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Study on the Quality of Human and Machine Translation of The Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area

Chuqing Zhang *, Yang Chen

Zhejiang Yuexiu University, Shaoxing, China

* Corresponding Author

Abstract

This study is grounded in the theory of functional equivalence and selects the Outline of the Development Plan for the Guangdong-Hong Kong-Macau Greater Bay Area as a case study. It aims to explore the quality assessment of government document translation between human and machine translation. By delving into the three dimensions of vocabulary, pragmatics, and culture as they relate to functional equivalence theory, this research explores the performance of human and machine translation in handling specific types of texts such as government documents. The study reveals that despite of advancements in machine translation, it still has limitations in dealing with complex semantic structures, cultural contexts, and specialized terminology. Human translation offers advantages in accurately conveying semantics, managing cultural differences, and defining specialized terminology. The paper proposes effective solutions to enhance the accuracy and readability of machine translation in practices, emphasizing the importance of translation quality in conveying accuracy in government documents, promoting international communication, government document as well as enhancing regional economic prosperity.

Keywords

Functional Equivalence Theory; Human-Machine Translation; Quality Comparison; Government Documents.

1. Introduction

1.1. Research background

In the era of globalization, the demand for fast and accurate language translation has surged, positioning machine translation as a critical tool. Over the decades, machine translation has evolved from rule-based and statistical methods to advanced neural machine translation, leveraging large corpora and deep learning to enhance efficiency and accuracy. Despite these advancements, machine translation struggles with complex semantics, cultural nuances, and specialized terminology, limiting its applicability in all scenarios.

This study focuses on *the Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area*, comparing human and machine translation quality to explore the strengths and limitations of machine translation in processing government documents. Government documents, as a subset of political literature, require precise and authoritative translation due to their formal nature and specialized contents. While human translation captures semantic and stylistic nuances effectively, it is time-intensive and sometimes subjective. Machine translation, though faster, often falls short in handling the unique linguistic and terminological demands of such texts.

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The Guangdong-Hong Kong-Macao Greater Bay Area is a key driver of China's economic growth, making the translation of its government documents crucial for both domestic and international stakeholders. The region's linguistic diversity and complex terminology pose significant translation challenges. Comparative studies of human and machine translation can highlight machine translation's potential and limitations, guiding the development of translation technologies and supporting the standardization and internationalization of the region's government documents.

The current study selects *the Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area as one case* to compare human and machine translation quality on government documents. The study aims to analyze machine translation quality on specific texts, contributing to the theoretical and practical advancement of translation studies and technology.

1.2. Research objective

The study conducts a detailed comparison between the official human-translated version and the translations generated by three advanced language model systems (ChatGPT, Youdao Translation, and Google Translate). The paper evaluates the capabilities of human and machine translation in accurately conveying semantics, handling cultural differences, and expressing specialized terminology from three dimensions: lexical, pragmatic, and cultural, analyzing their strengths and weaknesses. The purpose of this study is to provide theoretical support for enhancing the quality of government document translation and promoting the advancement of translation technology.

2. Literature Review

2.1. Artificial intelligence

The development of artificial intelligence (AI), initiated in the mid-20th century, is marked by multidisciplinary contributions and significant technological milestones. Turing (2007) set a human-like intelligence benchmark with the Turing Test in the 1940s-1950s. McCarthy's 1956 introduction of "artificial intelligence" at the Dartmouth Conference formally established AI as a research field [1]. The second development wave, driven by expert systems, saw AI applications in domains like medical diagnosis. The 21st century witnessed AI's mainstream adoption, with deep learning achieving notable successes. Mari (2024) reviews AI's history across domains, including theorem proving, expert systems, neural networks, natural language processing, genetic algorithms, deep learning, reinforcement learning, super-intelligence, and future trends [2]. Sandfeld (2024) examines the synergy between human and machine civilizations from an information perspective [3]. In summary, AI's evolution encompasses technological progress and profound societal, cultural, and ethical impacts, poised to play a crucial role in future human development.

2.1.1. AI and language

Early programming languages, like machine languages, offered rapid execution but were challenging to write and inefficient. The advent of high-level languages such as Fortran, COBOL, and ALGOL simplified programming, resembling natural language. Programming languages act as a medium for human-computer communication. Natural language, with its rich vocabulary and complex grammar, contrasts with the structured, rule-bound nature of programming languages. Despite their distinct origins, technological progress has fostered their integration. Advances in natural language processing have improved computer understanding of human instructions, and programming language evolution has streamlined human-computer interaction. Future AI and machine learning breakthroughs are likely to further blur the lines between these languages, enhancing interaction efficiency.

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2.2. Artificial intelligence use in translation

The surge in AI technology has elevated machine translation as a key focus in translation studies. Originating in the U.S. in the 1940s for Cold War intelligence, machine translation officially began with Georgetown University and IBM's 1954 experiment. Ward (1989) traced its evolution from rule-based to example-based, statistical, and now neural machine translation, with recent deep learning breakthroughs significantly enhancing translation quality [4]. In China, despite a later start, rapid progress from rule-based to statistical methods has led to notable tools like Baidu Translate and Google Translate, sparking extensive scholarly comparisons between human and machine translation quality.

2.3. Human-machine translation quality

Translation quality evaluation, traditionally subjective and inefficient, is crucial in translation studies. Automated methods like BLEU, METEOR, and TER have emerged to improve efficiency and objectivity by comparing machine translations to reference texts. Recent research, such as Sinambela (2024) corpus-based study, highlights machine translation's challenges with specialized terminology and cultural adaptation, despite advances in accuracy and fluency [5]. This underscores the need for human assistance in complex translations. As machine translation technology advances, evaluation methods are becoming more automated and intelligent, leveraging big data and deep learning for enhanced accuracy. This evolution not only improves assessment tools but also provides feedback for refining machine translation, foreshadowing a future of more sophisticated, automated quality analysis in translation practice and research.

2.4. Artificial intelligence applied to political texts

Political text translation is a critical field in machine translation, as its quality directly impacts international communication and diplomatic relations. Scholars have been analyzing political text translation quality using the functional equivalence theory. Ye and Xu (2011) explored the "deformation and conservation of meaning" strategy in English translation of political public diplomacy, using Hu Jintao's speech as an example [6]. Afterward, the research focused on the translation of political text metaphors and was conducted in conjunction with artificial intelligence algorithms. The results indicated that this research plays a significant role in the translation of political text metaphors. Meanwhile, it emphasized the crucial significance of integrating cultural perspectives for accurate translation [7]. In other respects, the research compared the differences between AI translation and human translation in legal text translation, aiming to explore whether there are distinctions between the two and the quality of AI translation. By selecting professional translators and AI programs to translate legal texts and evaluating them based on five criteria - accuracy, competency, content, language, and style - the results showed that human translation has a slight edge in legal text translation, while AI translation has advantages in terms of speed and consistency. The research holds that the translation method should be chosen according to specific requirements and points out that although AI translation may progress in the future, professional human translators are still needed to ensure the quality of legal text translation for now [8]. Duan (2023) mainly focuses on the Chinese-English translation of political texts from the perspective of curriculum ideology and explores its application value in translation teaching. These studies provide a theoretical foundation and practical guidance for translation of political texts [9].

3. Methodology

This study compares the quality of human and machine translation in translating government documents using the *Outline Development Plan for the Guangdong-Hong Kong-Macau Greater* Bay *Area* as a case study. The research uses the official Chinese version of the Outline

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Development Plan and machine-translated versions generated by three language models: ChatGPT, Youdao Translate, and Google Translate. The methodology combines quantitative and qualitative approaches, analyzing representative paragraphs from the original text and focusing on vocabulary accuracy, discourse structure, and cultural adaptability. The study also analyzes the advantages and disadvantages of human and machine translation in each dimension, and proposes future improvements based on these differences.

4. Case analysis

4.1. Characteristics of Target Texts

Government documents, as important documents issued by the government, possess a high degree of rigor and authority. These characteristics pose the following challenges for translation:

Firstly, the language used in government documents is often carefully selected, with each word carrying specific semantics and intent. Translators must ensure the accuracy and rigor of the translation, avoiding ambiguity or misunderstanding. For example, key terms such as "strategic positioning", "development goals" and "key tasks" that frequently appear in the *Outline Development Plan for the Guangdong-Hong Kong-Macau Greater Bay Area* require translators to accurately grasp their meanings and provide precise equivalents in the translation. Additionally, government documents typically have a strict structure and clear logic, with closely linked sections. Translators need to maintain the logical structure of the original text, ensuring that the translation is coherent and the argument is clear. For instance, content related to regional development positioning, spatial layout, and cooperation priorities in the *Outline Development Plan for the Guangdong-Hong Kong-Macau Greater Bay Area* requires careful analysis by translators and reasonable organization in the translation.

The language of government documents is usually formal and standardized, in line with the language style of official documents. Translators should use standardized translation language, avoiding colloquial or slang expressions. For example, professional terms such as "regional cooperation," "innovative development", and "institutional mechanism reform" used in the *Outline Development Plan for the Guangdong-Hong Kong-Macau Greater Bay Area* require accurate translation and consistent use of terminology.

Guangdong, Hong Kong, and Macau have different historical, cultural, and linguistic backgrounds, which translators need to consider and make appropriate adjustments and transformations. For example, place names, institutional names, and proper nouns that appear in the original text need to be translated according to the cultural background of the target audience to avoid misunderstandings or confusion. This involves many professional terms in economics, finance, technology, and other fields, which require translators to ensure the accuracy and professionalism of the translation. For instance, professional terms such as "CEPA Agreement", "free trade zone" and "technology innovation corridor" require accurate translation and compliance with professional standards in relevant fields.

Finally, government documents may contain cultural imagery or expressions, and translators need to consider how to effectively convey these cultural images to the target audience. For example, concepts such as "Belt and Road" and "Pearl River Delta" that appear in the original text require appropriate explanation or clarification by translators to help the target audience understand their meanings.

4.2. Comparative Analysis of Machine Translation and Human Translation

4.2.1. Lexical Equivalence

This section presents the differences between machine translation and human translation in some commonly used words in political documents (see Table 1). In terms of specialized

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terminology, official translation typically employs more standardized and contextually appropriate terms. For instance, "粤港澳大湾区" is translated as "Guangdong-Hong Kong-Macao Greater Bay Area" in official translations, which not only preserves the precise meaning of the place names but also enhances the regional characteristics and development context of the translation. In contrast, machine translations like Google Translate may simplify or omit certain information, such as translating it to "Greater Bay Area", which appears concise but lacks necessary regional information, thereby reducing accuracy. Additionally, both official translation and Google Translate adopt accurate translation for specialized terms like "一带一路" (Belt and Road), "粤港澳大湾区" (Guangdong-Hong Kong-Macao Greater Bay Area), and "战略性新兴产业" (strategic emerging industries), reflecting the principle of functional equivalence. When discussing the term "科技创新" (technological innovation), the official translation may use "technological innovation", " emphasizing the close integration of technology and innovation. However, in machine translations such as Youdao Translate, it might be translated as "innovation in technology", which is notcorrect in literal terms but appears flat in tone, failing to fully convey the deeper meaning embedded in the phrase within political texts. Furthermore, specific policy terms like "区域合作" (regional cooperation) are clearly translated as "regional cooperation" in official translations, whereas machine translation versions may suffer from semantic ambiguity or inconsistency. For example, ChatGPT might use "cooperation in the region", making the translation more general and less professional.

Regarding vocabulary omission, Youdao Translate exhibits omission in some terms, such as translating "经济互补性强" (strong economic complementarity) to "strong economic complementarity", omitting "性(ness)". This omission can lead to a decrease in translation accuracy, for example, "经济发展水平" (economic development level) translated as "level of economic development" is less accurate than the official translation "economic development level", as it lacks the word "水平" (level), affecting the completeness and accuracy of the translation.

In terms of word addition, both official translations and Google Translate sometimes add words, such as translating "区位优势明显" (the location advantage is obvious) to "The location advantage is obvious", and "便捷高效的现代综合交通运输体系" (a modern comprehensive transportation system that is convenient and efficient) to "a modern comprehensive transportation system that is convenient and efficient." This addition can make the translation more fluent, but it may also introduce unnecessary words, affecting the conciseness of the translation.

Regarding word substitution, Google Translate sometimes substitutes words, such as translating "国际化水平领先" (the level of internationalization is leading) to "The level of internationalization is the lead." This substitution can alter the meaning of the translation, for example, "The level of internationalization is the lead." is unclear and far from the original meaning of "the level of internationalization is leading."

Research shows that the inadequacies of machine translation in handling specialized terminology often result in information confusion and misunderstanding [10]. Nida and Taber's (1982) theory of functional equivalence emphasize that the accuracy and appropriateness of vocabulary are crucial for conveying information, especially in the translation of government documents, where precise term selection is indispensable [11].

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Table 1: Human vs. Machine Translation on Specific Words from the lexical equivalence.

Aspect	Text	Official Translation	Machine Translation (e.g., Google Translate, Youdao Translate, ChatGPT)
Specialized Terminology	粤港澳大湾区	Guangdong-Hong Kong-Macao Greater Bay Area	Greater Bay Area
Depth of Terminological Meaning	科技创新	technological innovation	innovation in technology
Vocabulary Omission	经济发展水平	economic development level	level of economic development
Clarity of Policy Terminology	区域合作	regional cooperation	cooperation in the region
Word Substitution	国际化水平领先	the level of internationalization is leading	The level of internationalization is the lead

4.2.2. Pragmatic Equivalence

At the pragmatic level, translators must pay attention to the context of language use, the purpose of communication, and the needs of the audience. Human translators, through contextual understanding, can convey not only the literal meaning but also capture the pragmatic function of the text (see Table 2).

In terms of sentence structure, both official translations and Google Translate generally maintain consistency, adhering to the habits and norms of the target language. For example, "区位优势明显" is translated as "The location advantage is obvious", and "经济发展水平全国领先" as "The level of economic development is leading the country." However, Youdao Translate exhibits differences in some sentence structures, such as translating "便利高效的现代综合交通运输体系正在加速形成" as "a modern comprehensive transportation system that is convenient and efficient is accelerating its formation." These differences may result in a decrease in the fluency of the translation.

In terms of voice, both translations predominantly use the active voice, maintaining consistency in this regard. Nevertheless, Youdao Translate occasionally employs the passive voice in some sentences, for instance, translating "香港、澳门服务业高度发达" as "Hong Kong and Macao have highly developed service sectors." This difference may alter the tone of the translation. Additionally, both translations generally use a straightforward tone, consistent with the style of official documents. However, Youdao Translate sometimes uses a more colloquial expression, such as translating "便利高效的现代综合交通运输体系" as "a modern comprehensive transportation system that is convenient and efficient", which may reduce the formality of the translation.

Regarding discourse coherence, official translations and Google Translate excel in maintaining coherence, as evidenced by the clear logical relationship between sentences like "区位优势明显" and "经济发展水平全国领先." Conversely, Youdao Translate faces issues with discourse coherence, such as the lack of a clear logical connection between "香港、澳门服务业高度发达" and "珠三角九市已初步形成以战略性新兴产业为先导、先进制造业和现代服务业为主体的产业结构."

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According to study, the quality of translation is closely related to the adaptability of the content [12]. Effective translation should consider the background and cultural receptivity of the audience. Machine translation often struggles to maintain pragmatic consistency when dealing with complex contextual backgrounds, leading to misunderstandings and information loss, which is particularly evident in texts requiring strategic thinking and policy orientation.

Table 2: Human vs. Machine Translation on words and phrases from the pragmatic equivalence

Aspect	Text	Official Translation	Machine Translation (e.g., Google Translate, Youdao Translate, ChatGPT)
Pragmatic Level	《粤港澳大湾区发展规划纲要》	Translates context, purpose, and audience needs	May lack contextual understanding
Sentence Structure	区位优势明显，便利高效的现代综合交通运输体系	Maintains consistency with target language norms (e.g., "The location advantage is obvious").	May differ in structure (e.g., "a modern comprehensive transportation system that is convenient and efficient is accelerating its formation").
Voice	香港、澳门服务业高度发达	Predominantly uses active voice (e.g., "Hong Kong and Macao have highly developed service sectors").	Occasionally uses passive voice, altering tone.
Discourse Coherence	香港、澳门服务业高度发达"，"珠三角九市已初步形成以战略性新兴产业为先导、先进制造业和现代服务业为主体的产业结构.	Maintains clear logical relationships between sentences.	Lack of clear logical connection between "香港、澳门服务业高度发达" and "珠三角九市已初步形成以战略性新兴产业为先导、先进制造业和现代服务业为主体的产业结构"

4.2.3. Cultural Equivalence

Typically, the challenge of translation primarily lies in grasping cultural characteristics, customs, and implicit meanings, Table 3 presents the different versions of cultural-loaded words or phrases between human translation and machine translation. see Table 3.

Successful translation is not merely a conversion of literal meanings but a profound understanding of cultural connotations. Official translations excel in conveying the cultural colors of the language, for example, when mentioning the concept of "人文交流", the official translation renders it as "cultural exchanges", accurately conveying the significance and meaning of cultural integration. However, machine translations like ChatGPT's version may handle such expressions more simplistically, resulting in phrases like "exchange of culture." While this translation is understandable on a literal level, it fails to convey the importance of

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culture and interpersonal communication implied in the original text. Similarly, when referring to "合作共赢", the official translation uses "win-win cooperation", a phrase that is widely accepted in the target culture and rich in local color. Machine translation might render it as "cooperation that wins for all parties", which, though comprehensible, is verbose and lacks conciseness, thereby diminishing the expression's cultural impact and appeal.

The complexity of cultural translation lies in the differences between cultural symbols. For instance, the Chinese phrase "和为贵" is appropriately summarized by the official translation as "harmony is the most precious", successfully conveying this cultural value. Machine translation might simply render it as "valuing harmony", which, while conveying basic information, loses the deeper cultural background and emotional value.

Furthermore, official translations and Google Translate are relatively accurate in conveying the cultural connotations of the original text. For example, "一国两制" is translated as "one country, two systems" and "粤港澳大湾区" as "Guangdong-Hong Kong-Macao Greater Bay Area", both reflecting the cultural characteristics of the original text. However, Youdao Translate has some issues in conveying certain cultural connotations, such as translating "岭南文化" as "Lingnan culture", which, though similar in meaning, may not fully convey the rich connotations of the original text.

Both official translations and Google Translate are also cautious in handling culturally loaded terms, such as translating "龙舟" as "dragon boat racing" and "点心" as "dim sum." However, Youdao Translate has some problems in dealing with certain culturally loaded terms, such as translating "点心" as "light meal", which may not fully convey the cultural connotations of the original text. Due to differences in cultural background, some culturally loaded terms may require additional explanation. For example, "dim sum" may need an explanation of its meaning and background. Official translations and Google Translate do a better job in this regard, while Youdao Translate may have some shortcomings.

Official translations and Google Translate are relatively accurate in conveying the cultural values of the original text. For example, "打造世界级城市群" is translated as "Develop a world-class city cluster", and "提升居民生活质量" as "Raise the quality of living of residents", both reflecting the emphasis on economic development and the quality of life of the people conveyed in the original text. However, Youdao Translate may have some biases in conveying the cultural values of the original text.

Pym (2023) points out that effective translation also needs to consider the construction of bridges between cultures, and machine translation often appears rushed and lacks flexibility when handling these culture-specific words and phrases [13]. In the face of cross-cultural communication, machine translation, due to its lack of in-depth analysis of cultural connotations, can easily create barriers to understanding.

After a detailed analysis of the differences between official translations, Google Translate, and Youdao Translate in excerpts from the "Guangdong-Hong Kong-Macao Greater Bay Area Development Plan", we observe that while each of these three translation versions has its advantages, they also have some defects. Official translations and Google Translate are closer to the requirements of the function...le translation has obvious advantages in terms of efficiency and convenience, it still relies on the professional skills of human translation experts when handling more complex and culturally rich text translation tasks.

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Table 3: Human vs. Machine Translation on words and phrases from the lexical equivalence.

Aspect	Text	Official Translation	Machine Translation (e.g., Google Translate, Youdao Translate, ChatGPT)
Cultural Connotations	合作共赢	win-win cooperation	cooperation that wins for all parties
	人文交流	cultural exchanges	exchange of culture
Cultural Symbols	和为贵	harmony is the most precious	valuing harmony
Cultural Connotations Accuracy	一国两制	one country, two systems	one country, two systems
	粤港澳大湾区	Guangdong-Hong Kong-Macao Greater Bay Area	Greater Bay Area
	岭南文化	Lingnan culture	culture of Lingnan (May not fully convey rich connotations.)
Handling Culturally Loaded Terms	龙舟	dragon boat racing	dragon boat
	点心	dim sum	light meal (Youdao)
Cultural Values Conveyance	打造世界级城市群	Develop a world-class city cluster	Youdao Translate may have biases in conveying cultural values.
	提升居民生活质量	Raise the quality of living of residents	

5. Conclusion

This study compares the quality of human and machine translation in Chinese-English translation of government documents, using *the Guangdong-Hong Kong-Macao Greater Bay Area Development Plan Outline* as a case study. The current study analyzes these translation versions from vocabulary, pragmatics, and culture dimensions and reveals that official translations and Google Translate are more accurate and standardized in translating specialized terminology, while Youdao Translate has inaccuracies or omissions in some terms. Additionally, the official translation and Google Translate are more in line with the norms and language structure of the target language and are more accurate in conveying the cultural connotations and values of the original text. However, Youdao Translate has shortcomings in handling culturally loaded terms, leading to misunderstandings. The study suggests that machine translation should be optimized by strengthening specialized terminology databases, refining algorithms, conducting human review based on machine translation, enhancing translation professional training, and establishing a more scientific and objective translation quality assessment system.

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