Risks and Strategies in the Translation of Scientific and Technical Texts: A National Security Studies Perspective

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Abstract: Science and technology security is a vital component of national security. Currently, the rapid advancement of AI technology has led to widespread issues such as data breaches, mistranslation of information, and algorithmic biases. These problems pose a significant threat to security in the translation of scientific and technical texts. This paper studies the current security risks in the target texts on China's leading science and technologies in the era of AI. From the perspective of the theory of ruling by both law and morality, this paper explores strategies to address security risks in terms of translator's subjectivity, translation media, risk assessment, and security guarantees. It is hoped to be of some help for the improvement of national translation security.

Keywords: national security studies; science and technology security; leading scientific and technical texts; translation risks

1. Introduction

Since the 1990s, science and technology have assumed an increasingly prominent role in socioeconomic development, becoming a primary source of national competitiveness[1]. In 2014, General Secretary Xi explicitly stated that science and technology security is an essential component of the holistic view of national security and a cornerstone of national survival and development[2]. Against the backdrop of the full integration of globalization and informatization, countries around the world have elevated technological competition to the level of national strategy, and science and technology security has become a key variable affecting core interests of a nation[3].

National translation security refers that a nation possesses the sovereign right to utilize translation services. Its translation practices, personnel or institutions, and the academic discipline of translation are not threatened or undermined; and the production and application of translation do not precipitate crises in the nation's political, economic, social, cultural, military, or informational domains[4]. Currently, China has achieved a series

of leading outcomes in frontier fields such as artificial intelligence(AI), biomedicine, new energy, and quantum communication. These scientific and technical achievements are exchanged and disseminated internationally through academic papers, technical patents, and product instructions, which has significantly enhanced China's technological discourse power. However, the translation of these texts also entails severe, underlying national security risks.

The rapid development of the translation service industry and translation technology has substantially increased translation efficiency, but has also led to a higher frequency of translation security incidents[5]. With the assistance of the Internet and machine translation, the translating tasks become increasingly diverse and the translation process becomes increasingly automated, which poses a great threat to translation security[6].

Therefore, this paper, from the perspective of the theory of ruling by both law and morality, studies the translation risks and strategies of China's leading scientific and technical texts in the age of AI. It is hoped to be of some help for deepening the comprehension of the emerging conception of "national translation security" and for enhancing the national security and confidentiality awareness of scientific and technical translators.

2. Previous Studies on Security in the Translation of Scientific and Technical Texts

In 2014, General Secretary Xi first introduced the strategic thought of the holistic view of national security, which deepened and expanded the theoretical horizons and practical fields concerning national security issues[7]. It has become a common public perception that national security is a major strategic issue on national development and lasting social stability[8]. Science and technology security is an integral component of the holistic national security. To address the risks and challenges posed by AI, it is necessary to consider them from the dimension of national security[9]. Therefore, upholding and safeguarding national security must be guided by the holistic national security concept, and be rooted in a firm awareness of potential risks and issues[8].

In recent years, with the rapid development of AI, issues in translation security have become increasingly prominent, including those related to machine translation, terminology translation, nomenclature translation, undertranslation, and the dissemination of translations[6]. Nowadays, national translation security has become an indispensable security element under the holistic national security[4]. Xu Jianzhong proposed the macro-level construction of "translation security studies"[4]. From a micro-level perspective, Jia Hongwei proposed a "translator security mechanism"[10] and a "translation security mechanism"[11]. Huang Yijuan[12] investigated English translation practices from the standpoint of national security interests. Hu Bo[13] explored the national practices of Chinese legal translation from a national security perspective. Hu Jian[14] examined translation security issues concerning the COVID-19 infodemic from the perspective of the holistic national security. Gao Yuxia and Ren Dongsheng[4] proposed constructing a research framework for national translation security from the perspective of national security studies. Despite the substantial body of domestic research on national translation security, the specific area of scientific and technical translation security has received relatively insufficient attention.

Domestic research on scientific and technical translation security is relatively limited. For instance, Liu Jijun and Liu Jiqing[15] studied translation methods for high-tech literature within the context of cybersecurity, and Huang Mei[16] researched the linguistic characteristics of translation of English scientific and technical books on seismic safety. As the amount of open-source information increases, its cybersecurity risks are projected to escalate further[17]. For scientific and technical translators, properly executing confidentiality duties and effectively responding to the new challenges in scientific and technical development is of great strategic

significance for upholding national science and technology security[18]. The *2025 Report on the Development of China's Translation Industry* issued by the Translators Association of China shows that the scale of translation practitioners in China has reached 6.808 million by the end of 2024. So, to ensure national science and technology security, more attention should be paid not only to researchers on classified projects but to the large number of full-time and part-time scientific and technical translators.

Current translation practices in scientific and technical texts mainly have issues such as insufficient terminological standardization, low cultural adaptability, and a lack of mechanisms for filtering sensitive information. Particularly within the context of the widespread application of generative AI, the risks of mistranslation and privacy breaches have increased markedly, posing a severe threat to national security. Therefore, a study on the risks and strategies associated with the translation of China's leading scientific and technical texts is imperative.

The USA places significant emphasis on the role of scientific and technical translation in its national security. Since the administration of Donald Trump, the country implemented the "Translating China" initiative which involves multiple entities including official translation agencies, think tanks, and foundations, with the objective of translating open-source texts from the Chinese Internet covering politics, science and technology, and military affairs into English[17]. It leverages data analysis technology and translation to extract substantial intelligence of strategic value from these Chinese open-source texts[17].

The European Union is a key entity in contemporary global technological innovation, with its leading technologies concentrated in areas such as clean energy, quantum computing, and AI. Consequently, the translation of related scientific and technical texts has attracted considerable attention, yet it is also fraught with security risks such as the leakage of sensitive data, cross-lingual terminological distortion, and cross-jurisdictional regulatory conflicts.

Foreign scholars have acknowledged the connection between translation and security. For example, Baker[19] investigated the function of translation narratives in the construction of terror and security threats, whereas Stritzel[20] and Berlingtal[21] approached security issues from the perspective of translation studies, proposing the concepts of 'security in translation' and 'translation of security' respectively[4]. The relationship between the translation of scientific and technical texts and national security essentially reflects the theoretical principle that translation activities are universally constrained by political power.

In accordance with Lefevere's rewriting theory, political factors necessarily influence the entire translation process from the text selection to the role of patrons and the reception of the target text[22]. Scientific and technical translation serves as a typical field for political manipulation, as it involves the core interests of national competition and security. In the field of scientific and technical translation, research hoshuoas focused on concepts such as fidelity, equivalence, and accuracy. Beyond these, scholars like Pym[23] have also investigated risk management. Pym asserts that "machine translation and generative AI make mistakes, sometimes very high-stakes mistakes"[23]. It is therefore evident that international scholars are significantly concerned with the risks and corresponding strategies for the translation of leading scientific and technical texts.

3. Introduction to the Theory of Ruling by Both Law and Morality in National Security Studies

3.1. Relationship Between National Security Studies and Translation Security

National security studies is a strategic discipline characterized by its indigenous theoretical knowledge system and distinct Chinese features[24][25]. The subject of its inquiry is a re-examination of the scientific nature,

rationality, and sustainability of the state's fundamental political objectives, pertaining to both national survival and development and encompassing both international and domestic issues[25]. As an emerging interdisciplinary field, national security studies comprise 12 fundamental components such as cultural security, and science and technology security. Although translation security does not directly constitute a primary element of national security, it is an integral part of cultural security. The pan-disciplinary and interdisciplinary nature of translation research is highly compatible with the cross-cutting and extensive character of national security studies[4]. National security studies address both extant security risks and significant security elements that could theoretically produce systemic impacts. Consequently, translation security has become an indispensable field of research within national security studies, and the two fields exhibit a deep coupling relationship[26,4].

The advent of AI has prompted a paradigm shift in national security, from a traditional focus on military security to a comprehensive framework encompassing economic, political, cultural dimensions and others. It has introduced novel issues for information security and language security while simultaneously presenting new challenges to national security[27].

As a critical domain within the national security system, science and technology security is integral to the nation's core interests and long-term development, serving as the foundation for maintaining national security and social stability[3]. The current proliferation of generative AI has led to a rampant increase in issues such as data breaches, algorithmic bias, and the mistranslation of information, which has adverse effects on national security and social stability[5]. So, the translation of leading scientific and technical texts, when subjected to such impacts, will inevitably exert a profound influence on translation security.

In short, the coupling relationship between national security studies and translation security constitutes a dialectical unity of theory and practice. As a strategic discipline, national security studies provide methodological guidance for translation security, whereas, translation security, as a component of cultural security, expands the practical domain for national security studies. The two fields are synergistic and symbiotic. This relationship is not only a crucial component of national security governance in the era of AI but is also fundamental to fortifying the security barrier for information transmission across different languages, thereby safeguarding the nation's technical, economic, and overall security.

3.2. Application of the Theory of Ruling by Both Law and Morality to Translation Security

Within the modernization of China's national governance, "ruling by both law and morality" refers to the harmonious unification of rule by virtue and rule of law, emphasizing the synergistic effect of ethical cultivation and legal constraints[28]. Ruling by morality provides the ethical foundation for ruling by law, ensuring that legislation corresponds with social justice and facilitating its implementation; it is thus a prerequisite for the effective functioning of the legal system. In contrast, ruling by law provides the bridge linking moral ideals with practical application, which offers procedural guarantees and institutional support for ruling by morality to ensure that ethical principles are not rendered void[29]. In the field of translation security, ruling by morality necessitates that translators possess a high degree of professional ethical awareness and national security consciousness to guarantee translational accuracy and maintain the confidentiality of all related documents[30]. Ruling by law serves as a critical pillar for the modernization of the national governance system and governance capabilities, and it is imperative that the translation industry fully leverage the constructive function of ruling by law within translation practice[31].

As a governance framework that synthesizes moral guidance with institutional constraints, the theory of

ruling by both law and morality should be applied to translating leading scientific and technical texts, which can fundamentally ensure both translation security and science and technology security. Morality pertains to the professional ethics and integrity of translation practitioners. By reinforcing translators' awareness of confidentiality and their sense of responsibility, it cultivates a profound understanding of the intellectual property, trade secrets, and national science and technology security value embedded within the source texts. Feng[32] posits that translation is a cross-cultural practical activity involving multiple stakeholders, including thesource text author, the translator, and target readers. For this reason, it needs to be constrained by ethical norms. Law establishes a rigid baseline for translation quality through a comprehensive system of industry regulations and standards. It entails end-to-end oversight of the translation, storage, and transmission processes for these texts, ensuring that the use of every document complies with legal statutes and security protocols. By imposing these dual constraints of virtue and law, it is possible to preclude the motive for violations at an ideological level while simultaneously severing the pathways for such actions at an institutional level. This method safeguards translation security and erects a robust barrier for the dissemination of scientific and technical achievements and the facilitation of international cooperation.

4. Risks in the Translation of leading scientific and technical texts

The demand for high-caliber scientific and technical translation talents has become increasingly urgent with the rapid development of frontier fields such as intelligent manufacturing, quantum information, AI, biomedicine, and aerospace[33]. Leading scientific and technical texts from these fields—including academic papers, technical documents, patent literature, and research reports—are characterized by a high degree of specialization and confidentiality. They are replete with professional terminology and are difficult to comprehend. Translators must not only ensure accuracy, professionalism, and logical coherence of the target text but also possess a high degree of political acuity.

The translation of scientific and technical texts is not merely a matter of linguistic conversion but is intrinsically linked to national security. Domestic scholars such as Fei Wan and Wei Chuxue [34] categorize translation risks into internal and external types. Internal risks primarily denote controllable factors, specifically those arising from the requesting party (client) and the service party (provider) of a translation project. External risks refer to factors beyond the scope of control, such as the policy and natural environments[34].

Prominent issues in the contemporary translation field pose a threat to the quality of translations of leading scientific and technical texts and, by extension, to the national image and national security. As the subjects of translation become increasingly diversified and generative AI develops at a rapid pace, the professional competence within the current translator community has become markedly uneven. This directly results in suboptimal outcomes for some translated texts. Leading scientific and technical texts are characterized by a high degree of linguistic professionalism, innovation, and logical rigor, making them difficult to translate. This increases the probability of issues such as terminological mistranslation and comprehension bias in practice. In the Internet era, the presence of such errors can readily facilitate the dissemination of misinformation, which in turn can mislead the public. In extreme cases, it may undermine China's naional image and national security[6].

The absence of institutional guarantees impedes the standardized development of translation practices for leading scientific and technical texts. China's national language capability building commenced relatively late, and there has been relatively scant attention from both the legal and translation professions toward establishing a legislative framework for the translation sector. A more pronounced deficit exists in executive standards for

the specific domain of scientific and technical translation[31]. The deficiency and lag in pertinent regulations and standards can readily lead to issues such as the ambiguous delineation of rights and responsibilities, nominal review mechanisms, and perfunctory confidentiality screenings. These problems obstruct the progression of the entire translation industry toward professionalization and enhanced security. In the long run, due to the lack of institutional guarantees, the translation of leading scientific and technical texts into foreign languages will become a weak link in national security, threatening the country's scientific and technological secrets and strategic interests.

In the Internet era, the emergence of new risks has further exacerbated the security challenges associated with the outward translation of leading scientific and technical texts. Information leakage is defined as the disclosure of commercial and confidential information, technical and system information, or government and national security information resulting from external attacks, internal threats, insecure configurations, or operational errors in translation[35]. As Internet technology advances at a rapid pace, these issues which manifest in forms such as cloud platform data breaches, localization system vulnerabilities, and algorithmic "black boxes", have become a critical factor threatening national security. It will not only cause the relevant entities to suffer direct losses of interests, but also trigger a chain reaction.

Meanwhile, the proliferation of disinformation adversely affects the translation of leading scientific and technical texts. Currently, globalization and great power competition coexist, and factors such as data manipulation, algorithmic bias, and data quality impede the public's ability to discern truth from falsehood within a massive volume of information. This renders the populace highly susceptible to misleading and incendiary harmful content[5]. The advancement of AI has not only reduced the cost of producing disinformation but has also enhanced its deceptive efficacy [36]. Leading scientific and technical texts not only carry technical information, but also implicitly contain China's scientific research concepts and innovative achievements. They function as a window through which the international community perceives China's scientific and technical proficiency and ideology. Once impacted, it will mislead other countries' understanding of China's scientific and technical achievements, and undermine China's scientific and technical image as well as international discourse power. Moreover, it may also be exploited by certain countries, thereby triggering a crisis of trust.

5. Strategies for Addressing Risks in Translating Scientific and Technical Texts

From the perspective of the theory of ruling by both law and morality, translators of leading scientific and technical texts are expected to be constrained by a dual system, which comprises both moral guidance and legal restrictions. It is necessary to fortify the ideological defense line of these professionals with professional morality and ethics, while delimiting their behavioral boundaries through explicit institutional laws and regulations. Only through the synergistic application of these two elements can security risks in the practice of scientific and technical translation be fundamentally mitigated. Accordingly, based on this theory, strategies for addressing the risks in the translation of China's leading scientific and technical texts can be examined from four dimensions: the translator's subjectivity, translation media, risk assessment, and security guarantees.

5.1. Translator's Subjectivity

Translator's subjectivity is a strategy where the translator exerts subjective initiative on the source text, predicated upon a comprehensive understanding of the fundamental principles of cross-cultural communicative acts and the issue of translational fidelity. This influences the progression of the entire translation process.

Fidelity is paramount regarding the translator's relationship to the source text author, so the translator must respect the author's intellectual property and authorial intent. In the context of leading scientific and technical texts, this protects not only the author's individual rights and interests but also guarantees the authenticity of knowledge. Translators are required to facilitate readers' accurate understanding of the source text through precise language conversion and necessary explanatory notes, thereby avoiding cognitive misunderstandings caused by translation deviations.

From the perspective of ruling by morality, translators must integrate national security awareness throughout the entire process of scientific and technical translation. The cultivation of ethical education and national security consciousness constitutes an essential foundation for training personnel in the translation of leading scientific and technical texts, as it pertains to the security of scientific and technological information, national interests, and the public credibility of the translation industry. So, strengthening ethical education and enhancing translators' awareness of confidentiality and their sense of accountability are critical initiatives for addressing the potential risks inherent in this field. Through the analysis of cases involving information leakage precipitated by translators' moral misconduct, translators can be made to profoundly comprehend the impact of their acts on national science and technology security. This fosters the establishment of an internal self-restraint mechanism against non-compliant behavior, enabling them to consciously resist material incentives and negligent acts and to avoid crossing the "red line" of security. It is an indispensable quality for professionals translating leading scientific and technical texts.

To construct a translator competence development system that is congruent with the demands of translating leading scientific and technical texts and can effectively mitigate ideological bias, the primary focus should be on enhancing translators' cross-cultural and cross-disciplinary comprehension, communication, and conversion abilities. This can be achieved by establishing a multi-dimensional training mechanism, incorporating an authentic corpus to enrich translators' experience in managing practical cross-cultural and cross-disciplinary issues. Specialized training in the identification and avoidance of ideology should also be instituted to heighten translators' sensitivity to potential biases, thereby safeguarding the objectivity and accuracy of the target texts.

From the perspective of ruling by law, it is essential to integrate education on pertinent legal statutes into the core curriculum, based on the particularities of the scientific and technical translation field. This will enable translators to systematically master the legal provisions most relevant to their practice. In conjunction with actual industry practices, legal guidelines for scientific and technical translation conduct should be formulated. These guidelines would stipulate explicit legal requirements for various stages of the translation workflow—including information acquisition, storage, transmission, and delivery—to ensure that practitioners have a clear legal basis for their behavior.

Regarding institutional admission, a stringent translator admission and vetting mechanism should be established. For personnel translating leading scientific and technical texts, particular emphasis should be placed on the review of their core translation competence and background information, and periodic re-assessments should be implemented. Translators should be required to sign a written pledge of conduct that explicitly defines the responsibilities they are to assume and the ethical and legal norms they must adhere to throughout the translation process, thus to control systemic risks at their source.

5.2. Translation Media

During the 1980s and 1990s, the media of translation evolved from paper-based texts to electronic media. Since the 21st century, the primary medium has become the ubiquitous Internet, and CAT tools have advanced from

corpora to real-time sharing and online editing systems, thereby promoting the development of the translation field[37]. In the era of AI, it is imperative to mitigate and prevent the security risks associated with the translation medium from a multi-faceted approach[36].

From the perspective of ruling by morality, a human-computer collaborative mechanism should be actively promoted, consistently ensuring the translator's dominant role in translation decision-making. Translators should be guided to consciously refrain from entrusting core technologies and sensitive information to machine processing, thereby averting the risk of information leakage that may arise from a machine's lack of ethical judgment. Technology developers should also integrate ethical considerations into their system design. This can be complemented by requiring translators to manually label and correct sensitive terminology and by conducting timely ethical reviews to ensure that the entire human-computer collaboration process complies with the moral and ethical requirements for translating leading scientific and technical texts. Moreover, efforts should be directed toward the research and development of independently controllable, sovereign machine translation systems to progressively reduce reliance on foreign translation tools. In addition, blockchain technology can be introduced to achieve full-process traceability. This prevents the tampering of information and data at any stage and enables the direct assignment of liability when issues are discovered.

From the perspective of ruling by law, it is necessary to establish rigid norms for human-computer collaboration through legislation. For instance, legal statutes should be used to define the criteria for delineating between non-sensitive terminology and core technical information. Corresponding punitive measures should also be stipulated for the non-compliant use of machine translation to process sensitive texts, thereby providing a legal basis for human-computer collaborative operations. At present, China has constructed a preliminary framework with the *Personal Information Protection Law*, *the Data Security Law*, *and the Cybersecurity Law,*etc. This framework lays a foundation for regulating machine translation in the era of AI; nevertheless, further clarification and refinement are still required[38]. So, legal validity should be granted to the revisions that translators make to machine translation outputs based on ethical principles, thus providing robust institutional support for moral judgments.

5.3. Risk Assessment

Scholars such as Lv Le and Yan Suli[39] have noted that risks in translation can emanate from multiple sources, including clients, business operations, individuals, and processes. Due to the extensive range of fields covered by translation and the diversity of its clientele, the interests of various stakeholders may be compromised. These stakeholders include translation practitioners, the original authors, translation commissioners, translation initiators, publishing entities, and the readers of the translated text[40]. Translation risk assessment is the process of analyzing previously identified risks to quantify the probability of their occurrence according to their likelihood, scope of impact, and the severity of their consequences. This process also involves estimating their broader social and economic significance[34].

From the perspective of ruling by morality, universally recognized ethical codes and classification standards should be fostered within the industry through moral initiatives, educational campaigns, and professional ethics training. The goal is to reduce classification biases stemming from cognitive differences. For instance, risks can be quantitatively classified according to the degree of information sensitivity, such as defining the leakage of core technical information as a Level 1 risk and terminological mistranslation as a Level 2 risk. This approach helps translators clearly comprehend the ethical responsibilities corresponding to different risk levels, compelling them to consciously adopt the safeguarding of national interests as their moral

code, and to prioritize the prevention of high-level risks in their practice. A multi-dimensional risk assessment system should also be constructed to implement quantitative assessments of key variables, such as text security classification and terminology sensitivity. This ensures that risk assessment is not confined to technical data measurement but also integrates a compliance review from a moral and ethical standpoint.

From the perspective of ruling by law, relevant laws and regulations should be made to ensure rigid criteria for risk classification. This involves legally defining the scope of key information, such as core technical information and sensitive terminology, in order to divest the risk classification process of its subjectivity and transform it into a standardized practice with a legal basis and established protocols. Additionally, a dynamic monitoring mechanism for the risks associated with the translation of leading scientific and technical texts should be established within the industry to provide full-process supervision of translation projects. This specifically includes pre-translation automatic scanning and the labeling of sensitive information, in-translation real-time monitoring of translator operational behavior and post-translation system validation and content verification. Furthermore, third-party security audit organizations should be engaged to conduct periodic assessments of high-priority translation projects and produce formal risk assessment reports, ensuring the timely discovery and remediation of vulnerabilities and latent hazards within the workflow.

5.4. Security Guarantees

The building of national translation security capability involves the systematic research of the processes, pathways, mechanisms, and strategies by which a nation establishes the conditions and systems to counter translation security threats in order to achieve preset objectives[4].

From the perspective of ruling by morality, translation agencies should be guided to proactively integrate security norms into their internal management systems. This enhances translators' confidentiality awareness and compels them to consciously fulfill their secrecy obligations, allowing moral self-discipline to function as a vital supplement to legal frameworks and consolidating the efforts of all parties to collectively safeguard the security of translating leading scientific and technical texts. In addition, a national translation security emergency response mechanism should be established. This would delineate the moral responsibilities of all entities during major translation security incidents, create a specialized body to oversee this work, and formulate emergency response plans with periodic drills. Furthermore, international cooperation should be enhanced, particularly by co-establishing a security cooperation mechanism with countries along the Belt and Road to jointly formulate translation security standards for transnational scientific and technical cooperation projects. This would contribute Chinese wisdom and solutions toward building a cross-border ethical responsibility community and defining and protecting sensitive information. This strategy promotes international scientific exchange while effectively addressing risks and preventing the escalation of cross-border security incidents that arise from ambiguous responsibilities.

From the perspective of ruling by law, the primary initiative should be to perfect the national security regulation system for the translation of leading scientific and technical texts. This requires constructing a multi-level, full-coverage security guarantee system and legally delineating the responsibilities of all relevant entities to ensure that security regulations are grounded in law. In addition, review and supervision mechanisms must be established and perfected. The review process should be strictly stipulated according to the source text's security classification, with top-secret level texts requiring submission to national science and technology departments for final review. Moreover, to safeguard national science and technology security, it is essential to actively participate in the formulation of international standards for scientific and technical translation. This will

promote the alignment of our national standards with international norms, thereby minimizing terminological misunderstandings that arise from discrepancies in standards.

6. Conclusion

Under the guidance of the holistic national security, this paper studies the coupling relationship between national security studies and translation security, focusing on the security issues about the translation of China's leading scientific and technical texts in the era of AI. From the perspective of the theory of ruling by both law and morality, this paper clarifies that the security of scientific and technical translation necessitates consideration of both moral constraints and institutional norms. Regarding strategies, this paper proposes a response framework structured around four dimensions: translator's subjectivity, translation media, risk assessment, and security guarantees. These four dimensions collaborate synergistically, covering the main process of translating leading scientific and technological texts. This paper also takes into account both source prevention and control and process supervision, thereby providing an operable solution for the practice of ensuring the security of such translation in China.

Disclosure statement

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