Google Translate Accuracy in Translating Specialized Language From English to Bahasa Indonesia:
A Case Study on Mechanical Engineering Terminology

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ABSTRACT

This research aims to discover the accuracy level of Google Translate in English – *Bahasa Indonesia* translation, especially in translating specialized language in mechanical engineering terms. This study belongs to descriptive qualitative research. The primary source of the data was the output translation texts of Google Translate. The sample texts were sentences taken from the book of the mechanical engineering field. The main concerns were on word and phrase levels. Since there were only two categorizations in accuracy research, the researchers divided the number into two. A text was said to be accurate if the accurate meanings were more than 50%. Conversely, it was inaccurate if the accurate meanings were less than 50%. The results revealed that in English – *Bahasa Indonesia* translation, Google Translate, especially in translating specialized language in mechanical engineering terms, was accurate for word translation, but inaccurate for phrases. This statement was based on the findings of accurate occurrence percentage in Google Translate translations, which were 70.73 % for the word level and 46.37% for the phrase level. The number for words was above 50 %, but it was the opposite for phrases. The inaccuracy was indicated by four inaccuracy indicators (omission, addition, different meaning and zero meaning). Moreover, several sentences translated by Google Translate were inaccurate. This research unveiled that Google Translate translated the sentences or paragraphs based on the sentence structure from the source text and the general meaning of the words or phrases.

Keywords: *Translation, Accuracy, Google Translate (GT), Specialized Language, Mechanical Engineering*

1. INTRODUCTION

Along with the need for global communication, translation has been a new academic discipline, separated from linguistics. Many studies have been conducted in various ways. The focus of translation can be on the process and the product, thus triggering many researchers to investigate these focuses. Moreover, several previous studies have discussed the use of translation tools [1] [2] [3], translation processes [4] [5] [6], translation quality [7] [8], the problems of equivalency in translation [9] [10] [11], and the translation activities related to translating specialized language from various fields [12] [13] [14]. When the translation focuses on the product, it concerns about the equivalency of the translation results. In contrast, when it focuses on the process, it concerns how the text is translated from the source language to the target language. It can be conducted by a human or a translation tool. Although using a translation tool, a human will do the last step in the translation process since he cannot depend merely on the tool.

The translation is the substitution of textual material in one language with textual equivalent material in another language [15]. It means a translator must find comparable textual translation content from the source language into the target language while translating. It is why, to replicate the message from the source language in the target language, a translator must grasp the message's context before rewriting the message in the target language.

Machine translation (MT) has been created to facilitate human work in the translation industry [16]. In short, translation activities follow the development of technology getting more sophisticated. The information revolution and technological innovation have driven

language industries' development and expanded multilingualism [17]. The use of machine translation has experienced unprecedented growth with many diverse new techniques and demands.

The history of research and applications of machine translation shows various machine translations being the subject of much research of machine translation quality assessment, such as example-based, open-source, pragmatic-based, rule-based, and statistical machine translation [18]. Among these machine translations, great effort has been devoted to studying Google Translate, the most famous applicable machine translation, in recent years [18].

Google Translate is a tool to translate various written texts from one language to another and translate 90 languages. It can translate not only a word but also an expression, a text segment, or a web page. To translate a text, Google Translate scans various documentaries to find the best suitable translation pattern among human translated texts. The quest for this pattern is called SMT. Consequently, Google Translate's accuracy depends on how many human translated texts it searches for [18]. Google Translate was initially based on a machine translation according to the rules. After that, an SMT using a statistical model was used to determine the translation of words in 2006. SMT uses a bilingual text corpora database of both a source land a target language sentences [18].

English for Specific Purposes (ESP) was created to meet the needs of learners wishing to use English in technical and educational contexts. Languages for specific purposes or ESP may deal with at least two perspectives: on the one side, from a didactic point of view, because ESP is a language instruction field. Specific linguistic code is required to describe the concepts governing the physical worlds. Scientific language(s) is reliable, simple, and unambiguous. Impersonal gestures, critical reasoning, simple and concise explanations prevail, although there are no metaphors, satire or affective connotations. English for Science(s) involves a particular vocabulary, frequently meaning a broad set of words of Latin or Greek origin, but the development of science and new discoveries impose the continuous renewal or enrichment of this scientific vocabulary [19]. There is also a 'science-specific' grammar. It means that the language of science favors very precise and unambiguous words, leading to a higher incidence of repeated phrases, to the regular use of relative pronouns (which, that, of which) or adverbials. Linking words expressing contradiction, explanation, and conclusion are unavoidable. Such linking words are the conjunctions (and, although, though, since, as), prepositions (despite, during) and adverbs (usually, meanwhile, firstly, secondly) [13].

One specific field dealing with English for science is mechanical engineering. Many translators face difficulty translating the mechanical engineering terminology, for example, from English to Indonesian, because many terms are difficult to find the equivalency. Experts prefer to use the English terms rather than translate them to Bahasa Indonesia. As one of the translation machines, Google Translate sometimes cannot translate the terms accurately as it is more familiar with the general vocabulary. This paper aims to examine the accuracy of Google translate in translating mechanical engineering terms from English to Bahasa Indonesia. The scope of discussion is limited only to words and phrases.

2. LITERATURE REVIEW

The translation of terms is an important topic, especially in science, because it can help translate or strive for equivalent terms in a particular field. There have been several researchers studying Google translate. Most of them examined the error analysis of Google translate in translating terms or sentences [18] [20], the comparison between the translation process using Google Translate and human translators [21] [22], and the use of Google translate [23] [24] [25]. However, translating mechanical engineering terms using Google Translate becomes a new challenge. Ghasemi [18] wrote an article entitled "A Comparative Study of Google Translate Translations: An Error Analysis of English-to-Persian and Persian-to-English Translations". He used a descriptive-comparative human analysis of translations utilizing the Keshavarz's model of error analysis. Following the model, 50 English and 50 Persian sentences were systematically chosen from reference sentences of Motarjem Hamrah, and then two profiles of their translations by Google Translate from Persian to English (TT1) and from English to Persian (TT2) were obtained. He analyzed the error frequencies based on six categories comprising lexicosemantic, tenses, preposition, word order, distribution and use of verb groups, and passive voice. The research revealed that the most error translation happened in lexicosemantic with 42 items from English to Persian and 26 items from Persian to English.

Purwaningsih [21] conducted a study entitled "Comparing Translation Produced by Google Translation Tool to Translation Produced by Translator". The research employed a descriptive qualitative method to compare translation produced by Google Translation to the one produced by a human translator. The data were taken through translation-product specimens made by a professional translation, as published at http://penerjemahonline.wordpress.com/contoh-terjemahan/. The result uncovered that the translation results from Google Translate sometimes did not match due to the specific field. The writer took an example of chemistry and found some words mistranslated. The words *ignite* and *as* in the *hydrocarbons become harder to ignite as the molecules get bigger* are translated into

menyalakan and *sebagai*. They should be translated into *terbakar* and *karena*, because the word *ignite* in the sentence has a passive meaning, and the word *as* here means *karena*. Therefore, human translators are needed to finalize the translation results.

Chandra [25] carried out a study entitled "The Use of Google Translate in EFL Essay Writing". It applied a qualitative research method. It was a case study of eight students, exploring the practice of Google Translate in students' essay writing. Five aspects were considered in the research, namely word, phrase, sentence, grammar, and spelling. He discovered that students used Google Translate for three different aspects of essay writing: vocabulary, grammar, and spelling. All respondents used Google Translate at both word and sentence levels. Respondents who preferred using Google Translate at word level believed that it could not handle longer sentences, and there would be mistakes in translating sentences.

3. THEORETICAL FRAMEWORK

3.1. Translation

The translation is a process of changing a text from one specific language to another. Hatim and Munday stated, "The first sense (translation) focuses on the role of the translator in taking the original or source text (ST) and turning it into a text in another language — the target language (TT)" [26]. In performing this process, Newmark [27] proposed several things to consider, as follows:

a. The meaning of the text involving the content of the text in its source language

b. The intention of the translator covering the purpose of the translation

c. The target readers and the text background focusing on politeness strategy and the dictions

d. The quality of the translation concerning the intention of the text in its source language

Hence, translation activity is not merely translating words and phrases, but more like the essence of the translated text.

Furthermore, Newmark suggested two methods in translating a text as follows:

a. Communicative translation: The translator tries to influence the readers in both source and target languages.

b. Semantic translation: The translator tries to produce the contextual translation in the target language by observing its syntactic and semantic structures.

Moreover, there are two types of translation [28]:

a. Textual: A word by word translation from the source language to the target language

b. Contextual: A translation focusing on the context of the text

In conclusion, the translation process can correctly transfer the message from the source language to the target language. Thus, this process requires several things to consider.

3.2. Specialized Language

In general, specialized language is a special vocabulary used in a specific field. This language is used to mention things or terms in the field that general language cannot express. Its development contributes to the development of specialized knowledge. In a world where science and technology take over, specialized language takes a big deal in how special knowledge is described [29]. Therefore, specialized language helps to explain the concept of specialized knowledge.

Mechanical engineering is one of the fields requiring specialized language to describe its nature. In translating a text in this field, the translator must understand the whole context and the conceptual knowledge to properly translate the terminology. Furthermore, Faber mentioned that by knowing the concept of the text or knowledge and not translating it word by word, an equivalent text in the target language could be achieved.

3.3. Google Translate Accuracy

In this sophisticated era, everything can be done with technology and machine. The translation process is not an exception. Many applications can be used to help and facilitate the process. Among other translation applications, Google Translate is the most popular one and used worldwide. This application is provided by Google and belongs to machine translation (MT).

However, the translation results of Google Translate are quite problematic. Many people question its accuracy. Research by Cromico [30] proved that the translation results from Google Translate were less accurate, less acceptable, and less readable. According to Villar [31], machine-translated texts have several problems, such as missing words, word order, incorrect words, unknown words, and punctuation errors

4. RESEARCH METHOD

This study is mixed-method research using the content analysis method to analyze the accuracy of the translation. The accuracy of the translation was analyzed both quantitatively and qualitatively. The research subject was the Google Translate version of the book "The Fundamentals of Engineering Thermodynamics", while the objects were the mechanical engineering terms in words and phrases. The data were collected through documentation. It was used to find data about things

determined. Using this method, the writers could use free sentences.

The first step of the data collection was performing the documentation to collect data from Google Translate. The second step was data analysis. The data were analyzed quantitatively by determining the accuracy score and then were examined qualitatively to discover the accurate meaning of the word or phrase. The instruments were notes, a laptop, and the researchers themselves.

Table 1. Total accurate translation at the word level

Total accurate translation	Loanword	Native words
29	(19/29) x 100% = 65.52%	(10/29) x 100% = 34.48%

The Inaccuracy of Mechanical Engineering Terminology Translation at the word level

The results are as follows:

Table 2. Word level accuracy

Data number	Source	Google Translate Version	Translated Book Version
1.18	force	*gaya*	*gaya*
1.37	turbines	*turbin*	*turbin*

However, a phenomenon is quite impressive in the data findings, which is the type of the word. More than

Table 3. Examples of translated loan words

Data number	Source	Google Translate Version	Translated Book Version
1.36	diffusers	diffuser	diffuser
1.38	compressors	*kompresor*	*kompresor*

Only 34.48% of Google's translations are accurate in the native Indonesian (not borrowed from a foreign language). For example:

Table 4. Example of translated terminology

Data number	Source	Google Translate Version	Translated Book Version
1.25	property	*sifat*	*sifat*
2.6	property	*properti*	*sifat*

Both data have the same terminology, which is *property*. However, the terminology is translated

5. FINDINGS AND DISCUSSION

5.1. The Accuracy of Mechanical Engineering Terminology Translation in word level

The results are presented as follows:

(29/41) x 100% = 70.73%

It can be elaborated as follows:

(12/41) x 100% = 29.27%

Based on the results, Google can translate almost all mechanical engineering terminology at word level with good accuracy, 70.73% of the total translated words. For example:

half of Google's accurate translations, which is 65.52%, are loanwords. For example:

differently by Google Translate, in which data 1.25 is translated accurately, while data 2.6 is translated

inaccurately. The difference might occur due to a specific condition, in which the terminology in data 1.25 occurs in a phrase, (an) intensive property, while in data 2.6, it is in a word, (a) property.

Table 5. Example of the formal Indonesian translation result

Data number	Source	Google Translate Version	Translated Book Version
1.35	nozzles	*nozel*	*nosel*

Based on the fifth edition of KBBI, *nosel* is listed as an informal form of *nozel*.

5.2. The Accuracy of Mechanical Engineering Terminology Translation at Phrase-Level

Table 6. Total accurate translation at phrase-level

Total accurate translation	Loanwords	Native words	Combination words
32	(10/32) x 100% = 31.25%	(7/32) x 100% = 21.87%	(15/32) x 100% = 46.87%

The Inaccuracy of Mechanical Engineering Terminology Translation at phrase-level

The results are:

(37/69) x 100% = 53.62%

Table 7. Examples of the translation results at phrase-level

Data number	Source	Google Translate Version	Translated Book Version
1.3	mass transfer	*perpindahan massa*	*perpindahan massa*
1.9	exhaust gas	*gas buang*	*gas buang*

Moreover, there is a unique condition of the findings, which is the type of the phrase. Compared to the other

Another finding reveals that Google Translate tends to use formal Indonesian. For example:

The results are:

(32/69) x 100% = 46.37%

It can be elaborated as follows:

In short, Google can translate less than 50% of mechanical engineering terminology at phrase-level with good accuracy, 46.37% of total translated phrases. For example:

types of translation, combination words between loanwords and native words have the most accurate percentage, which is 46.87%. For example:

Table 8. Examples of accurate results of the Google Translate version in translating phrases

Data number	Source	Google Translate Version	Translated Book Version
1.40	axial-flow compressor	*kompresor aliran aksial*	*kompresor aliran aksial*
1.45	conservation of energy	*kekekalan energi*	*kekekalan energi*

Furthermore, only 31.25% of Google's translations are accurate when the terminologies are in loanwords. For example:

Table 9. Examples of loan words

Data number	Source	Google Translate Version	Translated Book Version
1.2	fluid mechanics	*mekanika fluida*	*mekanika fluida*
1.20	elastic system	*sistem elastis*	*sistem elastis*

There are 21.87 % accurate translations when the terminologies are in native Indonesian (not borrowed from a foreign language). For example:

Table 10. Examples of the native Indonesian translation results

Data number	Source	Google Translate Version	Translated Book Version
1.15	pure substance	*zat murni*	*zat murni*
1.21	saturation sate	*keadaan jenuh*	*keadaan jenuh*

Therefore, in translating phrases in mechanical engineering terminologies, if Indonesian borrows the terminologies from English (or a foreign language) and combines them with the native words, Google's translations are most likely accurate. Meanwhile, if Indonesian uses its terminologies, it will be better to check the Google's translations.

5.3. Inaccurate translation results by Google Translate

Regarding the resulting number of the accuracy level, Google Translate made many inaccuracies in translating the texts. In other words, many indicators of inaccuracy in translation can be found in the target texts.

5.3.1. Omission

An omission is characterized by the absence of one or more items that must appear in translating a text, causing a different meaning. Any word in a sentence or phrase is a potential candidate for the omission. The example of the omission found is as follows.

Table 11. Example of omission process

Source text	Target text	Accurate translation
Engineers use principles drawn from thermodynamics and other engineering sciences, such as fluid mechanics and **heat and mass transfer**, to analyze and design things intended to meet human needs.	*Insinyur menggunakan prinsip-prinsip yang diambil dari termodinamika dan ilmu teknik lainnya, seperti mekanika fluida dan **perpindahan panas dan massa**, untuk menganalisis dan merancang hal-hal yang dimaksudkan untuk memenuhi kebutuhan manusia.*	*Insinyur menggunakan prinsip-prinsip termodinamika dan ilmu pengetahuan teknik lainnya seperti mekanika fluida, **perpindahan kalor,** dan **perpindahan massa**, untuk menganalisis dan merancang sesuatu sesuai kebutuhan manusia.*

The word *transfer* refers to *heat* and *mass*; thus, it should be translated into *perpindahan kalor* and *perpindahan massa.* The *heat* translation is also inaccurate as it is translated into *panas.* It should be translated into *kalor* expressing the heat energy. In the target text, the word *told* is omitted when it should be translated as *memberitahu.* Hence, it causes the inaccurate meaning of the target text.

Table 12. Example of different meaning

Source text	Target text	Accurate translation
A property is a macroscopic characteristic of a system, such as mass, volume, energy, pressure, and temperature to which a numerical value can be assigned at a given time without the knowledge of the previous behavior (history) of the system.	*Properti adalah karakteristik makroskopis sistem seperti massa, volume, energi, tekanan, dan suhu yang nilai numeriknya dapat ditetapkan pada waktu tertentu tanpa pengetahuan tentang perilaku sebelumnya (riwayat) sistem.*	*Sifat (property) merupakan karakteristik makroskopik sistem, seperti massa, volume, energy, tekanan, dan temperature di mana nilai numeriknya dapat diberikan pada suatu waktu tertentu tanpa mengetahui sejarah sistem itu sendiri.*

In mechanical engineering, the word *property* refers more to the word *characteristic* or *sifat* rather than *properti.* There are some definitions of the word *property* depending on the context, such as (1) an object or objects that belong to someone; (2) a building or area of land, or both together; (3) the legal right to own and use something; and (4) a quality in a substance or material, especially one meaning that it can be used in a particular way. The context of the sentence above refers to the fourth definition of *property.* Referring to KBBI, the word *property* has a general meaning as '*harta berupa tanah dan bangunan serta sarana dan prasarana yang merupakan bagian yang tidak terpisahkan dari tanah dan/atau bangunan yang dimaksudkan; tanah milik dan*

5.3.2. Different meaning

The next indicator of inaccuracy in translation is having a different meaning. Sometimes mistakes are made in the source text analysis or the transfer process, resulting in a different meaning. In the inappropriate meaning, the translator supplies something incorrectly. Table 12 presents an example of the different meaning of the translation results by Google Translate.

bangunan'. It does not seem suitable with the context of the sentence if Google Translate translates *property* as *properti.* Therefore, the accurate translation is *sifat.*

5.3.3. Zero meaning

The last indicator of inaccuracy in translation is having zero meaning. This indicator can be traced by the meaningless translation of the source text into the target language. In other words, the translation does not communicate any meanings at all, or the readers cannot understand the target text. This indicator is also found in the translation of Google Translate. Table 13 displays an example of the zero meaning.

Table 13. Example of zero meaning

Source text	Target text	Accurate translation
The assumption of a polytropic process is significant.	*Asumsi proses politropik adalah signifikan.*	*Asumsi proses berlangsung secara politropik sangatlah penting.*

The translation result of the source text does not have significant meaning. Google Translate translates the sentence based on its structure. However, the sentence structure in the target text is not used. Therefore, when translating using Google Translate, translators should check the prevalence of the sentence.

6. CONCLUSIONS

The research findings revealed that based on two categorizations of accuracy level, accurate and inaccurate translations, Google Translate, in translating mechanical engineering terms in words was considered accurate, but inaccurate for phrases. The accurate occurrence

percentages in Google Translate translations at both word and phrase levels were 70.73 % and 46.37 %, respectively. The number for words level was above 50%, while the number of phrases was below 50%. The inaccurate translations were only 29.27% for the word level and 53.62% for the phrase level. These results indicate several translation errors based on inaccuracy indicators (omission, addition, different meaning and zero meaning). In the case of phrase translation, the indicator of 'different meaning' frequently happened. Google Translate has failed to analyze the source text and its context, thus failing to translate the correct terms in the target language. In every inaccurate sentence, the inaccuracy indicators could be found. In translating sentences, Google Translate tends to follow the source text structure, resulting in not prevalent translations.

AUTHORS' CONTRIBUTIONS

Yashinta wrote the background, literature review, and data analysis for the inaccuracy of Google Translate in translating mechanical engineering terminology. Ika Puspita wrote the research method and data analysis for Google Translate accuracy in translating at the word level. Patria Handung wrote the theoretical background and data analysis of Google Translate accuracy at the phrase level. Three of us contributed to data collection.

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