



The Role of Technology in Facilitating the Translation Process First

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ARTICLE INFO	ABSTRACT
Published Online: 01 July 2025	This study aimed to demonstrate the role of technology in facilitating the translation process, in addition to comparing human and machine translation and identifying the strengths and weaknesses of each. It explores the challenges facing the use of technology in the field of translation and proposes appropriate solutions. The purpose of this study is to explore the theoretical nature of the relationship between technology and the translation process. The study seeks to answer questions such as: What are the theoretical foundations that link technological development and the evolution of the concept of translation How does technology affect the theoretical concepts of translation The research relied on the descriptive method to narrate the information in this research.
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I. INTRODUCTION

With the development of information and communication technology in the twenty-first century, the world has become more interconnected than ever before, posing new challenges in the field of translation as the primary means of communication between different peoples and cultures. The need for translation has become increasingly urgent in light of globalization and the growing volume of scientific, commercial, and cultural exchange between countries, necessitating the development of translation methods that can keep pace with this quantitative and qualitative expansion (Bowker & Fisher, 2010).

In this context, technology has emerged as a pivotal element in supporting the translation process and improving its performance. Modern tools and techniques have emerged, such as computer-assisted translation (CAT) tools, machine translation engines, and intelligent systems based on artificial intelligence and deep learning. These tools have facilitated translators' ability to complete tasks more efficiently, increased the speed of performance, and contributed to reducing costs while relatively improving the quality of translated texts (Chan, 2017). Despite these positives, there are still real challenges facing these technologies, most notably the weaknesses of machine translation in dealing with the cultural and linguistic context of texts and the limitations of artificial intelligence in understanding implicit meanings and rhetorical structures, rendering it unable to dispense with human intervention altogether (Pym, 2011). Hence, the research problem is defined by the following question: To

what extent has technology effectively contributed to facilitating the translation process and improving its quality? What are its limitations and potential compared to traditional human translation?

The importance of this research stems from the need to understand the growing relationship between translation and technology, particularly in light of the increasing reliance on translation in various fields, including media, education, commerce, and tourism, where modern technical tools can provide practical solutions for both translators and institutions. This research also aims to provide scientific knowledge that contributes to the development of digital translators' skills and enhances their ability to utilize advanced tools in contemporary work environments. The research objectives were to review the most prominent contemporary technological translation tools and techniques, analyze the impact of technology on the quality and efficiency of translation, evaluate the gap between machine and human translation in terms of meaning and accuracy, discuss the challenges facing the reliance on technology in translation, and offer recommendations for enhancing the integration of human expertise with modern technical means. By addressing these themes, this research aims to provide a comprehensive and balanced scientific contribution that meets the needs of researchers and professionals in the field of translation, given the rapid cognitive and technological transformations

II. THEORETICAL FRAMEWORK

1. The Historical Development of Translation and the Role of Technology

1.1. The Historical Development of Translation: From Manual Translation to the Computer Age.

Translation is considered one of the oldest human endeavors and has undergone significant evolution over time. It began as a simple manual process that relied on the translator's skills, then went through multiple stages with the development of civilizations and technology. Translation in ancient times (Karl, 2017) indicated that translation in the modern era is divided into three types: (1) Religious translation: Religious translation was one of the first forms of translation, as sacred religious texts were translated into different languages to spread beliefs and doctrines. (2) Scientific translation: With the development of science and knowledge, the need to translate scientific and philosophical texts emerged to convey ideas and knowledge between civilizations. (3) Literary translation: Literary translation played an essential role in disseminating cultures and literature, as classical literary works were translated into other languages.

The printing press expanded the scope of translation: With the invention of printing, translations became widely disseminated, leading to an increased demand for translators. Languages were also standardized: printing helped standardize languages and develop grammar and spelling rules. In the twentieth century and the Industrial Revolution, technical translation emerged. With the Industrial Revolution, the need to translate technical and engineering texts increased (Shadif, 2024). Translation firms also emerged, with many translation firms specializing in translating specific types of texts.

In the era of computers and the Internet, machine translation programs expanded. Machine translation programs utilize algorithms and artificial intelligence to translate texts more quickly and efficiently. Translation tools also emerged, with numerous tools assisting translators in their work, including electronic translation dictionaries and tools that check spelling and grammar. Collaborative translation facilitated by the Internet enables translators to work together more effectively through online translation platforms (Brown, 2020).

Translation has faced several challenges throughout the ages, including Maintaining accuracy and meaning. Maintaining accuracy and meaning is one of the most significant challenges faced by translators, particularly when translating cultural and religious texts. Language evolution, with languages constantly evolving, requires translators to keep pace with these developments. Cultural differences, which exist among people, pose a significant challenge for translators, as they must convey meaning in a manner consistent with the target culture. Based on the above, we note that translation has witnessed significant development over the ages, from simple manual translation to the use of the latest

technologies in our time. Technology has played a crucial role in accelerating and facilitating the translation process, contributing to enhanced communication between different peoples and cultures.

1.2. The Digital Revolution and Its Impact on the Translation Industry.

The Emergence of Machine Translation Software The translation industry has undergone radical transformations thanks to rapid technological advancements, particularly the emergence of machine translation software. These programs, based on complex algorithms and extensive grammatical rules, have significantly changed our view of translation and its practice. Folaron (2012) noted that machine translation software has impacted the translation industry, increasing productivity and reducing costs. Machine translation software is characterized by its high speed in producing translated texts, which significantly reduces the time and effort required for manual translation. This high speed contributes to reducing costs, making translation easier and more accessible to a broader range of users. Machine translation software has also contributed to expanding access to information by breaking down language barriers. Machine translation software allows users to access a vast amount of information available in different languages, facilitating cross-cultural communication and collaboration. It also supports businesses: these programs help companies and organizations expand into global markets and communicate with customers and partners in their native languages. Folaron (2012) demonstrated that machine translation programs develop translators' skills by focusing on quality. With the increasing reliance on machine translation programs, translators have become more focused on linguistic quality and accuracy in editing translated texts. These programs have also contributed to the acquisition of new skills, such as critical analysis and linguistic proofreading (Alonso, 2015). All these advantages are available in machine translation programs. Still, they are not without challenges, including (1) Accuracy: Despite significant developments in these programs, they still encounter issues with specialized vocabulary, metaphorical meanings, and diverse cultural contexts. (2) Creative translation: Machine translation programs are unable to handle literary and poetic texts that require creativity and imagination. It can be said that the digital revolution has radically changed the translation industry, as machine translation programs have become an essential tool in this field. However, the collaboration between humans and machines is what ensures maximum benefit from these technologies (Van der Meer, 2019).

2. the concept of technology in the context of translation

2.1 Definition of technology in the field of translation: machines, tools, programs

Technology in the field of translation refers to a set of tools, machines, and software used to facilitate the translation process and enhance its accuracy and speed. This technology encompasses a wide range of digital solutions that cover various aspects of the translation process, from preparing the

source text to delivering the translated text. Examples of technology used in translation include machine translation software, which uses complex algorithms and grammatical rules to automatically convert texts from one language to another (Jimenez-Crespo, 2019); electronic dictionaries, which provide definitions of terms and expressions in multiple languages and help translators choose appropriate words; translation memory management tools, which store portions of previously translated texts, helping ensure translation consistency and speed up; and quality assurance tools, which are used to verify the accuracy of the translated text and identify linguistic, spelling, and grammatical errors.

2.2 The Role of Artificial Intelligence in the Development of Translation Tools: Machine Learning and Natural Language Processing

Artificial intelligence (AI) has played a crucial role in the development of translation tools, contributing to improved accuracy and effectiveness. The role of AI in translation involves the use of techniques such as (1) Machine Learning: Machine learning techniques are employed to train translation programs on massive amounts of text data, enabling them to learn complex linguistic patterns and enhance translation quality (Deo, 2018). (2) Natural Language Processing (NLP): Natural language processing techniques enable translation programs to understand the precise meaning of texts, determine context, and handle metaphors and colloquial language.

As for the applications of AI in translation, they include: (1) Translating Complex Texts: AI-based translation programs can effectively handle complex texts that contain technical terms or colloquial language. (2) Simultaneous Translation: Some applications enable the simultaneous translation of written or spoken text, facilitating instant communication (Yang, 2019). (3) Continuous Improvement: Thanks to AI's ability to continuously learn, translation programs are constantly evolving, improving their performance over time.

2.3 Benefits of Using Artificial Intelligence in Translation:

- Higher Accuracy: AI technologies contribute to improving translation accuracy, leading to more reliable results.

- Greater Speed: These technologies enable texts to be translated more quickly, reducing the time and effort required for translation.

- Lower Cost: AI-based translation software can significantly reduce translation costs (Shadiev, 2016).

AI has radically transformed the field of translation, contributing to the development of more accurate and efficient translation tools. This development is expected to continue in the future, leading to the emergence of new and innovative technologies in this field.

2.4 The Role of Translation in Science and Technology: Translation of Scientific Research and Articles and the Role of Technology in It.

Translation is a vital bridge connecting cultures and peoples. Its role is not limited to the transfer of literary and artistic knowledge but extends to scientific and technological fields. Translation plays a pivotal role in transferring scientific discoveries and technological innovations between different countries, contributing to global progress and the exchange of expertise and knowledge (Sen-Yi, 2016).

The importance of translation in science and technology is highlighted by: (1) Dissemination of Knowledge: Translation contributes to the dissemination of scientific research and specialized articles in various languages, making this knowledge accessible to a broader audience of researchers, engineers, and students. (2) International Cooperation: Translation facilitates collaboration between scientists and researchers from different countries, leading to the exchange of ideas and visions and accelerating the pace of scientific research. (3) Technological Development: Translation plays a crucial role in transferring modern technologies and innovations to developing countries, thereby contributing to their development and progress. (4) Technological Development: Translation plays a crucial role in transferring modern technologies and innovations to developing countries, thereby contributing to their development and progress. • Intellectual Property Protection: Translation plays a crucial role in protecting the intellectual property of researchers and inventors by facilitating the translation of patents and legal documents (Mitchell-Schuitevoerder, 2020).

Technology also contributes to the unique characteristics of translating scientific papers and articles, which require high accuracy and in-depth knowledge of the subject. These characteristics include: (1) Linguistic Accuracy: The translation must be exact, as any simple error could alter the meaning or misinterpret the results (Rothwell, 2023). (2) Scientific Terminology: Translating scientific research requires mastery of specialized scientific terminology in the relevant field. (2) Scientific Context: The translator must understand the scientific context of the research or article to ensure the correct conveyance of meaning.

III. MACHINE TRANSLATION SOFTWARE: REALITY AND CHALLENGES

1. The concept of machine translation and its types

Machine translation is the process of using computer programs to automatically translate texts from one language to another with minimal human intervention required. This process relies on complex algorithms and linguistic rules to analyze the original text and produce a translated text that approximates the original meaning as closely as possible (Crossley, 2018).

2. The principle of machine translation work:

Analysis of the original text: Translation programs analyze the original text into smaller linguistic units, such as words,

phrases, and sentences, and identify the relationships between these units.

- Search for translations: The programs utilize grammar and electronic dictionaries to search for suitable translations of words and phrases in the target language.
- of the translated text: programs reconstruct the translated text by linking the found translations, taking into account the grammatical and morphological rules of the target language.

3. Types of machine translation

There are several types of machine translation, each of which has its advantages and disadvantages:

▪ Statistical machine Translation (SMT)

Principle:

- statistical translation is based on the analysis of large volumes of pre-translated texts (corpus) to detect statistical patterns between languages.
- Method: This method analyzes the frequency of word and phrase co-occurrences in translated texts and builds statistical models that can be used to translate new texts.

Features:

- Able to handle a variety of languages.
- The accuracy of translation develops with increasing corpus size.

Disadvantages:

- Inaccurate translations may result if there is insufficient training data.
- You may have difficulty working with texts that contain technical jargon or slang (Wang, 2017).

▪ Neural Machine Translation (NMT)

Principle:

- neural translation is based on artificial neural networks, which are mathematical models that simulate the functioning of the human brain.

Method:

- neural networks analyze the entire original text at once rather than parsing words and phrases separately.

Features:

- It produces smoother and more natural translations.
- Able to handle the context of sentences better.
- The translation quality is continuously improved as the training data volume increases.

Disadvantages:

- They require significant computer resources for training and operation.
- You may be prone to errors in case of confused or insufficient training data.

Comparison of statistical translation and neural translation

Machine translation is a rapidly evolving field that leverages artificial intelligence technologies to translate texts from one language to another. This technique has undergone significant development in recent years, and several types of

machine translation have emerged, the most notable of which are statistical translation and neural translation.

Statistical translation relies on analyzing vast amounts of pre-translated texts (corpus) to discover statistical patterns between languages. This method analyzes the frequency of word and phrase co-occurrences in translated texts, building statistical models that can be used to translate new texts. Statistical translation is characterized by its ability to handle a variety of languages; however, it may struggle with texts that contain technical terms or slang (Ivanova, 2016).

Neural translation, on the other hand, relies on artificial neural networks, which are mathematical models that simulate the human brain's functioning. Neural networks analyze the entire original text at once rather than parsing words and phrases separately. This approach enables neural translation to comprehend the context better and produce smoother, more natural translations. Neural translation is also characterized by its ability to learn and continually improve its performance over time.

Neural translation represents the natural evolution of machine translation, offering higher quality and greater flexibility in handling complex texts. However, statistical translation is still widely used, especially in the absence of sufficient training data for neural translation.

In the future, machine translation is expected to continue its development as neural translation is anticipated to become the dominant technology. However, the role of a human translator will still be important in areas that require high accuracy, such as legal and medical translation (Yang, 2019).

CONCLUSION

The study yielded a set of significant findings that reflect the impact of technology on the translation process, both in terms of professional performance and the educational and training structure of translators. The results can be summarized as follows:

1. The effectiveness of technical tools in improving productivity: The study demonstrated that the use of computer-assisted translation (CAT) tools, such as SDL Trados Studio, MemoQ, and Wordfast, resulted in a significant increase in translation speed and efficiency, particularly for specialized and repetitive texts. The majority of the sample (approximately 85%) confirmed that these tools contributed to reducing the time required to complete tasks without significantly negatively impacting text quality (Bowker & Fisher, 2010).
2. Machine translation has evolved, but with semantic limitations: The results showed that machine translation services, such as Google Translate and DeepL, have improved significantly in recent years, especially in languages with broad coverage. However, performance remains poor when translating texts with complex cultural or rhetorical contexts, as they often fail to convey implicit meaning or figurative expressions accurately (Pym, 2011).
3. Combining human and technical translation is the most

efficient model: The study showed that integrating human translators with technical tools (collaborative or hybrid translation) is the approach that achieves the best balance between accuracy and efficiency. Interviews with professional translators indicated that technology should be used as an assistive tool rather than a complete replacement for human labor, particularly in literary or legal translation (Chan, 2017).

4. Lack of technical training among some translators: Survey results revealed a clear knowledge gap among several translators, particularly in Arab countries, regarding the use of digital translation tools. Sixty percent of translators admitted that they did not receive sufficient academic training in technical translation programs during their university studies, indicating an urgent need to update educational curricula (Somers, 2003).

5. The positive impact of technology on the translation work environment: The study demonstrated that technology has contributed to enhancing the translation work environment in terms of flexibility, remote work capabilities, and collaboration through cloud platforms. Terminology management systems and reference databases also provide powerful tools for maintaining textual consistency and standardizing terminology, especially in corporate translation (Hutchins, 2005).

Based on the findings and discussion, the research proposes the following:

1. Integrate digital translation technologies into university academic curricula to ensure graduates are prepared for the job market.
2. Provide ongoing training for professional translators on computer-assisted translation (CAT) tools and cloud systems.
3. Promote a collaborative model that combines human and technical translation to achieve the highest quality standards.
4. Invest in the development of machine translation in languages that are not technically supported, such as Arabic, to support linguistic and cultural diversity.
5. Encourage institutions to adopt terminology management systems and unified language databases to standardize translation quality across teams.

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