

Functional Typology Approach in Evaluating Human Translation and Machine Translation: A Functional Adequacy Analysis Based on Christiane Nord's Model

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ABSTRACT

The rapid development of neural machine translation has transformed translation practices in academic and professional contexts. However, the ability of machine translation to preserve communicative functions within target texts remains debatable. This study compares the functional quality of Human Translation (HT) and Machine Translation (MT) using Christiane Nord's Functional Typology and functional adequacy framework, emphasizing communicative function, contextual sensitivity, and target-reader orientation as the main indicators of translation quality. A descriptive-comparative design with a mixed-methods approach was employed. Ten English academic texts categorized as informative texts were translated into Indonesian through both human and machine translation. Data were analyzed qualitatively using Nord's extratextual and intratextual factors and quantitatively through a scoring system of five indicators: text-function suitability, semantic accuracy, acceptability, contextual sensitivity, and cohesion-coherence. The findings reveal that Human Translation achieved a mean score of 19.0, categorized as highly adequate, while Machine Translation obtained a mean score of 13.2, categorized as moderately adequate. Human Translation demonstrated superior performance in maintaining academic register and communicative naturalness, whereas Machine Translation tended to produce literal structures with limited contextual adaptation. The novelty of this study lies in operationalizing Nord's functionalist framework into a measurable evaluation model for systematically comparing HT and MT. Functional evaluation proves more comprehensive than purely linguistic metrics in assessing translation quality in the AI-assisted translation era.

Keywords: Christiane Nord; functional adequacy; functional typology; human translation; machine translation.

INTRODUCTION

The advancement of artificial intelligence technology has considerably reshaped translation practices in recent years (Koehn, 2020). The emergence of Neural Machine Translation (NMT) systems such as Google Translate, DeepL, and OpenAI ChatGPT has enabled users to access instant translation services with increasing linguistic accuracy. These changes have accelerated the use of machine translation in academic, educational, and professional domains because of its efficiency and accessibility (Bowker & Buitrago Ciro, 2019). Recent developments in Large Language Models (LLMs) have further improved machine translation quality, particularly in terms of fluency and lexical selection. Nevertheless, challenges related to contextual

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interpretation, discourse coherence, and pragmatic adaptation remain unresolved, especially in academic and specialized texts (Kenny *et al.*, 2022). Despite its technological sophistication, machine translation still raises significant questions concerning translation quality, particularly regarding contextual meaning, communicative intention, and cultural sensitivity. Current research therefore emphasizes that translation quality should be assessed not only in terms of semantic transfer but also with regard to discourse coherence, pragmatic appropriateness, and functional performance (Costa-jussà *et al.*, 2022).

Within Translation Studies, translation is no longer perceived merely as the transfer of linguistic forms from source language to target language. Earlier theories emphasized equivalence and semantic transfer, as reflected in the work of Nida and Taber, who define translation as reproducing “the closest natural equivalent” of the source-language message in terms of meaning and style (Nida, 1982). However, later developments shifted the focus toward communication, discourse, and sociocultural context. (Hatim, 1997) argue that translation is fundamentally a communicative activity in which translators negotiate meaning across linguistic and cultural boundaries. Consequently, translation quality cannot be evaluated solely through lexical equivalence or grammatical similarity but must also consider whether the target text successfully fulfills the communicative function intended in the source text.

This communicative perspective became the foundation for the emergence of functionalist translation theories. Functionalist scholars criticize traditional equivalence-based approaches for focusing excessively on linguistic correspondence while neglecting communicative purpose and audience orientation. (Katharina Reiss & Vermeer, 2014), through Skopos Theory, propose that translation should be understood as a purposeful communicative action determined by the intended function of the target text. Within this framework, translation success depends on functional appropriateness rather than strict linguistic equivalence.

One of the most influential developments within functionalist translation theory is Functional Typology (Reiss, 2000). Functional Typology classifies texts according to their dominant communicative functions, including informative, expressive, operative, and phatic functions. Informative texts, for instance, primarily aim to deliver factual information clearly and accurately; therefore, their translations should prioritize semantic clarity, coherence, and readability. In academic contexts, informative texts also require adherence to formal language conventions and disciplinary discourse patterns. According to (Sgibneva, 2023) Nord’s typology can be relevant to decide the heterogeneous textual elements of a corporate newsletter and each part can have more than one function: referential, expressive, appellative or phatic. The functions are important in the translation process as they help to achieve that the translated text serves the same purpose as the source.

Nord further refined functionalist approaches by introducing the concept of functional adequacy, which emphasizes that translation quality should be evaluated according to the extent to which the target text fulfills the communicative purpose of the source text for the target audience. This functionalist orientation has also been applied in foreign language teaching contexts, where (Pontes, 2011) demonstrate that Nord’s model offers productive perspectives for developing translation competence among language learners. According to Nord, translation evaluation should incorporate both extratextual and intratextual factors. Extratextual analysis involves communicative intention, sender, receiver, medium, motive, and text function, while intratextual analysis examines lexical choice, syntax, cohesion, coherence, thematic structure, and presuppositions (Nord, 2018). This framework enables translation assessment to address linguistic, pragmatic, and communicative dimensions simultaneously.

The relevance of functionalist approaches becomes increasingly important in the context of Human Translation (HT) and Machine Translation (MT). Human translators possess linguistic, cultural, and pragmatic competence that enables them to interpret contextual meanings and sociocultural nuances effectively (Han & Gladkoff, 2022). As a result, Human

Translation generally produces more natural and communicatively appropriate texts. The role of human translators is evolving with greater emphasis on post-editing, quality assessment, and critical decision-making to ensure translation adequacy and communicative effectiveness (Mudarra, 2025). In contrast, Machine Translation refers to translation generated automatically by computational systems. The development of Neural Machine Translation has significantly improved fluency and grammatical accuracy compared with earlier rule-based and statistical models (Koehn, 2020). However, machine translation systems still encounter difficulties in interpreting contextual meaning, cultural references, and pragmatic nuances (Bowker & Buitrago-Ciro, 2019). Human raters assessing adequacy and fluency show a stronger preference for human over machine translation when evaluating documents as compared to isolated sentences (Läubli *et al.*, 2018).

Several studies indicate that machine translation performs relatively well in translating informative texts because such texts rely heavily on referential meaning. Nevertheless, MT outputs often remain literal and require post-editing to achieve professional standards, especially in academic texts demanding precision, readability, and contextual appropriateness. Castilho & Knowles (2025) further emphasize that contextual interpretation remains one of the major challenges in evaluating neural machine translation systems. Similarly, Freitag *et al.* (2021a) demonstrate through a large-scale study that human evaluation of machine translation is significantly influenced by context and evaluator expertise, highlighting the limitations of purely automated metrics in capturing true translation quality.

Translation quality assessment has therefore become one of the central issues within Translation Studies. Traditional and computational evaluation methods, such as BLEU, METEOR, and Translation Error Rate (TER), are widely used to measure lexical similarity and structural correspondence (Vilar *et al.*, 2006). Although these approaches are useful for measuring computational accuracy, they primarily evaluate surface-level linguistic correspondence and frequently fail to capture communicative effectiveness, pragmatic appropriateness, and contextual meaning. Linguistically accurate translations may still fail functionally when interpreted within the target-language context. A successful translation should fulfill its intended communicative purpose while reflecting human judgment and professional responsibility. This highlights the importance of evaluation frameworks that assess not only linguistic accuracy but also functional adequacy and human-centered quality (Floros, 2020).

Several scholars have consequently argued for more comprehensive evaluation frameworks. House (2015) emphasizes that translation quality assessment should incorporate functional-pragmatic dimensions because communicative success depends on contextual appropriateness and audience expectations. Supporting this view, Colina (2008) provides empirical evidence that functionalist approaches show more reliable and consistent results in translation quality evaluation compared to equivalence-based methods. Similarly, Nord's translation-oriented text analysis model offers a systematic framework integrating extratextual and intratextual dimensions into translation evaluation (Nord, 2005). This framework is particularly relevant for comparative studies between Human Translation and Machine Translation because it enables researchers to evaluate not only linguistic accuracy but also communicative performance. Nord's groundbreaking function and loyalty concept can be a bridge between the theoretical and practical dimensions of translation studies (Haidri, 2024). Furthermore, context influences evaluation and evaluation protocols which can distinguish high-performing machine translation systems and human translations (Knowles & Lo, 2025). However, as the field of translation continues to evolve, it is important to have training programs for human translators to adapt and meet the challenges, ensuring that future translators are equipped with the skills and knowledge necessary to excel in their craft (Alfarina & Hartono, 2025).

Despite the growing number of studies on machine translation quality, previous research has predominantly focused on computational accuracy, lexical equivalence, grammatical correctness, and translation errors. While some studies acknowledge the importance of contextual and communicative dimensions, research applying functionalist approaches to machine translation evaluation remains relatively limited. In particular, studies operationalizing Christiane Nord's functional adequacy framework into measurable evaluation indicators are still scarce. Furthermore, most existing studies rarely integrate qualitative functional analysis with quantitative scoring procedures, resulting in evaluations that remain either purely linguistic or statistical.

Therefore, the present study addresses this research gap by applying Functional Typology and Nord's model of functional adequacy to evaluate Human Translation and Machine Translation systematically. The study specifically investigates English-Indonesian academic translations categorized as informative texts. The novelty of this research lies in three aspects. First, it operationalizes Nord's qualitative functionalist theory into a quantitative scoring instrument. Second, it integrates extratextual and intratextual analysis into a comparative evaluation framework. Third, it provides empirical evidence regarding the strengths and limitations of AI-assisted translation from a communicative-function perspective rather than purely linguistic accuracy. Accordingly, this study aims to identify the communicative function of the selected source texts based on Functional Typology, evaluate the quality of Human Translation and Machine Translation using Christiane Nord's functional adequacy model, and compare the effectiveness of HT and MT in preserving communicative functions in academic translation.

METHODOLOGY

This study employed a descriptive-comparative design using a mixed-methods approach. The qualitative component focused on analyzing communicative functions and contextual appropriateness, while the quantitative component measured translation quality through scoring procedures.

The data source consisted of ten English academic texts categorized as informative texts. The texts were selected purposively based on three criteria: (1) academic register, (2) moderate linguistic complexity, and (3) relevance to educational and social contexts. Each source text was translated into Indonesian through two translation methods, namely; Human Translation (HT), produced by a professional translator from Tap Indo Translation and Machine Translation (MT), generated using ChatGPT.

The study used documentation techniques for collecting translation data. The procedures involved selecting source texts, generating human and machine translations, and compiling the translation outputs for analysis.

The evaluation instrument was developed based on Christiane Nord's functional adequacy framework. Five indicators were used to assess translation quality: (1) text-function suitability, (2) semantic accuracy, (3) language acceptability, (4) contextual sensitivity, (5) cohesion and coherence. Each indicator was scored on a scale of 1–4. The maximum score for each translation was 20.

Qualitative analysis was conducted by comparing HT and MT outputs based on extratextual and intratextual factors. The analysis focused on lexical choices, syntactic structures, contextual adaptation, and communicative effectiveness. Quantitative analysis involved calculating total scores and average scores for each translation category. The results were then interpreted to determine the level of functional adequacy.

RESULT AND DISCUSSION

Based on Functional Typology proposed by Reiss and further elaborated by Nord, all source texts in this study were categorized as informative texts because their dominant communicative purpose was to convey factual and academic information. Informative texts prioritize clarity, referential meaning, and accuracy of information delivery. Consequently, the success of translation in this context depends not merely on lexical equivalence but on the extent to which the translated text preserves the communicative and referential functions of the source text.

The selected texts also demonstrate characteristics commonly found in academic discourse, including formal lexical choices, abstract concepts, and syntactic density. Such characteristics require translators to possess not only linguistic competence but also sensitivity toward academic conventions in the target language. Therefore, the texts provide a relevant basis for examining the functional performance of Human Translation and Machine Translation.

TABLE 1. Source Text Data

No	Source Text
1	Effective communication plays a crucial role in improving organizational performance by ensuring clear information flow and mutual understanding among stakeholders.
2	The use of digital media in education requires teachers to adapt their instructional strategies to meet diverse learners' needs.
3	This study aims to analyze the impact of social media on students' critical thinking skills.
4	Clear guidelines are essential to ensure ethical practices in professional communication.
5	Language plays a significant role in shaping social interaction and cultural identity.
6	Advances in artificial intelligence have transformed the field of translation studies.
7	Academic writing requires clarity, coherence, and appropriate use of terminology.
8	Effective leadership depends on transparent communication and mutual trust.
9	Translation quality should be evaluated based on its communicative function.
10	Digital literacy is an essential skill for students in the modern educational context.

At the initial stage, a quantitative analysis was conducted on the extratextual and intratextual aspects using Christiane Nord's model. To strengthen the qualitative analysis, this study also applies a quantitative assessment scheme by assigning scores to each translation data set. This scheme aims to measure the level of functional adequacy more objectively. Each data set is evaluated based on Nord's five main indicators. Scores are assigned using a 1–4 scale, with the maximum score for each data is 20, as detailed below:

TABLE 2. Nord's Assessment Indicators and Scoring Scale

No	Evaluation Aspect	Description/Score
1	Text function equivalence (F1)	Equivalence between ST and TT function
	The text function is fully appropriate.	4
	The text function is mostly appropriate.	3
	The text function is fairly appropriate.	2
	The text function is inappropriate	1
2	Meaning accuracy (F2)	Accuracy of message delivery
	The meaning is conveyed accurately	4
	The meaning is conveyed with slight distortion.	3
	The meaning is conveyed inaccurately.	2
	The meaning is distorted	1
3	Acceptability (F3)	Naturalness and fluency of language
	Highly natural and grammatically appropriate.	4
	Fairly natural	3
	Less natural	2
	Unacceptable	1

4	Context Sensitivity (F4)	Cultural and audience adaptation
	Very appropriate	4
	Fairly appropriate	3
	Less appropriate	2
5	Inappropriate	1
	Cohesion and coherence (F5)	Textual coherence and structural unity
	Highly cohesive and coherent	4
	Fairly cohesive and coherent	3
	Less cohesive and coherent	2
	Less cohesive and coherent	1

QUALITATIVE DATA ANALYSIS

The following presents an analysis of one translation text along with the results of the analysis:

Source Text (ST): Effective communication plays a crucial role in improving organizational performance by ensuring clear information flow and mutual understanding among stakeholders.

Human Translation (HT): **Komunikasi yang efektif berperan penting dalam meningkatkan kinerja organisasi melalui penyampaian informasi yang jelas serta terciptanya pemahaman bersama di antara para pemangku kepentingan.**

Machine Translation (MT): **Komunikasi efektif memainkan peran penting dalam meningkatkan kinerja organisasi dengan memastikan aliran informasi yang jelas dan pemahaman timbal balik di antara para pemangku kepentingan**

EXTRATEXTUAL ANALYSIS BASED ON NORD'S FRAMEWORK

Nord emphasizes that translation quality is closely related to extratextual factors, particularly communicative intention, target readers, and contextual function. In the present study, the communicative intention of all source texts was informative, targeting academic readers and students within educational contexts. The following are the results of the extratextual factor analysis of Text 1, covering the aspects of text purpose, target audience, dominant function, and contextual appropriateness.

TABLE 3. Results of the Extratextual Factor Analysis

Aspek	ST	HT	MT
Tujuan teks	Informatif	Informatif	Informatif
Sasaran pembaca	Akademisi	Akademisi Indonesia	Umum/akademik
Fungsi dominan	Referensial	Referensial	Referensial
Kesesuaian konteks	Tinggi	Tinggi	Cukup

The analysis reveals that both Human Translation (HT) and Machine Translation (MT) were generally successful in maintaining the informative function of the source texts. However, significant differences emerged in terms of audience orientation and contextual adaptation. Human Translation consistently demonstrated stronger adaptation toward Indonesian academic discourse conventions. The translators tended to select formal and contextually acceptable lexical expressions that aligned with the expectations of Indonesian academic readers. For instance, in the sentence discussing organizational communication, the HT version employed the phrase “terciptanya pemahaman bersama,” which sounds more natural and conceptually coherent in Indonesian academic writing.

By contrast, Machine Translation frequently produced literal lexical renderings. Although these renderings preserved the core information of the source text, they often lacked pragmatic flexibility and stylistic appropriateness. Expressions such as “pemahaman timbal

balik” illustrate the tendency of MT systems to prioritize direct equivalence rather than contextual naturalness.

This finding indicates that MT systems still experience limitations in interpreting communicative nuances embedded within academic texts. While MT is capable of transferring semantic information, it does not always adequately consider sociolinguistic expectations of target readers.

INTRATEXTUAL ANALYSIS

LEXICAL SELECTION

Lexical choice became one of the most significant distinctions between HT and MT outputs. Human translators tended to select terminology that reflected Indonesian academic register and discourse conventions. In several data sets, HT used lexical items commonly employed in Indonesian scholarly texts, thereby increasing readability and acceptability.

Machine Translation, on the other hand, frequently generated literal lexical correspondences derived directly from the source language structure. Although semantically understandable, these lexical choices occasionally sounded rigid or unnatural within Indonesian academic contexts.

TABLE 4. Results of the Intratextual Factor Analysis: Lexical Aspect

Aspect	HT	MT
Lexical choice	Accurate and contextual	Tend to be literal
Naturalness	High	Moderate

The HT employs the phrases “berperan penting” and “pemangku kepentingan,” which are appropriate to the academic register of Indonesian, whereas the MT uses more direct translations without stylistic adjustment. These findings support House’s argument that translation quality involves not only semantic transfer but also pragmatic appropriateness. Lexical naturalness contributes substantially to communicative effectiveness because target readers interpret texts through familiar linguistic conventions.

SYNTACTIC STRUCTURE

Differences between HT and MT were also evident in syntactic organization. Human Translation generally reconstructed sentence structures to conform to Indonesian grammatical patterns. Such restructuring improved textual readability and reduced cognitive burden for readers.

Machine Translation frequently preserved the syntactic arrangement of the English source texts. As a result, several MT outputs sounded structurally rigid and less fluent in Indonesian. This tendency reflects one of the common limitations of machine translation systems, namely source-language interference. For instance, MT outputs often maintained long clause chains and direct modifier patterns that are acceptable in English but less natural in Indonesian academic writing. Human translators, conversely, reorganized information hierarchically to achieve clearer communicative flow. This syntactic flexibility enabled HT to achieve higher functional adequacy because the translated texts appeared more communicatively accessible to target readers.

COHESION AND COHERENCE

Another significant distinction between HT and MT appeared in cohesion and coherence. Human Translation demonstrated stronger textual cohesion through the use of appropriate conjunctions, reference markers, and thematic progression.

MT outputs remained generally understandable but sometimes lacked smooth transitions between clauses. In certain cases, cohesion was weakened because MT prioritized sentence-level equivalence rather than overall discourse organization.

This finding is particularly important because academic texts rely heavily on logical progression and coherence to support information clarity. Even when semantic meaning is preserved, weak cohesion may reduce communicative effectiveness and reader comprehension.

FUNCTIONAL ADEQUACY ANALYSIS

Based on the results of Nord's intratextual factor analysis, the evaluation of Functional Adequacy is as follows:

TABLE 5. Functional Adequacy Evaluation

Nord's Criteria	HT	MT
Text function equivalence	Highly appropriate	Fairly appropriate
Meaning accuracy	High	Moderate
Acceptability	High	Moderate
Context sensitivity	High	Low
Functional adequacy	Optimal	Parsial

Human Translation (HT) fulfills the principles of functional adequacy optimally because it not only conveys information but also adapts the style, structure, and register to the target language. Meanwhile, Machine Translation (MT) still functions informatively, but it has not fully met the communicative needs of the target readers.

Nord's concept of functional adequacy emphasizes that translation should fulfill the intended communicative purpose in the target context. The findings demonstrate that Human Translation achieved optimal functional adequacy because it balanced semantic accuracy, contextual adaptation, and stylistic acceptability. Human translators did not merely transfer information linguistically; they also adapted the texts according to academic conventions and communicative expectations of Indonesian readers. This adaptation enabled HT outputs to preserve both referential and communicative functions simultaneously.

Machine Translation, meanwhile, achieved only partial functional adequacy. The MT outputs successfully conveyed basic information but often failed to optimize contextual sensitivity and communicative naturalness. Consequently, MT outputs remained informative yet functionally limited.

These findings confirm Nord's argument that translation evaluation should extend beyond linguistic equivalence. A translation may appear semantically accurate while still failing communicatively if it does not align with target-language conventions and audience expectations. The findings from the qualitative analysis indicate that:

1. The Functional Typology approach is effective in systematically distinguishing the quality of HT and MT.
2. MT requires a post-editing process in order to achieve a level of functional acceptability comparable to HT.
3. Christiane Nord's model remains relevant for translation evaluation in the AI era.

QUANTITATIVE FINDINGS

The quantitative analysis further strengthens the qualitative findings. The quantitative analysis uses the assessment scheme presented in Table 1. The following are the scores of HT and MT translations.

TABLE 6. Scores of HT and MT Translation

Translation Type	Mean Score	Category
Human Translation	19.0	Highly Adequate
Machine Translation	13.2	Moderately Adequate

These quantitative results reinforce the qualitative findings presented in the previous subsection. The high scores achieved by HT are consistent with the finding that human translators are able to: adapt the academic register, consider the target audience, and maintain textual cohesion and coherence.

Meanwhile, the moderate scores obtained by MT indicate that machine translation still operates at a minimal functional level, namely conveying basic information without fully optimizing the communicative function.

Meanwhile, the moderate scores obtained by MT indicate that machine translation still operates at a minimal functional level, namely conveying basic information without optimizing the communicative function. According to Christiane Nord, translation quality is determined by the level of functional adequacy rather than literal equivalence. The findings of this study demonstrate that:

1. HT fulfills the principles of functional adequacy optimally.
2. MT has not yet been fully capable of accommodating extratextual factors.
3. Functional evaluation is more comprehensive than evaluation based solely on linguistic errors.

Thus, the Functional Typology approach based on Nord's model has proven effective in systematically and measurably distinguishing the quality of HT and MT. The quantitative analysis results show that Human Translation consistently achieved higher scores than Machine Translation across all data. The most significant differences were found in the aspects of contextual sensitivity (F4) and language acceptability (F3). Qualitatively, human translators are able to adapt academic terminology, syntactic structures, and language register in accordance with Indonesian language conventions. In contrast, machine translation tends to retain the source-language structure literally, making it less effective in fulfilling the communicative needs of the target readers. Based on Functional Typology, all source texts possess a dominant referential function. Human Translation successfully preserves this function in a complete and communicative manner, thereby fulfilling the principle of functional adequacy as proposed by Christiane Nord. Although Machine Translation is capable of conveying the main information, it still demonstrates limitations in adapting the text function to the context of use, resulting only in a partial level of functional adequacy. Human Translation consistently obtained higher scores across all indicators, especially in contextual sensitivity and language acceptability. These aspects represent areas where human cognitive interpretation and sociocultural awareness play crucial roles. Machine Translation demonstrated relatively stable performance in semantic transfer and basic textual cohesion. However, the lower scores in contextual sensitivity indicate that MT systems still struggle to accommodate pragmatic and audience-oriented dimensions of translation. The quantitative gap between HT and MT also illustrates that communicative quality cannot be fully measured through computational accuracy alone. Statistical similarity may indicate lexical correspondence, but it does not necessarily reflect communicative success.

DISCUSSION

The present study demonstrates that Human Translation (HT) performs more effectively than Machine Translation (MT) in preserving the communicative function of English academic texts when assessed using Christiane Nord's Functional Typology. Rather than reflecting differences in linguistic accuracy alone, the findings suggest that the key distinction lies in each translation's ability to achieve its intended communicative purpose in the target language. This observation aligns with Nord's functionalist perspective, which emphasizes that the quality of a translation should be judged by its success in fulfilling the function of the source text for the target audience instead of relying solely on formal equivalence (Nord, 2018).

Among the five assessment criteria, the largest differences were found in contextual sensitivity and language acceptability. Human translators consistently adapted lexical choices, sentence structures, and academic expressions to match Indonesian discourse conventions, resulting in translations that were more natural and communicatively appropriate. Such decisions require not only linguistic competence but also an understanding of cultural norms, disciplinary conventions, and the expectations of target readers. By contrast, although Machine Translation generated grammatically acceptable texts, its outputs often reflected the structure of the source language too closely. This tendency produced translations that conveyed the intended meaning but were less effective in meeting the communicative needs of Indonesian academic readers.

These results support previous studies that advocate functional approaches to translation quality assessment. House (2015) argues that communicative effectiveness and pragmatic appropriateness are indispensable components of translation quality, while Colina (2008) demonstrates that functionalist evaluation provides a more comprehensive basis for assessing translations than approaches focusing exclusively on lexical correspondence. The findings of the present study reinforce these perspectives by showing that a translation may appear linguistically accurate yet still be functionally inadequate if it fails to accommodate the context of use and the expectations of its intended audience. Moreover, the findings are also consistent with recent human-centered approaches to machine translation evaluation. Costa-jussà *et al.* (2022) argue that although recent AI-based translation systems have significantly improved translation quality, human evaluation remains indispensable because communicative success depends on contextual interpretation that cannot be fully captured by automatic metrics.

The results are also in line with recent developments in machine translation research. Despite remarkable advances in Neural Machine Translation, contextual interpretation remains one of the greatest challenges for AI-based translation systems (Castilho & Knowles, 2025). Likewise, Freitag *et al.* (2021) report that human judgments of translation quality are strongly influenced by contextual factors that cannot be fully captured through automated evaluation metrics. The current study provides additional evidence for this argument. While MT successfully transferred the core informational content of the source texts, it frequently lacked the contextual adaptation required to produce translations that function naturally within Indonesian academic discourse. This explains why satisfactory semantic transfer does not necessarily result in high functional adequacy.

Another important implication concerns the way translation quality is evaluated. Widely used automatic metrics, such as BLEU, METEOR, and Translation Error Rate (TER), are valuable for measuring lexical similarity and structural correspondence. However, these measures reveal little about whether a translation achieves its communicative objective. By incorporating both extratextual and intratextual dimensions, Nord's framework enables translation quality to be examined from a broader perspective that includes communicative purpose, audience orientation, contextual appropriateness, cohesion, and coherence. Consequently, the findings suggest that functional evaluation should complement, rather than replace, computational metrics when assessing AI-assisted translation.

Theoretically, this study reaffirms the continuing relevance of functionalist translation theory in the age of Artificial Intelligence. As machine translation becomes increasingly integrated into professional and academic practice, evaluating translation quality requires approaches that extend beyond grammatical accuracy and lexical equivalence. The operationalization of Nord's functional adequacy framework into a measurable evaluation model also represents a methodological contribution, offering researchers a practical instrument for systematically comparing human and machine translation from a communicative perspective.

The findings likewise have practical implications for translator education and professional translation practice. Although Machine Translation can substantially improve efficiency during the initial stages of translation, it cannot yet replace the interpretative and communicative expertise of professional translators, particularly in academic writing where precision and contextual appropriateness are essential. These results highlight the importance of strengthening post-editing competence, functional text analysis, and audience-oriented translation strategies within translator training programmes. Developing these competencies will enable future translators to work more effectively alongside AI technologies while maintaining high standards of translation quality.

Finally, the evaluation model proposed in this study may serve as a useful framework for future research. By combining Nord's functional analysis with a structured quantitative scoring system, the model provides a systematic approach for assessing translation quality across different languages, genres, and machine translation systems. Its application may contribute to the development of more comprehensive evaluation methods that capture not only linguistic accuracy but also the communicative effectiveness of translated texts.

CONCLUSION AND RECOMMENDATION

This study explored the comparative performance of Human Translation (HT) and Machine Translation (MT) in translating English academic texts into Indonesian using Christiane Nord's Functional Typology and functional adequacy framework. The quantitative analysis showed a clear difference between the two translation approaches. Human Translation obtained a mean score of 19.0 (Highly Adequate category), while Machine Translation achieved a mean score of 13.2 (Moderately Adequate category). The most noticeable differences emerged in contextual sensitivity and language acceptability, suggesting that although MT is capable of transferring the essential meaning of the source text, it has not yet fully accommodated the communicative conventions and sociocultural expectations that characterize Indonesian academic writing.

The findings highlight that evaluating translation quality requires more than measuring linguistic similarity or computational performance. A translation should also be assessed according to its communicative purpose, its suitability for the intended audience, and its ability to produce a coherent and contextually appropriate target text. Viewed from this perspective, the results lend further support to Nord's functionalist approach, emphasizing that the success of a translation depends on how effectively it fulfills its communicative role within the target-language environment.

This study demonstrates that Nord's Functional Typology continues to provide a relevant theoretical foundation for evaluating AI-assisted translation despite the rapid advancement of Neural Machine Translation technologies. In addition, by transforming Nord's qualitative framework into a structured quantitative scoring model that combines extratextual and intratextual analyses, this research offers a practical evaluation procedure that can

complement conventional assessment methods based primarily on automatic metrics or translation errors.

The practical implications are equally important. Rather than replacing professional translators, Machine Translation is better positioned as a supportive technology that can improve translation efficiency while still requiring human intervention to ensure functional adequacy. For academic and professional translation in particular, post-editing skills, functional text analysis, and audience-oriented decision-making remain essential competencies. These findings therefore reinforce the importance of integrating AI literacy and post-editing practice into translator education and professional training.

This research was conducted using a relatively small corpus consisting of ten English–Indonesian texts and evaluated the output of only one machine translation system. Future studies could broaden the dataset, comparing different Neural Machine Translation systems, and examining a wider range of text types, such as expressive, operative, and persuasive texts. Combining functional adequacy with translation error analysis, reader-response studies, and usability evaluation may also provide a more comprehensive understanding of translation quality in increasingly AI-assisted translation environments.

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