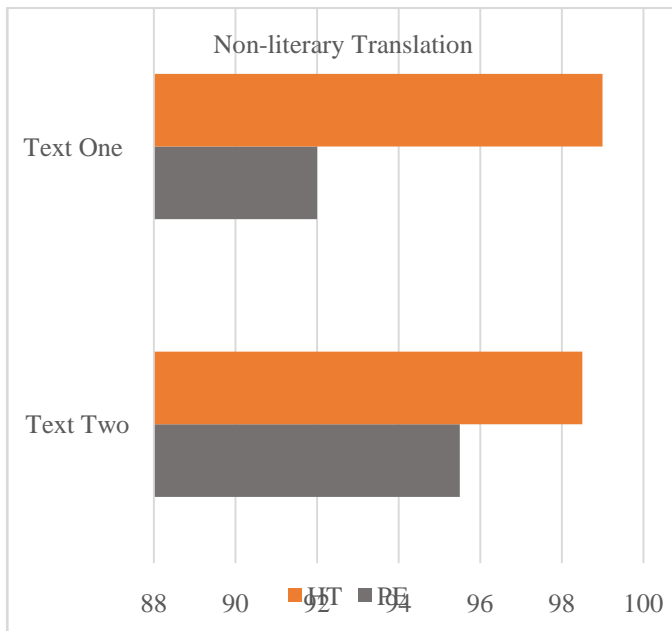
The bar chart shown in figure 3 is prepared to show the marks given for both HT and PE separately for the transposing of the surface structure and the deep structure of the selected non-literary text deducting marks for each error. Deduction of marks for the two translated texts did not affect accuracy achieved in transposing both surface structure and deep structure. The marks achieved are between range of 90-100.

Figure 3: Marks given for the translated non-literary texts (HT and PE) separately for S-Structure and D-Structure



Calculating the overall marks achieved by each HT and PE for each selected non-literary text (Figure 4), it seems that HT have been given higher marks than PE in both texts. The difference between HT and PE of the first text is 7 points and 3 points of the second text. However, marks given for both HT and PE of both texts place in between range of 90-100, which proclaims a good accuracy level.

Figure 4: Overall marks given for the translated non-literary texts (HT and PE)



In jotting down all the elaborated data shown in the above mentioned four bar charts, it seems that both HT and PE outputs of each literary and non-literary ST have achieved an

equal level of accuracy. Furthermore, the marks achieved in both HT and PE of all subjected non-literary translations is comparatively higher than of literary translations, proving that whatever the method of translation used in the translation process, it is difficult to rebuild the same image of the original literary text in another language. Yet, in this context the translators have successfully achieved marks above the pass mark of 70%.

Moreover, when giving consideration on the process of post-editing, it makes clear that while the translators who was post-editing the two literary translations given by GT have followed the method of full post-editing and the translators who post-edited the non-literary translation given by GT have followed the method of light post-editing as shown in the table 1.

Table 1: The method of Post-Editing used by the translators

Post-Editing in Translation		Light Post-Editing	Full Post-Editing
Literary Translation	Text One		√
	Text Two		√
Non-literary Translation	Text One	√	
	Text Two	√	

Both literary texts have been subjected into full post-editing, in which the translators have corrected every single error to produce good quality output. However, in this context, both translators have almost reproduced the whole document rather than editing the raw output of GT as GT failed to produce an output even closer to HT. Yet, in some instances some terms given by GT has been used in PE. Anyhow, in post-editing the non-literary texts, it seems that the process of post-editing became much easier and the translators have followed the method of light post-editing. In this context, it is not because their intention was to produce an understandable and usable raw output for a minor purpose of translation, but because Google Translate have given a good enough quality output.

IV. CONCLUSION

Finally, observing all the facts that has been investigated throughout this study, it has provided answers for the research problem and rest of the research questions in order to achieve the intended objectives.

This research found that both Human Translation output and post-edited Google Translate output are accurate translations and faithful to the ST. However, in producing a creative output in literary translation, translators have freely followed their own way in HT while in some instances in post-editing, the post-editors have depended on the terminologies given by the machine (GT). Yet, it has produced an accurate translation.

Further, translators engaged in HT and PE faced number of barriers, especially in transposing cultural aspects in literary translation which they have successfully overcome and in following few grammar rules in Sinhalese language, especially in correct usage of spelling and word division. In post-editing the literary texts, the post-editors have reproduced the whole document rather than post-editing which means post-editing the raw output of GT is rather similar to the process of HT and most of what GT produces for literary translation is hardly used in post-editing.

Advantages and disadvantages of Human Translation and Machine-Aided Translation (PE) that has been determined throughout this study are that, it is time saving task to use MAT or post-editing the GT output in non-literary translation rather than in literary translation as it consists of only few errors. Further, HT would be much appropriate for literary translation in which the creativity of the particular text can be grasped at once by the human translator and which provides freedom for the translator to translate it in his or her own way rather than depending on the less creative terms provided by a machine translation service which mostly happens in post-editing a literary output of a machine translation service.

Nevertheless, in finding the most appropriate method in translation among Human Translation and Machine-Aided Translation, it is a relative fact which HT is more appropriate in literary translation and post-editing the GT output is more appropriate in non-literary translation. Anyhow, throughout this study it indirectly proves that human involvement or post-edition task of human translator should be taken place in both literary and non-literary translation if it is done by a machine translation service, because the output is still not in a condition that a user can use it without any doubt on its quality.

Guide to Future Research

While conducting this research, a special fact that was being detected was the different outputs produced by Google Translate for the same word or phrase based on how the input is written in GT. For example, different ways of inserting the title ‘The Village in the Jungle’ into GT may affect the output of GT as shown in table 2.

Table 2: Different outputs given by Google Translate for the same set of words in different formats

English Input	Sinhalese Output	
	Title with Paragraphs	Title without Paragraphs
The Village in the Jungle	Vanāntaraya thuḷa gammānaya	Vanāntaraya thuḷa gammānaya
The Village in the Jungle-	Kālbada gammānaya	Vanāntarayē gammānaya
The Village in The Jungle	Kālāvē game	Kālāvē gamē
The Village in The Jungle-	Kālābada gama	Kālāvē gamē
-The Village in The Jungle-	Kālābada gammānaya	Kālāvē gamē

The Village in The Jungle-	Kālābada gammānaya	Kālāvē gamē
The Village in The Jungle_	Vanāntaraya thuḷa gammānaya	Vanāntaraya thuḷa gammānaya
the village in the jungle	Kālāvē gamē	Kālāvē gamē
The Village In The Jungle	Kālāvē gamē	Kālāvē gamē
THE VILLAGE IN THE JUNGLE	Juṅgvala gammānaya	Juṅgvala gammānaya
- THE VILLAGE IN THE JUNGLE -	- Juṅgvalēhi gammānaya	- Juṅgvalēhi gammānaya -
(The Village in the Jungle)	(Vanāntaraya thuḷa gama)	(Vanāntaraya thuḷa gama)
(the village in the jungle)	(Kālā gammānaya)	(Kālāvē gammānaya)
(The Village In The Jungle)	(Kālāvē gammānaya)	(Kālāvē gammānaya)
(THE VILLAGE IN THE JUNGLE)	(Juṅgvala gammānaya)	(Juṅgvala gammānaya)
(The Village In The Jungle	(Kālāvē game	(Kālāvē gamē

This table shows the changes appeared in the output of GT depending on how a particular term has been spelled, whether it is written along with a paragraph or not, whether any mark has been added to it, or else which may cause the accuracy of a translation. This issue occurs mostly in paragraph translation. Therefore, a new research can be conducted in this regard in the future to define how this fact affect to produce an accurate translation by Google Translate and what are the measures that can be taken by machine translation service developers in this regard. This can be an effective future research to make Google Translate more productive and accurate.

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