Human-AI Hybrid Translation Systems in Algeria:
Efficiency, Policy, and Practice from a Government Translator's View

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Abstract

Artificial intelligence (AI) has significantly transformed translation workflows within major international institutions, including the United Nations, the European Commission and the United States Department of Homeland Security. This is largely due to the adoption of promising advancements in neural machine translation (NMT) technologies and large language models (LLMs), which have improved the speed and accuracy of multilingual communication. These AI-driven tools allow institutions to efficiently manage large volumes of content while producing high-quality translations, which are crucial for global cooperation and policy implementation. In Algeria, recent developments in digital infrastructure, combined with a broader governmental agenda focused on institutional modernisation, provide a timely framework in which to explore the potential integration of hybrid human-AI translation systems within public sector bodies. This study specifically investigates the feasibility and benefits of tiered translation workflows, in which human editors, reviewers, and/or proofreaders refine AI-generated translations. These hybrid methods aim to combine the strengths of AI technologies and human expertise to achieve the best possible translation quality. The research draws on an analysis of international best practices, Algeria's national language policies, current digital infrastructure capabilities and existing regulatory frameworks. The paper assesses Algeria's readiness to adopt these advanced translation technologies, ensuring compliance with ethical considerations, linguistic diversity and legal standards. Furthermore, the paper identifies key operational challenges, including technological limitations, workforce training needs, and policy gaps. To address these challenges, the study proposes strategic recommendations for the responsible and effective adoption of AI in Algeria's multilingual governance. These include enhancing digital translation services, strengthening AI infrastructure, and establishing a dedicated national translation body. This body would play a crucial role in shaping national language policies; such as decisions around localisation, foreignisation, and the gradual linguistic transition from French to English, in addition to overseeing the integration and ethical use of advanced AI technologies like NMT and LLMs across governmental institutions.

Keyword: AI-Human Translation; Computational Linguistics; LLMs; NMT; Tiered Systems.

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Introduction

The integration of artificial intelligence (AI) into language technologies has fundamentally transformed translation practices in both the public and private sectors worldwide. Advances in neural machine translation (NMT) systems and large language models (LLMs) now allow for the production of faster, more scalable, and more cost-effective translations than ever before. These technologies have revolutionized the generation and management of multilingual content, facilitating communication across linguistic barriers with unprecedented speed.

However, despite their impressive capabilities, AI-driven translation tools present significant challenges. Issues such as context sensitivity, accurately conveying cultural nuances, and legal accountability remain critical concerns. These challenges are particularly pronounced in governmental contexts, where linguistic precision intersects deeply with policy formulation, legal interpretation, and diplomatic relations, making it not merely a matter of communication. Therefore, adopting AI-powered translation systems in these environments requires careful management to balance enhancing operational efficiency with upholding ethical and legal responsibilities.

Many international institutions, including the European Commission and the United Nations, have promoted the adoption of AI-based translation technologies. However, the integration of hybrid translation systems, which combine machine-learning models with human oversight, remains relatively unexplored in Algeria. However, Algeria's rapidly expanding digital infrastructure, including high-performance computing centers (HPCs), AI-focused educational initiatives, and emerging policy frameworks, offers a promising foundation for such integration. However, the practical implementation of tiered translation workflows, in which AI-generated content is systematically refined by human experts, is still in its nascent stages.

This paper aims to investigate the feasibility and strategic value of implementing tiered human-AI translation workflows within Algeria's public sector institutions. First, it provides a comprehensive overview of the evolution of translation technology, particularly contemporary practices involving neural machine translation and large language models. Drawing on national policy documents, educational breakthroughs, and international evaluation standards, this study critically examines Algeria's readiness for adoption, performance metrics, quality assurance mechanisms, and relevant regulatory frameworks.

Ultimately, the research assesses whether Algeria's digital transformation roadmap aligns with global best practices for ethical, secure, and culturally sensitive translation governance. In doing so, the study projects the future trajectory of AI integration within Algeria's multilingual public administration, which operates across Arabic, French, English, and Tamazight.

The author works in public administration but contributes to this article in a personal capacity. The views expressed are solely those of the author and do not reflect the position of any institution.

I. Evolution of Machine Translation

Machine translation (MT) technologies reflects successive eras of the uninterrupted evolution of computational linguistics. In the 1950s, rule-based machine translation (RBMT) systems emerged using hand-coded grammatical rules and bilingual dictionaries (Kocmi et al., 2023). However, they proved defective in handling linguistic asymmetries as the case in-between Japanese and Arabic for example.By the 1980s, statistical machine translation (SMT) indicated a greater adaptability by leveraging bilingual corpora to generate predictive probabilistic models (Bahdanau et al., 2015). However, on this occasion, SMT struggled with terminological inertia, lexical gaps, and low-resource languages.

The 2010s introduced Neural Machine Translation (NMT), characterized by encoder-decoder designs and attention mechanisms (Bahdanau et al., 2015). NMT proved more fluency and semantic coherence.

Recent advances like Meta AI's NLLB-200 (No language Left Behind, trained on 200 languages) demonstrate state-of-the-art multilingual performance, with an average BLEU score improvement of +44% for low-resource pairs compared to existing baselines (NLLB, 2024).

Post-Covid-19 era commenced robustly with the emergence of Large Language Models (LLMs). LLMs are deep learning systems that rely on transformer-based architectures to generate and understand human language (Hadi et al., 2023)

Table 1: Popular LLMs

Model Name	Developer	Notes
GPT-4	OpenAI	Multimodal, advanced reasoning
DeepSeek	DeepSeek AI	Open source, advanced features
LLaMA 3	Meta AI	Open weights, widely used for research
Gemini 1.5	Google DeepMind	Multimodal, Google Bard replacement
Mistral	Mistral AI	Open-weight, performant on limited compute

Source: KOBOUCH, A.B, 2025.

Despite their usefulness, LLMs display several critical limitations. The most visible is hallucination, where the model produces content that appears persuasive yet unable to rival with human prowess (Ji et al., 2023). This undermines credibility and trustworthiness in critical areas such as medicine and law.

Furthermore, LLMs frequently reproduce social, cultural, and gender biases, as they are easily manageable thanks to training datasets (Bender et al., 2021). Datasets often reflect historical and societal predispositions.

Environmentally, the training of large models similar to GPT-4 and PaLM involves immense energy consumption, (Patterson et al., 2021). This raises concerns about their carbon footprint and sustainability.

Another dilemma is the dichotomy of "black boxes"[2] and "glass boxes"[3] in AI. The opacity and inexplicability of LLMs' processing affect interpretability and transparency (Lipton, 2018), seen as decisive in settings such as the legal, medical and financial sectors.

Nonetheless, the industry tends towards human-in-the-loop verification. Enterprise systems such as the GlobalLink of TransPerfect integrate GPT-4 with verification models like Bloom, illustrating how the industry incorporates post-editing with AI verification (Schoening, 2024).

The brief cursory examination of the evolution of AI translation systems reveals a modern landscape characterised by heterogeneity and diversity in contemporary practices.

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[2] "**Black box** is a term used not only to describe models with many parameters, but also to indicate systems that lack transparency in both structure and decision rationale" (Lipton, 2018).

[3] "**Glass box**" model prioritizes transparency and makes its decision logic accessible to human reasoning (Lipton, 2018).

II. Contemporary AI Translation Practices

Organisations around the world are increasingly adopting hybrid workflows that combine AI suggestions with human post-editing via platforms such as Trados Studio and Lilt. For similar purposes, several AI translation platforms have been optimized to produce specialised translations. Some of the pioneering platforms are:

- MediTrans (HIPAA[4]-compliant) for medical documentation;

- DeepL's Next-Gen Model, especially for the English–German translations(Habash, 2025);

- Google' Gemini and Translation LLM excel in certain regional languages, outperforming GPT-4 in Telugu-to-English translations (Chandra et al., 2025).

For specialised translation, other AI tools demonstrated higher precision:

- Legal AI models trained on large legal corpora, including millions of statutes and court cases, demonstrate high terminology consistency (Villata et al., 2022);
- Medical systems embedding standards like Systematized Nomenclature of Medicine -Clinical Terms (SNOMED CT) and Unified Medical Language System (UMLS) are essential for ensuring clinical interpretability and reducing ambiguity in diagnosis and treatment translation (Bodenreider, 2008);
- Technical translators use computer-assisted translation (CAT) tools equipped with International Electro-technical Commission (IEC) 60050 terminology databases to ensure consistent use of standardized vocabulary (IEC, 2021).

To increase effectiveness, accuracy and reduce social and cultural biases, Human-AI translation workflow is structured based on tiered models. A tiered model refers to a layered architecture that systematises translation workflows based on automation, specialisation, human contribution, and quality control, meeting practical prerequisites and quality expectations (Lommel et al., 2014; Dzeguze, 2020; Panić 2020).

These workflows follow a three-stage process:

1. AI Drafting for non-critical and high-volume content;
2. Professional Post-Editing for moderate importance
3. Bilingual Review

Schoening (2024) suggests that structured post-editing workflows can substantially reduce translation errors, though figures are based on internal case studies rather than peer-reviewed data. In case of critical and/or confidential content, certified translators should be in charge of the whole process of translation (Lommel et al., 2014).

Table 2: The Layers of Recommended Human-AI Translation Workflow

Tier Level	Tasks	Role in Translation Workflow
1	AI Draft Generation	Initial translations provided by NMT or LLM
2	Automated Quality Checks	AI assures terminology equivalence, contextual relevance, and error detection
3	Human Post-Editing	Human translators review, proofread and refine AI output
4	Human Feedback Loop	Human corrections used to reskill or fine-tune future AI productions
5	Ethical Oversight	Human validation for cultural appropriateness and impartiality

Source: KOBOUCH, A.B, 2025.

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[4] The Health Insurance Portability and Accountability Act (HIPAA) of 1996 *"establishes federal standards protecting sensitive health information from disclosure without patient's consent"*. (CDC, 2024)

Table 2 elucidates the layers through which a translation product should pass in a given tiered model. According to Table 2, AI is responsible for text generation and automatic review, where the detection of equivalent terminology, contextual appropriateness and syntactic refinement are primordial. Human translators intervene as reviewers, trainers and cultural appropriateness experts; they localise the product to fit specific settings and protocols.

In such advanced systems, translators are frequently designated as language specialists. This professional transition can be attributed to the technological revolution, which has led to an increased demand for translators who can operate at a higher level of proficiency.

Table 3: Case Studies of Human-AI Translation Workflows

Organization / Entity	Tiered Elements	Use Case	Source	Link
European Commission	AI Draft + Human Post-Editing + Compliance Review	EU directives, legislative documents	EC Directorate-General for Translation	https://translation.ec.europa.eu/tools-and-resources/ai-translation-and-language-tools_en
United Nations Natural Language Processing Task Force (UN NLP)	AI Draft + Feedback Loop + Ethical Oversight	Multilingual policy and peacekeeping documents	UN NLP in collaboration with Workshop on MT Shared Tasks (2023)	https://www2.statmt.org/wmt23/2023.wmt-1.pdf
TransPerfect (GlobalLink)	Multi-Agent AI + MTPE + Human Sign-Off	Legal, marketing, and enterprise content	TransPerfect (2023)	https://www.transperfect.com/solutions/translation-and-language-services/ai-and-machine-translation
U.S. Department of Homeland Security (DHS)	AI Drafts + Human Legal/Intelligence Review	Internal reports, foreign language intelligence	DHS AI Use Framework (2023)	https://www.dhs.gov/archive/news/2024/11/14/groundbreaking-framework-safe-and-secure-deployment-ai-critical-infrastructure

Source: KOBOUCH, A.B, 2025.

Table 3 demonstrates some of the cases where human-AI translation workflow is proving diversity and efficiency in a range of different specialised work environments: legislative, legal, humanitarian, cultural, financial, economic and national security. As illustrated in Table 3, all the organizations and entities under discussion are distinguished by their substantial financial potential. The existence of considerable financial support is a crucial component, emphasizing the importance of substantial funding for a fruitful implementation.

Human-in-the-loop correction systems, including those reported by the UN NLP Task Force, have improved contextual accuracy, though quantitative metrics are not published.

III. Evaluation Metrics and Quality Assurance
The introduction of sophisticated technologies raises questions about performance evaluation, product quality assurance, and regulatory compliance.

Table 4 below illustrates in a comprehensive manner the metrics used to assure quality in AI translation models.

Table 4: AI Translation Evaluation Metrics

Metric	Methodology	Strengths	Limitations
Bilingual Evaluation Understudy (BLEU)	Compares word sequences in MT output to reference texts using precision (Papineni et al., 2002)	Fast, language-agnostic, widely adopted (Papineni et al., 2002)	Ignores meaning, sensitive to word order, weak on fluency (Papineni et al., 2002)
Cross-lingual Optimized Metric for Evaluation of Translation (COMET)	Uses pre-trained Language Models to compare embeddings and predict human scores (Rei et al., 2020)	High correlation with human judgment, robust to paraphrasing (Rei et al., 2020)	Requires large training data, more compute-intensive (Rei et al., 2020)
Multidimensional Quality Metrics (MQM)	Human reviewers annotate and score based on a structured typology (Lommel et al., 2014)	High granularity, interpretable, domain-adaptable (Lommel et al., 2014)	Labour-intensive, subjective variability across annotators (Lommel et al., 2014)

Source: KOBOUCH, A.B, 2025.

Evaluation metrics classify into statistical Automatic (BLEU), neural Automatic (COMET); where the semantic similarity is generated according to human references; and human-based framework (MQM) for enhanced accuracy and fluency.

Despite high BLEU scores, AI models struggle in capturing cultural nuances and pragmatic force. Illocutionary differences (e.g., "shall" vs. "may") and cultural metaphors are the most prominent issues in this regard (Ghassemiazghandi, 2024; Dewayanti & Margana, 2024).

MQM capture nuanced errors from terminology misuse to style violations (Lommel et al., 2014), particularly effective in regulated domains such as pharmaceuticals.

IV. Projection onto the Algerian case
The following analysis aims to demonstrate how Algeria's institutional translation and interpreting departments can benefit most efficiently from AI advances.

IV.1. Legal, Ethical, and Operational Requirements
A strategic and responsible AI implementation framework must ensure ethics, legality, security, and inclusivity. For example, bias audits are essential to detect gender, cultural, and political distortions in multilingual AI translation systems, particularly in government or policy-sensitive contexts (Bender et al., 2021). Additionally, compliance with FIPS 140-2[5] ensures the cryptographic security of sensitive data, particularly in healthcare and government environments (NIST, 2001).

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[5] Federal Information Processing Standard Publication 140-2 is a U.S. government security standard that defines the requirements for cryptographic modules used in software and hardware (NIST, 2001).

The United Nations (2024) along with the European Commission (2025) recommend responsible AI deployments must meet international standards like General Data Protection Regulation (GDPR) for data privacy, HIPAA for medical data (Mayover,2025), and UN multilingual parity to ensure inclusivity.

Translation performance should be evaluated using Key performance indicators (KPIs) such as BLEU/COMET scores, error rates, turnaround time, and post-editing efforts to guarantee both efficiency and linguistic fidelity (Rei et al., 2020; Lommel et al., 2014).

IV.2. AI Policy Developments in Algeria

Over the last few years, Algeria has created key institutions and strategic plans to endorse the emerging AI governance. These institutions and initiatives are organised in chronological order:

- E-Algeria Strategy from 2008 to 2013, extended up to 2018(Khalfallah & Bendjelloul, 2023);

- For the first time on 23 June 2020, the President issued a decree (No. 20-163) naming the first Minister for Digitalisation and Statistics in the history of the country;

- Digital Algeria I 2022-2025 (Khalfallah & Bendjelloul, 2023);

- On 6 September 2023, the Ministry has been replaced by the High Commission for Digitalisation, which operates under the direct authority of the President of the Republic (Presidential Decree No. 23-314);

- In 2023, The AI Council was established by a joint initiative between the Ministries of Higher Education, and Economy & Start-ups, with the aim of developing a multi-sector strategy on AI. The Council is responsible for guidance on AI development and governance and assuring AI innovation is aligned with national priorities and ethical standards. (Buza & Taha, 2025);

- Digital Algeria II 2026-2030 (Khalfallah & Bendjelloul, 2023);

- In 2024, the government released the National AI Strategy, targeting investment in infrastructure, research, and innovation. The strategy includes an AI fund and expanded roles for the National Data Protection Authority (ANPDP) to oversee AI-related data governance (Buza & Taha, 2025);

- Collaborating with regional and international partners for instance the African Union initiatives within the Continental AI Strategy and maintaining bilateral AI Research et Development (R&D) cooperation with China (Buza & Taha, 2025), and Slovenia recently.

Currently, there are no public enforcement measures, AI-specific regulatory guidelines, or full-fledged AI-targeted laws (Buza & Taha, 2025).

IV.3. National Digitalisation Strategy and Infrastructure

Algeria's 2024 Digitalisation Strategy emphasises:

- Development of High Performance Centres in Oran and Algiers to power AI in healthcare, industry, and smart cities (Naili, 2025; Yadav, 2024);

- Launch of an $11 million fund by Algérie Télécom to support AI, cybersecurity, and robotics start-ups (Telecom Review Africa, 2025);

- Expansion of digital infrastructure, including 265,000 km of fibre optic cables and thousands of 4G sites and laying the groundwork for 5G expansion (BTI Report, 2024);

- A target for AI to contribute 7% to national GDP by 2027 (Buza & Taha, 2025).

IV.4. Regulatory and Institutional Framework

The legal arsenal includes:

- Law No. 18-07 (2018) governs personal data processing, with National Authority for the Protection of Personal Data (ANPDP) as the regulatory body;

- Amendment of Audio-visual and Press Laws for content regulation, local content quotas, and platform moderation (Legal Doctrine, 2023);

- Law No. 09-04 of August 5, 2009, stipulates specific rules for the prevention and the fight against offences linked to information and communication technologies ICT. For instance, Articles 11, 12 and 13 empower judicial authorities to order ICT service providers (including Internet Service Providers, ISPs) to retain and provide data, i.e. data disclosure and identification obligation. Furthermore, Article 16 authorizes judicial authorities to order the seizure, blocking, or deletion of illicit digital content.

- The Competition Ordinance and Value Added Tax (VAT) expansion cover digital services taxation and market fairness (Laan, 2025).

IV.5. AI in Education, and in Translator/interpreter Training

Algeria integrates AI into education to promote digital transformation. According to Mohammed Brahimi, Senior Lecturer at the National AI Graduate School (ENSIA):

- Algeria is home to more than 50 universities offering courses in AI, in addition to 20 specialised research laboratories (APS, 2024);

- The country boasts 117 AI resource centres housed within academic institutions(APS, 2024);

- A graduate school of artificial intelligence (ENSIA) has been established; the first dedicated AI engineering school in Africa and the Arab world (APS, 2024).

In terms of translation education and continuous professional development (CPD), Algerian academic institutions are introducing programmes to integrate AI tools into translation education and organise scientific forums to facilitate AI integration.

In this regard, the Higher Arab Institute for Translation offers a specialised Master's course in Translation Technology for IT engineers, and Algiers 2 University Institute of Translation and Interpretation held "The First International Conference on Research Methods and Practices in Translation, Interpreting and AI" on May 2025. Among the Keynote speakers were Bernard Song, Maha El-Metwally, Fadhma Izri, Jorge Diaz Cintaz, Frederic Chaume, Ruslan Mitkov, Nora Diaz, Francesco Saina, and Rachid Yahiaoui.

The endeavours to promote AI in the country are highly valuable, yet it is acknowledged that the realisation and subsequent advancement of this initiative are encumbered by numerous challenges. A recent study (Bououden, 2025) was conducted among a cross-section of students, professors and professionals in order to explore the current situation of translation technology in Algeria.

Several challenges such as limitations, disparities and superficiality characterised the current situation. Inaccessibility to the latest technological updates, mediocre teaching materials and shortage of specialised trainers hinder the appropriate implementation. Financial constraints were a particular obstacle in professional settings, especially given that such software is not affordable for everyone. Institutionally, lack of funding and investment, and absence of national and/or regional interdepartmental collaboration and coordination were the most prominent issues (Bououden, 2025).

Institutions similar to The Supreme Council of the Arabic Language and the Arabic Language Academy, promoting Arabisation and preserving national identity, shape translation policy (mainly localisation) in the country. In this respect, the question arises of who is responsible for the promotion of Algeria on the international stage, i.e. who assumes the role of foreignization and cultural exportation.

On the other hand, the country is seeking to transition from French to English as its primary foreign language. Rwanda's switch to English and Saudi Arabia's trilingual policy provide strong examples for comparison of the feasibility of implementation.

The task is of critical importance, and the need for trilingual experts is more pressing than ever. Algerian translators and interpreters receive training and practise in a trilingual environment; i.e. Arabic, French and English/Spanish/German (Daoud, 2024), thus meeting the requirement for such linguistic and cultural transition. The Algerian community of translators and interpreters is organised into national and sub-regional chambers. These chambers are reserved for official, sworn, state-approved offices.

This suggests that the legal framework governing the profession exerts a lesser influence on independent, freelance and public translation personnel. Consequently, There have been calls for the establishment of a national body specialised in translation, interpreting and cross-cultural communication. This body would be responsible for national, localisation and foreignisation policies.

The necessity for the establishment of such an institution is predicated on the aspiration to promote Algeria's culture, education, technology and economy on an international scale. The body should contribute to the digital transformation aligned with Algeria's Vision 2030, and the national transition strategy from French to English.
Institutions such as the People's National Assembly, the Presidency of the Republic, and different Ministries could enhance their translation departments and services by investing in similar intelligent language models.

Conclusion

The present overview supports the prevailing argument that artificial intelligence (AI) should function as a collaborator, not a substitute, in public sector translation. Security concerns, data privacy, technological accessibility, and financial constraints are challenges that can be addressed through political commitment, targeted investments, and the implementation of updated legal and institutional frameworks.

Collaboration and knowledge transfer with strategic partners; such as China and Slovenia, can enhance the infrastructure currently under development. Hybrid translation systems, which integrate the scalability of neural machine translation (NMT) with human judgment, have proven to yield optimal results.

These technologies can be employed most effectively when accompanied by continuous training, facilitated through cooperation between national schools and institutes of information technologies (IT) and translation & interpretation.

AI has demonstrated its value in increasing efficiency, enhancing quality, and reducing error rates across various sectors. However, its integration necessitates the development of comprehensive frameworks to ensure appropriate usage in line with national policies, international standards, and ethical and deontological norms.

Transitioning from French to English, while preserving Algeria's sociocultural and linguistic specificities, will require sustained collaboration among the government, and language professionals and academics such as translators, interpreters, and linguists.

The analysis renews call for the establishment of a national body specialised in translation and foreignisation. Such institution should be tasked with shaping and overseeing the National Language Transition Policy.

Efforts should be directed toward developing a national language model that aligns with local policies and protects linguistic diversity. Encouraging innovation and supporting start-ups that offer integrated language and AI solutions through locally trained, open-source, publicly/privately funded initiatives will further enhance services across both the public and private sectors. Similar initiatives should strengthen digital sovereignty and reduce the risk of dependency on international service providers.

Further research should focus on cross-disciplinary translator training and the development of robust support for underrepresented language pairs, such as Arabic–Tamazight and English–Tamazight, in both directions.

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