

# The Routledge Handbook of Translation Technology and Society

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## Translation Technology and Machine Agency in Contemporary Multilingual Societies

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# TRANSLATION TECHNOLOGY AND MACHINIC AGENCY IN CONTEMPORARY MULTILINGUAL SOCIETIES

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## 1 The translation technology conundrum

Translation and technology share a complex and often challenging relationship. They have formed an alliance of necessity where one cannot do without the other. There is this deeply human and historically intellectual task that is wedded to this profoundly mechanical and algorithmic force. Translation involves the careful interpretation of meaning, semantic nuance and cultural context. Technology strives to automate the processes of meaning-making, it prioritises speed, efficiency, and quantity over subtlety and interpretation (Moorkens 2020). There is also the cultural complexity of historically evolving natural languages that contrasts with the rule-based and data-driven processes of translation technologies. The richness of human language risks being flattened into standardised data output, raising questions about the limits of technologically mediated translation in capturing the full depth of human expression. The efficiency and mathematical precision of neural machine translation (NMT) and generative AI have triggered a debate on the apparent demise of the translation profession. We cannot foresee to which extent AI-based technologies might replace some professional sectors in the translation and interpreting industries. Only time will tell. What we can do, however, is to critically engage with ongoing developments and assess their impact on ethics, cultures, societies, and the global political economy. Most importantly, however, we need to frame the discussion outside a binary either-or narrative that pits human translators against machines (O'Brien 2023).

This handbook is a first attempt to present a line of research that has, somewhat surprisingly, gained very little traction in the field of translation studies (TS). Perhaps we, as translation researchers, never dared to admit that our object of investigation – translation in all its material and immaterial forms – only very rarely can be studied as an exclusively *human endeavour*. It is not unreasonable to argue that a deliberate and often exclusive focus on human translation and translators has impeded progress in research on translation as a *sociotechnical endeavour* (cf. Rozmysłowicz 2014, 2020). Around a decade after the advent of NMT, the ‘elephant in the room’ of TS – the translation machine – is finally acknowledged. Increasingly, TS scholars are beginning to recognise the importance of engaging with what Rozmysłowicz (2014: 26) aptly calls the “empirical return of the theoretically repressed” (Tieber and Baumgarten 2024: 381–382, our translation). This shift reflects a growing awareness of the need to examine machine translation (MT)

not just as a technological tool but as an empirical object that challenges fundamental assumptions about translation as a sociocultural and mediated practice, as a practice that has increasingly been moving beyond a purely human-centred paradigm. At the same time, most of us still marvel at the wonders of technological progress, exemplified by uncountable studies on NMT output quality, translator efficiency in post-editing, and so on. There exists, in other words, a large gap between critical hermeneutical, business-oriented, and purely techno-scientific research in the field of TS.

The presence of technology, however, needs to be integrated into our research efforts, lest we end up with a skewed picture of translation's cultural and socioeconomic significance. Dilek Dizdar (2014: 210) claims as much, stating that in "the case of translation technologies, there is an obvious imbalance between instrumentally oriented and critical research". This harks back to the imbalance between STEM subjects and humanities-related subjects at schools and universities. There is a clear need to secure technological progress by educating capable engineers or data scientists. Technological progress, however, appears to come first, then – perhaps – social progress. When contemplating the societal implications of technology, it is necessary to differentiate between deontological ethics and consequentialist ethics. The former may only capture the immediate consequences of *single* human actions, whereas consequentialist ethics considers the long-term consequences of *networked* human activities (Jonas 1984). The social consequences of translation technologies – such as the perceived decline in social and professional status (Sakamoto *et al.* 2024: 57) and the reduced economic value of translation as a product (do Carmo 2020) – cannot be fully understood by merely attributing blame to powerful market players and Silicon Valley tech giants. On the other hand, of course, the positive consequences of translation technologies warrant equal attention. These tools have the potential to democratise access to information and knowledge while facilitating cross-cultural communication on an unprecedented scale. In either scenario, the social impact of new technologies can only be investigated with an awareness of historically evolved *networked complexity*, since innumerable settings and actors contribute to their development and dissemination.

The profound global influence of technology transcends the boundaries of human societies and cultures. In constructivist parlance, technology is a *socially constructed* and simultaneously a *socially constructing* phenomenon (Pinch and Bijker 1984). Technology is socially constructed, as it emerges in complex networks of human interaction, shaped by cultural, political, and economic forces (Olohan 2017, 2019). Technology is socially constructing as it continuously redefines these networks, shaping social relations, market paradigms, and human behaviour. Technology, however, is more than just a social force. Many contemporary observers claim that world history, usually differentiated along succeeding geological paradigms and climate regimes, has now entered the age of the Anthropocene. For the first time, a biological species – humanity – is leaving such an indelible environmental imprint that it is acting itself as a geological force (Crutzen and Stoermer 2000). Extractivist industries and resource-intensive technologies accelerate ecosystem degradation and threaten biodiversity. The gradual destruction of the natural environment exacerbates the impact of global climate change, intensifying the vulnerability of communities around the globe. Seen in this light, the relentless growth in global computing power and digital data needed for LLMs appears unsustainable in the long term (Shterionov and Vanmassenhove 2023). And this, of course, includes the huge amounts of data needed for AI-based NMT (Bender *et al.* 2021).

This handbook arguably intends to square the circle: to highlight the need for a concerted effort to establish critical sociotechnical research firmly in the TS landscape. By providing a systematic and critical overview of key sociotechnical issues, it will enable researchers to develop their own lines of inquiry and areas of interest. However, sociotechnical perspectives alone won't provide us with a more comprehensive view on translation in a globalised and digitally interconnected world.

Technology bears material and immaterial causes and consequences. In the wake of the emergence of AI on the global stage, and from an epistemological perspective, it has become evident that this technology must be considered as a *social agent par excellence* (Floridi 2023: 10). Technology's societal relevance is one thing, and its social agency another. It is therefore significant to accumulate a critical body of theoretically grounded and empirically rigorous research on the sociotechnical *and* agent-oriented dimensions of translation technologies. We need, for instance, to examine how these technologies shape and are shaped by power dynamics, ideological and commercial interests, and ethical values. Additionally, we need to explore the social agency of AI-based translation technologies and how this agency affects professional practices, the translators themselves, and the overarching sociocultural context.

## **2 The philosophy of sociotechnical translation studies**

The philosophy and ethics of technology represent the paradigmatic foundation for sociotechnical research on translation. Classical seminal works in this area take a holistic approach to the impact and consequences of technology on nature, culture and society (e.g., Anders 1956/2016; Ellul 1964; Feenberg 1999; Heidegger 1977; Horkheimer 1947; Jonas 1984; Simondon 1958/2017; Winner 1986). Recent work engages more directly with the contemporary challenges and potentials posed by AI and LLMs (e.g., Crawford 2021; Floridi 2023; Raus 2023; Rehm and Way 2023), the Internet and cloud computing (e.g., Mozorov 2013; Amoore 2020), data control and surveillance (e.g., Zuboff 2018; Couldry and Mejias 2019), as well as connectionist and transhumanist ideologies (e.g., Zuckerman 2013; Frodeman 2019). While these and other recent investigations serve as the cornerstone of sociotechnical translation research, it is worthwhile to begin outlining the field by briefly sketching the foundational philosophies underlying some classical works. Heidegger (1977), for instance, warned of technology's potential to *enframe* our life world in material and immaterial ways. Technology enframes the world like a frame does with an image attached to a wall. And technology enframes the world by imposing new ways of perceiving, thinking, and behaving. The danger inherent in this recasting of our sensual perceptions and interactions consists in a gradual alienation from alternative, potentially much more meaningful, relationships with the world. Horkheimer (1947) focuses on the hegemony of *instrumental reason*, a mode of thinking solely concerned with control, efficiency, and the achievement of specific ends, where interpretation and decision-making are based on what is effective rather than what is inherently good or just. Feenberg (1999) expands on these ideas, critiquing *technological determinism*, suggesting that we must develop democratic mechanisms to steer technology toward socially beneficial outcomes. And Jonas (1984) most vehemently emphasises the urgency to consider technological evolution and its future impact strictly through the lens of a *consequentialist ethics*.

What is common to these approaches is not only their classical humanist and near-universalist perspective but also the recognition that technology's colonising encroachment reduces our planet and human experience to mere resources to be exploited and commodified (Braidotti 2019). In philosophical and ethical terms, language and translation technologies hold the capacity to significantly reshape how we perceive and engage with culture, communication, and language itself. These foundations of human meaning-making are rooted in sensory experience, and they are poised for considerable transformation with the spread of communicative AI and machine learning. It is against this background of sociotechnical enquiry that translation technologies are to be judged in the foreseeable future. AI-driven translation and interpreting machines are not socially neutral tools. These technologies embody both a new form of agency and a considerable epistemic potency, as they reframe our understanding of language and communicative interaction

(cf. Larsonneur, this volume). Today's ubiquitous translation technologies compel us to rethink what it means to be human in a digitally interconnected and thus distinctly non-binary sociocultural reality. This inevitably guides us toward a *posthumanist ethics of translation*, one that calls for decentering the human as the sole agent of meaning-making by reevaluating the traditional boundaries between humans and technology, both within translation theory and practice (O'Thomas 2017).

A sociotechnical paradigm for translation technology research is well served by a systematic outline of its ontological, epistemological, and axiological dimensions (Tieber and Baumgarten 2024: 388). Let us begin with the *ontological* plane. Ontology transcends the boundaries of knowledge, it deals with *what* can be known about nature and existence. Ontology interrogates the nature and structure of the material and immaterial world. What does this mean for the critical study of translation technology? A critical posthumanist ontology, for instance, envisages a *longue durée* entanglement across humans, non-humans and technology framed by capitalist relations of domination and exchange (cf. Baumgarten 2023, also Cronin 2020). According to Braidotti (2019: 20), the "posthuman predicament is . . . framed by the opportunistic commodification of all that lives which . . . is the political economy of advanced capitalism". Just as capitalist exchange mechanisms have become normalised in most social interactions, so it happens with quasi-universal commodification and with the growing appreciation of new forms of social agency in the guise of advanced technologies. And just as today's exploitative practices on work-for-hire digital translation and interpreting platforms may become increasingly normalised (Firat 2021; Giustini 2024), our traditional concepts of culture, language, text, meaning – and translation itself – will be moulded into a future techno-scientific ontology barely compatible with our contemporary frames of knowledge.

The *epistemological* plane is concerned with the processes and methods of knowledge creation and dissemination. The way we envisage the ontological nature of social reality, for instance, has an influence on *how* we understand the machinic entanglements and dynamics of communication and agency in today's translation workflows. In this context, it is essential to realise that sociotechnical research cannot avoid being ideological, as all our interpretations of technology, language, and agency are filtered through the prism of societal values and power relations (Feenberg 1999: 113). AI-based translation technologies and their underlying LLMs tend to be embedded in capitalist imperatives that treat language as data to be moulded and exploited for commercial gain. To date, translation researchers and practitioners have not been sufficiently involved in creating translation technologies that prioritise *ecological, human, and societal well-being*, technologies that are environmentally sustainable (Cronin 2019), ergonomically sound (Olohan 2021: 13–14), and explicitly non-profit-driven (Cronin 2013: 96–97). As a result, capitalist values, instrumental thinking, and techno-determinist attitudes have dominated the global implementation of professional translation workflows. Developing ethically sustainable and human-friendly translation technologies, therefore, requires critical engagement with these underlying epistemic forces and an intentional shift toward a digital translational ecosystem that is driven by a spirit of "fairness, collective ownership and democratic governance" (Firat 2024: 4) and that engages with human and non-human efforts in meaning-making (Marais 2019: 15).

Finally, we encounter the *axiological* plane. As a branch of philosophy, axiology subsumes ethics and aesthetics, addressing questions of moral and aesthetic value (Bahm 1993). Human activity – and by extension, research – is inherently value-driven. For this reason, a sociotechnical approach, rather than being framed strictly as a methodology, may be better categorised as an axiological mode of inquiry. Indeed, axiology, as "one of the three most important kinds of science . . . has the goodness of all other inquiries . . . including the general sciences of metaphysics and epistemology" (Bahm 1993: 4). Postmodern translation theory has inspired us to reject simplistic and harmful dichotomies (Tymoczko 2007: 16). Thus, non-binariness encourages us "to reject

utterly the false dichotomies that produce violence as the direct consequence of inequality”, while a “culture of binary language splits us in two, and makes us choose which parts of ourselves fit existing power structures” (Bridle 2022: 228–229). Given that translation technology is bound by human values, interests, and biases, we have no choice but to explore how AI and human translation expertise can complement each other in a non-binary fashion. Furthermore, we need to establish methodological synergies that promote environmental, social, and human well-being (Cronin 2017). Sociology largely understands itself as an *empirical* social science. In the following section, and in presenting the handbook’s structural map, we shall sketch the contours of a nascent sociology of translation technology – an empirical-axiological inquiry that aligns with our core values.

### **3 The sociology of translation technology**

Six years prior to the publication of this handbook, in a brief survey on sociotechnical research, Maeve Olohan (2019) already set the tone for the direction this handbook aims to pursue, emphasizing the need for a critical-reflexive and empirical approach to translation technology and its social implications. The following cited words belong to the concluding section entitled “Towards a sociology of translation technology”, and her call to critically assess the power structures, ideologies, and values embedded in these technologies, serves as a foundational perspective for this handbook:

As in other areas of social life, our understanding of translation technology could be significantly enhanced by examining how technologies are inscribed with hegemonic values and by analysing the socio-economic and political conditions and configurations that bring about the technologies and normalize them. That research will require us to continue to explore the contexts of translation technology design and use, in professional workplaces of translators but also increasingly beyond them, as the deployment of machine translation technology becomes ubiquitous.

(Olohan 2019: 393)

We seek to bridge philosophical reflection, theoretical and conceptual work, and empirical observation with critical analysis, guiding researchers to inquire not only into the contexts and applications of AI-based translation tools but also into how they reshape conceptions of translation, language, culture, economic paradigms, business models, labour relations, and translation practices. Further critical questions concern the shifting cultural, social, economic, and symbolic capital held by the professional field, its practitioners, and its products and services (Bourdieu 1983). We must ask who actually profits from translation technologies, whether they engender new forms of domination and dependency, whether they reinforce hegemonic societal and linguistic norms, to what extent they propagate new synthetic forms of linguistic expression, and whether these forms of “digital translationese” may create sanitised and flattened varieties of language. On the flip side, however, there is also great potential. Translation technologies may have the capacity to push democratic processes, fostering a global (digital) commons (Larsonneur 2021; Baumgarten and Firat, this volume). Building on this idea, how can these tools empower marginalised communities by offering affordable and accessible translation solutions? Can they play a significant role in preserving and promoting endangered languages by facilitating their integration into digital spaces? Finally, how can translation technology enhance interdisciplinary collaboration on a global scale, providing equal access to information across diverse knowledge cultures and linguistic boundaries?

The *Handbook of Translation Technology and Society* addresses the evolution and impact of translation technologies within broader cultural, societal, and economic contexts. It navigates new interdisciplinary intersections, theoretical avenues, and methodological approaches that examine the complex – and, in significant ways – disruptive interface between translation technology, human life, and society. Beyond providing the first systematic survey of how transcultural technological mediation affects global cultures, this handbook also offers a springboard for critical future research. The handbook is organised into six main parts:

- (1) **Language, ideology, and theory:** This part investigates the linguistic, ideological, and theoretical challenges emerging from new sociotechnical paradigms in transcultural communication.
- (2) **Translation politics in the platform society:** Examining translation's political embeddedness within digital platforms and crisis-driven scenarios, this part sheds light on the influence of technological infrastructures on power and access.
- (3) **Translation machines in the knowledge economy:** This part explores how the enormous spread of translation technologies impacts (inter)disciplinary frameworks and pedagogy, particularly within higher education.
- (4) **Translation automation and labour:** Focusing on the volatile relationship between automation and labour, this part delves into the multi-layered and shifting sociotechnical dynamics within professional translation workflows.
- (5) **Translation technology and (non-)human agency:** This part considers the interplay between human and machinic agency across environmental, material, literary, and gendered landscapes.
- (6) **Machine translation in everyday life:** The final part examines non-professional uses of NMT, observing usage patterns, the need for critical digital literacy, and perspectives on the future trajectory of translation technologies.

Any project aspiring to a comprehensive and systematic exploration of a multidimensional and highly complex subject will inevitably encounter significant thematic overlaps. At the same time, even an ambitious undertaking such as this cannot claim to be exhaustive. Major themes and future alleyways, however, are likely to emerge as we reach a critical mass of theoretical innovations and empirical data. The handbook does not include a dedicated contribution on interpreting, as interpreting carries its own distinct challenges and workflows. This mode of transcultural communication, with its diverse modalities and practices, would indeed warrant a separate volume devoted to surveying the multifarious relationships between interpreting technologies and societal dynamics.

### ***Part I: Language, ideology, and theory***

The first six chapters explore the relationship between artificial intelligence, language, and society, highlighting both historical and contemporary developments. A key theme in this first part is *Translation and Language as a Commodity and Resource*, where AI-powered tools increasingly view language not only as a means of communication but as an economic asset (Chapters 1 and 2). This shift, driven by technological advances, has far-reaching ideological and political consequences for language diversity, sustainability, and questions of access. Another theme is *AI's Impact on Translation and Society*, examining how NMT and language processing tools transform the translation industry, raising concerns about bias, linguistic standardization, and the marginalization of minority languages (Chapters 3 and 4). These transformations are set against the backdrop of AI development, tracing the evolution of AI from early cryptographic work in the Cold War to advanced systems like ChatGPT. This first part also delves into *Metatheoretical and*

*Critical Philosophical Concerns* (Chapters 5 and 6), particularly the “black box” phenomenon, where the opaque nature of AI models compromises accountability and transparency. The first six contributions collectively underscore the complexities and challenges of AI’s influence on language, gender, and society, urging deeper reflection on the ideological and political implications of a technological shift towards a new machinic agency.

Chapter 1, by **Stefan Baumgarten**, is sounding out the relationship between professional translation practices and digital capitalism, where digital workflows intersect with processes of capital accumulation. This chapter examines the ideological, political, and environmental dimensions of the contemporary translation industry, criticising the accelerating commodification of language, translation, and its digital gadgetry within an exploitative global labour market. Leaning on insights from critical theory, the author highlights sociocognitive and material challenges such as instrumental rationality, technological determinism, and data colonialism, all of which significantly refashion our perception of translation and its sociotechnical processes. By emphasising a cooperative and ecologically sustainable approach, the chapter envisions a democratised digital future, where human translators and their craft remain vital amidst a technologically saturated and increasingly interconnected global political economy. Chapter 2, by **Félix do Carmo**, examines the transformation of translation’s economic value through the prism of advanced technologies and market strategies. Neoliberal frameworks have commodified translation labour, reducing it to a mere product within the global value chain, since after “the introduction of machine translation in industry workflows, translation as production of translated words became emptied of its value, to the point that even machines can do it, and for free” (p. 44). Drawing on economics and critical theories, do Carmo highlights the widening gap between the industry’s increasing financial gains and the diminishing compensation for translators. This chapter resonates with others in this part by addressing themes of power, ideology, and the often invisible and precarious labour embedded in today’s networked and sociotechnical ecologies of translation.

Chapter 3, by **Claire Larsonneur**, explores how language and translation have been perceived in AI from its origins in Cold War cryptography to modern-day applications. The contribution highlights the difference between human and AI-powered translation, noting that AI’s focus on standardising information neglects the nuanced layers of human sensual and linguistic experience. Larsonneur also reflects on the societal implications of AI, emphasising concerns like bias and the commodification of language. This historical and critical perspective provides new insights into the intersections between language ideologies and AI’s technocapitalist frameworks. In Chapter 4, **Debbie Folaron** analyses the complex intersections of translation technologies and minority languages in multilingual societies. The unequal global access to technology highlights how neoliberal market forces prioritise major languages, often at the expense of smaller, less economically profitable ones. The author contends that the “commodification of fundamental activities of human communication in the digital sphere has been intensifying as economic and commercial values steadily encroach on social, cultural, and political values” (p. 68). Her argument thus ties into the broader themes of language commodification and digital divides, raising critical questions about inclusivity and representation in a multilingual digital present and future.

Chapter 5, by **Odile Šobačić**, brings to the fore feminist interventions in the digital sphere, offering a critique of how technology perpetuates social domination and discrimination. The chapter examines AI’s impact on translation through a cyberfeminist lens, emphasising how technologies like ChatGPT tend to replicate cultural and societal biases. Drawing on Donna Haraway’s (1985) concept of the cyborg, the author challenges traditional boundaries between humans, animals, and machines, revealing how AI systems reinforce sociopolitical power structures. Šobačić also addresses how AI-driven translation can silence marginalized voices, situating

these technologies within broader frameworks of control and domination. Any resistance towards “algorithmic oppression”, she maintains, could involve “disengaging with neoliberal codifications of identity . . . as well as challenging neoliberal power structures, their patrimonial legacy and attendant notion of authorship” (p. 96). In Chapter 6, **Manuel De la Cruz Recio** examines the intersection of technology and translation through meta-theoretical frameworks of critical theory. The chapter focuses on the notion of a “critical theory of technology” and its application to translation technologies like MT and computer-assisted translation tools. Drawing on Andrew Feenberg’s (1991) influential work, De la Cruz Recio critiques the pervasive public perception of technology as a socially neutral phenomenon, emphasising that technological artefacts are highly dependent on power structures and ideological interests. Like the other authors in this part, De la Cruz Recio questions the commodification of translation and advocates for human-centred, ethical approaches to technological development.

### ***Part II: Translation politics in the platform society***

The second part of this handbook examines the dynamics of platform capitalism (van Dijck, Poell, and de Waal 2018), where neo-Taylorist surveillance practices that monitor translator productivity heighten concerns about job security and fair play within the gig economy (Baumgarten and Bourgadel 2023). Digital platforms are radically transforming labour relations and translation practices, with crowdsourcing and commercial work-for-hire sites often fostering precarious working conditions. Freelance translators, for instance, tend to be exploited under a model of “uberisation” (Firat 2021), where workers perform isolated tasks without sufficient labour protections. The initial three contributions in this part explore *Translation Technologies and their Capacity for Empowerment and Marginalisation* (Chapters 7, 8, and 9). These technologies may promote collaboration, inclusivity, and accessibility, but they may also deepen power imbalances, leading to exclusion and dispossession of certain groups. The remaining three contributions assess *The Integration of Machine Translation into Public Services and Crisis Response Systems* (Chapters 10, 11, and 12). These discussions concentrate on the essential role of policymaking in ensuring that multilingual technology effectively reaches and serves diverse communities, and they also address the risks of reinforcing linguistic hierarchies and limiting access for minority languages. In crisis situations, NMT facilitates rapid information sharing, empowering both end-users and responders, even though over-reliance on technology can pose great risks in high-stakes environments (Canfora and Ottmann 2020). Together, the chapters in this part offer a nuanced critique of the political, ethical, and social implications of translation in the platform society.

Chapter 7, authored by **Fruela Fernández**, investigates the entanglement of translation technologies in the arena of political struggle. These tools simultaneously foster inclusion and exclusion, they create shared resources and empower marginalised communities, but they also risk perpetuating dispossession and inequality. Translation technologies are deeply embedded in political power structures, they wield significant influence over resource distribution. Drawing on case studies and Langdon Winner’s (1980) assertion that technology inherently shapes hegemonic norms and social domination, the chapter situates these tools within broader discussions on the ideological impact of technology on equitable access to language resources and digital translation practices. In Chapter 8, **Gökhan Firat** examines the transformative role of translation cooperatives within cognitive capitalism (Fumagalli *et al.* 2019), an explanatory framework that accentuates the exploitation of intellectual and creative capacities within the workforce. These cooperatives challenge profit-driven models by fostering collective ownership, democratic decision-making, and equitable resource distribution. The chapter envisions translators as knowledge workers (Fuchs 2010)

whose labour enriches the knowledge commons, a shared pool of intellectual resources accessible to all. Through an analysis of cooperative governance and collaboration, Firat illustrates how these models promote social and economic justice, emphasising how alternative economic structures can empower linguistic communities and sustain grassroots translatorial practices. Chapter 9, written by **Chuan Yu**, studies the dynamics of online collaborative translation within the framework of platform capitalism. Yu examines collaborative practices across various digital platform models, addressing the socioeconomic implications from crowdsourcing to participatory subtitling. While online collaborative translation facilitates platform localisation and internationalisation, it also prompts concerns about the exploitation of translators as unpaid or underpaid digital labourers. By conceptualizing collaborative practices across five dimensions – platform nature, engagement pathways, initiation, agents, translation modalities – the chapter offers a systematic and in-depth analysis of the transformation of translation work, linking these transformations to broader issues of ideology and power in translation practices.

Chapter 10, authored by **Raquel Pacheco Aguilar**, explores digital translation policies within the public service sector, using a multidisciplinary approach to investigate the impact of disruptive technologies like NMT, cloud computing, and AI on multilingual communication. The chapter highlights the role of regulatory frameworks in overseeing digital transformations, underscoring the need for policies that address digital sovereignty, data governance, and human oversight in AI-driven translation systems. By engaging with these critical issues, the chapter situates translation technologies within broader discussions on ethics and accessibility. Chapter 11, by **Rei Miyata**, complements the previous chapter by delving deeper into the governance and practical applications of translation technologies in public services. The author investigates how local governments in Japan utilise MT to facilitate multilingual communication with residents, particularly in critical contexts such as legal services and disaster management. The chapter highlights the limitations of raw MT outputs, particularly for low-resource languages, and explores strategies like pre-editing and post-editing to enhance translation quality and reliability. Miyata argues that for local governments to effectively leverage translation technologies, “formulating and sharing policies, guidelines, best practices, and training materials based on accumulated research findings will be crucial” (p. 175). Chapter 12, by **Khetam Al Sharou, Mieke Vandenbroucke, and Gert Vercauteren**, addresses the role of digital translation in crisis management. Based on sociological theories of agency (Giddens 1984; Pickering 1995) and various case studies, the chapter illustrates how translation technologies and automation tools can facilitate the swift dissemination of critical information, improve accessibility, and empower affected communities. However, the ways in which “technology is developed, deployed, and controlled affects both crisis preparedness and containment”, often resulting in the dominance of governing bodies and technology providers’ voices over those “directly affected” (p. 187). The authors, therefore, advocate for more inclusive crisis management approaches that effectively balance human agency with automated systems. The six contributions in this second part do not explicitly foreground a consequentialist ethics but future investigations may fruitfully lean on Jonas’ (1984: 18) vision of an “ethics for the future”, since in the technological age “new kinds and dimensions of action require a commensurate ethic of foresight and responsibility which is as novel as the eventualities which it must meet”.

### ***Part III: Translation machines in the knowledge economy***

The third part examines the profound impact of translation technologies on the academic field of TS, the concept of translation itself, and how technology is modifying educational approaches and

practices. This part features five contributions that highlight promising synergies between TS and the evolving field of Digital Humanities as well as the integration of translation technologies in both academic and professional contexts. The first theme addresses the intersections of *Translation Studies, Sociotechnical Agency, and Digital Humanities* (Chapters 13, 14, and 15), aligning with the handbook's broader aim of encouraging greater inter- and transdisciplinary collaboration concerning the societal relevance of translation and its technologies. This theme considers how AI-driven technologies are challenging the discipline's ontological certainties and epistemological frameworks, recasting classical theories, concepts, processes, and professional roles. This ongoing transformation not only irrevocably reshapes our conventional perceptions of translation as a cultural and professional practice but also prompts critical questions about our growing reliance on algorithmic machines. The second theme focuses on *The Integration of Translation Technologies in Educational Settings* (Chapters 16 and 17). MT has become an essential component of translator training, but the growing reliance on commercial proprietary technologies calls for a critical rethink. Beyond translation pedagogy, universities are also adopting multilingual agendas, making it all the more important to foster machine translation literacy (MTL).

Chapter 13, by **Raluca Tanasescu**, sets the stage by discussing the relationship between TS and Digital Humanities (DH). The author highlights how translation, once central to DH, has been overshadowed by broader fields such as linguistics and literature. However, TS should reclaim its place within DH by fostering multilingualism, encouraging global collaboration, and “transforming monolingual, research-led digital studies into a more dynamic dialogic, outward-looking enterprise” (p. 200). Closer collaboration between TS and DH would also allow translation scholars to enrich their methodologies by embracing computational research and practices that transcend the traditional boundaries of subfields such as MT research and corpus-based translation research. In Chapter 14, **Tomasz Rozmysłowicz** problematises the rigid distinction between human and machine translation, framing it as a central yet often overlooked theme in TS since its post-World War II origins. Drawing on the concept of *Leitdifferenz* (“guiding difference”), he traces this distinction across the various paradigm shifts within the discipline. With a focus on “transhumanist” and “humanist” perspectives, Rozmysłowicz proposes an alternative genealogy that disrupts traditional progress narratives in TS. The enduring dichotomy between human and machine translation has influenced both translation theory and practice, spanning from the discipline's linguistic beginnings – where MT triggered foundational norms of mechanistic equivalence (Tieber 2022: 112) – to the cultural and social turns that foreground creativity and human agency. This study bridges these historical phases with contemporary debates, illustrating how earlier theoretical and conceptual engagements with MT continue to influence our thinking about translation and its advanced technologies. Chapter 15, by **Michael Tieber**, builds on the previous discussion by contrasting the nuanced scholarly perspectives on translation in TS with the mechanistic approach often found in MT research, where translation tends to be reduced to a simple input-output process. These reductionist views risk undermining the sociocultural and professional value of translation. Tieber advocates for an “adoption of translation concepts that balance inclusivity with specificity, encompassing a wide range of translation phenomena while preserving the term's analytical value” (pp. 230–231). Such an approach would not only enhance public understanding of the critical role human translators play in transcultural communication but also foster a more nuanced and critical evaluation of MT's actual capabilities and limitations.

Chapter 16, by **Adrià Martín-Mor**, critically engages with the adoption of commercial proprietary translation technologies in translator training institutions. Drawing on Bertolt Brecht's *A Life of Galileo* (2013), the author contextualises the political and ethical responsibilities associated with advanced technologies. Reliance on proprietary tools reinforces corporate hegemony, undermines

autonomy, and fosters technological dependency. To counter these trends, Martín-Mor advocates for the use of open-source software and open educational resources to promote inclusivity and combat technological discrimination, arguing that digital “policies based on freedom and openness would increase the autonomy of higher education institutions and reinforce their technological sovereignty” (p. 242). In Chapter 17, **Gary Massey** and **Maureen Ehrensberger-Dow** focus on the use of translation technology in higher education outside dedicated translation programmes. Thoughtfully implemented, MT can promote institutional multilingualism, internationalisation, and inclusivity, but there are also concerns about academic integrity, overreliance on technology, and challenges in error detection for less proficient users. Additionally, unclear institutional policies and limited teacher training can hinder an effective integration of these tools. The authors emphasise that ethically sound and informed practices are essential when adopting translation tools in educational settings, noting that “in the classroom and in other HE settings, the engagement with MT, the most public of TT, seems to have increased awareness of the desirability of more multilingual content” (p. 254).

#### ***Part IV: Translation automation and labour***

This part critically examines the transformation of the translation profession during the current paradigm of artificial intelligence, MT and translation automation, with a focus on their impact on professional autonomy, personal well-being, and job satisfaction. Many translation workers now find themselves tasked with machine translation post-editing (MTPE), evaluating MT output quality, and ensuring that specialised content meets in-house and industry-specific standards. Translation automation delivers undeniable productivity gains but significant concerns persist regarding quality, human agency, and autonomy, as well as the erosion of professional identity. These challenges arise as machines begin to dominate industry structures, business models, and workflows. Chapters 18, 19, and 20 address *The Transformation of the Translator’s Role*, examining how translators face mounting productivity demands, often at the expense of professional autonomy and fair compensation. These pressures have prompted calls for regulation and ethical guidelines, particularly regarding AI integration. Maintaining high-quality standards has become increasingly challenging and stressful, not least given the rapid pace and reduced pay often linked to post-editing duties. Chapters 21 and 22 focus on *Translation Automation and the Optimisation of Workflows*, showing how AI-driven workplaces are geared up for streamlining processes, accelerating translation production, and reducing costs. A quasi-automatised and efficiency-driven workplace, however, risks marginalising human translators by curtailing their decision-making authority. These two contributions emphasise the need for a careful balance between technology-driven automation and optimisation, and the human expertise essential for upholding the ethical and quality standards that underpin the profession.

In chapter 18, **José Gustavo Góngora-Goloubintseff** and **Silvia Terribile** focus on the significant and widely debated topic of human-machine – or translator-machine – interaction. The transformation of professional translation workflows stands in close correlation to the equally shifting dynamics of translator-machine interaction. The authors note that translators’ attitudes towards MT are highly context-dependent, influenced by factors such as the translation’s intended purpose and the quality of the machine-generated output. When the output is perceived as low-quality, translators tend to express dissatisfaction, frequently opting for extensive intervention. Beyond individual attitudes and practices, the authors stress the need for more robust regulatory measures to better balance the “complex power relations among different social groups involved in the translation industry” (p. 269). In Chapter 19, **Kristine Bundgaard** and **Tina Paulsen Christensen** also

examine the digital transformation of work routines, workflows, and cognitive processes in professional translation. They integrate insights from organisational theory and ergonomics to address the psychological and professional impact of various translation technologies (Tarafdar *et al.* 2011; Bondanini *et al.* 2020). While the rapid adoption of these tools brings productivity gains, the authors note that “negative psychological outcomes may indicate the presence of technostress” (p. 279). Automation poses risks of deskilling and marginalising the human factor, with technostress potentially stemming not only from changes within the industry but also from a broader “neoliberal-oriented discourse surrounding translation automation in society at large” (p. 283). Chapter 20, by **David Orrego-Carmona** and **Samuel Läubli**, explores the professional changes wrought by MTPE through perspectives from industry, academia, and practitioners. Advancements in natural language processing have significantly improved MT accuracy, shifting the onus from manual translation production to the revision of machine-generated output. The authors observe “a growing disconnect between the industry’s expectations concerning productivity and profit and the professionals’ roles and their working conditions” (p. 288). They also assert that “it is unclear how professional translators can voice their concerns and contribute to the consolidation of fair market conditions from a disenfranchised position” (p. 296). In response, the authors call for the development of fairer, more sustainable MTPE processes that prioritise translator well-being alongside industry demands for efficiency and productivity.

Chapter 21, by **Christopher D. Mellinger** and **Thomas A. Hanson**, delves into the pivotal role of data in optimising translation workflows, particularly in relation to NMT and automated speech recognition. The authors emphasise the need to address biases and ethical concerns embedded within datasets, advocating for improved data management practices such as inclusive data sourcing, rigorous curation, and regular maintenance. They further argue that bias mitigation should involve “a diverse range of stakeholder perspectives throughout [technology] development and deployment” (p. 305). Such measures would help reduce systemic biases, ensure equitable access, and promote responsible automation that respects translators’ expertise, protects their working conditions, and ensures their long-term professional stability. In Chapter 22, **Ralph Krüger** tackles a neglected area in automation research, highlighting the interplay between domain-specific MT, epistemic distortion, and specialised translation. While domain-adapted NMT systems are designed to handle the intricacies of specialised texts, MT-induced phenomena such as “machine translationese” and “post-editeese” often “introduce unwanted effects of epistemic distortion into intercultural specialised communication by suppressing target-cultural genre conventions” (p. 321). The growing reliance on NMT and automated workflows triggers sociotechnical – and, indeed, epistemic – effects that jeopardise the expert status and agency of translators. To counter these risks, Krüger calls for “a fully-fledged technology impact assessment”, enabling stakeholders to make “fully informed decisions regarding an optimal division of labour between humans and machines” (pp. 321–322).

### ***Part V: Translation technology and (non-)human agency***

The fifth part addresses the balance between machinic and human agency against the broader backdrop of the natural environment and human (digital) culture, underscoring the importance of sustainability, inclusivity, and human creativity in contemporary translation settings. Chapters 23, 24, and 25 explore *Sociotechnical and Environmental Dimensions of Machinic Agency*, drawing attention to the significant energy demands of machine learning models, their ecological footprint, and the pressing need for more sustainable practices. Particularly compelling is the discussion of how digital infrastructures embedded in our immediate environment, such as the

Internet of Things, are poised to redefine translation beyond the boundaries of human language. Chapters 26, 27, and 28 converge around the shared theme of *Balancing Creativity and Ethics in Digital Translation*, interrogating the interplay between AI, literary practices, human creativity, and gender issues. The use of AI in literary translation has sparked debates about the risk of losing authentic human expression and creativity (Guerberof Arenas and Toral 2022). These three chapters also tackle the biases embedded in language technologies, particularly those affecting gender representation and minority groups. They emphasise the indispensable role of professional human translators in upholding ethical standards and safeguarding quality and diversity in literary and other creative (con)texts.

Chapter 23, by **Dimitar Shterionov**, **Eva Vanmassenhove**, **Kristiina Taivalkoski-Shilov**, and **Elena Murgolo**, problematises the environmental impact of translation technologies, focusing on the energy consumption and carbon emissions associated with machine learning systems. The authors underscore the need to balance the efficiency of digital translation tools with their ecological consequences, suggesting practical measures such as adopting eco-friendly practices in AI model training and deployment, using power-monitoring tools, and optimising hardware. They call for legislative action by governmental bodies, working alongside developers, industry stakeholders, and translation practitioners, to establish sustainable translation workflows that align productivity gains with environmental responsibility. In Chapter 24, **Renée Desjardins** calls attention to the unexplored interface between translation and the Internet of Things (IoT). Adopting a bold and expansive non-human concept of translation, this chapter investigates how IoT devices, such as sensors and smart systems, translate data across diverse contexts, from personal devices to smart cities. Drawing on Michael Cronin's (2017) *Eco-Translation*, Desjardins explores how these "IoT translations" extend beyond human agency, carrying profound ecological and ethical implications. Similarly, Piotr Blumczynski's (2017) *Ubiquitous Translation* frames datafication – the process of turning human activities into digital data – as a pervasive form of translation that transcends the boundaries of human language. This perspective challenges mainstream concepts of translation while foregrounding the sociotechnical ramifications of data-intensive technologies. Chapter 25, by **Alessandra Molino**, **Rachele Raus**, and **Tania Cerquitelli**, discusses the linguistic, social, and educational implications of integrating machine learning into MT through neural network technology. While valuable in many applications, NMT risks promoting language homogenisation by English-centric training data, potentially eroding linguistic diversity and reinforcing sociocultural biases. The authors stress the importance of rigorous data curation "to avoid producing results that perpetuate unacceptable forms of exclusion, stereotyping, or verbal violence against women and minorities" (p. 354, Cf. Mellinger and Hanson, this volume). Echoing themes from other chapters in this handbook, they make a case for increased human oversight in the deployment of language technologies and call for a prudent balance between innovation and ethical responsibility to preserve "linguistic, cultural and epistemological diversity" (p. 362).

Chapter 26 delves into the interaction between creativity and technology in translation, with **Ana Guerberof Arenas** challenging the entrenched notion that machine-generated translations are inherently devoid of authentic creative value. This contribution interrogates creativity through the dual prisms of social theory (Sawyer and Hendriksen 2024) and translation theory, spotlighting its evasive nature and the complexities of measuring it, particularly when comparing human translations with MT-generated outputs. Guerberof Arenas contends that "creativity is not only a skill for optimal translation output but an ability that brings enjoyment and job satisfaction (and self-value) that is necessary for professionals in the field" (p. 376). This, again, underscores the imperative to approach translation technology with an eye on the professional, psychological, and emotional well-being of human translators. In Chapter 27, **Dorothy Kenny** probes the shifting

status of MT in literary contexts, charting its journey from a near-taboo topic to a subject of vibrant debate. Advances in machine learning have rendered NMT and generative AI increasingly viable – albeit still contentious – for literary applications. In light of growing concerns over the ethical, cultural, and economic challenges posed by advanced translation technology, some critics indeed argue that “current AI-assisted translation is based on the theft of data from the very translators the technology would replace” (p. 391). Despite such critical voices, however, “augmentation-focused empirical research has the potential to show how translators can use the technology in empowering ways” (p. 391). By adopting an axiological-empirical lens, this chapter inspires us to reimagine policies and ethical standards to empower literary translation. Chapter 28, by **Manuel Lardelli** and **Dagmar Gromann**, surveys the sociotechnical implications of gender bias in MT, with a particular focus on non-binary gender representation. The authors highlight how MT systems tend to perpetuate gender stereotypes and overlook non-binary identities, raising critical issues of fairness and inclusivity. Drawing on Piergentili *et al.* (2023), they unpack the technical and conceptual challenges involved in implementing gender-fair translation strategies within MT systems. Developing MT models that accurately represent non-binary identities across languages – for example, translating from gender-neutral English into gendered languages like German – remains a formidable challenge. The authors advocate for a paradigm shift in MT design that embraces greater flexibility in handling gender to ensure fair representation. It is essential to address these issues – especially in relation to non-binarity – to align MT with evolving societal norms.

### ***Part VI: Machine translation in everyday life***

This final part of the handbook aligns with broader discussions on balancing AI-driven technology with human oversight. It highlights *The Ubiquity of NMT in (Non-)Translation Environments*. Chapters 29, 30, and 31 stress the importance of non-professional users developing stronger competencies in understanding and effectively applying MT systems. Today, NMT and, increasingly, multilingual AI are widely used by non-experts in all kinds of professional and personal contexts. The widespread adoption of translation technology offers both opportunities and challenges. In non-translation workplaces, users must be trained to become MT literate to manage risks and uphold quality and ethical standards (Nurminen and Koponen 2020). These contributions collectively underline the importance of user awareness, comprehensive risk assessment, and responsible MT practices to navigate these complexities. Chapter 32 counters hyperbolic industry claims that MT could fully replace human translators. It offers a hopeful outlook on the enduring relevance of translators, even as technology evolves. Persistent challenges – ranging from data limitations to language complexity and cultural nuances – will require human expertise for years to come. To remain integral to the professional “translation game”, translators must leverage MT advancements to their advantage, enhancing workflows while maintaining control, oversight, and quality.

Chapter 29, authored by **Lucas Nunes Vieira** and **Khetam Al Sharou**, concentrates on MT as an everyday communication tool, highlighting its impact across online and physical environments, from web browsing and social media to face-to-face exchanges. A central theme here concerns the increasingly porous boundaries between technologies, digital media, and physical spaces, which points to an epistemological shift (cf. Jones, Chik, and Hafner 2015) in analyses of “the diverse social roles that MT plays in daily life” (p. 419). As advanced MT tools become ever more seamlessly embedded into digital platforms and in-person encounters, they blur the line between offline and online worlds. New translation technologies extend the reach of communication, but they also risk introducing distortions, especially when dealing with non-standard languages on social media. In Chapter 30, **Mary Nurminen** explores how non-experts incorporate MT into their professional

workflows, highlighting MT's growing application in sectors such as healthcare, law, journalism, and academia. While MT offers significant benefits to multilingual communication in these areas, there remains a pressing need for greater emphasis on risk management, MTL, and comprehensive guidelines and regulations. There is also an increasing demand for specialised tools tailored to the needs of non-expert users. Looking to the future, Nurminen reflects that "MT will find its way into more processes and more people will interact with it. Research on current instances of MT use at work can help us predict new uses and define best practices and guidelines for them" (p. 432). Chapter 31 builds on the preceding discussions of non-expert MT use by underscoring the vital importance of MT literacy, framed as an adaptable concept to address ever-evolving technological paradigms. **Lynne Bowker** contends that as MT becomes increasingly accessible, users must cultivate a comprehensive understanding of its strengths and limitations. This chapter outlines key aspects of MTL, including an awareness of how data-driven methods operate, the ability to differentiate various translation contexts, the critical role of transparency, and strategies for effective tool engagement. Bowker ties together the arguments from the previous two chapters by stressing that successful MT use – whether in crisis response or in (non-)professional and (non-)expert settings – depends on informed users equipped to navigate its complexities. Chapter 32, the handbook's concluding contribution by **Andy Way**, ponders on future developments in translation technology. Way is critical of industry claims that MT could one day replace human professionals, noting that despite remarkable technological advances, substantial challenges persist, particularly with low-resource languages, and specialised and creative texts. Human expertise will remain essential to refine and oversee MT, as it ensures ethically and contextually appropriate results. Advocating a proactive approach, Way encourages translators to "use their 'gold standard' data curated by themselves over several years to build their own high-performing Gen-AI systems" (p. 457). This closing chapter highlights not only the critical balance between technological innovation and human oversight but also the enduring cultural and societal contributions that human translators will continue to provide.

We hope that this handbook, the first of its kind to situate multilingual technologies within broader cultural and socioeconomic dynamics, will serve as both a valuable resource and a springboard for bold, future-facing research. Technology does not operate in a vacuum. Technology shapes and is shaped by political power structures, ideological currents, market forces, and social norms. Novel AI-enabled innovations emerge daily, further entangling the networked complexity of our physical and virtual environments. As multilingual LLMs become increasingly entrenched in digital networks, the theoretical, conceptual, and axiological perspectives outlined in our call for an engaged, critical sociology of translation technology will only gain in urgency and significance. With each successive generation of AI-enabled translation tools, the stakes of understanding their cultural impacts, ethical ramifications, and sociotechnical underpinnings will only intensify.

We are, therefore, convinced that potential technological innovations that lie ahead will only reaffirm our handbook's central conviction: that human agency and critical reflection must remain at the heart of any new disruptive technological paradigm. After all, translation machines will remain limited in their capacity to grasp contextual and cultural nuances, risking the diminishment of human language's vibrancy and depth into a sterile, one-dimensional output. Moreover, language and translation technologies operate within a capitalist paradigm that prizes scalability, speed, and profit above the meaningful engagement with language and its cultural dimensions. It is therefore imperative that we resist a slide into unchecked AI-driven machinic agency, algorithmic control, and data-centric translation flows. Allowing the world to become entirely technologically "enframed" – in a Heideggerian *coup d'état* – may not align with our deepest core values.

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