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Bridging the Resource Gap for Malay-to-Arabic Translation: Evaluating Machine Translation of News Headlines

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Abstract

Machine translation (MT) technology has become essential for cross-lingual communication, surpassing traditional human-centric translation methods. Many translation studies and MT developments have focused primarily on English, leading to significant improvements in MT systems for English. However, the quality may not be as reliable when translating between less widely spoken languages, such as Malay and Arabic, due to the scarcity of resources and research on improving MT for these language pairs. While MT systems provide good translations for widely spoken languages like English, there is a need for more research and development to improve the quality of translation for less common language pairs like Malay–Arabic. This study aims to address this gap by focusing on translating Malay news headlines into Arabic, contributing to improving MT systems for these language pairs, and providing a resource for translation students and professionals, where Arabic translation materials can be scarce, especially in Malaysian institutions. This study used a mixed-methods approach, integrating quantitative analysis of 20 news headlines scored on accuracy, style, and clarity by evaluators with 5-27 years of expertise in Arabic language and translation. A qualitative thematic analysis was conducted by the researcher to achieve the aim of this study. Results showed significant variations in MT system performance. While some systems preserved linguistic features and accuracy, cultural nuances were often lost, with common errors in idioms and structure. This study evaluates user feedback on Google Translate (GT) and Bing Microsoft Translator (BMT). Due to unequal participant distribution, potential bias exists. The findings highlight the need for advanced MT tools for Malay-Arabic translation and enhance MT technology, promoting cross-cultural understanding in the news industry. Future studies should aim for a more balanced sample size for better comparability.

Keywords: Machine Translation (MT), Google Translate (GT), Bing Microsoft Translator

(BMT), Malay News Headlines, Arabic Translation.

Introduction

Effective and efficient communication across linguistic boundaries is crucial in today's increasingly interconnected world. Machine translation (MT) technology plays a pivotal role in this communication revolution, offering the potential for instant understanding despite language barriers (Carillo, 2007). The field of news journalism, characterised by its relentless pace and the need for timely dissemination of information, significantly benefits from advancements in translation technology (Way, 2012). As news outlets aim to reach a global audience, the demand for accurate and nuanced content translation, including headlines, has surged (Vieira, 2020).

Previous research has demonstrated the utility of MT in various domains, including scientific literature (Wu et al., 2016), technical documents (Koehn, 2009), and real-time communication (Carl & Way, 2012). Studies have particularly highlighted the effectiveness of MT in translating news content to reach multilingual audiences swiftly (Imamura et al., 2020). For instance, research by Philip (2005), and Och and Ney (2004), has laid the foundation for statistical MT models, while more recent studies by Vaswani et al (2017), have focused on neural MT, which has significantly improved translation quality by leveraging deep learning techniques.

This study explores the intricacies of translating Malay news headlines into Arabic using MT systems. Malay and Arabic, rich in cultural and linguistic traditions, present unique challenges for translation (Omar, 1982; Ryding, 2014). This research aims to investigate the preservation, distortion, or loss of linguistic features in machine-translated Malay news headlines into Arabic. By analysing a corpus of machine-translated headlines, we aim to understand how current technologies handle the complexities of grammar, syntax, and semantics in Malay and their rendering into Arabic (Md et al., 2021). This study delves into the impact of translation quality on the news perception among Arabic-speaking audiences. The impact of MT on cross-cultural understanding and the potential for miscommunication is a topic that warrants further investigation (Habash, 2010). We evaluate the performance of different machine translation models, identifying their strengths and areas where human intervention remains indispensable (Toral & Way, 2018).

Through a detailed examination of machine-translated Malay news headlines into Arabic, this research contributes to the broader discourse on MT technology. It offers insights into the state of the art in translation technology, the linguistic intricacies of Malay-to-Arabic translation, and the impact of these technologies on global news consumption (Liu et al., 2019). Our findings aim to inform developers, linguists, and news organisations, guiding future improvements in machine translation to foster more accurate and culturally sensitive communication across diverse linguistic landscapes (Costa-Jussà & Fonollosa, 2014).

The primary objective of this study is to evaluate the performance of these MT tools of machine-translated Malay news headlines into Arabic by drawing upon the frameworks of Albrecht & Hwa (2007), Munday (2016), and O'Brien (2012). These models, renowned for their application in headline translation studies, provide a structured framework for assessing adherence. The selection of Malay and Arabic reflects their importance in global communication, especially those in the translation field language-pair of Malay-Arabic,

underscoring the study's potential to contribute to cross-cultural understanding and linguistic exchange (Lewis, 2009).

Literature Review

Evolution of Machine Translation (MT) Technology

Machine Translation (MT) has evolved significantly from its inception. Early rule-based MT systems relied on linguistic rules and dictionaries, enabling essential translations but often struggling with linguistic complexities and nuances. The advent of statistical machine translation (SMT) marked a significant improvement by leveraging large bilingual corpora to predict translations based on probability. However, it still faced challenges with syntax and context (Koehn, 2009). Neural Machine Translation (NMT), particularly with the development of the Transformer model by Vaswani et al (2017), has revolutionised the field. NMT systems use deep learning to model entire sentences, resulting in more fluent and contextually appropriate translations. This approach significantly enhances translation quality, especially for well-resourced languages.

Artificial Intelligence (AI) versus Machine Translation (MT)

While Artificial Intelligence (AI) and Machine Learning (ML) have revolutionized many fields, including translation, there are notable differences in the accuracy and reliability of translations produced by general AI systems compared to specialized machine translation (MT) tools. AI translation refers to the use of general AI systems, such as large language models (LLMs) like OpenAI's Chat GPT- 3, to translate text from one language to another. These systems are trained on vast datasets encompassing a wide range of topics and styles but are not specifically tailored for translation tasks. Whereas MT tools, such as GT, BMT, Babylon, DeepL, etc are specialized software designed specifically for translation. These tools employ advanced neural machine translation (NMT) techniques and are continuously optimized and fine-tuned for language translation tasks. General AI systems, on the other hand, may lack the precision and consistency of specialized MT tools even though they can generate translations that are contextually appropriate and fluent in many cases. As Brown, Mann et al (2020) stated in their study that AI systems are trained on diverse datasets that include text from various domains, but not all of this data is translation specific. This can result in less accurate translations, especially for specialized or technical content

Another reason mentioned by Vaswani et al (2017), is Optimization. General AI systems are not optimized solely for translation tasks. They are designed to perform a wide range of language-related tasks, which can dilute their effectiveness in translating accurately. The reason that Philipp & Koehn (2005), mentioned is their contextual understanding. While AI systems are good at understanding context, they may struggle with idiomatic expressions, cultural nuances, and domain-specific terminology, which are critical for accurate translation. Although AI systems have made impressive advancements in NLP, specialized MT tools still provide better accuracy and reliability for translation tasks. These tools are highly effective in delivering accurate translations due to their specialized training, ongoing enhancements, and ability to adapt to specific domains.

Whereas specialized MT tools offer higher accuracy and reliability in translation due to their focused training as mentioned by (Melvin et al.,2017). Their study stated that MT tools are trained on parallel corpora, which consist of texts and their translations. This focused training

allows them to learn direct mappings between languages, resulting in more accurate translations

Another factor is continuous improvement mentioned by (Yonghui et al., 2016). These tools are continuously updated and fine-tuned based on user feedback and new data, enhancing their translation quality over time. Sennrich et al (2016), provided another factor that is domain adaptation. MT tools often include features that allow them to adapt to specific domains or industries, improving their ability to handle specialized terminology and contexts.

Research and Evidence

Research comparing the accuracy of general AI systems and specialized MT tools supports the observations by 1-Philip & Koehn (2005), emphasized the importance of domain-specific training and optimization in achieving high-quality translations, which are hallmarks of specialized MT tools; 2- Bahdanau, Cho, Bengio (2015), pioneered the attention mechanism in NMT, which significantly enhanced the performance of specialized MT tools by allowing models to focus on relevant parts of the input sentence, thereby improving accuracy and fluency; 3- Bentivogli et al (2016) analyzed the performance of neural versus phrase-based MT systems and found that specialized neural systems showed marked improvements in translation quality, particularly in handling complex sentence structures and idiomatic expressions; 4-Vaswani et al. (2017) demonstrated that specialized NMT models outperform general AI models in translation tasks due to their focused architecture and training; 5-Melvin et al (2017), explored Google's Multilingual NMT System, which showed significant improvements in translation quality across multiple languages due to its specialized architecture and multilingual training; 6- Brown, et al (2020), highlighted that while AI systems like GPT-3 (a predecessor of GPT-4) are versatile, they often lag behind specialized MT tools in terms of translation accuracy. Through a literature survey, these studies collectively underscore the advantages of specialized MT tools over general AI systems in achieving high accuracy and quality in translations, particularly for complex and nuanced languages.

Scarcity of Research on Malay-Arabic Translation

Despite advancements in MT, research specifically addressing Malay-Arabic translation is limited. Most studies have focused on major language pairs involving English, Chinese, or European languages, leaving a significant gap in resources and methodologies for lesser-studied pairs like Malay and Arabic (Ahmed, 2021; Zbib et al., 2012). This scarcity is particularly evident in the lack of parallel corpora, which is essential for training effective MT models. Through the literature survey, numerous other researchers focus on the Arabic language as the main language translated into other foreign languages for their research. As asserted by Noorsyuhada (2015) there are many researchers in the field of translation involving translations from foreign languages into Malay such as Thai-Malay, Chinese-Malay, Arab-Malay, French-Malay. Meantime, studies on translations from Malay into foreign languages seem rare. Thus, much previous research focuses more on the challenges and difficulties faced by Malay learners in acquiring Arabic language skills, rather than the research landscape on Malay-Arabic translation. This one study by Aliyu et al (2018), is a study indicates that there are challenges and difficulties faced by Malay learners in acquiring Arabic language skills, such as lack of exposure to the Arabic language outside the classroom, lack of motivation and confidence in using the Arabic language, influence of the first language

(Malay) on learning Arabic, and ineffective teaching methods focused on traditional approaches rather than engaging students. However, their study does not directly address the scarcity of research on Malay-Arabic translation, which only makes this research worth conducting.

Quality Assessment in Machine Translation

Accurate quality assessment is crucial for evaluating MT systems. Metrics like BLEU (Papineni et al., 2001) provide quantitative measures by comparing machine output to reference translations. However, these metrics often fall short of capturing the subtleties of language, such as idiomatic expressions and contextual appropriateness. Human evaluation remains indispensable for assessing translation fluency, adequacy, and cultural relevance (Callison-Burch et al., 2006).

Cross-Linguistic Studies on Machine Translation

Cross-linguistic studies highlight the complexities involved in translating between semantically rich languages. Research by Kirchhoff (2015); and Almahairi et al (2016), underscores the difficulties in maintaining semantic integrity and cultural nuances across languages with divergent linguistic and cultural backgrounds. These insights are particularly pertinent to Malay-Arabic translation, where both languages exhibit significant typological and cultural differences.

Impact of MT on News Consumption

MT plays a critical role in news translation, enabling broader access to global information. However, inaccuracies can lead to misinformation, emphasising the need for high-quality translations (Al-Haj et al., 2011; Bulté & Tezcan, 2022). In the context of news, timely and accurate translations are essential for reliable information dissemination. Human-Aided Machine Translation-aided MT, particularly through post-editing, has proven effective in enhancing translation quality. Post-editing involves human translators refining machine-generated outputs to correct errors and improve fluency, combining MT's efficiency with human expertise's accuracy (Mitchell et al., 2014; Garcia, 2011). This approach is especially beneficial for under-resourced languages like Malay.

Domain-Specific Translation

MT systems trained on general datasets often perform poorly on domain-specific texts, such as news headlines, which require specialized vocabulary and stylistic conventions (Koehn, 2009). News headlines are particularly challenging due to their need for conciseness and impact, which can be lost in translation without domain-specific training data. This highlights the necessity for training MT models on datasets that are specifically curated for the news domain to improve translation quality (Liu et al., 2020).

Ethical and Social Implications

The ethical and social implications of widespread MT usage are underexplored, particularly concerning privacy, bias, and the preservation of linguistic diversity (Smith, 2018). MT systems can inadvertently perpetuate biases in the training data, affecting translations' fairness and inclusivity. Furthermore, the increasing reliance on MT might impact the livelihoods of professional translators and the preservation of minority languages, including regional dialects of Malay and Arabic (Bellos, 2011).

Long-Term Impact on Language Learning

There is limited research on the long-term impact of MT on language learning and bilingualism (Lewis, 2009). Dependence on MT could reduce the incentive for individuals to learn new languages, potentially affecting linguistic diversity and proficiency over time (Ryding, 2014). This is particularly relevant in Malay and Arabic, where language proficiency is crucial for cultural and educational purposes.

Addressing the Research Gap

Despite the advancements in MT, studies specifically addressing Malay-to-Arabic translation remain scarce. Existing research has explored various aspects of MT and translation quality but has not comprehensively addressed the unique challenges of this specific language pair (Abidin, 2020; Abdul Majid, 2022; Azman & Nazlena, 2015; Zajic, 2005; Almeshkry & Aziz, 2012; Abdallah, 2012; Azimah et al., 2014; Noorsyuhada, 2015; Luwaytha, 2013; Ismail, 2020). This study was conducted with a strong focus on ethics, especially considering the scarcity of Arabic translation courses in Malaysian institutions. The research aims to bridge this educational gap by offering valuable insights into Malay-Arabic translation that could support curriculum development. The findings are intended to be a resource for educators and students in the field. This study aims to fill this gap by focusing on translating Malay headlines into Arabic, which is of growing importance given the increasing exchange of information between Southeast Asia and the Arab world.

Methodology

Research Design

This study employed a mixed-methods approach, combining quantitative and qualitative methods to analyse the data comprehensively. The mixed-methods approach allows for a robust examination of the research questions by integrating numerical data with thematic insights.

Quantitative Method

Descriptive statistics were employed for this study. The quantitative component of the study involved the systematic evaluation of 20 news headlines using predefined criteria. The criteria included accuracy, style, and clarity; each scored on a scale from 1 to 4. The quantitative data was collected and analysed to determine the percentage of agreement among evaluators for each criterion. The frameworks used for these criteria are based on recent scholarly works by (Albrecht & Hwa 2007; Munday 2016; and O'Brien, 2012). The selection of frameworks for evaluating this objective was guided by the need for robust, well-established criteria that address the unique translation challenges between these languages. The frameworks from these three scholars provide a comprehensive approach to assessing different aspects of translation quality.

Qualitative Method

The qualitative analysis was conducted to enhance the quantitative evaluation and better understand the translations' quality. The method employed is document analysis, which involves thematic and content analysis, and it utilized the Albrecht & Hwa (2007); Munday (2016); and O'Brien (2012), frameworks to define the analytical criteria for the qualitative analysis.

Analytical Framework

The methodology was employed to evaluate the quality of MT news headlines from Malay into Arabic. The evaluation is based on three critical criteria: accuracy, style, and clarity. Albrecht & Hwa's (2007), framework for sentence-level MT evaluation is particularly relevant for assessing the accuracy of translations. Their approach emphasizes semantic equivalence and morphological correctness, which are critical in ensuring that the translated text accurately reflects the original meaning. The strengths of the semantic equivalence framework ensure that the translated text conveys the same meaning as the original, which is crucial for maintaining the integrity of news headlines. Given the complexity of Arabic morphology, the morphological correctness aspect ensures that translations are grammatically accurate, preserving the intended message without distortion. The focus on accuracy is significant in news translation, where even minor deviations in meaning can lead to considerable misinterpretation. Albrecht & Hwa's framework provides a rigorous method for evaluating this criterion, making it an ideal choice for the study.

Munday's (2016), framework, "Introducing Translation Studies," is a comprehensive guide to the rhetorical aspects of translation, including nuances of style. This framework was chosen to preserve the original text's tone, register, and stylistic elements. The strength of the register and formality framework ensures that the translation maintains the appropriate level of formality, which is critical in Arabic due to its diglossic nature. As for rhetorical features strengths, the framework helps preserve rhetorical devices and stylistic nuances, ensuring that the translation retains the original's stylistic impact. The relevance of style is critical in news translation, affecting how the audience perceives the information. Munday's framework provides a structured approach to evaluating style, ensuring that the translated headlines are appropriate and engaging for the target audience.

The work on translation guided the reason for choosing O'Brien's (2012), framework of clarity, as human-computer interaction focuses on readability, coherence, and cohesion, making it highly relevant for assessing the clarity of translations. This framework addresses the ease with which the target audience can understand the translated text. The strengths of the readability framework ensure that the translated text is easily readable, which is crucial for news headlines that must quickly convey information. On the other hand, coherence and cohesion maintain the logical flow and connectedness of ideas, which is essential for the overall clarity of the translation. Moreover, the relevance of clarity is particularly important in news translation, where the primary goal is to communicate information effectively and unambiguously. O'Brien's framework provides a comprehensive method for evaluating this criterion, ensuring the translated headlines are clear and comprehensible.

Selection of Headlines

There are several reasons for the choice of news headlines for this research. News headlines concisely represent current events to emphasize the relevancy of the information, capturing the essence of news stories in a brief and impactful manner. By focusing on news headlines, this study allows for analyzing language translation in a context that reflects real-time communication and the immediacy and relevance of news events.

In light of the journal's scope and the need for a succinct yet comprehensive analysis, this study concentrated on a dataset of 20 carefully selected news headlines. These headlines, all

from the year 2020, were sourced from notable Malay-language news outlets, namely Harian Metro, BERNAMA, and Berita Harian (BH), and specifically pertain to the coverage of COVID-19 in Malaysia. This specific timeframe was selected because 2020 marked the onset of the COVID-19 pandemic, which had a significant impact in Malaysia and globally. By focusing on this period, this study aims to evaluate MT performance during a critical and highly relevant period in recent history. To ensure a diverse and comprehensive dataset, the study selected news headlines covering various aspects of the COVID-19 pandemic, including its impact on public health, the economy, social issues, and government responses. This approach allowed this study to evaluate MT performance across various topics and linguistics complexities, providing a holistic assessment of translation quality.

Automated Translation Technology

Google Translate (GT) and Bing Microsoft Translator (BMT) were chosen for their prominence and advanced technology in the MT market. GT is renowned for its widespread use and continuous updates, leveraging a vast user base for its neural machine translation (NMT) models. BMT, while not as widely used as GT, offers robust language services and NMT capabilities, making it a valuable tool for analysis. The study utilizes both platforms to reflect the current state of MT and to understand how both MTs manage the translation of complex news headlines. This approach provides insights into the performance of leading MT tools in real-world applications.

Data Collection

Quantitative Data

- 20 Malay news headlines were selected from 3 prominent Malay news agencies: BERNAMA, Harian Metro, and Berita Harian (BH) for the sample size.
- A selection of Malay news headlines and their Arabic translations was collected from automated translation tools.
- An online survey distributed to the respondents whose proficiency in Arabic Language, Linguistics, and Translation is more than 10 to 27 years in the field to achieve the aims of evaluating MT performances of Machine-translated Malay news headlines into Arabic in terms of accuracy, style, and clarity.

Each headline was scored on a scale from 1 to 4 by the respondents. The scoring criteria were defined as follows:

1. Accuracy: 1 = Information is entirely different; 2 = Only some information is the same; 3 = Most information is the same; 4 = Information is entirely the same.
2. Style: 1 = Language is inappropriate; 2 = Most of the language is inappropriate; 3 = Most of the language is appropriate; 4 = Language is appropriate.
3. Clarity: 1 = Not understandable; 2 = Only a few parts are understandable; 3 = Mostly understandable; 4 = Fully understandable.
    - Before beginning to answer the questionnaire, respondents are advised to provide their specific answers/information, as all feedback will be based on the respondents' given information. The specific answer/information includes Name, Department, Expertise, and Years of Experience in Arabic Studies.
    - Statistical data on translation accuracy, style, and clarity were gathered from the same set of headlines.

- The scores from the feedback were rounded up to the nearest whole number to simplify the data analysis process.
- Scores from the survey were recorded in a structured table (see Table 1 for the GT score and Table 2 for the BMT score)

- Qualitative Data
  - Thematic and content analysis was conducted by the researcher to achieve the objective.
  - The translations were examined for their conformity to the quality concepts proposed by the three scholars' models mentioned previously.

- Data Analysis
  - Qualitative Document Analysis: Thematic and content analysis was conducted to evaluate the feedback survey from the respondents of the translated news headlines.
  - Quantitative Descriptive Statistics: Statistical measures and analysis were performed to quantify translation accuracy, style, and clarity in the translated news headlines.
  - The percentage of agreement among the respondents was calculated for each criterion, and statistical methods were used to analyze the data.

This section provided the methodology, including the survey design, data collection, and analysis procedures, setting the stage for the presentation of results in the next chapter.

Results

Overview of the Findings

The results of this study provide a comprehensive evaluation of machine-translated Malay news headlines into Arabic, drawing upon both quantitative and qualitative analyses. The findings demonstrate how closely GT and BMT adhere to the quality of machine-translated news headlines Albrecht & Hwa (2007), Munday (2016), and O'Brien (2012) traits the model defines as characteristic of headline language. The survey conducted with Arabic language experts offered subjective evaluations of the translations' accuracy, style, and clarity. In sum, the results shed light on the capabilities and limitations of current MT technology in handling the nuances of news headline translation from Malay to Arabic.

Quantitative Findings

Two online surveys were created separately to differentiate the findings between GT and BMT results, with the title of each survey 'The Quality of Machine-Translated Malay News Headlines into Arabic in Terms of Accuracy, Style, and Clarity.' One survey used Google Translate (GT), and another one used Bing Microsoft Translator (BMT). Each headline was evaluated by respondents using a scale ranging from 1 to 4 for each criterion.

Eight respondents with expertise in Arabic language, linguistics, and translation participated in the survey. 3 had 6 -8 years of experience in Arabic studies; 2 had 15 – 17 years of experience; and another 3 had 20 – 27 years of experience in Arabic studies. However, 6 respondents provided feedback in both GT and BMT survey versions of the headlines. 2 respondents only provided feedback on the GT versions, resulting in 6 complete responses for

both translation tools. In other words, 8 respondents participated in GT, and 6 respondents participated in BMT. This response pattern is acknowledged in the study's analysis, as it may have implications for the comparative evaluation of the two MT tools. Despite the relatively small number of respondents (eight individuals), their extensive experience of proficiency in Arabic language, linguistics, and translation studies provides a depth of expertise that enriches the analysis.

Google Translate (GT)

The following table presents a numeric table for GT scores from the feedback respondents.

Table 1

Google Translate (GT) Score Percentage

Headlines ID	Accuracy				Style				Clarity			
	1	2	3	4	1	2	3	4	1	2	3	4
1.			25%	75%		13%	25%	63%			13%	88%
2.		38%	50%	13%	25%	25%	50%		13%	25%	50%	13%
3.		13%	38%	50%		38%	25%	38%		25%	25%	50%
4		38%	38%	25%	13%	38%	38%	13%		38%	38%	25%
5.	25%		38%	38%	25%	13%	50%	13%	13%		25%	63%
6.		25%	75%		25%	38%	38%		13%	13%	50%	25%
7.		50%	38%	13%	25%	63%	13%		13%	38%	50%	
8.	13%	13%	63%	13%	25%	50%	25%			38%	63%	
9.	13%	25%	63%		25%	25%	50%		25%	13%	50%	13%
10.	13%	38%	38%	13%	25%	38%	38%		13%	25%	50%	13%
11.	13%	38%	38%	13%	50%	25%	25%		13%	38%	38%	13%
12.		13%	50%	38%		38%	25%	38%		13%	38%	50%
13.	13%	13%	63%	13%	25%	25%	38%	13%	13%	25%	38%	25%
14.	13%	38%	50%		25%	38%	38%		13%	25%	63%	
15.	25%	13%	38%	25%	13%	50%	38%			50%	50%	
16.	38%	50%	13%		38%	38%	25%		38%	38%	25%	
17.		38%	50%	13%	25%	25%	38%	13%		50%	38%	13%
18.	50%	38%	13%		50%	38%	13%		50%	38%	13%	
19.	25%		13%	63%	25%		13%	63%	25%		13%	63%
20.	38%	50%	13%		50%	50%			50%	38%	13%	

Bing Microsoft Translator (BMT)

Table 2 is the breakdown of the numeric table of BMT scores.

Table 2

Bing Microsoft Translator (BMT) Score Percentage

Headlines ID	Accuracy				Style				Clarity			
	1	2	3	4	1	2	3	4	1	2	3	4
1.			50.%	50.%		17%	50.%	33%			50%	50%
2.		67 %	17%	17%		100%				67%	17%	17%
3.		17 %	33%	50%		17%	50%	33%		17%	33%	50%
4		33 %	33%	33%	33%	33%		33%	17%	33%	17%	33%
5.	33 %	33 %	33%		33%	50%	17%		33%	33%	33%	
6.	33 %	67 %			67%	33%			50%	50%		
7.		50 %	33%	17%	17%	50%	17%	17%	17%	17%	50%	17%
8.	33 %	17 %	33%	17%	50%	50%			33%	33%	17%	17%
9.			67%	33%		50%	17%	33%			67%	33%
10.	17 %	33 %	33%	17%	33%	33%	33%		33%	17%	33%	17%
11.	33 %	50 %	17%		33%	67%			33%	67%		
12.	33 %	33 %	17%	17%	33%	50%		17%	33%	17%	33%	17%
13.		33 %	33%	33%		50%	33%	17%		33%	50%	17%
14.	33 %	17 %	33%	17%	33%	33%	17%	17%	33%	33%	17%	17%
15.	33 %		50%	17%	50%	17%	33%		33%	33%	17%	17%
16.	33 %		67%		67%	17%	17%		33%	17%	33%	17%
17.	17 %	50 %	17%	17%	50%	33%	17%		17%	63%		
18.	33 %	67 %			50%	33%	17%		33%	67%		
19.	17 %		33%	50%	17%		33%	50%	17%		17%	67%
20.	33 %	33 %	33%		33%	67%			33%	33%	33%	

Qualitative Findings

Google Translate (GT)

The survey conducted with eight experts proficient in Arabic language and translation provided insights into the quality of headlines translated by GT. The findings are summarized as follows:

Accuracy: The majority of respondents (75%) found that the translations contained entirely the same information as the original headlines, indicating a high level of accuracy in the factual content conveyed by GT.

Style: While most experts (63%, rounded up from 62.5%) deemed the language appropriate, a notable minority (13%, rounded up from 12.5%) felt that improvements could be made to better match the stylistic expectations of Arabic headlines.

Clarity: A significant majority (88%, rounded up from 87.5%) reported that the translated headlines were fully understandable, suggesting that GT generally maintains clarity in its translations.

The survey results varied across individual headlines, with some showing a higher degree of perceived accuracy, style, and clarity than others. For instance, Headline 2 ("Tiada kes Koronavirus di Ipoh—KP Kesihatan") received mixed responses regarding accuracy and style, with 38%, rounded up from 37.5% of respondents indicating that only some information was the same and 25% finding the language mostly inappropriate. Overall, the survey findings suggest that while GT performs well in terms of accuracy and clarity, there is room for improvement in the stylistic rendering of headlines to better align with Arabic language conventions.

Bing Microsoft Translator (BMT)

Accuracy: Responses indicate mixed perceptions of accuracy across the headlines. For some headlines, a majority of respondents (50% for Headline 3 and 50% for Headline 19) found that the translations contained entirely the same information as the original headlines. However, for other headlines, respondents were split, with a significant portion indicating that only some information was the same.

Style: The majority of respondents rated the style of translations as mostly inappropriate or inappropriate for several headlines, suggesting that BMT's translations may not consistently align with the stylistic expectations of Arabic headlines. For example, 100% of respondents found the language mostly inappropriate for Headline 2, and 67%, rounded up from 66.7% found it inappropriate for Headline 6.

Clarity: Clarity ratings varied, with some headlines being rated as mostly or fully understandable by a majority of respondents, while others were rated as only a few parts being understandable. For instance, 50% of respondents found Headline 1 fully understandable, while 67%, rounded up from 66.7% of respondents found only a few parts of Headline 11 understandable.

Overall, the survey results for BMT show variability in the translations' perceived accuracy, style, and clarity. While some headlines are rated as mostly or entirely accurate, others are seen as having only some accurate information. The style is frequently rated as inappropriate

or mostly inappropriate, and clarity ranges from mostly to fully understandable, with several headlines having only a few parts understandable. These findings suggest that while BMT may provide some accurate translations, there are inconsistencies in the quality, particularly concerning style and clarity. Some translations are perceived as lacking in stylistic appropriateness and are only sometimes clear or fully understandable, indicating areas where improvements could be beneficial.

Performance Evaluation of Translation Tools and Error Analysis

In the era of advanced AI, MT tools remain indispensable for several compelling reasons. While AI encompasses a broad range of technologies and applications, MT tools represent a specialized application of AI that addresses specific linguistic challenges. Their continued relevance lies in their ability to provide efficient, scalable, and high-quality translation services, making them an essential component of our globalized digital landscape.

GT generally provides accurate and fluent translations, effectively maintaining the original message's meaning across various headlines. While it occasionally introduces minor errors or slightly awkward phrasing, it consistently retains the context and tone of the original text. Additionally, GT is more widely used than BMT, which may contribute to its more refined translation algorithms and extensive language data. BMT also conveys the main messages, but sometimes with less precision and clarity compared to GT. It occasionally omits essential information, such as attributions, and introduces ambiguous phrases or grammatical issues that could lead to misinterpretation. In comparative summary, GT tends to outperform BMT in terms of accuracy, fluency, and preservation of contextual meaning. Its wider usage and more extensive language data likely contribute to this superior performance. GT is generally perceived to have a slight edge in overall performance due to its larger language model and more extensive data than BMT. GT supports more languages than BMT, which can be a critical factor for users requiring translations in less common languages. However, both services have room for improvement, with specific errors and phrasing issues identified in the analysis. The quality of translations varies by headline, with some being well-translated by both services and others revealing significant discrepancies.

DISCUSSION

Discussion of Survey Results with Previous Studies

Google Translate (GT)

The survey results for GT indicate high levels of accuracy and clarity but mixed perceptions regarding stylistic appropriateness.

Accuracy: The survey found that 75% of respondents believed GT's translations contained entirely the same information as the original headlines. This aligns with previous research suggesting that GT generally performs well in terms of maintaining factual accuracy. For instance, Yonghui Wu, et al. (2016) highlighted GT's ability to handle a wide range of languages and maintain high accuracy due to its extensive training data and continuous updates.

Style: While 63% of respondents deemed the language appropriate, 13% felt improvements were needed to better match the stylistic expectations of Arabic headlines. This is consistent with findings by Bentivogli et al (2016), who noted that while GT provides grammatically correct translations, it sometimes struggles with stylistic nuances and idiomatic expressions, especially in languages with complex stylistic conventions like Arabic.

Clarity: A significant majority (88%) reported that the translated headlines were fully understandable, suggesting that GT generally maintains clarity. Research by Aiken and Balan (2011), supports this, noting that GT tends to produce clear and readable translations, although occasional clarity issues can arise in more complex sentences.

Bing Microsoft Translator (BMT)

The results for BMT show variability in accuracy, style, and clarity, with mixed perceptions across different headlines.

Accuracy: Responses indicate mixed perceptions, with some headlines deemed entirely accurate by 50% of respondents, while others were seen as only partially accurate. This variability is echoed in the literature. A study by Habash, N., & Sadat, F. (2006)) found that effective Arabic preprocessing schemes are crucial for improving the accuracy of statistical MT systems, which can be applied to understanding the performance variability of BMT
Style: The majority of respondents rated the style as mostly inappropriate or inappropriate for several headlines. This is in line with findings by Farghaly, A., & Shaalan, K. (2009), who reported that BMT sometimes produces translations that fail to meet the stylistic norms of the target language, particularly in more formal or domain-specific texts.

Clarity: Clarity ratings for BMT varied, with some headlines being rated as fully understandable by 50% of respondents, while others were deemed only partially understandable. This aligns with research by Zbib, R., Malchiodi, E., Devlin, J., Stallard, D., Matsoukas, S., Schwartz, R., & Makhoul, J. (2012), which found that while BMT can produce clear translations, it often struggles with maintaining clarity in more complex or technical content.

Comparative Analysis

The survey results for GT and BMT illustrate a common theme in the literature. While both tools are capable of producing accurate and clear translations, they often fall short in stylistic rendering. This is particularly pertinent for languages like Arabic, where stylistic and idiomatic nuances are crucial for conveying the intended meaning and tone.

Previous Studies

Wu et al (2016), highlighted the strengths of GT in maintaining accuracy due to its extensive training data. Bentivogli et al (2016), highlight an in-depth comparison between neural machine translation (NMT) and phrase-based machine translation (PBMT), evaluating their performance across different languages and domains. Aiken and Balan (2011) found GT generally produces clear and readable translations. Habash and Sadat (2006) emphasized the importance of Arabic preprocessing schemes for improving accuracy in Hassan, Menezes, and Sawaf (2014), reported variability in BMT's accuracy depending on language pair and content. Farghaly and Shaalan (2009), discussed BMT's challenges in meeting the stylistic norms of the target languageZbib et al. (2012), found BMT often struggles with clarity in complex content.

Implications

The discrepancies observed in the performance of translation technologies have several implications for both users and developers, which are closely connected to the discussion of survey results and previous studies.

- *For Users*
  For users, particularly those in the media industry who rely on these tools for quick translations of news headlines, inaccuracies could lead to misunderstandings or misrepresentations of the original content. This is especially critical in news dissemination, where the precise conveyance of information is paramount. The survey results indicated mixed accuracy and clarity, echoing findings by Habash and Sadat 2006; and Hassan et al (2014), which emphasize the need for effective preprocessing and variability in translation accuracy.

- *For Developers*
  For translation technology developers, the findings highlight the need for more sophisticated algorithms capable of contextual understanding and cultural nuance. Studies like Farghaly and Shaalan (2009); and Toral and Way (2018) have pointed out the challenges BMT faces in stylistic rendering, indicating a significant opportunity for improvement in MT systems. The current limitations suggest that advancements in neural MT models, which can learn from a vast corpus of bilingual text, are essential for enhancing translation quality.

- *For Education*
  The study's results have educational implications as well. Language educators and learners can utilize these insights to gain a deeper understanding of the challenges often encountered in MT between languages with complex stylistic and idiomatic structures like Arabic. This will help them improve their ability to evaluate and utilize such technologies critically. The findings align with Bentivogli et al (2016), who noted the struggles of GT with stylistic nuances.

- *For Computational Linguistics*
  Finally, the implications extend to the field of computational linguistics. The study contributes to the ongoing discourse on the challenges of cross-lingual information retrieval and machine translation. It underscores the importance of incorporating linguistic diversity into developing translation tools to ensure they are robust and reliable across different language pairs. This is supported by Wu et al (2016); and Zbib et al (2012), who highlighted the strengths and weaknesses of current MT systems in handling diverse and complex languages.

  The survey results and previous studies suggest that while both GT and BMT are effective in providing accurate and clear translations, they face challenges with stylistic appropriateness, particularly for languages with complex stylistic conventions like Arabic. This indicates a need for further improvements in MT tools to better align with the stylistic and cultural expectations of different languages. These findings suggest that while translation technologies are advancing, their ability to fully grasp and translate the subtleties of language deeply rooted in cultural context and linguistic structure still needs improvement. The results underscore the importance of developing translation models sensitive to improving the quality of automated translations between Malay and Arabic.

Conclusion

This study has comprehensively evaluated MT performance between Malay and Arabic, two linguistically distinct languages. The findings reveal that while current MT tools like GT and BMT can produce essential translations, there are significant challenges in capturing the nuances of these languages, particularly regarding grammar, idioms, and cultural expressions.

From a practical standpoint, this study underscores the need for improved MT systems that can handle the complexities of Malay and Arabic. The potential for these tools to facilitate communication and access to information across linguistic boundaries is immense, provided the technology continues to evolve. This study acknowledges that this research has limitations, including the scope of the MT tools analyzed and the size of the dataset. Future research should expand into these areas, exploring a broader range of MT systems and larger corpora to validate our findings. Additionally, longitudinal studies could monitor the progress of MT over time, particularly as AI and ML continue to advance.

Future Work

Given the limitations identified in our study, several avenues for future research emerge. Expanding the scope to include a more comprehensive array of translation tools and technologies would provide a more comprehensive understanding of the current state of translation performance from Malay to Arabic. This could involve evaluating open-source translation models or custom-developed systems that may offer different approaches to handling linguistic features. Further research could also explore the translation of different text genres, such as full news articles, literature, or technical documents, to assess how well translation technologies perform across various contexts. This would help us understand the versatility and adaptability of translation tools to different styles and complexities of language. Incorporating a longitudinal aspect into future studies could track the progress of translation technology over time, providing insights into how machine learning advancements impact translation quality. Additionally, studies could investigate the effectiveness of post-editing by human translators to refine machine-generated translations, which could bridge the gap between current technology capabilities and the need for accurate translations.

Limitations

This study's methodology encompasses several limitations that should be considered when interpreting the findings. The analysis utilized GT and BMT, two widely used MT systems, to assess their capabilities, acknowledging that they represent only a portion of the MT technology spectrum. The study's focus on the Malay-to-Arabic language pair limits the generalizability of the results due to unique linguistic characteristics. Swan's model was employed to evaluate MT output, but it may need to fully account for the contextual and cultural nuances of the original Malay headlines. The limited sample size of news headlines analyzed could affect the depth of understanding of MT performance, and the journal's page limitations constrain the findings. Additionally, MT systems are constantly evolving, meaning the study's results may not apply to future versions of GT and BMT. The qualitative analysis involved subjective judgement, introducing potential bias despite efforts to minimize it. The study presumed the accuracy of the MT output, not accounting for possible mistranslations or source text errors, and it should have extensively considered the cultural and sociopolitical context that could influence headline interpretation across different regions. By acknowledging these limitations, the study provides a transparent account of the potential constraints and areas for future research to build upon.

In conclusion, while the path to perfecting Malay-to-Arabic MT is fraught with challenges, this study represents a step forward in understanding and improving this complex process in the hope that this research will inspire further studies and lead to the development of MT systems that are not only technically proficient but also culturally aware. Finally, research is needed

to develop more advanced evaluation metrics that go beyond accuracy and fluency to include cultural appropriateness and idiomatic correctness. Such metrics offer a more detailed assessment of translation quality and guide the development of better translation models. It is also crucial to consider the inherent difficulties in translating languages like Arabic, one of the ten most difficult languages for automated translation due to its complex grammar, morphology, and various dialects. Understanding these challenges is essential for improving machine translation systems and their application to Arabic language translation.

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Table 3

Machine-Translated Malay News Headlines into Arabic

Headline No. & Sources	MALAY HEADLINE	GOOGLE TRANSLATE (GT)	BING MICROSOFT TRANSLATOR (BMT)
1. 11 Jan 2020/ BERNAMA	Kematian pertama akibat koronavirus dilaporkan di Wuhan, China	تم الإبلاغ عن أول حالة وفاة بفيروس كورونا في ووهان، الصين	أول وفيات بفيروس كورونا تم الإبلاغ عنها في ووهان، الصين
2. 25 Jan 2020/ Harian Metro	Tiada kes Koronavirus di Ipoh – KP Kesihatan	لا توجد حالات فيروس كورونا في ايبوه – كي بي كسيهاتان	لا حالات الفيروس التاجي في الصحة إيبوه -KP
3. 26 Jan 2020/ BERNAMA	Tiada Wabak Coronavirus dikesan di Malaysia	لم يتم اكتشاف تفشي فيروس كورونا في ماليزيا	لم يتم الكشف عن أي تفشي لفيروس كورونا في ماليزيا
4. 28 Jan 2020/ BERNAMA	Dakwaan kononnya 2019 novel koronavirus terhasil dari makmal adalah tidak benar	الادعاء بأن الفيروس_ التاجي الجديد_2019 تم إنشاؤه من المختبر غير صحيح	يزعم أن الفيروس التاجي الجديد لعام 2019 المتولد من المختبر غير صحيح
5. 29 Jan 2020/ BERNAMA	Koronavirus tidak beri implikasi kepada ekonomi Malaysia setakat ini – Azmin	لا توجد آثار لفيروس كورونا على الاقتصاد الماليزي حتى الآن – أزمين	كورونا فيروس ليس له آثار على اقتصاد ماليزيا يكون أقرب ما إلى هذا –
6. **4** Feb 2020/ Berita Harian (BH)	Budak positif coronavirus sudah sihat, kes pertama pulih di Malaysia	الفتى المصاب بفيروس كورونا بصحة جيدة، وتتعافى أول حالة في ماليزيا	كورونا فيروس الصبي إيجابية صحية، أول حالة تعافى في ماليزيا
7. 13 Feb 2020/ Harian Metro	RM50 sehari Individu dilindungi mySalam layak tuntut bayaran hilang pendapatan jika dijangkiti Covid-19	50 رينجيت ماليزي في اليوم الأفراد المحميون بواسطة مؤهلون للطالبة*mysalam* بدفع تعويض عن فقدان الدخل إذا أصيبوا بفيروسCovid-19	رينغيت ماليزي في اليوم RM50 مؤهلون الأفرد *mySalam* المشمولين ببرنامج للمطالبة بالدخل المفقود إذا أصيبواب Covid-19
8. 9 Apr 2020/ BERNAMA	'Ada hikmah', bekas pesakit bangga derma plasma untuk rawat COVID-19	"هناك حكمة "، تبرع المريض السابق بفخر بالبلازما COVID-19 لعلاج	'هناك حكمة '، المريض السابق فخور التبرع البلازما COVID-19 لعلاج
9. 27 Apr 2020/ Harian Metro	Covid-19: Malaysia terus catat perkembangan baik	كوفيد-19: ماليزيا تواصل تسجيل تقدم جيد	كوفيد-19: ماليزيا تواصل إحراز تقدم جيد
10. 6 May 2020/ Harian Metro	Jumlah kes COVID- 19 terus turun, petugas KKM menarik nafas lega	يواصل عدد حالات الإصابة بكوفيد -19 الانخفاض، ويتنفس موظفو وزارة الصحة الصعداء	ستمار 19 -COVID اًفي عدد الانخفاض، وتنقس موظفو وزارة الصحة الصعداء
11.	Pamer notis tidak terima	اعرض إشعارًا بعدم قبول	إظهار إشعار عدم وجود

23 May 2020, BERNAMA	tetamu di Aidilfitri elak penularan COVID-19	الضيوف على COVID-19 انتشار Aidilfitri لتجنب	ضيف Aidilfitri COVID-19 في لتجنب انتقال
12. 30 May 2020, Berita Harian (BH)	Rantaian jangkitan COVID-19 hampir putus di Malaysia	تكاد تكون سلسلة عدوى مكسورة في ماليزيا COVID-19	سلسلة COVID-19 العدوى كادت أن تندلع في ماليزيا
13. 7 Jun 2020, BERNAMA	Guna dana awam selamatkan syarikat penerbangan terjejas akibat COVID-19 bukan 'bailout' - NUFAM	استخدم الأموال العامة لإنقاذ شركات الطيران المتضررة من COVID -19 وليس "الإنقاذ" NUFAM -	استخدام الأموال العامة لإنقاذ شركات الطيران المتضررة من ليست عملية إنقاذ COVID -19 NUFAM -
14. 14 Jun 2020, BERNAMA	Malaysia diiktiraf sebagai lima negara terbaik di dunia mengawal pandemik COVID-19	تم الاعتراف بماليزيا كأول خمس دول في العالم تتحكم في COVID-19 جائحة	ماليزيا تعترف بأنها أفضل خمسة بلدان في العالم لمكافحة COVID - وباء 19
15. 11 Jul 2020, Berita Harian (BH)	COVID-19: Jangan seronok sangat	كوفيد -19: ليس لديك الكثير من المرح	لا تكون ممتعا جدا: COVID-19
16. 18 Jul 2020, Harian Metro	Masyarakat semakin lupa yang COVID-19 masih mengganas	يتناسى المجتمع بشكل متزايد أن COVID-19 لا يزال عنيفًا	الناس ينسون بشكل متزايد أن لا COVID-19 يزال إرهابيا
17. 26 Sept 2020, Berita Harian (BH)	COVID-19: 79 daripada 82 kes baharu adalah penularan tempatan	تم ترجمة 79 حالة : COVID-19 من أصل 82 حالة جديدة	79 :COVID-19 حالة جديدة من بين 82 حالة انتقال محلي
18. 30 Sept 2020, BERNAMA	Kit ujian COVID-19 buatan Malaysia dilancarkan	إطلاق COVID-19 مجموعة اختبار الماليزية الصنع	ماليزيا الصنع COVID-19 مجموعة اختبار أطلقت
19. 15 Oct 2020, Berita Harian (BH)	Kes di Sabah terus tertinggi	الحالات في صباح لا تزال الأعلى	الحالات في صباح لا تزال الأعلى
20. 24 Dec 2020, Harian Metro	Saringan Covid-19: Tindakan undang-undang jika majikan ingkar	فحص Covid-19: إجراء قانوني إذا تخلف صاحب العمل عن السداد	الفحص Covid-19: الإجراءات القانونية إذا تخلف صاحب العامل عن السداد