

A Comparative Analysis of Translation Quality in Scientific and Technical Texts from the Perspective of Eco-Translatology

-- Taking Deep Seek Translation and Human Translation as Examples

Hairong Liao^{1,*}

¹College of Foreign Studies, Guilin University of Technology, Guilin 541000, Guangxi, China

*Corresponding author: Haiyong Liao (Email: 2536116288@qq.com)

Abstract: Based on the Three-Dimensional Transformation Theory (linguistic dimension, cultural dimension, and communicative dimension) of Eco-Translatology, this study conducts a comparative analysis of the quality differences between Deep Seek and human translations of scientific and technical texts. The research selects several scientific and technical articles from *The Economist* as objects of study and compares the two translation versions in terms of terminology accuracy, fluency, and cultural adaptability. The results indicate that Deep Seek demonstrates advantages in terminology accuracy and standardized text processing, but still falls short of human translation in handling cultural-loaded words and maintaining logical coherence. Furthermore, the study explores potential career pathways for foreign language learners in the AI era, providing valuable insights and suggestions for their professional development.

Keywords: Deep Seek, Eco-Translatology, human-machine translation comparison, human-machine collaboration, scientific and technical translation.

1. Introduction

The 21st century marks the era of artificial intelligence (AI). Wei Zhang [11] mentions that AI can execute language processing tasks (e.g., writing, summarization, translation) within seconds, posing significant challenges to foreign language learners and professional translators. Pessimistic utterances about AI replacing human translators have proliferated across media. In the New Year of 2025, Deep Seek emerged as a cutting-edge AI with advanced algorithms, superior interaction capabilities, and enhanced emotional analysis, outperforming most human translators in efficiency and accuracy. Zhonghua Lei [6] shows this AI has fueled debates such as “AI will soon replace interpreters,” “Studying foreign language is obsolete,” and “Translation is a declining profession.” Thus, can machine translation ultimately replace human translation entirely?

Moreover, with the rapid advancement of AI, AI (e.g., Deep Seek, Doubao) are increasingly applied to scientific and technical texts. However, these texts are characterized by high specialization, rigorous logic, and terminological density, demanding exceptional accuracy, standardization, and adaptability in translation. Gengshen Hu [4] points out that Eco-Translatology, grounded in the “adaptation/selection” paradigm, emphasizes translator-centredness to achieve a dynamic balance across linguistic, cultural, and communicative dimensions. Taking some of scientific and technical articles from *The Economist* as research subjects, this study investigates whether machines or humans better achieve this three-dimensional balance in scientific translation and explores the potential for human-machine collaboration in translation.

2. Eco-Translatology

Eco-Translatology emerged under the dual influence of global ecological trends and ancient Chinese ecological wisdom. First proposed in 2001 by Chinese scholar Gengshen Hu [4-5], it is defined as “translation studies from an ecological perspective or an ecology-oriented approach to translation studies”. At its core lies the “translation as Adaptation and Selection” theory, which posits that translation is a process wherein translators adapt to the translational eco-environment and make selective decisions. In subsequent research, Hu [4-5] introduced a series of key concepts that form the foundation of Eco-Translatology, including the translational eco-environment, adaptation and selection in translation, translator-centredness, and three-dimensional transformation. Below, let us elaborate on these central principles.

About translator-centeredness, it underscores the translator’s pivotal and leading role throughout the translation process. By positioning the translator as the central figure, this concept empowers them to oversee the entire workflow, enabling the creative production of target texts that can influence the culture and society of the receiving audience. Moreover, according to Gengshen Hu [4-5], this concept encourages translators to cultivate self-discipline, cultural literacy, and professional competence.

As for three-dimensional transformation, Gengshen Hu [4-5] says Eco-Translatology advocates a translation methodology termed “multi-dimensional adaptation and adaptive selection,” briefly summarized as “three-dimensional transformation.” This refers to adaptive transformation from the linguistic dimension, adaptive transformation from the cultural dimension, and adaptive transformation from the communicative dimension. In other

words, translators must adjust their strategies based on language-specific features, cultural contexts, and communicative purposes. For instance, adaptive transformation from the cultural dimension demands translators pay attention to terminological precision, syntactic conformity, and textual coherence, requiring translators to align the target text with the grammatical structures, stylistic norms, and formal conventions of the destination language to eliminate translationese. Adaptive transformation from the cultural dimension necessitates translators know the sensitive handling of culture-loaded terms and effective cross-cultural message transfer. Adaptive transformation from the communicative dimension focuses on ensuring the translated text resonates with the cognitive expectations of the target audience to facilitate meaningful communication.

3. A Comparative Analysis of Deep Seek vs. Human Translation in Scientific and Technical Texts from the Perspective of Eco-Translatology

3.1. Characteristics and Translation Principles of Scientific and Technical Texts

Hongwei Chen & Yadan Li[1] tell us that scientific and technical texts are a distinct genre shaped by advancements in science and technology, encompassing specialized literature across various disciplines, including technical monographs, scientific reports, and popular science readings. The stylistic features of scientific texts differ markedly from other genres in terms of lexicon, syntax, and discourse. Lexically, both Chinese and English scientific texts employ standardized, rigorous terminology with extensive use of specialized and semi-specialized vocabulary, ensuring objectivity. Syntactically, scientific English favors complex sentences, passive voice, nominalizations (particularly noun-based structures), and prevalent use of present and future tenses. To sum up, Yonglin Fu and Yueqin Tang [3] believes scientific and technical texts feature clarity, objectivity, logical rigor, conceptual precision, and coherence.

As language serves communicative purposes, the function of scientific and technological texts is the same, which is used to transmit and exchange technical information. Based on these characteristics, Yonglin Fu and Yueqin Tang [3] propose three core translation principles for scientific and technical texts: accuracy, fluency, and terminological standardization. Accuracy requires the target text to faithfully reproduce the source content without mistakes aligning with the objective nature of scientific texts. This principle corresponds to the linguistic dimension of Eco-Translatology. Fluency demands natural expression in the target language, adhering to its grammatical norms and avoiding ambiguity. This aligns with the communicative and cultural dimensions of Eco-Translatology. Terminological Standardization mandates the use of established domain-specific terminology in the target language, ensuring professional conformity. Collectively, these principles are highly consistent with the three-dimensional transformation of Eco-Translatology.

3.2. A Comparative Analysis of Human and Machine Translation

3.2.1. Terminology Translation Comparison

Yonglin Fu and Yueqin Tang [3] show that the lexicon of English scientific and technical texts generally comprises

three categories. The first category consists of common English words that have acquired specialized meanings. For instance, the word “channel,” whose basic meanings are “strait” or “pipe,” assumes a different meaning in technical contexts; in electrical engineering, “conducting channel” refers to an electrical circuit. The second category includes purely technical terms with narrow application scopes and precise definitions. The third category involves the specialization of common nouns that retain their general meanings while also possessing domain-specific interpretations. Adaptive transformation from the linguistic dimension of Eco-Translatology requires translators to ensure terminological accuracy and standardization. As Fu Yonglin and Tang Yueqin [3] emphasize, scientific translation must adhere to the principles of “accuracy” and “terminology standardization.”

Example1: The company jumped into China’s crowded **EV market** in March with its **debut models** the **SU7、SU7 Pro and SU7 Max**, which was one of the most widely watched business shifts by a Chinese tech company.

Human	translation:
小米于今年3月进军中国竞争激烈的 电动汽车市场 ，推出了 首款电动车型--SU7、SU7 Pro和SU7 Max ，这一举动被认为是中国科技公司最受关注的商业转型之一。	

Deep	Seek	translation:
这家公司于今年3月高调进军中国竞争激烈的 新能源汽车市场 ，推出 首款车型 SU7、SU7 Pro和SU7 Max系列 ，成为中国科技企业最受瞩目的业务转型案例之一。		

Analysis: Example 1 contains two specialized terms: “EV market” and “SU7, SU7 Pro, and SU7 Max” along with “debut models,” a common term with domain-specific meaning. Regarding “EV market,” human translation rendered it as “电动汽车市场,” while Deep Seek translated it as “新能源汽车市场.” In fact, EV (Electric Vehicle) specifically denotes electric-powered vehicles, whereas “new energy vehicle” constitutes a broader category including Battery Electric Vehicles, Plug-in Hybrids Electric Vehicles, and Hydrogen Fuel Cell vehicles. In terms of terminological precision, the human translation demonstrates closer semantic in line with the original text, while Deep Seek’s broader interpretation sacrifices terminological accuracy. For the vehicle model designations “SU7, SU7 Pro, and SU7 Max,” both translation versions maintain the original nomenclature, satisfying the primary requirements of scientific translation (accuracy and standardization) as well as adaptive transformation from the linguistic dimension. As for the term “debut models,” its literal meaning refer to “first models,” but its contextual reference was to the inaugural release of these three specific vehicles. The human translator adds the qualifier “电动” to maintain terminological accuracy, whereas Deep Seek use its literal meaning. This contextual adaptation in the human translation demonstrates superior adherence to professional translation standards and terminological precision.

Example2: The researchers then checked to see which genes were especially active in the **enamel-producing cells**. **Tooth enamel** is made mostly of **calcium phosphate**, and genes that code for proteins designed to bind to calcium were particularly busy. They also assessed another type of cell called **odontoblasts**. These express genes that produce

dentine, another type of hard tissue that lies beneath the outer enamel.

Human translation: 随后, 研究人员检查并确定了哪些基因在产生**牙釉质的细胞**中特别活跃。**牙釉质**主要是由**钙磷酸盐**构成的, 而那些等同于与钙结合的蛋白质遗传密码的基因最是活跃。他们还评估了另一种细胞, 即**成牙本质细胞**。这些细胞显化产生牙本质的基因。牙本质则是位于外牙釉质下面的另一种坚硬组织。

Deep Seek translation: 随后, 研究人员重点检测了**釉质生成细胞**中活性尤为突出的基因。由于**牙釉质**主要由**磷酸钙**构成, 那些编码钙结合蛋白的基因表现出高度活跃性。研究团队还分析了另一种**成牙本质细胞**, 这类细胞表达的基因能生成牙本质——这是位于外层釉质下方的另一种坚硬组织。

Analysis: The professional terms contained in Example 2 are “enamel-producing cells,” “tooth enamel,” “calcium phosphate,” and “odontoblasts.” First, regarding the translation of “enamel-producing cells,” the human translator translate it as “牙釉质的细胞”; Deep Seek translates it as “釉质生成细胞.” Judging from the context, the article is discussing topics related to “teeth.” The human translation has clearly indicated that they are cells of “tooth” enamel, not enamel of other parts; while Deep Seek’s translation is relatively vague and not very precise. Therefore, in terms of the translation of this term, the human translation is slightly better. Secondly, regarding “odontoblasts,” human translator translate it as “成牙本质细胞,” which is a correct and standardized translation, conforming to the terminology standards of stomatology. Deep Seek translates it as “成牙本质细胞,” which is also a correct and standardized translation. Both are correct, but the standard Chinese translation of this term belong to “成牙本质细胞” (“牙本质” is a standardized term and a colloquial expression; “牙本质” is more commonly used in the medical field). Therefore, “成牙本质细胞” is more rigorous in professional contexts, and in this case, Deep Seek’s translation is better.

Example 3: The fossil—dated to about 125m years ago, during **the Cretaceous period**—was formed when a flow of boiling volcanic mud engulfed two animals seemingly locked in mortal combat. The one on top is a **ferret**-like mammal known as **Repenomamus robustus**. The animal below is a herbivorous relative of Triceratops known as **Psittacosaurus lujiatunensis**. Animal interactions such as this are exceptionally rare in the fossil record.

Human translation: 这块化石大约是 1.25 亿年前的**白垩纪时期**形成的。两只爬兽当时似乎深陷生死搏斗, 突然之间一股沸腾的火山泥流将二者吞没, 由此形成了化石。化石上方是一只类似**雪貂**的哺乳动物, 又名**硕爬兽**; 下方则是食草三角龙的近亲, 即**鹦鹉嘴龙**。这样的动物“交流”在化石记载中极为罕见。

Deep Seek translation: 这块距今约1.25亿年 (**白垩纪时期**) 的化石, 记录了两只动物在殊死搏斗时被沸腾火山泥流吞没的瞬间。上方是一种类似**鼬鼠**的哺乳动物——**强壮爬兽**, 下方则是**鹦鹉嘴龙**, 这种植食性恐龙与三角龙有亲缘关系。此类动物互动场景在化石记录中极为罕见。

Analysis: The professional terms contained in the original text of Example 3 are “the Cretaceous period,”

“Repenomamus robustus,” “Psittacosaurus lujiatunensis,” and “ferret”. First, “the Cretaceous period” refers to the last period of the Mesozoic Era. Both human and machine translations are accurate and professional. Secondly, “Repenomamus robustus” is a Latin term, meaning “硕爬兽.” It belongs to the Gobi saber-toothed cat family of mammals, with a body size similar to that of an opossum or badger, and is now extinct. The human translator translate it as “硕爬兽,” which is accurate and concise, while Deep Seek literally translates this professional term, which is less professional and standardized, thus inferior to the human translation. In addition, “Psittacosaurus lujiatunensis” is also a Latin term, referring to the genus Psittacosaurus, also known as parrot lizards, which belong to the Psittacosauridae family of Ceratopsia. This species lived in Asia during the Early Cretaceous, approximately 130 million to 100 million years ago. Both the human and machine translations are standardized and correct. Finally, according to the Oxford Dictionary, “ferret” (雪貂) refers to a slender-bodied animal used for hunting rabbits, catching mice, etc. Compared with Deep Seek’s translation of “鼬鼠,” the human translation is more in line with the principles of scientific and technological text translation and the requirements of the language conversion dimension in Eco-Translatology.

3.2.2. Comparison of Fluency

Jiaqi Liu [10] points out that English scientific and technical texts contain a large number of long and complex sentences. If literal translation is adopted, it will not conform to Chinese expression habits, resulting in translations with translationese. In such cases, adaptive transformation from the communicative dimension of Eco-Translatology suggests that translators can adjust according to the expressive habits of English and Chinese to ensure that the translation caters for the cognitive habits of target readers, thereby achieving effective information transmission and communication. Meanwhile, “fluency” is also one of the principles for translating scientific and technological texts. This requires the translation to be clear and easy to understand, conform to the expressive habits of the target language, and avoid translationese.

Example 1: Faced with the eye-watering costs of training and running more powerful models, for instance, **OpenAI is not yet training its next big model, GPT-5, but GPT-4.5 instead**, a more efficient version of its current leading product.

Human translation: 例如, 由于训练和运行更强大模型的成本惊人, OpenAI 尚未训练下一代大模型 GPT-5, 而只在训练 GPT-4.5, 这是其当前拳头产品的高效版。

Deep Seek translation: 面对训练和运行更强大模型所需的惊人成本, 例如Open AI目前并未开发下一代大型模型GPT-5, 而是转向研发GPT-4.5——这个基于当前旗舰产品改良的高效版本。

Analysis: The main clause of the original text is that “...OpenAI is not yet training its next big model, GPT-5, but GPT-4.5...,” which contains three key information: ① the reason (high training costs); ② the contrast (not developing GPT-5, but GPT-4.5); ③ the definition of GPT-4.5 (a high-efficiency version of its current flagship product). The human-translated version conforms to the Chinese expression habit of “cause precedes effect.” It explicitly introduces the cost issue with “由于” (due to), ensuring clear logic.

Meanwhile, the latter sentence, “这是其当前拳头产品的高效版,” uses “这” (this) to refer to GPT-4.5, achieving a natural coherence. Many short sentences used accords with the “parataxis” feature of Chinese. Overall, human-translated version has a prominent subject, clear causal relationship, and natural semantic cohesion. In contrast, Deep Seek’s translation fails to clarify the causal relationship, appears unnatural, and involves word-for-word translation with a strong translationese. Therefore, in terms of overall fluency, the human translation better complies with the “fluency” principle of scientific and technological translation and the requirements of adaptive transformation from the communicative dimension.

Example 2: **The first to be discovered**, more than 100 years ago, **was mercury**—though it only becomes a superconductor when chilled to within a few degrees of absolute zero, or -273°C , the coldest temperature possible.

Human translation: 第一个被发现超导材料的是水银，那是在 100 多年前——尽管它只有在被冷却到离绝对零度（即零下 273 摄氏度，也是最冷的温度）只有几度的时候才会变成超导体。

Deep Seek translation: 最早在 100 多年前被发现的是汞（水银）——尽管它只有在冷却至接近绝对零度（约 -273°C ，即可能达到的最低温度）几度范围内时才会转变为超导体。

Analysis: The main clause of the original text is that “the first to be discovered was mercury,” which contains three important information: ① the core fact (mercury was the first superconductor discovered over 100 years ago); ② the conditional (it becomes a superconductor only at extremely low temperatures); ③ supplementary explanation of “absolute zero” (-273°C , the lowest temperature). The human-translated version conforms to the Chinese habit of “stating the main body first and then supplementing the time.” Secondly, the explanation of “absolute zero” is layered with “即” and “也是,” which accords with the Chinese expression logic of “defining a proper noun first and then supplementing its attributes.” In this way, semantic cohesion can be clear. However, Deep Seek’s translation does not conform to such Chinese expression habits and even omits the important information of “the first.” Therefore, in terms of overall fluency, the human-translated version better complies with the “fluency” principle of scientific and technological translation and the requirements of adaptive transformation from the communicative dimension.

Example 3: That dinosaurs ate the mammals that scurried beneath their feet is not in doubt. **Now an extraordinary fossil newly described in Scientific Reports, unearthed by a team led by Gang Han at Hainan Vocational University of Science and Technology in China, shows that sometimes the tables were turned.**

Human translation: 将急于逃窜的哺乳动物按在脚下大快朵颐毫无疑问是恐龙的惯习。不过，海南科技职业大学韩刚领导的团队最近发表在《科学报告》上的文章显示，一块新出土的令人惊叹的化石表明，恐龙也曾是哺乳动物的捕食对象。

Deep Seek translation: 恐龙曾以在其脚下奔走的哺乳动物为食，这一点毋庸置疑。然而，由中国海南科技职业大学韩刚团队发掘并最新发表在《科学报告》上的一项非凡化石研究表明，有

时强弱之势也会发生逆转。

Analysis: The main clause of this long and complex sentence is “an extraordinary fossil shows that sometimes the tables were turned,” which contains three information: ① the subject (an extraordinary fossil); ② background information (discovered by Han Gang’s team and newly published in *Science and Technology*); ③ the significance of the fossil. As noted by Yonglin Fu and Yueqin Tang [3], Chinese tends to place secondary information first and important content later. The background information in this long sentence is secondary. Both the human translation and Deep Seek’s translation follow this expression habit. However, in handling the main content, the human-translated version is more accessible than Deep Seek’s. This is because the human-translated version directly clarifies that “dinosaurs were once prey to mammals,” concretizing the abstract phrase “the tables were turned” to convey a clear meaning, which is easier for non-professional readers to understand. Nevertheless, in terms of semantic fluency, the human-translated version is inferior to Deep Seek’s. The reason is that the human translation contains two nested structure “文章显示，一块化石表明,” which is slightly cumbersome. In summary, the human-translated version is more accessible and vivid, reducing the comprehension barrier through concrete expression and thus being suitable for general readers, though it lacks a certain degree of fluency. Deep Seek’s translation is more fluent but less concise.

3.2.3. Comparison of Cultural Dimension

Fengqi Li’s research [7] indicates that while scientific and technical texts rarely contain numerous cultural-loaded words, limited available cases still demonstrate the superiority of human translation over machine translation. This advantage stems from human translators’ exerting subjective initiative during the translation process. It is an ability that machines do not possess. Meanwhile, Eco-Translatology emphasizes translator-centeredness, advocating for translator dominance throughout the entire translation process. In other words, Eco-Translatology fundamentally asserts that translators possess subjective initiative. The following two examples will further substantiate this comparative analysis.

Example 1:

赞刺者，直入直出，数发针而浅之出血，是谓治痈肿也。

Human translation: The twelfth kind is called **the repeated-shallow-puncture** of which the thrusting and lifting of needle are perpendicular, and the pricking is swift and shallow to treat the carbuncle and swelling.

Deep Seek translation: The technique of **“Zan Ci”** involves inserting the needle straight and withdrawing it straight, applying multiple shallow punctures to induce bleeding. This is known as the treatment for abscesses and swellings.

Example 2: 我们现在所说的指南针是个总的名称，在各个不同的历史发展时期，它有不同的形体，也有不同的名称，如**司南、指南鱼和指南针**。

Human translation: The term “compass” in this article includes all the various models in different historical periods, among which there are **the sinan (south-pointing ladle), the zhinanyu (south-pointing fish) and the zhinanzhen (south-pointing needle).** (*Ancient China’s Technology and Science*)

Deep Seek translation: The compass, as we know it today, is an umbrella term. Throughout different historical periods, it took on various forms and names, such as **the Sinan (ancient south-pointing ladle), the south-**

pointing fish, and the magnetic needle compass.

Analysis: “赞刺” In Example 1 refer to a method in traditional Chinese medicine that involves treating boils and abscesses by needling specific acupoints. When a Chinese medical practitioner treats a patient with this method, the silver needle is inserted shallowly and withdrawn quickly. This term belongs to a cultural-loaded word within China’s unique traditional medical culture. The human translator translates it as “the repeated-shallow-puncture,” which should have been a full understanding of the process of the method. This interpretation can eliminate cultural barriers and enable foreign readers to better understand China’s traditional medical culture. This is an embodiment of exerting subjective initiative of human translators. However, Deep Seek simply translate the Chinese character by transliteration. It will only make most foreign readers more confused. That is because transliteration retains the Chinese pinyin, but most foreign readers are not familiar with Chinese pinyin. In Example 2, “司南” “司南鱼” and “指南针” are terms referring to “the compass.” These names were simply given different names at different time. Three Chinese characters also belong to cultural-loaded words. Human translators retain Chinese culture through transliteration to the greatest extent. However, most foreign readers are not familiar with Chinese pinyin, so human translators exert their subjective initiative and add annotations later. transliteration combined with annotations can better restore the meaning of cultural-loaded words and facilitate foreign readers’ understanding. Deep Seek lacks this awareness. In summary, in the cultural dimension, human translators better retains the cultural information of the original word. The reason for this is that humans have self-awareness and possess subjective initiative. This reason also provides evidence for the assertion that “machine translation ultimately cannot completely replace human translation.”

In conclusion, in translation of scientific and technical texts, Deep Seek has deficiencies in the adaptive transformation in the communicative dimension and the cultural dimension. However, due to its powerful corpus and engine search capabilities, Deep Seek has certain advantages in the adaptive transformation in the linguistic dimension. While humans are more adept at flexibly adjusting strategies and faithfully translating the original text based on context. However, this study found during the comparative analysis that human translators also make mistakes similar to those of AI, or even worse.

4. Implications and Recommendations

With the rapid advancement of artificial intelligence, machine translation has become widely adopted in the translation industry. Indeed, the prospects of learning a foreign language may seem uncertain. In this era, how can students of foreign languages, and professional translators secure their future? According to prior research (such as Zhang[11]; Zheng and Pan[12]; Li and Qi, [8]), human-machine collaboration is the solution and will inevitably become the dominant trend in translation industry. Since it is inevitable, we must adapt and keep pace with the times. Additionally, Eco-Translatology reminds us to maintain translator-centeredness. In other words, to follow people-oriented principles is to avoid being led astray by machines.

4.1. Upholding Translator-Centeredness

First of all, in an increasingly intelligent era, Wei Zhang[4]

shows that it is even more important to attach importance to the dominant role of humans in social development and human’s subjective initiative. Only in this way can humans avoid being eliminated by society and completely replaced by machines invented by humans. Secondly, although AI has been widely applied in the field of translation, language contains rich cultural, emotional and contextual connotations, and these complex factors are difficult for machines to fully understand. By virtue of their in-depth understanding of both the source language and the target language, translators can convey these subtle differences more accurately, ensuring that the translation is not only faithful to the original text but also conforms to the local cultural background and avoiding misunderstandings. In addition, AI usually works according to fixed rules and patterns formulated by humans. Human translators can exert their own subjective initiative to flexibly handle texts according to specific situations. Especially in fields such as literature and poetry, where creativity is indispensable, translators can better convey the style and emotions of the original works. Finally, AI may produce errors or inaccurate expressions, especially when dealing with texts rich in cultural information. Translators, however, can proofread translations to ensure their accuracy and fluency, and provide high-quality translations. In a word, although AI shows great potential in the field of translation, the role of translators is irreplaceable. Adhering to the principle of “translator-centeredness” can ensure more accurate translations and higher-quality outputs. Moreover, “translator-centeredness” does not mean denying the role of AI. Instead, we emphasize a collaboration between humans and AI. Translators can use AI to improve efficiency while exerting their own advantages to ensure translation quality.

4.2. Establishing a Human-Machine Collaboration Model

To construct a human-machine collaboration model in the translation industry, it is necessary to deeply integrate the advantages of artificial intelligence and human translators, achieving a balance between efficiency and quality. First, at the technical level, technicians need to develop artificial intelligence with capabilities in context understanding, terminology management, and style adaptation. For example, neural machine translation (NMT) can efficiently process large-scale texts and provide preliminary translations for human translators. Second, at the process level, human-machine collaborative work is required, such as the “machine translation + post-editing” model. In this model, machines complete the first draft, and human translators polish and proofread it to ensure the authenticity and professionalism of the language. In addition, at the cognitive level, translators need to adapt to the role transformation in collaboration with AI, focusing on areas that are difficult for machines to replace, such as cultural adaptation and creative expression. For instance, tools like DeepL and Deep Seek have been widely used in professional translation, significantly improving translation efficiency, most translators adopt the human-machine collaboration model, which has greatly enhanced their work efficiency. In the future, with the iteration of AI technology, human-machine collaboration will drive the translation industry toward intelligence and refinement, enabling a higher level of cross-lingual communication.

5. Conclusion

In the translation of scientific and technological texts, although Deep Seek has certain advantages in the linguistic dimension, it has obvious deficiencies in the adaptive transformation of the communicative and cultural dimensions. Human translators, relying on their subjective initiative, is more capable of achieving a dynamic balance among the three dimensions. Yet it is not flawless either. It is thus evident that machines can hardly completely replace humans, and human-machine collaboration is the right path. We adhering to translator-centeredness and integrate the advantages of both human and AI. The human-machine collaborative model can promote the high-quality development of the translation industry. In the future, the human-machine collaborative model is likely to become the mainstream direction of the translation industry.

References

- [1] Hongwei Chen and Yadan Li. *A Course in Chinese-English Translation* (Book style). Shanghai: Shanghai Foreign Language Education Press, 2018, p. 207.
- [2] Shuang Dong. “Research on Scientific Text Translation Under Functional Equivalence Theory: A Case Study Comparing Google Translate and Human Translation” (Periodical style). *Brand*, no. 02, p. 128, 2015.
- [3] Yonglin Fu and Yueqin Tang. *Science and Technology Translation* (Book style). Beijing: Foreign Language Teaching and Research Press, 2011, pp. 2–30, 112.
- [4] Gengshen Hu. “Viewing Translation Theory Through Terminology: An Overview of the Adaptation and Selection Approach to Translation” (Periodical style). *Shanghai Journal of Translators*, no. 02, pp. 1–5, 2008.
- [5] Gengshen Hu. “Research Focus and Theoretical Perspectives of Eco-Translatology” (Periodical style). *Chinese Translators Journal*, vol. 32, no. 02, pp. 5–9, 95, 2011.
- [6] Zhonghua Lei. “A New Wave of Challenges Facing Translation Programs and Countermeasures”. Beijing: Beijing Language and Culture University, 2025. [Online]. Available: <https://mp.weixin.qq.com/s/SGZoHQF5IFfC70vNAZwcgw>
- [7] Fengqi Li. “A Comparative Study on Machine vs. Human Translation Quality in English-Chinese Translation in the Era of Artificial Intelligence” (Periodical style). *Foreign Language World*, no. 04, pp. 72–79, 2022.
- [8] Yan Li and Xinyuan Qi. “Transformation and Innovative Development Paths of the Translation Industry Under Human-Machine Collaboration” (Periodical style). *Technology Enhanced Foreign Language Education*, no. 02, pp. 31–36, 46, 101, 2025.
- [9] Junying Liang and Yiguang Liu. “The Advantage of Human Intelligence in Translation Competence: A Corpus-Based Comparative Study of Human and Machine Translation” (Periodical style). *Foreign Languages and Their Teaching*, no. 03, pp. 74–84, 147–148, 2023.
- [10] Jiaqi Liu. “Key Points in Translating Scientific Texts on Automotive Part Casting: An English-Chinese Perspective” (Periodical style). *Special Casting & Nonferrous Alloys*, vol. 43, no. 03, pp. 438–439, 2023.
- [11] Wei Zhang. “Challenges and Prospects for Translation Programs in the AI Era: Analysis Based on a Large-Scale Social Survey” (Periodical style). *Chinese Translators Journal*, vol. 45, no. 05, pp. 139–148, 2024.
- [12] Guofeng Zheng and Xi Pan. “Terminology Machine Translation in the Era of Artificial Intelligence: Challenges and Prospects” (Periodical style). *Foreign Languages in China*, vol. 22, no. 04, pp. 96–104, 2025.