Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index

OPEN ACCESS Article

Human and Machine Collaboration in Translation: A Systematic Review of Emerging Practices

https://doi.org/10.31004/jele.v11i1.2093

*Alda Dea Andani, Jesika Bungaria Br Sinaga, Silvia Ramanda Putri, Refika Andriani [abcd]
[1234]English Language Education Program, Faculty of Vocation and Education, Universitas Lancang Kuning, Pekanbaru, Indonesia
Corresponding Author: aldadeaandani@gmail.com

A B S T R A C T

The rapid advancement of Artificial Intelligence (AI) has transformed translation from something primarily done by humans to something done by humans and computers working together to create meaning. This study aims to systematically analyze research on AI-Assisted Translation (AIAT) published from 2020 to 2025 to understand the linguistic, collaborative, and ethical dynamics influencing this profession. However, existing studies often emphasize technical accuracy and efficiency, while the integrated understanding of linguistic performance, human-AI collaboration, and ethical-cultural accountability remains limited. Using the PRISMA framework and the CASP checklist, twenty empirical studies were analyzed from the Crossref, Scopus, and Google Scholar databases. The findings revealed three dominant themes: improved linguistic performance through neural systems and large language models; the emergence of human-AI collaboration reshaping translators' cognitive and professional roles; and ethical concerns regarding bias, transparency, and cultural accountability. These findings indicate that AIAT should not only be understood as a technological innovation, but also as a sociolinguistic phenomenon that requires critical human involvement. This study concludes that effective translation in the digital age relies on the synergy between technological accuracy and human interpretive intelligence.

Keywords: *AI-Assisted Translation, Human–AI Collaboration, Translation Ethics, Linguistic Performance, Digital Translation Studies*

Article History:
Received 26th January 2026
Accepted 24th February 2026
Published 26th February 2026

INTRODUCTION

In recent years, the emergence of Artificial Intelligence (AI) has profoundly changed the landscape of translation, creating a dynamic fusion between language, human cognition, and technology. Traditionally, translation technologies were associated with Machine Translation (MT), which refers to fully automated translation systems that operate without direct human involvement. With technological advancement, Neural Machine Translation (NMT) emerged as a more advanced form of MT, employing neural network architectures to improve fluency and contextual accuracy. This rapid transformation has given rise to a new trend in which translation no longer relies solely on humans, but has increasingly shifted toward AI-Assisted Translation (AIAT), a collaborative paradigm in which intelligent systems support human translators while human judgment remains central to meaning-making. The emergence of NMT and Large Language Models (LLMs) as advanced technologies has set new benchmarks for accuracy and efficiency, enabling machines to produce translations that are remarkably similar to natural human fluency across various fields such as education, law, and media (Wang, 2024; Li, 2025). However, this evolution has highlighted significant concerns regarding cultural sensitivity, moral responsibility, and the evolving identity of translators as technology takes precedence over human influence in shaping linguistic meaning in a global context (Alghamdi & Alotaibi, 2025; Breskas et al., 2025). Yet existing studies still tend to prioritize linguistic accuracy and productivity, leaving the ethical, cultural, and identity-related dimensions of human-machine collaboration insufficiently integrated into a cohesive

framework. Recent research emphasizes that AI-assisted translation should not only be viewed as a technological breakthrough but also as a sociolinguistic phenomenon impacting professional education, human responsibility, and ethical standards in translation practice (Bowker, 2025; Fu, 2024).

In line with rapid digital changes, translation has evolved from a simple transfer of language codes to a complex cross-cultural negotiation, shaped by algorithms and data systems. These developments have transformed the construction, dissemination, and interpretation of meaning in cross-linguistic communication. Within this context, AI-assisted translation (AIAT) tools are increasingly being integrated into the routine activities of translators, editors, and instructors in professional settings. This integration has spurred new collaborative methods and driven changes in the understanding and assessment of translation abilities (Nguyen et al., 2025; Torres, 2023). The emergence of hybrid translation methodologies that integrate human skill with machine intelligence has prompted scholars to re-evaluate key concepts such as creativity, authorship, and ethical accountability in this era of automation (Alkhofi, 2025; David, 2025). Language teaching has also been influenced by this progress, with classrooms increasingly adopting AI as a cognitive collaborator. This approach allows students to develop digital literacy and critical thinking skills (Breskas et al., 2025). As a result, translation studies are evolving toward a more holistic framework that emphasizes linguistic accuracy alongside human values, cultural sensitivity, and ethical considerations in the collaborative meaning-making process between humans and intelligent technological systems.

A number of systematic studies have explored the application of artificial intelligence (AI)-supported translation technology in educational and professional settings; however, the scope of this research remains relatively limited. The article "Benefits and Challenges of AI Translation Tools in University-Level Translation Education" identifies eight key advantages and seven obstacles encountered in translator education, including issues such as over-reliance, accuracy limitations, and lack of training facilities (Nguyen et al., 2025). Recent research indicates that in the industrial and healthcare sectors, AI-assisted translation can improve operational efficiency; however, significant challenges remain, particularly with low-resource languages and texts containing complex cultural contexts (Fu, 2024; Li, 2025). Taken together, these finding show that existing discussions are largely organized around efficiency and pedagogical utility, leaving broader ethical, cultural, and identity related question within human-machine collaboration lee systematically addressed. (Bowker, 2025; Carpuat et al., 2025).

Although research on AI-Assisted Translation has increased significantly, the progress achieved is uneven across different language and cultural situations. In this study, an analysis of twenty empirical studies shows that most current research emphasizes post-editing performance and productivity rather than cultural, ethical, or educational factors. Empirical data shows that neural models like GPT-4 and DeepL outperform human performance in grammatical accuracy, but still struggle with idiomatic phrases, emotional nuances, and cultural subtleties (Fu, 2024; Torres, 2023). The gap between linguistic output and humanistic issues is exacerbated by data inequality, which impacts low-resource languages (Carpuat et al., 2025). In addition, research on translation education and ethics tends to be fragmented and rarely utilizes an interdisciplinary approach that integrates cognitive linguistics, sociotechnical analysis, and digital ethics (Breskas et al., 2025; Bowker, 2025). Recent research also highlights that algorithmic bias in AI-Assisted Translation often intersects with ethical representation and cultural pedagogy, requiring the development of more inclusive datasets and intercultural pedagogical frameworks that promote justice and equity in translation education and practice. These limitations of the current literature highlight the need for a more integrated framework that places AI-Assisted Translation within ethical, cognitive, and sociolinguistic contexts to ensure that the human component remains central in the process of automated meaning production.

This study positions itself in translation studies by offering an integrated perspective that connects translation performance with human-machine systems. it expands the

discussion by conceptualizing AI-assisted translation as a form of hybrid cognitive collaboration, distinguishing it from other studies that largely emphasize comparative efficiency and accuracy. Employing a multidisciplinary framework, integrating posthuman translation theory, to examine the interaction between human cognition and machine intelligence as a reflective partnership, rather than a purely mechanical process (David, 2025; Alkhofi, 2025). Unlike previous research that treated performance, collaboration, and ethics as separate components, this study synthesizes these elements into an integrated conceptual framework that reconceptualizes translation competence for the digital age. This approach addresses previously underexplored concerns, including human agency, cross-cultural responsibility, and strategies for reducing bias, while building a new theoretical framework that captures the simultaneous evolution of translators and intelligent systems (Carpuat et al., 2025; Bowker, 2025).

This research is significant because it attempts to provide an integrated and ethical paradigm for assessing the impact of AI on translators' professional practices and identities. By integrating linguistic, educational, and ethical factors, unlike previous assessments that focused solely on technical or linguistic elements, to provide a broader perspective on human-machine collaboration. It synthesizes recent findings from research published between 2020 and 2025 on how AI is transforming translation capabilities, professional assessment, and intercultural understanding. Accordingly, this research aims to achieve three main objectives: to investigate theoretical and practical advancements in AI-based translation, to identify methodological and conceptual shortcomings in current research, and to emphasize the reciprocal relationship between human and artificial intelligence in meaning construction (Nguyen et al., 2025; Breskas et al., 2025).

Rather than treating AI-Assisted Translation as a purely technical advancement, this study frames AI-Assisted Translation as a transformative approach that reconfigures the interaction between human translators and intelligent technology. By integrating empirical data, a cohesive framework is built that connects language performance, collaborative cognition, and ethical awareness. The study suggests that modern translation transcends quantitative methodologies, embodying an interpretive and ethical pursuit rooted in human reflection and empathy. As David (2025) and Alghamdi & Alotaibi (2025) have shown, the future of translation depends on how well technology and human intelligence can work together to add meaning, rather than replace human interpretation**.** Although translation is increasingly shape by system, and algorithm. It remains anchored in cultural understanding, ethical responsibility, and human values.

METHOD

Search Strategy

After conducting systematic search, relevant studies were identified and found. Keywords such as “AI-assisted translation,” “translation,” “human-AI collaboration,” and “ethical AI in translation” were used in the search. Specific constraints apply, such as focusing solely on peer-reviewed publications from 2020-2025. Eligible articles proceed through a detailed selection phase, starting with an assessment of their abstracts. The data pool includes 2,514 entries sourced from databases including Crossref (2,000 articles), Google Scholar (200 articles), and Scopus (314 articles). These chosen articles are then examined thoroughly, with a critical appraisal of their specifics and methods, particularly emphasizing core results and study implications. All inferences from the analyzed articles are compiled into a cohesive, organized summary, outlining primary takeaways, additional discoveries, conducted comparisons, and derived conclusions.

Study Selection

The search for databases is based off system like Crossref, Google Scholar, and Scopus. This approach targeted scientific publications that met academic community standards. Futhermore, a peeer reviewprocess was implemented to minimize potential bias. Keywors and

their synonyms are listed in Table. 1. these terms were selected based on their relevance to the research topic and their alignment with the research questions.

Table 1. Keyword of the search process

Keywords	Synonyms
AI Assisted Translation	"AI Assisted," "Technology Supported Translation," and "Hybird Translation".
AI Translation	" ChatGPT," "Gemini," "Human Machine;" and "Computer Translation".
Human–AI Collaboration	"Cognitive Human–AI Synergy," "Hybrid Translation" and "Human–AI Partnership".
Ethical AI in Translation	"AI-Driven Translation Ethics," "Intercultural Ethics in AI Translation, and " Human-Centered AI Translation Ethics"

Study Inclusion and Exclusion criteria

To ensure direct alignment with the research objectives, predefined inclusion and exclusion criteria were applied, as highlighted in Table 2. These criteria specified the publication time frame (2020-2025), language (English), full-text availability, and relevance to AI-Assisted Translation (AIAT).

Table 2. inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Peer-reviewes empirical studies	Non-empirical papers
Published 2020-2025.	Purely technical MT/NLP studies with no link to translation practice/education/ethics
Written in english	Not about AIAT/ not about human-machine collaboration
Full- text available	Studies outside 2020-2025
Focus on AI-Assisted Translation (AIAT) in translation practice/education (human-machine collaboration)	Non-English articles
Discusses at least one aspect: performance/post-editing, education, ethics/bias, or cultural/identity	No full-text acces
.	Duplicate articles.

Studies were retrieved from Google Scholar, Crossref, and Scopus. Keywords included "AI-assisted translation" OR AIAT OR "human–AI translation" OR "human–machine translation" OR ChatGPT, combined with "translation errors" OR "post-editing" OR "translation quality," and "ethics" OR bias OR "translator identity." One search string used was: ("AI-assisted translation" OR AIAT OR "human–AI translation" OR "human–machine translation" OR ChatGPT) AND ("translation errors" OR "post-editing" OR "translation quality") AND (ethics OR bias OR "translator identity").

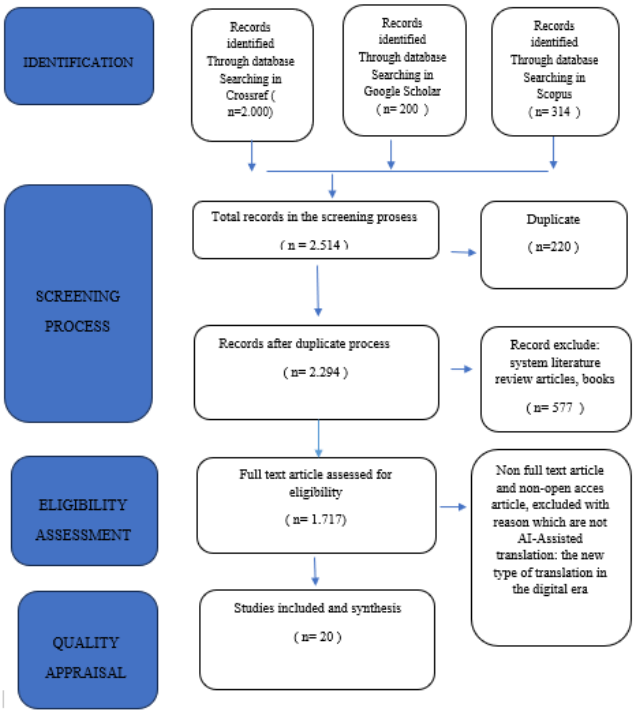

Figure 1. Prisma Flow Diagram

Following the database search, 2,514 records were identified from Crossref (n=2,000),Google Scholar (n=200), an Scopus (n=314). After removing duplicates (n=220), 2,294 records remained for screening. Titles and abstracts were screened first, and 577 records were excluded. The remaining 1,717 full-text articles were assessed for eligibility; 1,697 articles were exluded primarily due to lack of full text access and/or insufficient relevance to AI-Assisted Translation and human-machine collaboration. Ultimately, 20 studies met the criteria and were included in the synthesis.

Data Extraction

Data were extracted from the selected empirical studies using a standardized form. The following information was collected:

Study design and methodological approach.
Type of AI translation tool used (e.g., ChatGPT, DeepL, Google Translate, NMT).
Research focus, including performance evaluation, human–AI collaboration, ethics, and pedagogy.
Data sources and participant characteristics, where applicable.
Key findings related to translation accuracy, efficiency, ethical implications, and translator education.

Quality Assessment

This study used the Critical Appraisal Skills Program (CASP) checklist to ensure methodological rigor and credibility by evaluating the clarity, validity, and relevance of the research. Each of the 20 selected studies was assessed based on ten CASP domains, including research objectives, methodological appropriateness, sample size adequacy, data collection and analysis methods, bias reduction strategies, ethical considerations, validity of results, and overall contribution to AI-Assisted Translation (AIAT). Each domain was rated using a 10-point scoring system, where a score of 8–10 indicated high quality, 5–7 represented moderate quality, and below 5 denoted low quality and was therefore excluded.

The 20 chosen studies all underwent an evaluation of the ten domains in CASP, which consists of the research aim, appropriateness of the methodology, adequacy of the sample, collection and analysis of data, bias mitigation, ethics, validity of the result, and contribution to AI-Assisted Translation (AIAT). Each of the domains employed a scoring metric of 10 where 8 to 10 reflected high quality, 5 to 7 was moderate quality, and anything below 5 was considered poor quality and subsequently discarded.

The CASP framework was chosen because it is a structured and clear evaluation approach, reduces personal bias, and ensures quality is measured in the same way in both qualitative and quantitative research. CASP was chosen over other quality appraisal tools because it is practical and consistent for appraising heterogeneous empirical studies (qualitative,quantitative, and mixed-methods) in contrast, many alternative tools are designed specifically for intervention trials or for evaluating systematic review, which did not match most studies included in this review. This comprehensive evaluation makes the current review more reliable by demonstrating that the selected empirical studies provide a strong foundation for the thematic synthesis of findings on linguistic performance, human-AI collaboration, and ethical dimensions in AI-Assisted Translation research.

Data Synthesis

This study uses narrative and thematic synthesis methods to identify patterns, similarities, inconsistencies, and research gaps in 20 selected works on AI-Assisted Translation (AIAT). The synthesis process consists of three structured steps: thematic categorization of findings, comparative analysis, and integration of qualitative and quantitative data.
Thematic Classification: These studies are classified into key themes that emerge from the dataset, including translation performance and linguistic accuracy, collaboration between humans and AI and post-editing efficiency, and ethical and pedagogical considerations in translation education and practice. These categories illustrate how AI technology is complexly and

continuously reshaping translation competencies, translator identity, and cognitive decision-making processes.

Comparative Analysis: The findings were rigorously analyzed across a range of research contexts, encompassing professional and academic translation environments, human-generated in contrast to AI-generated outputs, and high-resource alongside low-resource language pairs. This comparison enables the recognition of methodological disparities, contextual differences, and varying viewpoints on AI application among translators, educators, and students. Careful examination of conflicting findings uncovered possible reasons for discrepancies in research design and evaluation criteria.

Integration of Qualitative and Quantitative Findings: The majority of studies employ qualitative approaches such as interviews, content analysis, or discourse analysis. However, several studies utilize quantitative methodologies, including BLEU scores, translation accuracy rates, post-editing duration, and user satisfaction measures. Integrating qualitative insights with quantitative evidence strengthens the synthesis by merging interpretive depth with measurable performance indicators.

To address heterogeneity, the synthesis employed a structured subgroup analysis to categorize findings by methodological focus, translation domain, and type of AI technology utilized (such as ChatGPT, DeepL, Google Translate, and other NMT systems). This approach ensured comprehensive representation of the field while acknowledging the diverse perspectives embedded within the examined studies. Overall, the synthesis constructed a coherent narrative demonstrating how AI-assisted translation research integrates linguistic, cognitive, and ethical dimensions into a unified understanding of human and machine collaboration.

Addressing Heterogeneity

This review manages methodological and contextual variations by categorizing studies based on the type of AI system used (e.g., ChatGPT, DeepL, Google Translate), field of research (education, professional practice, ethics), and language context (high-power versus low-power language pairs). The variations in study design and data types are analyzed using cross-validation of qualitative and quantitative results. This methodological technique ensures consistency in interpretation and enhances the reliability of the synthesis, facilitating a fair representation of the various perspectives in AI-assisted translation studies

FINDINGS AND DISCUSSION

the main findings of this study indicate that AI-based translation has undergone a shift from a structural approach to a collaborative model that integrates human and machine capabilities. Systems such as GPT-4, DeepL, and Gemini have been proven to enhance productivity, speed, and consistency in translation outcomes. However, these technical advantages are still unable to replace the human capacity to comprehend pragmatic and cultural contexts. Yan (2024) emphasizes that human intervention through post-editing processes remains essential to produce translations that are both semantically accurate and acceptable. Alghamdi and Alotaibi (2025) demonstrate that translators today act as active collaborators in evaluating and refining AI outputs, rather than merely serving as passive editors. This collaboration creates a balance between algorithmic precision and the interpretive sensitivity characteristic of human translators. From a functionalist perspective, these findings suggest that translation quality is defined not only by linguistic correctness but also by purpose, audience, and contextual appropriateness. This also aligns with posthuman views in translation studies, where translation is understood as distributed meaning-making within a human-technology assemblage rather than a purely human or purely mechanical act.

This section presents a list of articles that form the basis of a systematic analysis on AI-assisted translation. Rather than summarizing each study individual, the discussion synthesizes patterns across the literature and interprets them through translation-studies lenses to explain how AIAT reshapes translation quality, agency, and responsibility. A total of

20 articles published between 2020 and 2025 were selected according to their relevance to the themes of linguistic performance, human–machine collaboration, and ethical dimensions in digital translation. These articles encompass a range of international journals such as Translation Studies, Meta: Translators' Journal, and Frontiers in Artificial Intelligence, which discuss significant developments in neural-based translation technology and large language models. The data selection was carried out through a multi-stage screening process to ensure the accuracy and representativeness of the issues addressed. Accordingly, the following table illustrates the map of contemporary research that serves as the foundation for the discussion in the subsequent section

Table 3. Selected Studies on Ai-Assisted Translation

No	Author(S)	Title	Journal	Year
1	Abdelhalim, S. M., Alsahil, A. A., & Alsuhaibani, Z. A.	Artificial intelligence tools and literary translation: a comparative investigation of ChatGPT and Google Translate from novice and advanced EFL student translators' perspectives	*Cogent Arts & Humanities*	2025
2	AlAfnan, M. A.	Large Language Models as Compulational Linguistics Tools: A comparative Analysis of ChatGPT and Google Machine Translations	*Journal of artificial and Technology*	2024
3	Alghamdi, F. A., & Alotaibi, H.	Using AI in Translation Quality Assessment: A Case Study of ChatGPT and Legal Translation Texts	*Electronics*	2025
4	Alharbi, M. A.	Navigating AI- Driven Translation in Saudi Arabia's Media: Challenges and Opportunities	*Arabic Journal for Translation Studies*	2025
5	Al-Salman, S., & Haider, A. S.	Assessing the accuracy of MT and AI tools in translating humanities or social sciences Arabic research titles into English: Evidence from Google Translate, Gemini, and ChatGPT	*International Journal of Data and Network Science*	2024
6	Atarchi, K., Elamari, A. & Marouane, M.	The Role of Artificial Inteligence Translation Tools in Academic Translation: Faculties of Pure Sciences as a Case Study	*International Journal of Translatiaon and Interpretation Studies*	2024
7	Bekkum, M. van, Boer, M. de, van Harmelen, F., Meyer-Vitali, A., & ten Teije, A.	Modular design patterns for hybrid learning and reasoning systems	*Applied Inteligence*	2021
8	Breskas, A., Hansen-Schirra, S., Kapnas, D., & Johannes.	AI and digital literacy in translation competence development	*SKASE Journal of Translation and Interpretation*	2025
9	Fu, L.	What are The differences? A comparative study of generative artificial inteligence translation and human translation of scientific texts	*Humanities & Sciences Communications*	2024
10	Haider, A. S., & Alkhatib, R.	Subtitling English Legal Acronyms into Arabic: Human vs Machine	*Kutafin Law Review*	2024
11	Li, X.	An Empirical Analysis of Neural Network Machine Translation and Human Translation	*Journal of Artificial Inteligence Practice*	2025
12	Lu, Y.	Comparative study of machine translation versus human translation	*Lecture Notes on Language and Literature*	2024
13	Moneus, A. M., & Sahari, Y.	Artificial inteligence and human translation: A contrastive studybased on legal texts	*Heliyon*	2024
14	Nguyen et al	The Benefits and Challenges of AI Translation Tools in Translation	*International Journal of*	2025

		Education at the Tertiary Level: A Systematic Review	*TESOL & Education*	
15	Ouyang, L., et al.	Training language models to follow instructions with human feedback	*Conference on Neural Information Processing Systems*	2022
16	Sadiq, S.	Evaluating the Translation of Egyptian Colloquial Arabic Body Idioms into English: A Comparative Analysis of Four AI Tools	*Egyptian Journal of Linguistics and Translation*	2025
17	Tang, N., & Moindjie, M. A.	Reference in English- Chinese Legal Translation: Human Translators Versus ChatGPT	*World Journal Of English Language*	2024
18	Wang, C.	Large language models in translation quality assessment: the feasibility of human -AI collaboration	*CADERNOS de TRADUCAO*	2025
19	Wang,	The Impact of Technology on Human Translators and Translation Quality: A Study on Machine Translation and Computer-Assisted Translation Tools	*English Linguistics Research*	2024
20	Wei, X.	The Use of Large Language Models for Translating Buddhist texts from Classical with ChatGPT 4, ERNIE Bot 4, and Gemini Advanced	*Religions*	2024

As shown in the table, the twenty articles represent a broad spectrum of research directions in AI-Assisted Translation. Most studies emphasize improvements in linguistic performance and evaluations of machine translation quality, as demonstrated by Wang (2024), while others focus on human–AI collaboration and the integration of professional ethics into modern translation practices, as illustrated by Breskas (2025). This diversity of findings indicates that research on digital translation is not solely oriented toward technological efficiency but also engages with epistemological reflections on the human role within translation processes. From a translation studies perspective, this supports the view that translation quality is purpose and context dependent and that AIAT functions as a sociotechnical arrangement in which translator agency remains central. Therefore, this collection of articles provides a solid conceptual foundation for structuring the discussion into three main themes: linguistic performance, human-AI collaboration, ethnics, bias and algorithmic justice in translation

Performance and linguistic accuracy

The first theme emphasizes that the improvement in the linguistic performance of AI-Assisted Translation systems has occurred in tandem with the advancement of Neural Machine Translation architectures and Large Language Models. Fu (2024) explains that deep learning models contribute to more precise word selection through complex contextual mapping, although they still struggle with interpreting idioms and metaphorical expressions. He also said that the quality of grammar has improved since transformer-based systems are better at finding word relationships in long texts. Li (2025) observed that increased lexical accuracy does not inherently lead to superior pragmatic equivalence, as contextual interpretation still relies on human judgment. Particularly the ability to interpret social nuance and culturally embedded meaning. From a functionalist perspective, this pattern suggests that "better linguistic output" does not automatically mean "better translation", because adequancy depends on purpose, audience and context. Therefore, these linguistic advancements in AI should be viewed as a form of collaboration between efficient machines and humans who are attuned to meaning.

Table 4. Performance and Linguistic accuracy

Sources	Syntax & Grammar	Lexical Accuracy	Semantic Consistency	Fluency & Readability	Limitations Noted
Fu & Liu (2024)	✓	✓		✓	
Wang (2024)	✓		✓	✓	✓
Li (2025)	✓	✓			
Torres (2023)		✓	✓	✓	✓
Nguyen (2025)	✓	✓	✓	✓	✓

Table 5 summarizes how the reviewed studies assess AI translation performances accross dimensions such as syntax, lexical accuracy, and fluency, readability, and pragmatic. AI systems consistenly demonstrate strong gains in grammatical well-formedness and surface fluency, yet recurring limitations remain in idiom interpretation, implicit meaning, and culturally embedded pragmatic (Fu & Liu, 2024; Wang, 2024; Li, 2025). Torres (2023) emphasized lexical accuracy, semantic consistency, fluency, and limitations in an educational context, while cautioning that excessive reliance on machine-generated output could undermine their critical language competence. Nguyen (2025) reported broad improvement swhowing that the use of AI in translation training can truly help people learn to speak and write better. However, his research also showed that human translators are still needed in areas such as cultural understanding and contextual sensitivity. From a translation-studies perspective, this pattern reinforces that translation quality is pupose and context dependent. So high fluency does not automatically guarantee pragmatic and cultural appropriateness. Overall, the evidence highlight that although AI systems have achieved remarkable progress in precision and fluency, human creativity and intuition remain essential for maintaining cultural meaning and pragmatic depth in translation.

Human–AI collaboration

The second theme examines human-AI collaboration and how it reshaping translation work and professional roles. It highlight how human expertise and AI capabilities can be combined to produce high quality translation. Alghamdi and Alotaibi (2025) stated that the best translation results are achieved when human translators edit AI-generated content to correct pragmatic inaccuracies and enhance cultural nuances. Wang (2024) found that this type of collaboration not only saves time but also helps translators better understand how adaptive languages work. Thus, human-AI collaboration is not just a technical issue, but also a new form of scientific relationship that places the translator as the main director in the digital translation ecosystem.

Table 5. Human-Ai Collaboration

Sources	AI as Collaborative Tool	Post-Editing & Human Role	Workflow & Productivity	Quality Outcome
Alghamdi & Alotaibi (2025)	✓	✓		✓
Breskas et al. (2025)	✓		✓	✓
Atarchi et al. (2024)		✓		
Li (2025)	✓		✓	

Table 6 summarizes how researchers have examined how human translators and AI systems can work together. Alghamdi and Alotaibi (2025) describe artificial intelligence as a collaborative tool that enhances speed and efficiency, but requires human intervention through post-editing to maintain quality and coherence. Breskas et al. (2025) focused on process optimization, demonstrating that artificial intelligence can improve efficiency when used in teams where humans and AI tools work together. Nevertheless, maintaining constant accuracy still relies on human oversight. Atarchi et al. (2024) explored how translators improve content generated by artificial intelligence, highlighting their essential role in adapting stylistic and cultural subtleties. Li (2025) discovered that merging human expertise with artificial intelligence support leads to greater workflow efficiency, yet cautioned that quality results

remain unreliable without proper human assessment. In summary, these studies emphasize that artificial intelligence functions most effectively as a partner rather than a substitute, underlining the critical importance of human involvement in preserving the integrity and meaning of translations.

Ethics, bias, and algorithmic fairness

The third theme focuses on the shifts in the relationship between human translators and artificial intelligence, particularly how this collaboration is transforming translation in the digital sphere. In ethical terms, this shift matters because AI systems are not neutral model behavior and training data can reproduce bias, shape representation, and effect whose meanings are preserved or distorted in translation. Newer studies show how AI systems have progressed beyond being simple tools and are increasingly partners in collaboration on tasks that require human insight and imagination. Alghamdi and Alotaibi (2025) argue that in post-translation editing of AI-prepared texts, translators have the opportunity to revise the tone and style, and incorporate vital cultural elements that preserve the authenticity of the text and contextual accuracy. Breskas et al. (2025) demonstrated that the integration of collaborative workflows of humans and AI achieves the desired quality of outputs and, at the same time, enhances the workflows' effectiveness, hence, transforming translation to be more collaborative and less automated. Atarchi et al. (2024) and Li (2025) emphasize that successful integration heavily relies on the translator's ability to critically oversee and interpret the machine-generated text. In this light, the theme articulates that the collaboration of humans and AI is most productive when AI works as a facilitating tool that enhances workflow, thereby assisting human oversight, compassion, and ethical accountability in meaning-making. This oversight is also central to algorithmic faierness, as translators can identity culturally harmful choices, mitigate biased outputs, and ensure and endure responsible representation across language.

Table 6. Ethics, bias, and algorithm fairness

Sources	Ethical Reflection	Ai Literacy/ Pedagogical	Translator Responsbility	Algorithmic Transparancy	Limittaion Noted
AlAfnan (2024)	✓	✓	✓	✓	✓
Alharbi (2025)	✓	✓	✓		✓
Haider & Alkhatib (2024)	✓		✓	✓	
Atarchi et al. (2024)	✓	✓			✓
Bekkum et al. (2021)	✓		✓	✓	✓
Lu (2024)	✓			✓	✓

Table 7 revisits the ethical and pedagogical scopes of recent AI-assisted translation studies. AlAfnan (2024) took a fully integrated stance by covering algorithmic transparency and translator ethics, while also considering AI literacy in one's profession. Alharbi (2025) connected ethical pedagogy with innovation, arguing that AI- integrated teaching of translation "will promote ethical awareness and moral reasoning". Haider and Alkhatib (2024) examining legal translation acknowledged AI's contribution of consistency in legal documents, asserting that it is human conscience that ethically interprets the moral legal translation oversight. Atarchi et al. (2024) studied in academic environments ethics, and the pedagogical issue of promptness and AI-integrated writing. Van Bekkum et al. (2021) spoke of accountability and offered AI explainability as a means. Lu (2024) examining equity claim and the reinforcement of cultural and linguistic biases. Together, these illustrate the interdependence of ethical awareness, pedagogical literacy, and transparency. From a translation studies, this reinforces ethics of representation and translator responsibility: biased or opaque outputs are not only technical problems but translation problem because they shape meaning, voice, and cultural legitimacy. AI-assisted translation is efficient, and it is the ethical integration of pedagogy that sustains it.

The results presented in three main themes comprehensively address the objectives set out in the introduction. The initial goal, which aimed to gather and examine new perspectives

on AI-assisted translation, is demonstrated through the systematic arrangement of thematic results. Each segment illustrates how previous research has evaluated linguistic capabilities, human-machine partnerships, and ethical considerations surrounding these developments. Overall, these results indicate that the quality of machine translation has made significant advancements, although pragmatic and cultural sensitivity still relies on the expertise of human translators. From a functional perspective in translation studies, this suggests that "quality" depends on purpose, audience, and contextual appropriateness, not on fluency or accuracy alone. This research effectively maps the evolving landscape of AI-assisted translation from both conceptual and applied perspectives, revealing how human insight remains central to creating meaning in an increasingly automated process.

The second and third objectives, which focus on exploring collaborative development and professional ethics, are discussed in the final two themes. The collaboration between humans and AI has created new work models where translators function as interpreters of meaning rather than simply correcting errors, transforming translation into an interactive exchange between human thought and machine-generated logic. This partnership not only boosts workflow productivity but also reshapes the role of translators as discerning professionals who bridge the gap between algorithmic accuracy and human understanding. This aligns with posthuman and sociotechnical perspectives in translation studies, where translation is seen as distributed work within a human-technology assemblage and translator agency remains central to decision making. In this evolving landscape, translators must develop digital proficiency, critical thinking, and adaptability to ensure that machine-generated content remains ethical and contextually relevant.

The ethical dimension reinforces the importance of moral responsibility and representational justice as fundamental principles of trust in AI translation. Instead of viewing technology as a neutral instrument, researchers are increasingly recognizing that technology is a cultural and ethical actor that reflects the values and biases of its creators. Awareness of this duality has sparked calls for greater transparency, justice-oriented system design, and the integration of AI ethics into translator training programs. As a result, the findings reveal that AI-assisted translation is no longer a purely technical or linguistic process, but rather a complex sociolinguistic phenomenon that combines linguistic accuracy with cognitive empathy. Although large language models like GPT-4, DeepL, and Gemini show remarkable improvements in syntactic accuracy and semantic coherence, the best results still depend on human ability to interpret nuances, emotions, and cultural meaning. The convergence of human creativity and machine intelligence thus not only represents technological progress but also a paradigm shift that repositions translation as a reflective practice, one that unites innovation, humanism, and ethical awareness to preserve meaning across languages and cultures.

CONCLUSIONS

Theoretically, this review expands the conceptual framework of posthuman translation theory by demonstrating how translators evolve into cognitively flexible and morally aware collaborators within AI-mediated environments, marking a shift from translation as a purely linguistic activity to a cognitive-technological process shaped by human judgment and algorithmic learning. This perspective encourages translation educators and professional organizations to redesign curricula by emphasizing AI literacy, ethical reasoning, cross-cultural competence, and critical post-editing so that future translators engage with intelligent systems reflectively rather than passively. The integration of linguistic performance, human–AI collaboration, and ethical awareness shows these dimensions operate interdependently: improved linguistic accuracy enhances collaboration, while ethical awareness ensures responsible technological application, creating a transformative ecosystem where meaning emerges through interaction, reflection, and accountability. In this framework, translation studies move beyond binary comparisons between human and machine toward a model of shared cognition in which optimal effectiveness depends on adaptability, cultural awareness,

and moral sensitivity from both users and algorithms. Although AI-assisted translation increases speed and consistency, pragmatic sensitivity, cultural nuance, and accountability remain grounded in human expertise and interpretive agency. However, this review is limited by its selected databases, search terms, 2020–2025 publication window, and focus on English-language accessible full-text studies, potentially introducing publication bias. Future research should therefore adopt longitudinal and cross-linguistic designs to examine the long-term cognitive, creative, and ethical impacts of sustained human–AI interaction, address inequalities in AI training data by comparing high- and low-resource languages, and apply interdisciplinary approaches integrating cognitive linguistics, data ethics, and digital education to explore not only algorithmic efficiency but also the emotional, cultural, and ethical dimensions of AI-assisted translation, ultimately framing translation as an ongoing negotiation between human judgment and technological capability.

REFERENCES

Abdelhalim, S. M., Alsahil, A. A., & Alsuhaibani, Z. A. (2025). Artificial intelligence toolsand literary translation: A comparative investigation of ChatGPT and Google Translate from novice and advanced EFL student translators' perspectives. *Cogent Arts & Humanities*, *12*(1), 2508031. https://doi.org/10.1080/23311983.2025.2508031

AlAfnan, M. A. (2024). Large Language Models as Computational Linguistics Tools: A Comparative Analysis of ChatGPT and Google Machine Translations. *Journal of Artificial Intelligence and Technology*. https://doi.org/10.37965/jait.2024.0549

Alghamdi, F. A., & Alotaibi, H. (2025). Using AI in Translation Quality Assessment: A Case Study of ChatGPT and Legal Translation Texts. *Electronics*, *14*(19), 3893. https://doi.org/10.3390/electronics14193893

Alharbi, M. A. (2025). Navigating AI-Driven Translation in Saudi Arabia's Media: Challenges and Opportunities. *Arabic Journal for Translation Studies*, *4*(12), 10–31. https://doi.org/10.63939/ajts.91zp6t15

Alkhofi, A. (2025a). Man vs. machine: Can AI outperform ESL student translations? *Frontiers in Artificial Intelligence*, *8*, 1624754. https://doi.org/10.3389/frai.2025.1624754

Alkhofi, A. (2025b). Man vs. machine: Can AI outperform ESL student translations? *Frontiers in Artificial Intelligence*, *8*, 1624754. https://doi.org/10.3389/frai.2025.1624754

Al-Salman, S. (2024). Assessing the accuracy of MT and AI tools in translating humanities or social sciences Arabic research titles into English: Evidence from Google Translate, Gemini, and ChatGPT. *International Journal of Data and Network Science*, *8*(4), 2483–2498. https://doi.org/10.5267/j.ijdns.2024.5.009

Atarchi, K., Abdelkarim Elamari, & Mohamed Marouane. (2024). The Role of Artificial Intelligence Translation Tools in Academic Translation: Faculties of Pure Sciences as a Case Study. *International Journal of Translation and Interpretation Studies*, *4*(3), 07–17. https://doi.org/10.32996/ijtis.2024.4.3.2

Atarchi, K., Elamari, A., & Marouane, M. (2024). The Role of Artificial Intelligence Translation Tools in Academic Translation: Faculties of Pure Sciences as a Case Study. *International Journal of Translation and Interpretation Studies*, *4*(3), 7–17. https://doi.org/10.32996/ijtis.2024.4.3.2

Bowker, L. (2025). Multilingual Scholarly Publishing and Artificial Intelligence Translation Tools: Weighing Social Justice and Climate Justice. *The Journal of Electronic Publishing*, *28*(2). https://doi.org/10.3998/jep.7100

Breskas, A., Hansen-Schirra, S., & Kapnas, D. (2025). AI and digital literacy in translation competence development. *SKASE Journal of Translation and Interpretation*, *18*(2). https://doi.org/10.33542/JTI2025-S-7

David, nehemiah boluvatife. (2025). The Future of Translation and Interpretation: Integrating AI with Human Expertise for Optimal Results. *International Journal of Applied Linguistics and Translation*.

Fu, L., & Liu, L. (2024). What are the differences? A comparative study of generative artificial intelligence translation and human translation of scientific texts. *Humanities and Social Sciences Communications*, *11*(1), 1236. https://doi.org/10.1057/s41599-024-03726-7

Haider, A. S. (2024). Subtitling English Legal Acronyms into Arabic: Human vs Machine. *Kutafin Law Review*, *11*(4), 810–842. https://doi.org/10.17803/27130533.2024.4.30.810-842

Haider, A. S., & Alkhatib, R. (2024). Subtitling English Legal Acronyms into Arabic: Human vs Machine. *Kutafin Law Review*, *11*(4), 810. https://doi.org/10.17803/2713-0533.2024.4.30.810-842

Li, X. (2025). An Empirical Analysis of Neural Network Machine Translation and Human Translation. *Journal of Artificial Intelligence Practice*, *8*(3). https://doi.org/10.23977/jaip.2025.080310

Lu, Y. (2024). Comparative study of machine translation versus human translation. *Lecture Notes on Language and Literature*, *7*(2). https://doi.org/10.23977/langl.2024.070211

Moneus, A. M., & Sahari, Y. (2024). Artificial intelligence and human translation: A contrastive study based on legal texts. *Heliyon*, *10*(6), e28106. https://doi.org/10.1016/j.heliyon.2024.e28106

Nguyen, T. N. N., Tran, T. T., Nguyen, N. H. A., Lam, H. P., Nguyen, H. M. S., & Tran, N. A. T. (2025). The Benefits and Challenges of AI Translation Tools in Translation Education at the Tertiary Level: A Systematic Review. *International Journal of TESOL & Education*, *5*(2), 132–148. https://doi.org/10.54855/ijte.25527

Ouyang, L., Wu, J., Jiang, X., Almeida, D., Wainwright, C. L., Mishkin, P., … Lowe, R. (n.d.). *Training language models to follow instructions with human feedback*.

Sadiq, S. (2025). Evaluating the Translation of Egyptian Colloquial Arabic Body Idioms into English: A Comparative Analysis of Four AI Tools. *Egyptian Journal of Linguistics and Translation*, *15*(1), 1–36. https://doi.org/10.21608/ejlt.2025.378658.1109

Tang, N. (2024). Reference in English-Chinese Legal Translation: Human Translators Versus ChatGPT. *World Journal of English Language*, *14*(4), 254–263. https://doi.org/10.5430/wjel.v14n4p254

Van Bekkum, M., De Boer, M., Van Harmelen, F., Meyer-Vitali, A., & Teije, A. T. (2021). Modular design patterns for hybrid learning and reasoning systems: A taxonomy, patterns and use cases. *Applied Intelligence*, *51*(9), 6528–6546. https://doi.org/10.1007/s10489-021-02394-3

Wang, C. (2025). Large language models in translation quality assessment: The feasibility of human-AI collaboration. *Cadernos de Tradução*, *45*(Query date: 2025-10-14 01:40:30), 1–21. https://doi.org/10.5007/2175-7968.2025.e108395

Wang, Y. (2024). The Impact of Technology on Human Translators and Translation Quality: A Study on Machine Translation and Computer-Assisted Translation Tools. *English Linguistics Research*, *13*(1), 19. https://doi.org/10.5430/elr.v13n1p19

Wei, X. (2024). The Use of Large Language Models for Translating Buddhist Texts from Classical Chinese to Modern English: An Analysis and Evaluation with ChatGPT 4, ERNIE Bot 4, and Gemini Advanced. *Religions*, *15*(12). https://doi.org/10.3390/rel15121559