Routledge Advances in Translation and Interpreting Studies

USING TECHNOLOGIES FOR CREATIVE-TEXT TRANSLATION

Edited by
James Luke Hadley, Kristiina Taivalkoski-Shilov,
Carlos S. C. Teixeira and Antonio Toral

"This is an important and necessary book, on a subject about which I often ponder and speculate and converse, but never know where exactly to turn to deepen my understanding. I suspect that there are many, many others out there in the same position, and they will welcome this publication too."

Polly Barton, *Japanese-English prize-winning literary translator* (www.pollybarton.net/about-me)

"This is a book to be read by anyone who has a practical or theoretical interest in the newly emerging field of the use of machines in the translation of literary and creative texts, be they students of translation, translation scholars or practising literary translators."

Roy Youdale, *Spanish-English literary translator and author of* Using Computers in the Translation of Literary Style: Challenges and Opportunities *(Routledge Advances in Translation and Interpreting Studies)*

"This volume offers a fresh look at one of the most exciting areas in contemporary translation studies: computing, creativity and translation, as well as offering a new look at the interaction between technology and the translation of creative texts. With this timely contribution to one of the most exciting areas in contemporary translation studies, Hadley et al. make the case for a closer look at the role of computers in translation, even for creative texts."

Dorothy Kenny, *Professor of Translation Studies at Dublin City University*

Using Technologies for Creative-Text Translation

This collection reflects on the state of the art of research into the use of translation technologies in the translation of creative texts, encompassing literary texts but also extending beyond to cultural texts, and charts their development and paths for further research.

Bringing together perspectives from scholars across the discipline, the book considers recent trends and developments in technology that have spurred growing interest in the use of computer-aided translation (CAT) and machine translation (MT) tools in literary translation. Chapters examine the relationships between translators and these tools—the extent to which they already use such technologies, the challenges they face, and prevailing attitudes towards these tools—as well as the ethical implications of such technologies in translation practice. The volume gives special focus to drawing on examples with and beyond traditional literary genres to look to these technologies' use in working with the larger group of creative texts, setting the stage for many future research opportunities.

The book will be of particular interest to students and scholars in translation studies, especially those with an interest in literary translation, translation technology, translation practice, and translation ethics.

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Introduction

James Luke Hadley, Kristiina Taivalkoski-Shilov, Carlos S. C. Teixeira, and Antonio Toral

How to solve the problem of translation

The histories of Machine Translation and Translation Studies are fundamentally intertwined, and not only because both concern themselves with translation. They both developed as focused areas of study in the wake of the Second World War (Tymoczko 2006, 156). At this time, a new awareness of translation as a means by which speakers and writers of other languages can be made intelligible was being led by developments in communications, computational technologies, increasingly mechanised work practices, widespread literacy, and the availability of written materials. During the war, early computers had famously been employed by cryptographers in the race to decode enemy transmissions (Gambier 2018, 132–133). Fundamentally, these machines were codebreakers that could decipher the cyphers used to encode messages, such that the messages could be decoded in order to make them intelligible.

This approach has close parallels with Saussurean linguistic theories, which were preeminent at the time and which had shifted the study of linguistics away from etymology and language change to the analysis and description of linguistic structures, underpinned by the notions of the *signified* and the *signifier* (De Saussure 2011, 75). Under this paradigm, the lexical unit used to express something is seen as arbitrary, acknowledging that there is no intrinsic link between a word and the thing it represents (De Saussure 2011, 68). In turn, this notion tends to lead to the conclusion that signifiers or words are interchangeable, and, therefore, that one language can be used to indicate the same things as another language, even though the two may have no words in common.

Thus, if cryptographical machines could be used to replace one set of signs with another to encode or decode messages, it is reasonable to think that the signs could be replaced by words, and, therefore, languages could be treated as coding systems. Under this paradigm, translation is effectively the act of moving between coding systems such that the message is recoded but not fundamentally altered (see Lennon 2014, 137). Kenneth E. Harper (1955, 41), an American Russianist and early participant in experiments in what he calls "mechanical translation", reasons that

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"since mathematics is itself a language—a set of symbols used to communicate thought—why can't computers be used to translate French into English, or Chinese into Portuguese?"

Some version of this understanding of translation, that texts in different languages could be "equivalent" to one another in terms of the messages they convey, underpinned much research in Translation Studies for the majority of the second half of the twentieth century. This research could be seen as a search for the solution to the equivalence problem, which made translation a messy, time-consuming, and laborious business.

The same understanding informed the early experiments in Machine Translation, which took place in the early years of the Cold War, when American intelligence hoped to develop an automatic tool for the deciphering of Russian materials, essentially seeing the Russian language as a code to be broken. Early experiments, though crude by today's standards, appeared to provide a proof of concept for the researchers, who created a system capable of translating over 60 Russian sentences into English and, on the basis of this, assumed that the problem of translation could be overcome in the foreseeable future:

> "Linguists will be able to study a language in the way that a physicist studies material in physics, with very few human prejudices and preconceptions … The technical literature of Germany, Russia, France, and the English-speaking countries will be made available to scientists of other countries as it emerges from the presses"
>
> (Macdonald 1954, 8)

The experiments and their promised results led to substantial state investment over the following years, though the speed of progress was not as meteoric as had been hoped. Despite early successes in translating simple sentences, training machines to decode messages in one language and then recode equivalent messages in another was more difficult than had been anticipated. Early systems attempted to imitate language teaching models that relied on rules and exceptions. Thus, grammatical structures were programmed into the systems along with those cases which did not conform to the same structures. The highly complex and labour-intensive nature of this work, coupled with the limitations on storage and processing power available in the mid-twentieth century, led to slow progress. This progress was assessed in 1966 by the Automatic Language Processing Advisory Committee (ALPAC), which determined in its report that the early confidence in Machine Translation's potential had been overestimated, asserting that "translations of adequate quality are not being provided" (National Research Council 1966, 16). As a result, it recommended that research funding be redirected into more fruitful endeavours. Such endeavours included finding "means for speeding up the human translation process," the "adaptation of existing mechanised editing and production processes in translation," and the "production

of adequate reference works for the translator, including the adaptation of glossaries that now exist primarily for automatic dictionary look-up in Machine Translation" (National Research Council 1966, 34). As a result, funding into Machine Translation-proper was reduced, with the funds channelled into what later came to be known as computer-aided translation.

Re-evaluating priorities

This move opened the door for the development of rudimentary computer-aided translation features, such as terminology databases, which store previously encountered terms in the source language and their user-defined translations in the target language. The same concept developed into translation memories, which are effectively corpora of previously encountered source language sentences, paired with their previously provided translations. These features developed from the 1990s on into a series of tools that could very well be argued to be indispensable to most professional translators of technical texts by the second decade of the twenty-first century.

Meanwhile, Machine Translation had also shifted its focus from rules and exceptions to parallel corpora, entering the Statistical Machine Translation paradigm by the late 1980s (Brown et al. 1988). Instead of relying on manually programmed rules and exceptions, Statistical Machine Translation relies on large bodies of parallel sentences representing both the source and target language. Systems built under this paradigm use statistical inference to determine the most likely parallel to the source text provided by referring to the parallel source-target corpus of sentences. The benefits of these systems are not limited to output quality but also include flexibility and the level of human intervention they imply. With rules-based systems, it is necessary to build one system per language pair, and the effort of programming all the rules and exceptions is very substantial. On the other hand, statistical systems rely on the corpora they are given, meaning that the work associated with building a system for a new language pair focuses on creating the parallel corpus rather than crafting the system itself.

Statistical Machine Translation systems improved translation quality, especially for language pairs such as English and French, which have similar grammatical structures and large enough amounts of data for the parallel corpora to be created. However, translation between languages with very different structures, or between languages with less human-translated material to base a corpus on, was still problematic.

During this time, Translation Studies too saw a shift of paradigms, from the focus on equivalence that had historically dominated research to a more nuanced examination of translations as sociocultural phenomena. The first steps in this direction had been made several years before, when Toury (1978) and others instigated the shift from prescribing best

practice in translation activity to describing observed translation activity. Functionalist approaches had come to see translations as texts that fulfil specific roles in their target contexts, as opposed to simply representing their sources, and the field shifted to assessing those roles and the strategies used by the texts to meet them (Snell-Hornby 2006, 51–56). As a result of two developments, the field shifted from attempts to make overarching theories of translation in the search for equivalence to more granular assessments of translation activities in context. Thus, the field expanded and diversified exponentially in response to the number of contexts in which translation activity is to be found, the case study became the dominant approach, and the theoretical basis around which Translation Studies had previously gravitated—the search for equivalence—lost most of its meaning.

Literature and other creative texts

Interest in literary translation as a distinct subdivision of Translation Studies could be said to have begun emerging around this time. However, it is important to note that literature had dominated theoretical and prescriptive discussions of Translation Studies since the earliest days of the field. And, to this date, it is not clear whether there is, or could be, a clear divide between literary and non-literary forms of translation. Even while Translation Studies diversified into fields ranging from non-professional translators to translation in crisis scenarios, from publishing practices to audiovisual translation, a substantial substratum of research remained squarely focused on the translation of literature in historical or contemporaneous contexts. A strong branch of research developed around the production of translation historiography, which very frequently focused on works of literature. For example, a whole series of works entitled The Reception of British and Irish Authors in Europe (www.bloomsbury.com/uk/series/the-reception-of-british-and-irish-authors-in-europe/) has been published by Bloomsbury since 2004, covering figures such as Jane Austen (Mandal and Southam 2007), Robert Burns (Pittock 2014), H.G Wells (Parrinder and Partington 2005), and Oscar Wilde (Evangelista 2010). While this series does include figures such as Charles Darwin (Glick 2014), the vast majority are individuals whose work was either fictional or poetic in nature.

As has already been noted, literature had a historically prominent place in theoretical studies on translation. However, while professional training in translation and interpreting existed since before the Second World War in some contexts (Gambier 2018, 133), systematic training specifically for the translation of literature and other creative texts was less widely available. However, the early years of the twenty-first century saw the development of an increasing awareness of the specific skills and training pertinent to the translation of texts of a primarily aesthetic, rather than primarily functional, nature. Thus, this period saw an

increasing number of specialist courses on the translation of literature and other creative texts emerge. Eventually, this growing awareness of what sets creative texts apart, and the training needs of translators specifically working on them, led to codification in the form of the PETRA-E Framework for Literary Translator Training. This framework is the first of its kind and was originally the product of a network of eight European partners with specialisms in literary translator training: BCLT (Norwich), CEATL (European network), Deutscher Übersetzerfonds (Berlin), ELTE (Budapest), FUSP (Misano), KU Leuven, Nederlandse Taalunie (The Hague), and Universiteit Utrecht, which, by 2022, has expanded to at least 25. It aims to "set up and strengthen the European infrastructure for the education and training of literary translators" (https://petra-education.eu/about-petra-e). As part of this aim, the framework was first produced in 2014, drawing together the research and pedagogical expertise of the network's partners. The framework sets out to catalogue, rather than prescribe, the skills and competencies pertinent to contemporary literary translators, subdividing these competencies into five levels: Beginner, Advanced Learner, Early Career Professional, Advanced Professional, and Expert (https://petra-educationframework.eu). Many of the skills listed inside this framework, including research and evaluative skills, overlap substantially with those expected of translators with many different specializations.

When the PETRA-E Framework was first developed, literature was still very much beyond the reach of Machine Translation systems, and this relative incompatibility was reflected by the framework's competencies, in which technology was only mentioned in relation to the ability to search the internet. However, this situation was soon to change, since, at much the same time, Machine Translation was experiencing another paradigm shift with the introduction of Neural Machine Translation systems (Bahdanau, Cho, and Bengio 2014). Like statistical systems, neural systems rely on corpora of existing parallel texts in both source and target languages. But the underlying mechanics of how these systems work differ in that statistical systems "chunk" sentences into smaller units which can be processed as they are. On the other hand, Neural Machine Translation systems process each sentence as a whole. But instead of representing the words as they are, the system represents them as numerical vectors, which can be used to calculate mathematical relationships, including the distances between words, leading to an improved level of fluency.

Thanks to this approach, Neural Machine Translation systems represent a substantial advance in output quality over statistical systems. However, they still suffer from similar limitations, including some which were previously unseen in Statistical Machine Translation systems. For instance, systems that are intended to work in specific domains of knowledge work best if the training data they are built on also draw from the same domains. It can also be that there is a payoff between generic

training data and domain-specific training data, meaning that more is not always better than less. The exception, however, is literature and other forms of creative text. Creative-text translation here refers to the translation of texts from one language to another where the texts themselves pivot broadly on the human creativity employed in their production. They rely more heavily on aesthetics for their existence than texts that aim to bring about an outcome directly, as in the case of technical texts. Thus, although literary texts—fictional works: novels, short stories, poems, plays, comics, and so forth—have historically occupied the central focus, the broader category of creative texts includes these and also:

- non-fictional texts, such as philosophical works, didactic books, and self-help books;
- performative works, such as songs, speeches, films, TV shows, and computer games; and
- promotional texts, such as commercials, advertisements, and propaganda.

While there appears to be a correlation between the quality of domain-specific technical translations produced using domain-specific training data, some, though not all, creative texts challenge this correlation by being highly internally variable. On one end of the literary spectrum are highly popular recent bestsellers with high readability scores brought about by their short, uncomplicated sentences and use of standard vocabulary. However, on the other end of the spectrum are works such as James Joyce's *Ulysses* (1922), which has comparatively low readability and generally very low BLEU Machine Translation quality scores (Toral and Way 2018).

One of the reasons that Neural Machine Translation systems tend to work better in the specific domains of knowledge on which they have been trained is because these knowledge domains tend to have formulaic constructions that become recognisable and reproducible when enough training data are introduced. On the other hand, creative texts are, to a large extent, defined by their idiosyncrasy, fitting into one and many national, cultural, temporal, and even personal styles. Neural Machine Translation systems generally require training data of many millions of words, organised as parallel sentences. Thus, training a system to translate legal statutes is fundamentally different from training a system to translate sonates, because while all the legal statutes included in the training data may follow a given tradition, the equivalent number of sonates will likely straddle multiple authors, periods, or traditions. Moreover, whereas, in a statute, each sentence can generally be taken as a distinct unit of meaning, enjambment means that, in a sonate, one line may or may not represent one unit of meaning and may also capitalise on this ambiguity to create further meaning. Thus, because a Machine Translation system needs to

break up a text into units before processing can begin, where such breaks should be introduced in the context of creative texts is not always clear.

Broadening the field

At the same time as the Translation Studies' shift from generalized equivalence-based arguments was allowing for greater consideration of context and a questioning of its historic Eurocentrism, the advance into Neural Machine Translation systems facilitated experimentation with new means of dealing with the issue of so-called low-resource languages, those languages that are generally not supranational and do not have large amounts of material that readily lends itself to the creation of parallel corpora. Previously, these languages could not readily be included in Machine Translation systems because there was insufficient data to achieve a meaningful result. However, Neural Machine Translation systems open new opportunities for such languages, including so-called transfer learning, in which a system is first trained using a high-resource language then a low-resource language that is related. For example, Spanish, a high-resource language, could be used as the basis for training a system to work with Catalan, a comparatively low-resource language that is closely related.

Another issue associated with translating creative texts is the comparatively high rate of referential consistency they exhibit (Voigt and Jurafsky 2012). Referential consistency describes meaning that ties individual sentences together, often introducing ambiguity if each sentence is considered in isolation. This issue, like other issues of ambiguity, is often not even noticed by human translators, who have a real-world understanding of the contents of the text that underpins their interpretation of it. However, the machine has no recourse to any such knowledge. Therefore, in examples such as "the cat tried to climb into the box but it was too small," a human intuitively grasps that "it" most likely refers to the box into which the cat attempted to climb. However, for the machine, whether "it" refers to the cat or the box most likely comes down to a statistical operation in the training data that is irrelevant to the specific sentence in question, effectively meaning that the choice informing the translated output is a guess. In a language like English, such a guess is unlikely to have a noticeable effect. However, if translated into a language such as French, Italian, Portuguese, or Spanish, where "cat" and "box" belong to different grammatical genders, the effects could be sizeable.

For these and many other reasons, literature specifically, and creative texts more broadly, have traditionally been viewed as fundamentally beyond the ken of Machine Translation systems as well as computer-assisted translation systems, which also function most efficiently in contexts with large amounts of repetition and large numbers of formulaic constructions. Among literary translation specialists, this sentiment has traditionally been expressed with a certain amount of hubris,

where computer-based systems in general are seen as a threat, but one which is kept at bay by the nature of the material. Conversely, Machine Translation specialists have tended to see literary translation as a high cost–low reward activity when compared to the translation of medical, legal, or other technical documentation.

However, traditional sentiments change, and, on both sides of the divide, a new generation of scholars has come to ask new kinds of questions over the past ten years (Voigt and Jurafsky 2012; Besacier and Schwartz 2015). In the world of literary translation, a generation of scholars who consider themselves digital natives has arrived who tend away from the subjective description that has often underpinned much case study research in Translation Studies towards empirical evidence. In Machine Translation, challenge-oriented scholars have come to describe literary translation as the last bastion of human translation (Toral and Way 2014, 174). Both camps are converging with their discreet skillsets on the textual, societal, economic, legal, and technological issues associated with translating creative texts with machines.

The year 2019 saw the first CALT (Computer-Assisted Literary Translation) workshop, which was followed by a workshop at the Machine Translation Summit on Literary Machine Translation and a panel at the EST Conference on Technology for creative-text translation. In 2020, the Goethe Institut created an online debate on AI and Literary Translation. In 2021, a full conference on CALT was instigated, there was a panel at the IATIS conference on creative texts, technology and ecology, and the PETRA-E conference devoted a whole day to issues surrounding literary Machine Translation and computer-aided literary translation. Over the same period, seminal publications making the first steps towards synthesizing a range of technological solutions with the translation of literary and other creative texts have been appearing, mostly in the form of the journal articles that are heavily cited throughout this book, but also, importantly, in monograph form. The year 2019 saw the appearance of Youdale's *Using Computers in the Translation of Literary Style: Challenges and Opportunities*, which combines Translation Studies' traditional translation and commentary approach with a range of electronic tools that can inform the human translator's work.

Thus, it is clear at this stage that interest in the subject is high and growing rapidly, not only among Machine Translation scholars keen to push the boundaries of what is technically possible but also Literary Translation specialists keen to assess the effects of the advancing technology on texts and readers. This synthesis is bringing about new ways of researching translation for both parties. For Machine Translation specialists, it is increasingly clear that seeing a human translation as the monolithic embodiment of the ideal, as has traditionally been the case, is an overly simplistic perspective on a highly variable process. More and more, it is becoming clear that for what and for whom a translation is produced are also important questions to ask when designing Machine

Translation systems. Equally, for literary translation specialists, it is clear that, without a quantifiable definition, nebulous but fundamental aspects of text production such as style are not easily analysed empirically, and subjective assessments of textual features can fall flat for an unsympathetic audience. However, retaining relevance in translation practice is a substantial challenge for Translation Studies as a whole, as it continues to grapple with the palpable divide with the industry, which has traditionally viewed "theory" as useless.

Crafting a snapshot

This book represents a snapshot of research into this emerging topic at this early stage. It is by no means representative of all the work currently underway on synthesizing technology with creative-text translation. However, it demonstrates not only how far the research has already come in a relatively short period but also what kinds of developments we may begin seeing soon. The chapters are arranged to flow from surveys on existing knowledge through new developments in tools for translating. A further examination of tools, this time in the context of analysing existing translations, follows. Finally, the book moves on to consider the legal and ethical implications of machines being more heavily integrated into human creative-text translation workflows.

In Chapter One, Ruffo sets out to assess the state of the relationship between technology and literary translators, asking about translators' perceived roles in society as well as their attitudes towards the use of technology in literary translation. She goes about this assessment by first establishing the basis on which literary translators build their own self-image and the input that literary translators have had in conversations on the technologiation of translation workflows to date. However, at the core of Ruffo's study lies a survey of 150 literary translation practitioners from 35 countries, designed to capture their positionality relating to the use of technology and correlate this with other aspects, such as their language pairs or level of experience. Building on Youdale's distinction between general and translation-specific technology, Ruffo's findings highlight an important point when considering technology in general as far as it relates to translation of whatever kind—that it is not clear where a line should be drawn between technological and non-technological interventions. While few would argue with the statement that Machine Translation is inherently technological, it is, perhaps, less immediately apparent, but no less true, that an online dictionary or archive, or indeed a word processing application, is also inherently technological in nature, as are paper dictionaries, even though the technology in question may not be digital.

In Chapter Two, Daems also makes use of a survey method, focusing on emerging technologies pertinent to literary translation workflows. Daems assesses the awareness and adoption of such technologies among 155

literary translators working into Dutch and establishes the factors that impact a translator's willingness to adopt new tools into their workflows. Her findings indicate that literary translators may be relatively slow to learn about emerging technologies, implying a kind of vicious cycle of technical translators being the heaviest users of such tools, and, therefore, the group to which such tools are primarily marketed. A minority of Daems' respondents appear to hold that technology is inappropriate for the translation of literary texts, implying that it might not be technology in general, but rather the technology that exists currently that is not ideally suited to literary translation. Daems further demonstrates that, despite the potential knowledge gap between the tools that exist and the literary translators who might make use of them, an overwhelming majority of the literary translators she surveyed have an interest in knowing more about technological developments pertinent to them. Thus, it may be that tools specifically aimed at literary translation, which are sensitive to the concerns expressed by literary translators, may be met with less resistance than may be assumed.

Turning to one of the functions that such creative-text translation-specific tools might focus on, in Chapter Three, Kolb and Miller assess the usefulness of PunCAT, a tool that assists in the translation of puns. Kolb and Miller focus on the English-German language pair on which the system was originally built by Miller (2019). They evaluate translations produced with and without the tool, the latter done by nine graduate students. Their findings demonstrate that tool use is not always straightforward, particularly in the context of translating. They find that, in some cases, users' reactions to the outputs provided by the tool are not as simple as reject or accept but are more nuanced than this, serving as ingredients for brainstorming, and ultimately assisting the translator in coming to an ideal solution. Importantly, Kolb and Miller also assess the translators' emotional reactions to the use of this tool, finding that, while many appreciated the tool as something that provides suggestions which can be ignored or built on, others found the use of the tool stressful and potentially constraining. These findings are very important both for the future development of the field and for tools that may be developed in the coming years. They show that managing expectations is as important as producing a tool that fulfils a given need. It is important that translators are made to feel that their agency is expanded, rather than constrained, by the tool. Or, to put it another way, that the tool provides one or more possible candidates, but these candidates aim to assist, rather than replace, the human translator's thinking.

In Chapter Four, we turn to the use of Machine Translation as a tool for advanced language learning. Oliver, Toral, and Guerberof Arenas discuss the use of a Neural Machine Translation engine in conjunction with the InLéctor collection of bilingual books for the creation of translated works of fiction that are not intended to be read in isolation but are aids for advanced language learners to decipher the work in the original

language. The underlying principle is that there is a balance to be struck between the speed of Neural Machine Translation and the quality of its outputs. If a language learner is sufficiently advanced to be able to read the work primarily in the original language and only requires reference to a translation as a means of support, the quality of the output may be sufficient to serve this purpose, and the speed by which the output can be produced may make its availability highly attractive. Oliver, Toral, and Guerberof Arenas' findings show that readers, especially those with a high level of proficiency in the target language, can benefit substantially from the presence of the machine-generated outputs. Specifically, the readers of the bilingual editions, as opposed to monolingual counterparts, found the reading experience easier and more enjoyable. At this stage, it remains to be seen whether these findings transfer into increased learning on the part of the readers or whether finding the answer instantly may hamper retention. Nonetheless, this experiment does stand in very good company with, for example, the Loeb Classical Library, which has been publishing works of classical literature with facing English gloss translations for pedagogical purposes for over 110 years (www.hup.harvard.edu/collection.php?cpk=1031). Moreover, the experiment highlights the importance of not seeing translation, whether machine or human, in monolithic terms but as a highly nuanced practice with different requirements depending on intended readership and use.

Naturally enough, comprehension works on multiple levels, particularly in the case of literary and other creative texts, which may make use of idioms and other devices that problematise understanding through gloss translation. In Chapter Five, Zajdel asks about the specific case of metaphor, comparing the translation of a work of literature into Spanish by a Machine Translation system with the same work translated by human translators. Zajdel subcategorises metaphors into four types, along with idiomatic expressions, and assesses the translation procedures used by a Machine Translation system on 50 of these metaphors found in a single work of literature. She then compares these procedures with their counterparts in two human translated versions of the same text. Zajdel's findings underscore the importance of not necessarily perceiving a human translation as the zenith of translation quality, as the procedures employed by the two human translators in question vary somewhat. Indeed, this variability is of note, since one of the biggest dividers between the human and machine translators in Zajdel's findings is the range of procedures employed by each when encountering metaphors. Whereas the Machine Translation system tends to translate each metaphor with a metaphor, the human translators exhibit a wider range of procedures, such as extrapolating metaphors or replacing them with alternative metaphors. Zajdel also finds, to some surprise, that idiomatic expressions tend not to be well translated by the machine in this case, despite such idiomatic expressions presumably finding their way into training data. This finding may be pertinent to future research on idioms and puns as far as training

data are concerned. One might conjecture that idiomatic expressions do not become statistically significant in training data until the point that they can be seen as cliché by human readers. Zajdel's work is important in dispelling any assumption that Machine Translation is simply incapable of working with metaphor or is restricted to working on the purely superficial level in this regard. Her results illustrate the creativity that can emanate from the use of Neural Machine Translation systems, which could easily prove to be a highly positive attribute as research in the field of literary Machine Translation develops.

In Chapter Six, Brusasco focuses centrally on this issue of creativity in Neural Machine Translation systems. She uses three Neural Machine Translation systems to translate the same extract of a literary text in order to assess the procedures that each undertakes and the extent to which creativity is manifest in each case. Brusasco's analysis assesses the quality of each translation, not only on the basis of creativity but also on the basis of acceptability in the target context. She also raises the important point that it can and possibly should be taken for granted at this stage that the outputs of Neural Machine Translation systems, particularly in the context of translating literary and other creative works, require human intervention in the form of post-editing. While some literary translators may see this shift as a profound one, where the human is demoted to controlling the quality of the machine's outputs rather than producing their own outputs directly, taken from another point of view, Neural Machine Translation systems as a whole could also be seen as computer-aided translation systems. In other words, since the human post-editor still retains decision-making agency and can choose to alter or overrule the machine's outputs, in just the same way as in Kolb and Miller's study, if human post-editing is taken for granted, the post-editor may rise in perceived importance. Brusasco speculates on the possible effects associated with training Machine Translation systems on works of literature, possibly by collecting texts belonging to single genres or even by single authors, and identifies certain potential issues with such a practice. She observes that such an approach could codify idiosyncrasies of style in Machine Translation outputs, which may have the effect of fossilising or stratifying high and popular literature, in a manner reminiscent of the current stratification between high- and low-resource languages.

Niskanen shifts our attention in Chapter Seven to the use that machines can have in supporting and augmenting the kinds of descriptive case study research that have become the norm in Translation Studies. His research focuses on intertextuality in four human translations of the same pastiche-laiden text, asking whether the extratextual cues present in the source text are reproduced in each of the translations. Niskanen's analysis is based theoretically and terminologically on Genette's (1997) work, codifying the *hypertext*, *hypotext*, and *paratext*. The tool he develops uses an electronic version of the text which contains tags that allow a user to gain further insights on intertextual references present within the text and to

assess their treatment in each of the translated versions. Niskanen's primary aim in this study is to explore the range of new research questions that such a system may make possible to Translation Studies researchers. He finds that, in the process of analysing these intertextual links, it can be observed that some human translators use the translation procedure of drawing on the target tradition as well as, or instead of, the source tradition. While Niskanen's work immediately opens up new ways for Translation Studies scholars to bring technology into traditional close reading analytical techniques, it also highlights the research element that lies at the heart of much literary and creative translation practice. It is easy to see that, armed with a tool that identifies and elucidates intertextual elements in a literary work, the element of chance that can underpin such work may be reduced. Translators using such tools may be able to work with a certain level of confidence that any intertextual links missed by the human translator will likely be found by the machine. Naturally enough, as seen in Kolb and Miller's work, the obverse may also be true, that such tools could lead especially emerging translators into a false sense of security that all intertextual links will be identified by the machine, or that the human translator is obliged to act on the links and only those that the machine has identified.

Bringing the book to a close are Koponen, Nyqvist, and Taivalkoski-Shilov in Chapter Eight, whose focus falls onto the legal, technical, and ethical issues of copyright and ownership in the context of creative and literary works translated in part or in whole by machines. Koponen, Nyqvist, and Taivalkoski-Shilov set out by assessing the situation of translation in general in the context of copyright, observing the uneasy relationship between a mode of text production that is inherently derivative and a system intended to control the creation of derivative work. Copyright further operates on the assumption that works have named and identifiable originators whose rights can be asserted in the event of derivations of those works being produced. Koponen, Nyqvist, and Taivalkoski-Shilov rightly point out that much computer-aided translation technology, as well as Machine Translation technology, relies on corpora of work produced by many individuals whose precise contribution may or may not be identifiable. Even in simple cases such as individual companies' Translation Memories, the production of the memories' contents is a collective process, and the assumption is that individual segments will be reused many times in the production of translations. Koponen, Nyqvist, and Taivalkoski-Shilov revisit the assumption that texts produced by Machine Translation systems currently require human intervention in the form of post-editing by pointing out that there are many cases where the copyright for a work has lapsed, leading to the production of new translations in which no such intervention has taken place. This issue, as Koponen, Nyqvist, and Taivalkoski-Shilov point out, is one of quality and reputation from the point of view of authors. They conclude by calling for a reassessment of copyright practices to reflect the

changing landscape of translation in general. Now that the use of technology has come to be integrated into many translation workflows, such legislation should continue to act as a protective measure for text producers in general and not only for those in positions of power.

The missing chapters

While it cannot claim to be comprehensive in encompassing all research into the use of machines in the translation of creative texts, this book does offer an overview of some of the key aspects of the emerging topic, which may become increasingly prominent over the coming years. In many ways, these topics are tied to the progress not only of technology but also of our understanding of the processes associated with translating creative works. Research abounds in Translation Studies on the interplay between ideology or philosophy and the translation process (e.g. Mason 1994; Leonardi 2007; Tymoczko 2006), the visibility or not of the translator in the final product (e.g. Venuti 2017), and the effects on target readers of the interpretations underpinning translations (e.g. Ece 2015; Vandaele 2002).

On the other hand, in Machine Translation, focus has historically fallen squarely on the question of how to produce translations of the highest possible quality. Now that Neural Machine Translation outputs, in the context of high-resource language pairs at least, have reached the stage of being directly comparable with human translations on more than the superficial or grammatical level (see Toral and Way 2018), it is possible to begin knitting these two areas of exploration together to ask how and whether decisions made in the creation of Machine Translation systems go on to have observable effects on the texts produced that fall beyond the scope of quality control.

At the same time, it becomes more meaningful than ever before to begin asking questions of a primarily stylistic nature about text-specific features, genre-defining conventions, and author-particular idiosyncrasies, and how and whether these are rendered by human and machine translators given the same task.

With such features in mind, it is no surprise that experiments are beginning in Machine Translation and computer-aided translation specifically in the context of highly stylised or formally constrained traditions of text production such as poetry and song. Questions are beginning to be asked about how such constraints can be harnessed in the production of Machine Translation outputs, and, concurrently, how machines can be used to facilitate the work of human translators working with such texts—for example, by identifying rhyme schemes and metrical patterns automatically. Similarly, advances in artificial intelligence mean that it may soon become possible to make computer-aided translation tools in general work not only more efficiently but also more intelligently. At the

same time, work on the experiences of users working with these systems may see changes to interfaces that could assist in familiarising technology to translators who have been historically resistant to it or found it less than useful. In the coming years, it is likely that the pace of research in these and many other aspects will increase, leading to ever more flexibility in translating under formally constrained conditions and other situations relevant specifically to creative texts.

Another topic that is not directly handled in this book and is likely to attract attention over the coming years is that of voice dictation. As speech recognition software improves in quality, particularly for high-resource languages, it has been integrated with Machine Translation systems, giving a rudimentary workaround for the interpreting of the spoken word. Interpreting is seen by many as a sister skill to translation, with many of the same concerns as well as additional practical constraints, the most obvious of which is possibly the ephemeral nature of the spoken word. Machine Translation systems and CAT tools, on the other hand, have historically only processed written text, meaning that oral speech has needed to be transcribed before it could be translated. In the context of creative texts with oral and other performative components, such as speeches, plays, and many forms of poetry, conceptualizing the material purely in textual form tends to overlook the performative aspect and the textual fluidity that this creates. It is not currently clear how or whether current Machine Translation or CAT tool systems could be adapted to material that is not in a written form. There are fundamental differences between written text and spoken speech that go beyond their two media of communication.

Work on copyright and other legal aspects associated with the production of translations, of the kind seen in Koponen, Nyqvist, and Taivalkoski-Shilov here, is also likely to become increasingly important over the coming years and as the number of works of literature produced primarily or partly by machines rises. The substantial variation in copyright law in various jurisdictions around the world, coupled with dramatically different translation and publication norms and expectations globally, will likely mean that issues pertaining to the legal interplay between human and machine in the production of intellectual property is likely to become substantially more complex as the technology advances.

Thus, the primary objective of this book is to capture the state of the art of the use of machines in the translation of creative texts at the first stage of its development, when discussing the field in solid, rather than abstract, terms has become meaningful. The book works in full awareness that, in such a rapidly developing field, the gap between the cutting edge and obsolescence is short. However, the thematic range of the research represented by its chapters also goes some way to showcasing the vast opportunities and challenges that are only now being made apparent to us as we take the first steps into this new landscape of research.

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1 Collecting literary translators' narratives

Towards a new paradigm for technological innovation in literary translation

Paola Ruffo

Introduction

Research on technological innovation in translation tends to systematically exclude literary translation. This trend was best captured by Toral and Way when they defined the latter as "the last bastion of human translation" (2014, 174). The rationale behind this is mainly twofold. On the one hand, the very nature of creative texts almost implies an inherent degree of resistance to automation. In fact, they are characterized by "vocal multilayeredness and deliberate ambiguity" (Taivalkoski-Shilov 2018, 695), which makes them uniquely inscrutable to the machine's eye. On the other hand, literary translators' self-imaging strategies are rooted in the creation of idealized personae, which revolve around their most human qualities and further remove them from the wider discourse surrounding other branches of translation (Sela-Sheffy 2008). In view of this, there would seem to be little to no place for the adoption of tools such as Computer-Aided Translation (CAT) and Machine Translation (MT) for the translation of creative texts. However, despite such tools often being perceived "as either inappropriate or a threat to the skills and livelihoods of literary translators" (Youdale 2019, 199), an increasing number of studies are focusing on the introduction of translation technology to literary translation workflows. These have mainly focused on the application of MT and post-editing to the translation of poetry and prose (Genzel, Uszkoreit, and Och 2010; Greene, Bodrumlu, and Knight 2010; Voigt and Jurafsky 2012; Jones and Irvine 2013; Toral and Way 2014, 2015a, 2015b, 2018; Besacier and Schwartz 2015; Tezcan, Daems, and Macken 2019; Toral, Wieling, and Way 2018; Murchú 2019). This being said, little attention has been given to literary translators as end users of such tools. Furthermore, their voices are consistently missing from the discourse around technological innovation in their profession, with only a few recent studies relating to their attitudes and perceptions, namely Moorkens et al. (2018), Slessor (2019), and Kenny and Winters (2020).

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The characterisation of translation as a form of Human-Computer Interaction (HCI) by O'Brien (2012) ultimately highlighted the need to account for both material and immaterial aspects when investigating contemporary translation. In this respect, Littau (2016) defines materiality as the non-human element, e.g., digital tools, machines, computers. Conversely, immateriality is embodied by creativity, spirit, mind, conscience, soul, and anything associated with being quintessentially human (Littau, 2016). In her view, both material and immaterial elements interact symbiotically and reciprocally shape and influence each other to the point where "[technologies] are active in effecting the ways in which we think, read, write and translate" (Littau 2017, 100). Furthermore, Cronin notes how the constant stream of information, incessant digitalisation of materials, automation of processes, and speed of communication that are typical of the Information Age contribute to an overall "sense of confusion" (Cronin 2013, 1). This "sense of confusion" characterizes translators as they try to give meaning to this new order of things (Cronin 2013, 1). Thus, it is paramount to include translators in the conversation and, by giving them a voice, perhaps discover new ways for literary translators to exist in this new socio-technological landscape, as well as co-exist with new technologies.

This chapter is based on a 2018 study aimed at exploring the dynamic between human (immaterial) and non-human (material) factors in literary translation, recognising materiality as central to contemporary translation practice and trying to bring literary translators' voices back into the conversation. More specifically, literary translators were asked to share their attitudes towards technology and perceptions of their role in society. The study's main research question was "what is the dynamic between humans and technology in literary translation?". Two sub-questions were formulated to assist and guide the research process, respectively (a) "how do literary translators perceive their role in society?" and (b) "what are their attitudes towards technology as related to literary translation?". Respondents' narratives were collected via means of a questionnaire that registered 150 responses, mostly from Europe. Overall, the study adopted an interpretivist, constructionist, and mixed-methods approach. The theoretical framework and data analysis were informed by the Social Construction of Technology (SCOT) framework as theorized by Pinch and Bijker (1984). Although the overall relationship between self-image and technology will be briefly discussed in this chapter, its main focus will be on how participants constructed the notion of technology as related to their professional practice. The chapter will first provide a review of the literature on literary translator status and the application of technology to literary translation workflows. It will then introduce the study's methodology and present the research findings on literary translators' attitudes towards both general and translation technology tools. Finally, it will discuss the results and suggest a way forward for research on the topic.

Literary translators' self-imaging strategies

Literary translators are often depicted as having a different perspective on their profession than that of their readership, clients, or colleagues in other branches of translation (Sela-Sheffy and Shlesinger 2008; Katan 2017; Ruokonen and Mäkisalo 2018). In particular, this seems to be a direct response to the way their profession is depicted by outsiders, which usually clashes with the way literary translators see themselves. In this respect, their self-imaging strategies can be said to be based on an anti-professionalisation discourse through which literary translators elude any form of standardisation and institutionalisation in order to affirm their professional identity (Sela-Sheffy 2005, 2010, 2016).

According to Sela-Sheffy (2008), literary translators adopt three main idealized personae, mainly to oppose their profession's low status: custodian of language, cultural ambassador and innovator, and artist. As custodians of language and cultural ambassadors, literary translators portray themselves as gatekeepers of entire cultural and linguistic systems, in that they determine both what enters the translated literature ecosystem and how, effectively shaping the literary landscape in which they operate (Sela-Sheffy 2008). In a similar way, they are innovators of said systems, introducing new works of literature to an audience who would be unable to access them otherwise (Sela-Sheffy 2008). Lastly, their ability to bring creative texts to life in another language is often described with words belonging to the semantic fields of artistry and craftmanship, highlighting the creative effort involved in their work (Sela-Sheffy 2008).

These accounts are further probed by other research on the topic, where literary translators' identities have been found to be deeply related to their perceived professional status. The dynamic between identity and status results in a tendency to amplify traits associated with personal qualities and circumstances and to place emphasis on characteristics that are hard to quantify in terms of professionalisation, such as vocation and creativity. In this regard, the literary translation career path is often depicted as the result of a natural inclination, an almost inevitable occurrence, more than a professional choice (Sela-Sheffy 2005, 2008, 2010, 2016; Sapiro 2013; Voinova and Shlesinger 2013). According to Heino (2020), literary translators prioritize social and cultural capital over economic capital. Furthermore, the line between writing and rewriting is often blurred, and literary translators emerge as agents of artistic creation, often assuming the role of directors as well as performers in the obscure process of the translation and dissemination of literary works (Jänis 1996; Sela-Sheffy 2008, 2016; Sapiro 2013; Voinova and Shlesinger 2013).

Ultimately, literary translators' symbolic capital is structured around the need to actively respond to outside narratives of low professional status, which, if not perceived as threatening, are at least viewed as unrepresentative of their lived truths. In order to oppose these narratives,

literary translators construct their self-image by emphasising their unique traits and by creating distance from the outside world, a quality that Voinova and Shlesinger call a "strange outsiderness" (2013, 41).

Literary translation and technology

As mentioned in the introduction, despite translation technology being an integral part of contemporary translation workflows, its use in literary translation and by literary translators is understudied. This has started to change in the past few years, with an increasing number of research projects exploring the potential uses of MT, post-editing, and CAT tools for literary texts. The first of these studies focused primarily on MT, and results highlighted how it struggled to preserve both meaning and form with literary and poetic texts (Genzel, Uszkoreit, and Och 2010; Greene, Bodrumlu, and Knight 2010; Jones and Irvine 2013). This being said, subsequent studies found that factors such as predictability of the text and relatedness of the language pair could improve MT output, thus making it more suitable for post-editing (Toral and Way 2014, 2015a, 2015b). In this respect, Besacier and Schwartz (2015) found that including post-editing in the translation workflow halved translation time, although at the expense of quality. The introduction of Neural Machine Translation (NMT), which, unlike its predecessors, uses artificial neural networks to predict translations, is rapidly changing this. In fact, most of the studies cited above used Statistical Machine Translation (SMT), which works at phrase level and uses probability to determine its output. NMT, instead, considers both the source and content that has already been translated in the target text. Recent studies that employed NMT noted an increase in both productivity and MT output quality, with 17–34% of output being evaluated as equivalent to human translation (Toral and Way 2018).

This being said, the studies mentioned so far seem to focus primarily on improving productivity and reducing costs, while practitioners' wants, needs, and support are rarely considered. In this respect, Youdale (2019) opted for taking the spotlight off MT and post-editing to leave more space for the exploration of an alternative technological workflow revolving around the literary translator. In doing so, Youdale (2019) introduces the close and distant reading (CDR) approach. This leverages corpus linguistics and text-visualisation tools to support and enhance the process of literary translation while respecting the translator's workflow and prioritising their point of view. With a similar premise, Youdale and Rothwell (forthcoming) challenge the notion that CAT tools are inherently incompatible with literary translation, investigating ways and situations in which their functions might indeed assist the translator and enhance their work. This might be the case for retranslation, for example, whereby the co-presence of the source text and previous translations could not only highlight connections between them that may otherwise have been lost but could also give the texts a multidimensional

character with the potential of shedding new light on both the source and its retranslation (Youdale and Rothwell, forthcoming).

Despite an evident shift towards human-centred approaches to technological innovation in creative-text translation, the voices of literary translators are still virtually absent from research accounts of technological innovation in the profession. This is especially surprising given that literary translators are arguably the ones who are most likely to be affected by the introduction of such tools in their daily practice. At the time of writing, the only exceptions to this are Moorkens et al. (2018) and Slessor (2019). In the former, literary translators indicate a marked preference for translating from scratch rather than post-editing MT output, which they feel hampers their creativity and leads towards a more literal rendition of the text (Moorkens et al. 2018). Slessor (2019), instead, reports the findings of a survey on literary translators' attitudes towards technology. Results indicate that literary translators employ several standard tools and electronic resources, while translation technology is almost absent from their practice (Slessor 2019). Furthermore, when they do employ translation technology, they do so in unique ways, which suggests a need to review technology training for literary translators, considering their distinctive approach to technology adoption (Slessor 2019). These studies indicate that the reasons behind translators' rejection of technology might not always be straightforward. In non-literary translation, Koskinen and Ruokonen (2017) found that translators are not averse to technology as such but rather to poor usability and tool malfunctions that hinder efficiency and productivity. They ultimately propose user-centred translation technology design and development as a possible solution (Koskinen and Ruokonen 2017).

Overall, research on literary translators' relationship with technology has highlighted a discrepancy between the focus of translation technology research and practitioners' attitudes. In this respect, Taivalkoski-Shilov (2018) shines a light on how many of the studies on MT in literary translation seem to neglect narrative aspects of literary texts and separate content from form when evaluating translation quality. The separation of content and form is also inherent in the MT+PE pipeline itself, which seems incompatible with literary translation, in that it separates structure and content (Taivalkoski-Shilov 2018, 694). In fact, it prevents translators from working on the text as a narrative whole since "the segment-by-segment or sentence-by-sentence translation made by the machine cannot but alter the meaning and structure of the source text" (Taivalkoski-Shilov 2018, 694). This being said, MT and other translation technologies could still be useful to the translation of literary text, provided their introduction is the result of sustainable development involving all stakeholders (Taivalkoski-Shilov 2018). From this perspective, it is not the nature of translation technology itself that should be criticized but the discourse surrounding it and the lack of inclusion of all interested parties in the innovation process.

Since the introduction of translation technology in non-literary translation workflows, translators have reported feelings of devaluation and dehumanisation, as well as a worsening of working conditions and pay (O'Brien 2012). In order to prevent this from happening in literary translation, it is paramount to proactively explore the boundaries of Human-Computer Interaction in literary translation and identify areas for improvement, collaboration, and change. As suggested by Large (2018), by attending to the more mechanical tasks, translation technology could ultimately encourage more creativity for the human involved. One of the broader aims of the study reported in this chapter was indeed to explore this newfound interaction between material and immaterial elements in literary translation and identify possible solutions to reduce the gaps between research, practice, and development in the process of technological innovation by centring literary translators' viewpoints. Some of these possible solutions will be presented in this chapter when discussing results. The next sections will delve deeper into the study's methodology and the data collected on participants' attitudes towards technology and technology use.

The SCOT framework

The theoretical and methodological structure of the study was supported by the Social Construction of Technology (SCOT) framework, which was theorized by Pinch and Bijker (1984) to study technological innovation from a sociological standpoint. It is characterized by being a multidirectional model, in that it takes into consideration not only the final version of a technological artefact as resulting from a linear development process but also all of its variations before it reached the stage of closure. This allows the researcher to lead a retrospective social constructionist analysis of technological innovation by accounting for the problems and solutions that emerged from contrasting meanings assigned to it by different social groups.

The framework refutes technological determinism, in that it is not technology that determines society. Rather, in order to be accepted in society, every new piece of technology goes through a process of variation and selection until all issues raised by relevant stakeholders are agreed upon, solved, or a compromise is reached. In practice, a SCOT-informed analysis allows for a retrospective analysis of this process and consists of three main stages. In the first stage, all social groups relevant to the development of a certain technological artefact and their varying interpretations of it are identified. The objective of the second stage is to identify any conflicts that arose from these differing interpretations and how these were ultimately solved and stabilisation reached. This is usually achieved by devising what Pinch and Bijker (1984) call an appropriate "closure mechanism". During the third stage, research findings are reported to the wider sociocultural context.

SCOT has been identified by Olohan (2017, 2019) as an ideal framework for the study of technology in translation from a sociological rather than historical standpoint. In fact, looking at technological development through a SCOT lens could help foster a better understanding of the social and power dynamics underlying technology acceptance, its rejection, and the consequences of its introduction in professional translation practice (Olohan 2017). In this study, the SCOT framework was adopted at a conceptual level to guide data collection and analysis, with some of its tenets having been amended to serve the study's research questions. In Pinch and Bijker's (1984) words: "our model is not used as a mould, into which the empirical data have to be forced, *coûte que coûte*. […] Its function is primarily heuristic—to bring out all the aspects relevant for our purposes" (Pinch and Bijker 1984, 419). More specifically, this study is not retrospective in nature, as its object is not the *ex post facto* exploration of a tool that has already reached closure. Instead, SCOT is here adopted proactively, in order to address controversies as they arise in the present and give voice to literary translators as a relevant social group. Furthermore, instead of identifying all relevant social groups and analysing one specific artefact, this study focuses on literary translators only and on technology in general. This is due to the lack of previous studies in this area and to the limited timeframe of the project, which led to prioritising literary translators as a social group whose livelihood is more likely to be affected by socio-technological changes in their profession. Furthermore, the study is not ethnographic in nature—as SCOT research usually is—due to literary translators' technology use being an under-researched area, which thus calls for the need to survey this aspect before proceeding with an ethnography of specific tools. The overall aim when employing SCOT was to pre-emptively identify emerging issues in the relationship between materiality and literary translation, as well as devise potential solutions.

Methodology

The study adopted an interpretivist, constructionist, and mixed-methods approach. It is interpretivist, in that it "prioritizes people's subjective understandings and interpretations of social phenomena" (Saldanha and O'Brien 2014, 11–12)—in this case, literary translators' narratives of the technologisation of their profession. In doing so, it also recognizes their role as "a constructing and constructed subject in society" (Wolf 2007, 1) and as agents of sociocultural change. An interpretivist and social constructionist analysis thus allows insights into the way practitioners interpret and assign meanings to their professional reality, which is a pivotal step for a sustainable technological development. As far as the mixed-methods approach is concerned, this was adopted to maximize the potential of a large data set, with quantitative elements helping to support and contextualize the qualitative nature of participants' narratives. Both

elements were combined in a questionnaire by using closed and open questions.

The questionnaire consisted of 31 questions and was divided into 6 main sections, namely Background Information, Language Skills, Professional Practice, Confidence with Technologies, Open Questions on perceptions of role and attitudes towards technology, and Final Comments. The language used in the questionnaire was English and all answers received were in English except for one written in German, which was translated by the researcher. The sampling frame was defined using non-random sampling and by targeting literary translators in UK translation associations and online translation communities. The questionnaire was sent out to a total of 13 UK general and literary translation associations and 68 online translation communities. The latter included online forums, Facebook and LinkedIn groups, and mailing lists aimed at both general and literary translation. Due to the non-random nature of the sample, results cannot be statistically generalized; instead, theoretical and logical generalisation was sought. In this respect, Luker (2008) notices how, even when sampling issues do not allow for statistical generalisation, it is still possible to work on a logical and theoretical level of abstraction. When theoretically generalising, findings are compared to previous theories and studies "to see how [they] illuminate, contradict, extend, or amplify existing theory" (Luker 2008, 127).

The questionnaire was live on the Online Surveys (formerly BOS) platform for six weeks between September and October 2018, and it was completed by 150 respondents. This chapter presents and discusses data related to participants' professional and educational background, their levels of confidence with technology, the technology tools used in their practice, and their overall attitudes towards technology in literary translation. It is worth mentioning that the questionnaire did not include closed items about specific tools. Instead, it only distinguished between general and translation-specific technology. General technology was defined in the questionnaire as "any technology tool that is not translation-specific (e.g., online dictionaries, a time management app, a text-editor software, etc.)." Translation-specific technology was defined as "any technology tool that is translation-specific (e.g., Translation Memory systems, terminology management software, Machine Translation systems, etc.)." Given the exploratory nature of the study and the lack of previous research in this area, respondents could indicate the tools they use in their daily practice and express their attitudes with as few restrictions from the researcher as possible. In turn, results could form the basis for future research on specific tools.

The data analysis consisted of three main phases. During the first stage, a thematic analysis of the open questions was performed. The coding process was supported by the use of NVivo, a software package for qualitative and mixed-methods data analysis. The second phase focused on quantifying and collating results from the closed questions; no statistical

analysis was performed. During the third stage, data related to age, educational background, and professional status was cross-referenced with data on perceptions of role and attitudes towards technology to delve deeper into the relationship between respondents' background and the way they construct their self-image and approach technology. The SCOT framework informed the structure and analysis of the Open Questions section of the questionnaire. In particular, questions about literary translators' feelings and attitudes towards technology and its appealing and unappealing aspects were designed to uncover respondents' interpretations as a social group and any emerging controversies in relation to other stakeholders.

Results and analysis

Respondents' profile

The questionnaire attracted 150 respondents from 35 countries and all age brackets, providing a large and varied sample. The majority of respondents belong to the age groups 36–45 (23%) and 46–55 (28%), while the youngest respondents (18–25) are the least represented, making up 6% of the total. Three-fourths of respondents work in Europe. They are mostly based in the UK (24%), and almost half have English as their first language. As far as respondents' academic background is concerned, 63% hold an academic qualification in translation—40% have a Master's degree and 9% a PhD—however, only 20% have received translation technology training as part of said qualification. A quarter of respondents have received non-academic training in translation technology. In terms of professional background, there is an almost equal number of respondents with 1–5 years of experience (27%) and those with over 20 years of experience (26%). Almost all of them work as freelancers (87%) and define their status as "professional literary translator" (83%), while more than half work part-time (58%). Finally, 65% are members of a translation association and 88% of an online community.

Confidence with technology

Participants were asked to indicate on a Likert scale their levels of confidence with general and translation-specific technology, respectively. The great majority of respondents indicated being either "Confident" (44%) or "Extremely confident" (35%) with general technology, with only 3% being "Not confident at all" (Figure 1.1).

The situation appears considerably more complex when looking at data for confidence with translation technology (Figure 1.2). In fact, levels of confidence drop considerably, with a quarter of respondents indicating they are not confident at all with translation technology. When compared with the previous question, values are halved for the answer

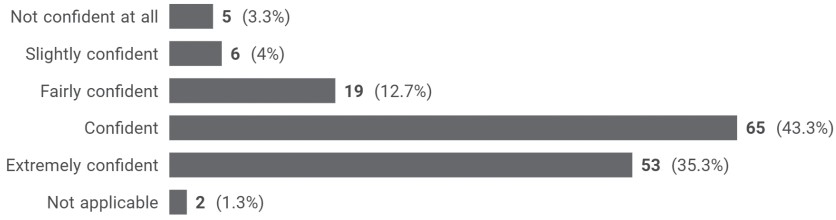

Figure 1.1 Confidence with general technology.

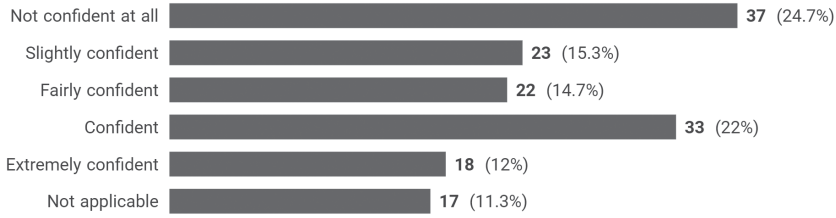

Figure 1.2 Confidence with translation technology.

"Confident" and reduced by two-thirds for the answer "Extremely confident". Notably, 11% mention that the question is not applicable to them, suggesting they are either not aware of or not using any translation technology tool.

The youngest respondents (aged 18–25) are the most confident with translation technology, while the least confident are the oldest, aged over 65. Overall, levels of confidence start decreasing for everyone aged over 36. Conversely, age does not affect confidence with general technology. Educational background has a bearing on confidence with both general and translation technology, as those with a postgraduate academic qualification in translation tend to be the most confident. When looking at translation technology, 45% of those with a Master's degree and 39% of those with a PhD are either "Confident" or "Extremely confident". These values lower to 29% and 21% respectively for those with an Undergraduate degree and those with no academic qualifications. Furthermore, levels of confidence rise considerably for those who have received translation technology training, both academic and non-academic. In particular, 63% of respondents who received academic technology training were either "Confident" or "Extremely confident", as opposed to 28% of those who did not receive academic training. Values are similar for non-academic technology training, with 50% of those trained being either "Confident" or "Extremely confident" versus 29% of respondents without technology training. Finally, professional status appears unrelated to how confident literary translators are with translation technology.

Technology use

Two open questions asked participants to list, respectively, all the general and translation technology tools they employ in their literary translation activity. For general tools, 82% of respondents mentioned online dictionaries, which top the list, while 38% mentioned, respectively, text-editing software and internet search (Table 1.1). Other popular tools are digital glossaries, terminology databases and thesauri (11%), and task- and time-management apps (10%). Additionally, 9% of respondents said they use no general technology whatsoever. Overall, 397 responses were recorded, and the tools mentioned were grouped into 29 categories. The great variety of tools revealed how, while most respondents agree on online dictionaries, text-editing software, and internet search, both their definition of general technology and the technological customisation of their workflow present widely differing degrees of complexity. In fact, answers include basic hardware, such as mouse, keyboard, and screen, as well as slightly more complex tools, such as bookkeeping software and web hosting services, and highly specific technology (for instance, speech recognition software, desktop publishing, and alignment tools). This suggests that literary translators' technological landscapes—and their notion of technology—could be as unique as the translators themselves. Finally, it is worth noting that, while the number of mentions for each tool gives an indication of the ones that are most widely used, it is possible that some of these are so integral to their workflow that many respondents might not have thought about mentioning them at all.

Data on translation technology use also supports the distinctiveness of literary translators' relationship with technology, with 71% of respondents reporting not using any translation technology tools in their practice. Of all the different tools mentioned by those who employ translation technology in their literary translation practice, the vast majority

Table 1.1 General technology tools in literary translation (selection)

General technology tools	*Count*	*%*
Online dictionary	123	82%
Text-editing software	58	39%
Internet search	57	38%
Digital glossary/terminology database/thesaurus	17	11%
Task-/time-management app	15	10%
None	13	9%
Laptop/PC	11	7%
Microsoft Office suite	9	6%
Social media/Online communities	9	6%
Corpora	9	6%
Speech recognition software	6	4%
Total respondents: 150		

Table 1.2 Translation technology tools in literary translation

Translation technology tools	*Count*	*%*
None	107	71%
Translation technology	43	29%
CAT tools	38	25%
MT	10	7%
Terminology management tools	7	5%
Subtitling software	1	1%
Total respondents: 150		

were CAT tools, with only a few mentioning MT and terminology management tools (Table 1.2). Although only a few participants further commented on their use of translation technology, their answers still provide an insight into potential reasons for tool adoption or rejection and the alternative ways in which literary translators might adapt existing technology to their specific needs. More specifically, four respondents described how they use CAT tools for literary translation: one uses them to compile the first draft of a translation, one only when working with a specific agency that requests it, and the other two are in the process of learning how to use them.

Finally, it is worth noting that all 43 respondents who reported using translation technology in their practice have high levels of confidence with technology, being either "Confident" or "Extremely confident". Furthermore, slightly less than half (n=21) of those using translation technology have received training (academic or not), and virtually all of them (n=39) also use translation technology in their non-literary translation work. Having seen in the previous paragraph how training increases confidence, it would seem that literary translators who are more familiar with translation technology—be it because of specialized training or having to use it for other types of translation—are also more prone to integrating these tools into their workflows. The following sections will explore this further by detailing how literary translators' attitudes towards technology play into this dynamic.

Appealing aspects of technology

One of the open questions asked participants to list appealing aspects of technology, whether general or translation-specific (Table 1.3). The most appealing aspect of technology concerns research. In particular, respondents mentioned online dictionaries, internet searches for context clarification, asking colleagues and experts for advice on translation solutions, and the ability to access a great amount of information instantly via the internet. As some respondents put it, appealing is anything "that allows fast information retrieval and fast working and

Table 1.3 Appealing aspects of technology (selection)

Appealing aspects of technology	*Count*	*%*
Research	58	39%
Efficiency	33	22%
Assistance to human	27	18%
Accuracy and consistency	24	16%
None	23	15%
Networking	14	9%
Total respondents: 150		

reworking of texts" and facilitates "the breadth and depth of research needed for a good literary translation to be done from home." Technology is also appreciated when it improves efficiency—for example, by reducing time spent typing or proofreading and editing a text. Dictation and voice-recognition software, Translation Memory (TM) and autosuggest features all make an appearance in this category. By assisting translators with "the housekeeping aspect", this type of technology can "[take] out the donkey work" and allow them "more time to focus on the creative part of [their] work." Technology was also praised for its ability to compensate for human shortcomings, especially in relation to memory. In fact, several responses mentioned TM being effective in "[reminding] the translator of previous renderings (perhaps also the need to avoid them)" and providing "a searchable record of [one's] decision-making process." Overall, an appealing tool is one that "helps [one] concentrate on translating instead of having to fiddle around with complicated systems." To add to this, one respondent notes: "I would welcome technology […] that enabled me to make better quality choices […]—quality being judged in my subjective experience of freedom and self-expression."

Ultimately, literary translators welcome technology that enhances their practice by assisting with all aspects surrounding the act of translation—be it in terms of accuracy, consistency, reducing editing time, or accessing previously translated content—rather than interfering with the act of translation itself. This becomes even clearer in the next section, which looks at their narratives of unappealing aspects of technology.

Unappealing aspects of technology

While appealing aspects were mainly associated with general technology and TM, the discourse on unappealing aspects is almost exclusively focused on translation technology (Table 1.4). In this respect, TM resurfaces here as a hindrance to human translation, being described as causing memory to grow lazy and language to become standardized. According to respondents, TM is in direct opposition to literary

Table 1.4 Unappealing aspects of technology (selection)

Unappealing aspects of technology	*Count*	*%*
Hindrance to human	41	27%
None	30	20%
Disruption/Loss of autonomy	27	18%
Outsiders' narratives	21	14%
Usability and access	17	11%
Inaccuracy and inconsistency	9	6%
Total respondents: 150		

translation's essence. In fact, it "takes away from the need to artfully turn a phrase over and over until it is right, accurate, and artful." Furthermore, others expressed concerns regarding the impoverishment of language, with one respondent noting: "I doubt we'd agree on a voice." This being said, stronger attitudes are expressed in regard to MT and AI, which are associated with a potential worsening of working conditions and wanting to substitute human translators. What is unappealing about this type of technology is that it "tries to bypass the human understanding of language and its nuances in order to save costs" and, according to another participant, "attempts to push the boundaries of technology within an essentially contemplative profession which requires an unfashionable degree of isolation and respect for experience." Another theme that emerges here is that of translation technology disrupting the translation process and diminishing translator autonomy. CAT tool segmentation and MT are often mentioned as examples of this, with one respondent simply stating: "I don't want a machine singing my part of the duet for me." In addition to this, narratives of replacement surrounding some of these tools are also a source of frustration for literary translators, who simply do not believe MT to be compatible with literary translation. The uneasiness that participants feel in this respect is engendered by what they perceive as a misunderstanding of what literary translation entails and the misuse of technology in the name of saving time and costs. The fear is that "all the talk by technology buffs who claim that [this] art/profession will be obsolete" will "[lead] publishers to think that all they need is a good translation tool and a skilled editor." Finally, other unappealing aspects mentioned include accessibility of translation technology tools in terms of costs and learning curve, complicated user interfaces, and inefficiency caused by too many or wrong inputs.

Ultimately, when talking about unappealing aspects of technology, the focus shifts to tools developed specifically for translation. In particular, MT and TM are perceived as a hindrance to the translator, as well as causing disruption to the translation process, with the discourse surrounding them threatening translators' livelihoods in the future.

Attitudes towards technology

One of the open questions devised to elicit respondents' attitudes towards technology asked them to share their feelings about the relationship between the latter and literary translation. Overall, 49% of participants expressed positive feelings. These were followed by 20% feeling torn and 13% demonstrating negative attitudes. The rest of the responses mentioned indifference, uncertainty, and the belief that technology is in no way relevant to literary translation. The majority of respondents felt lucky, comfortable, confident, happy, grateful, relaxed, and even excited about technology in literary translation. Among those who demonstrated ambivalence in their attitudes are those who are torn between love and hate, gratitude and anxiety, and, again, hate and thankfulness. These feelings seem to originate from uncertainty regarding the future role of technology in the profession and the nature of some translation technology. In particular, some of the unappealing aspects of CAT tools and MT are reprised here, whereby the former are perceived as "inflexible", while some respondents are "uncomfortable about the rise of machine translation," which is "good in theory, but potentially abusive." Conversely, technology that facilitates networking and communication is appreciated, together with the internet, the virtually instantaneous availability of electronic resources, and online dictionaries, which is in line with what was reported earlier in relation to general technology use. Finally, negative feelings were mainly directed at the future of the profession and the potential role of translation technology in it. These were feelings of apprehension, sadness, uneasiness, or anger. One respondent states: "I should not be expected to use MT and if I am, I will probably leave the job to someone else."

With the aim of further uncovering their narratives of technology in their profession, respondents were also asked to describe how they see technology as related to their profession (Table 1.5). Differences with the previous question are immediately evident, in that the results are less polarized. In fact, the largest group of respondents either regarded

Table 1.5 Relationship between literary translators' self-image and technology (selection)

Relationship with technology	*Count*	*%*
Ambivalent	36	24%
Helpful	36	24%
Less or not helpful for literary translation	23	15%
No relationship	19	13%
Resistance	9	6%
Imposed	5	3%
Total respondents: 150		

technology as helpful or expressed ambivalent attitudes, while 15% stated that there is no relationship between the two or that technology is less or not helpful for literary translators.

The differences between general and translation technology first noted when looking at appealing and unappealing aspects of technology re-emerge even more clearly in the answers to this question. In particular, the ambivalence originates from thinking of general technology as helpful for research, terminology, and networking, while translation technology once again is a source of concern in terms of disruption of the translation process. One participant thinks such tools "discourage freedom in interpreting text on larger scales," while another states: "I wonder how much they interfere with my originality." Corpora, online search engines, and dictionaries are often referred to as helpful, together with any technology that aids in "sorting thoughts, terminology, and other things you'd have to keep in your head otherwise." Translation technology is also at the centre of participants' more negative attitudes. These narratives see translation technology as not relevant or less helpful for literary translation than for other kinds of translation and revolve around the incompatibility of such tools with the complexity of the literary translation task. Epitomising this viewpoint, one respondent states: "I have the impression those [translation technology tools] are for people in a hurry. I work slowly and carefully". Finally, a few literary translators mentioned being unwilling to adopt translation technology regardless of its usefulness and feeling that technological innovation in literary translation is an imposition from above rather than a response to practitioners' actual needs.

When linking attitudes towards technology with respondents' backgrounds, those aged between 18–25 have the most positive relationship with technology: 50% thought of technology as helpful for literary translation, while the rest described the relationship between the two as either necessary (25%) or harmonious (25%). Generally, those aged 46+ are more inclined to think of technology as being unrelated to literary translation. In fact, the "No Relationship" category barely appears in respondents below 45 years of age (it does not appear at all in the 18–25 group); however, it occurs for all 46+ respondents (14% of the 46–55 group, 23% of those aged 56–65, and 15% of the over 65s). Those who have received academic translation technology training also view technology more positively. In particular, 70% of those with academic training believe the relationship between literary translation and technology to be a positive one, against 45% of respondents without academic training. The latter present higher levels of torn feelings (27% versus 7% of those with academic training). The same happens for those with higher levels of confidence with technology, as respondents with less or no confidence were more likely to think of technology as irrelevant or unhelpful for literary translation. For example, 44% of those who are extremely confident find technology helpful and only 6% think there is

no relationship between the two. Conversely, most of those who are not confident at all think there is no relationship between literary translation and technology (24%), while 18% find technology helpful, and 14% less or not helpful.

Eventually, while literary translators are generally positive about technology, their attitudes become more nuanced when this is put in direct relation to their professional character. This manifests in more ambivalent attitudes, which, in turn, consolidate the emerging opposition between general and translation technology tools. The dichotomy between general and translation technology tools and the relationship between literary translators' self-image and technological innovation that emerge from the findings will be discussed in the next section.

Discussion and conclusion

The results have highlighted that literary translators are not averse to technology as such. In particular, a dichotomy between general technology and translation technology has emerged when respondents were allowed to define technology in their own terms. Overall, general tools align with narratives of enhancement and support of the literary translator's character and work. This type of technology is more frequently associated with efficiency, quality, and consistency, and it is not perceived as compromising literary translators' self-image. Conversely, the description of translation technology takes on a tone that is more deeply related to the essence of literary translation than the practicalities of the work. Furthermore, tools such as CAT, TM, and MT are portrayed as imposed from above, incompatible with the very essence of literary translation, and generally interfering with creativity, originality, and freedom. The (perceived) inflexibility of translation technology is where virtually all negative associations with technology converge. Fear, anger, and uncertainty surround the narrative (perceived or real) that translation technology's aim is to replace the translator, despite it being incapable of handling the complexities of literary texts, while threatening to impoverish language. Ultimately, literary translators, rather than refuting technology as a whole, seem to inhabit two spaces at the same time, one where technology proves useful to "craft the best literary texts," and one where its trajectory is in contrast to their notion of a good translation—possibly a sign of the "sense of confusion" highlighted by Cronin (2013, 1). The above are in line with Koskinen and Ruokonen's (2017) findings that translators reject technology because of its poor usability and negative effect on efficiency and productivity rather than on principle.

The complex relationship between materiality and immateriality in literary translation seems to be further exacerbated by what Pinch and Bijker (1984) would term a controversy between different social groups involved in the technological innovation of the field. In this respect, the focus of recent research on MT and post-editing appears to be at odds

with results from this study, as 71% of respondents do not use translation technology for literary translation and only 8% mention MT. These results also confirm Slessor's (2019) findings regarding the limited use of translation technology by literary translators and support Taivalkoski-Shilov's (2018) views on MT and post-editing as not aligned with literary translation. Additionally, when looking at participants' attitudes towards technology, both research and tool development processes appear removed from literary translators' realities and are mainly perceived as being preoccupied with reducing costs and enhancing productivity rather than accounting for practitioners' practical needs or reflecting their demands.

One of the aims of employing the SCOT framework proactively was to identify potential closure mechanisms (Pinch and Bijker 1984) arising from social groups' different interpretations of technology in literary translation. Findings indicate that stabilisation could be found by promoting collaboration between all social groups involved, paying particular attention to developing tools that consider literary translators' specific needs and unique ways of employing existing technology and changing the discourse (or how it is perceived) around technology implementation in the profession. Overall, the relation between self-image and materiality in literary translation is complex and warrants nuance. For example, although the association between positive attitudes and general technology and negative attitudes and translation technology has emerged, some results point towards aspects of translation technology that are not thought of as antithetical to literary translation. This is the case for TM tools sometimes seen as helpful in dealing with recurrent translation and consistency issues. Thus, a more productive way of reframing the discourse around materiality in literary translation would be to focus on the concept of enhancement (as also suggested by Youdale 2019). In terms of SCOT, enhancement emerges in this study as the link between literary translators and other social groups involved in the process of technological innovation. In fact, according to the participants, a sustainable tool is one that supports literary translators and empowers them to improve quality and consistency by allowing them to spend less time on more mechanical tasks, freeing up space for an enhanced creativity. While Youdale's (2019) approach is remarkable in this sense, it appears too complex at this stage, in that it involves different text-visualisation and text-analysis tools and techniques. In this respect, it is worth recalling that levels of confidence with translation-specific tools are generally low: between 65–75% of respondents did not undertake any translation technology training and only 6% mentioned corpora. Nevertheless, Youdale's focus on enhancement and offer of an alternative to MT-centred workflows show great potential for the development of new technology-inclusive workflows in the future. This study's results suggest that an ideal tool for literary translators would feature easy access to online dictionaries and internet searches, a straightforward

text-editing interface, translation memory functions, and powerful terminology, autosuggest, and quality assurance tools that interfere as little as possible with the translation experience. In order to achieve this, a highly customisable interface would seem ideal. Additionally, since most literary translators work in other areas of translation that often require the use of translation technology, a highly customisable interface could promote the development of a single tool that would be able to adapt to different types of texts and areas of translation. Optimising translation technology in this way would also help tackle issues related to tools' cost and learning curve.

Results also showed how technology training positively affects levels of confidence with technology, in addition to being linked to more positive attitudes. This suggests training as another central aspect of potential closing mechanisms. In particular, the active inclusion of literary translation in technology training and a focus on how existing technology can be adapted to the specificities of literary translation could provide literary translators with practical ways of navigating the new socio-technological landscape, as well as improving their confidence. This is also in line with Slessor (2019), who noted the need to account for literary translators' specific needs when developing technology and training.

Findings also show that, for technological innovation to be sustainable and respectful of literary translators' self-image, it is fundamental for the latter to be included in the conversation around technological innovation as well as in the tool development process itself, as suggested by Taivalkoski-Shilov (2018). To achieve this, collaboration between all relevant stakeholders should be promoted, with the aim of producing tools that support and enhance literary translators. By rebalancing the relationship between materiality and immateriality, literary translators could eventually "be liberated from the shackles of 'faithful' reproduction, of 'equivalence' narrowly defined, and freed up to become rather their inner Picasso" (Large 2018, 94). In this respect, this chapter has identified (1) the inclusion of literary translators in the tool development process and discourse and (2) the development of translation technology training for literary translators as potentially successful closure mechanisms and something future research should focus on.

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2 Dutch literary translators' use and perceived usefulness of technology

The role of awareness and attitude

Joke Daems

Introduction

While recent developments in machine translation (MT) have raised hopes of its potential for literary translation (Toral and Way 2018), there are signs that the post-editing of machine translation can lead to homogenization and normalization (Farrell 2018), which would be problematic for creative text types. Modern translation environments such as Trados Studio and Lilt attempt to solve these issues by offering custom machine translation systems and by including interactivity and adaptivity. Finding out whether or not these features do indeed offer sufficient support for literary translation is the main research objective of the MUTUALIST project, where we aim to study the impact of adaptive translation environments on individual translator style for Dutch literary translation. Before conducting experiments in which we measure the actual impact of such tools on the translation product and the translator's experience, however, we must first understand the factors at play in literary translators' potential use of technology. To understand these, we must gain insight into literary translators' awareness of translation technology as well as their attitude towards technology generally. Past surveys with translators (not focused on literary translation) have shown that "non-adoption of translation tools was more a function of translators' lack of awareness of, and familiarity with, these tools than an active rejection decision based on thorough knowledge of the tools and their functionality" (Fulford and Granell-Zafra 2005, 12). Likewise, translator attitude towards technology has been shown to influence translators' interactions with technology (Bundgaard 2017). We therefore conducted a survey among literary translators working from or into Dutch in order to answer the following key questions:

- To what extent are literary translators aware of modern developments in translation technology?
- To what extent do literary translators make use of (translation) technology?
- What reasons do literary translators have for (not) using technology for literary translation?

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- Do factors such as age, education, and experience have an impact on literary translators' use of and attitude towards technology?
- How do literary translators perceive the (potential) usefulness of translation technology upon learning more about it?
- What are the limitations of current translation technology for literary translation and which desires do literary translators have when it comes to translation technology?

The answers to these questions will help us understand to what extent modern translation environments might be of use to literary translators and whether or not certain translators are more open to working with such environments. The survey serves both a fundamental and practical purpose. First, when discussing technological developments and their potential, it is crucial to include the (intended) users in the development and evaluation, as argued by O'Brien and Conlan:

> Considering the major shifts we are witnessing due to technological innovation, and to avoid repeating the mistakes of the past, it is surely worth making translators central to the current developments. More collaboration and consultation between technology researchers and developers and their end users is needed.
>
> (O'Brien and Conlan 2018, 85)

Second, in order to find suitable participants for the next phases in the project, we need to understand which users are open to using the technology and which users are most likely to benefit from using it.

In the following sections, we first introduce some related research on technology and translation technology use and acceptance, and the potential and limitations of translation technology for literary translation. We then describe our methodology, covering the survey and respondents, the analysis performed on the data, and the results. We conclude with a discussion of the answers to the questions formulated above and some pointers for potential future empirical studies on the use of technology for literary translators.

Related research

Technology use and acceptance

A variety of psychological and sociological factors are at play when someone determines whether or not to use technology. Researchers have been trying to capture these factors in models and theories for decades in an attempt to predict technology acceptance and use. One of the earlier models was the Technology Acceptance Model (TAM) (Davis 1989), which stated that the use of technology was influenced most strongly by a person's perception as to the usefulness of the technology and its ease

of use. Since then, increasingly complex models have been proposed, the most widely accepted of which is the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). The UTAUT model was created as a synthesis of eight earlier models of acceptance (such as the TAM mentioned before) and was found to outperform all of them (Venkatesh et al. 2003). The theory builds on four core concepts: performance expectancy, effort expectancy, social influence, and facilitating conditions. These constructs can be defined as follows:

- Performance expectancy: the degree to which a person believes that using technology will positively influence their work performance—for example, by making them more efficient or productive, or by improving the quality of their work.
- Effort expectancy: the degree to which a person believes that the technology is easy to use.
- Social influence: the influence of a person's environment on their use of technology, or the degree to which someone feels that their environment expects them to use the technology—for example, clients or employers demanding they use certain software.
- Facilitating conditions: anything offering additional support to someone using technology, such as the availability of training and technical support.

Although UTAUT has been used extensively and successfully since its creation, it has not been free from criticism. "[A] key element missing from the UTAUT model is the 'individual' engaging in the behaviour—i.e., individual characteristics that describe the dispositions of the users may be influential in explaining their behaviours" (Dwivedi et al. 2019, 721). By conducting a meta-analysis, Dwivedi et al. (2019) found that the attitude of the individual was indeed a key factor in the acceptance and use of technology that was missing in the original UTAUT model. They proposed an adapted UTAUT model that included the factor "attitude" and found that it was being mediated by the four factors of the original UTAUT model and, in turn, had an influence on behavioural intention (i.e., the extent to which a person intends to use technology) as well as use behaviour (i.e., the actual use of said technology).

Translation technology use and acceptance

While (to the best of our knowledge) none of the earlier studies into technology use among translators have explicitly looked at the underlying factors from a UTAUT perspective, these factors can be found throughout. In what follows, we make a distinction between "(general) technology" and "translation technology". "General technology" covers all digital tools and software that can be used by a translator to support their work but were not developed specifically for translation work.

Examples of these kinds of technology would be word processing tools, dictionaries, grammar and spelling reference works, and dictation software. "Translation technology", then, covers the digital tools and software specifically developed for translators. These consist of termbases, translation memories, and machine translation, potentially integrated into a translation environment tool.

A large body of research on technology in translation has focused on the "performance expectancy" of technology: to what extent does using technology improve a translator's performance, either from a productivity or a quality perspective? The potential of general technology to improve a translator's performance has been more or less established, and few modern day translators choose to work without any form of technological support (Fulford and Granell-Zafra 2005). Its positive impact on performance often goes hand in hand with a reduction in effort compared to analogue equivalents. Word processing tools lend themselves more to the recursive process of generating and correcting a text during translation than handwriting or typewriting on physical paper, for example, and rather than having to leaf through hefty volumes of physical dictionaries, translators can now find those same dictionaries in digital form, along with many other types of resources that one might want to consult during the translation process.

The potential benefit of using translation technology for translation, however, is somewhat more controversial. In theory, using translation technology should lead to increased productivity—a translator needs less time to look up specific terms, can reuse existing translations through fuzzy or exact matches in the translation memory, or can start from MT suggestions rather than having to start from scratch—and increased quality (e.g., consistency improvements). To a certain extent, this is supported by research. When used correctly, termbases (ideally integrated into a translation environment) can lead to time gains, as they reduce lookup or typing effort, although translators need to be taught how to critically evaluate the suggestions from terminology resources (Bowker 2015). Translation memories can indeed increase productivity (Bowker 2005), although the actual time gains depend on the content and style of the translation memory (Yamada 2011). Likewise, post-editing machine translation is generally found to be faster than translating from scratch (Zhechev 2012), without reducing a translation's quality (Daems 2016), although time gains vary wildly across translators, with not all translators benefiting from MT (Macken, Prou, and Tezcan 2020). The impact of translation technology on a translator's performance is not always positive, however. Although there are translation memory systems that work on a paragraph level, many translation memory systems force a translator to work on a sentence level, which can cause them to lose the overview of the text as a whole (Bowker 2005). Working with a translation memory can lead a translator to avoid the use of pronouns and references to increase reusability of the translations, which, in turn,

can negatively impact the coherence and quality of a translation (Bowker and Barlow 2008). Translations produced with translation memories in such a way have sometimes negatively been referred to as "sentence salad" (Bédard 2000) or "collage translation" (Mossop 2006). Especially when under time pressure, there is a risk of translators not being critical enough of translation memory suggestions, leading them to blindly accept exact matches even when they contain errors (Bowker 2005). The same trend can be seen with student translators putting too much trust in MT output and accepting it without correcting errors (Depraetere 2010). In addition, regular human translation was found to outperform post-editing with regards to language and consistency (Guerberof Arenas 2009).

Factors such as effort expectancy, social influence, facilitating conditions, and attitude are mostly found in usability or user studies, such as the one conducted by Vargas-Sierra (2019), which showed that students do not seem to find it easy to learn to work with CAT tools such as Trados Studio. The different factors are often found together, which fits the adapted UTAUT model proposed by Dwivedi et al. (2019). In a study on translators' opinions on TM systems, for example, McBride (2009) found that the availability of technical support and the cost (which would be examples of facilitating conditions) are really important to users when deciding whether or not to use translation technology, a steep learning curve (effort expectancy) could act as a deterrent, and translators sometimes felt they had to use a certain tool or risk losing work (social influence). Where attitudes towards MT post-editing and human translation are concerned, translators feel that human translation is more rewarding (attitude) and that editing MT is more effortful (effort expectancy) (Daems 2016). In a study on the (non-)adoption of machine translation, Cadwell, O'Brien, and Teixeira (2018) established that professional translators have a variety of reasons for (not) using MT. Many of those were related to performance expectancy (expected negative or positive impact on quality or productivity), but quite a few were linked to attitude (level of trust in the MT technology, the fear of it reducing their translation ability) or social influence (being required to use machine translation).

Translation technology and literary translation

With the introduction of neural machine translation (NMT) systems in 2016, the expectations of what machine translation could achieve skyrocketed to the extent that researchers began to explore its potential for more creative text types. Toral and Way (2018) argue that its increased quality (Wu et al. 2016; Junczys-Dowmunt, Dwojak, and Hoang 2016) and the fact that NMT can handle lexically rich texts (Bentivogli et al. 2016) make it better suited for literary translation than phrase-based

statistical machine translation (PBSMT) systems. By training an NMT and PBSMT system on literary texts and comparing the output, Toral and Way (2018) indeed found that NMT quality outperformed PBSMT quality in an automated evaluation as well as a human evaluation. Up to 34% of the NMT sentences were perceived to be of equal quality to human translations (compared to 20% for PBSMT). Toral and Way (2018, 285) conclude with the wish to "assess the feasibility of using MT to assist with the translation of literary text." Whether this wish is shared by literary translators, however, remains to be seen.

Ruffo (2018) studied literary translators' perceptions of their roles in an increasingly technological society and their attitude towards technology and found that, while most literary translators appreciated technology such as the internet, corpora, or terminology tools, they did not consider CAT tools or MT to be suitable for literary translation. She further states that literary translators are "against those tools that threaten to steal the essence of their translation activity, ignoring the peculiarly human aspects of it" (Ruffo 2018, 130). These sentiments are not entirely new. Already in 1980, Martin Kay described what he called a *translator's amanuensis*, a cooperative man-machine system for translation. The core idea was that the translator should retain control of the translation process, but that they could request support from the computer when needed.

> A computer is a device that can be used to magnify human productivity. Properly used, it does not dehumanize by imposing its own Orwellian stamp on the products of the human spirit and the dignity of human labor but, by taking over what is mechanical and routine, it frees human beings for what is essentially human.
>
> (Kay 1980, 1)

This need for control by translators has been echoed throughout the years, and only relatively recently do translation technology developers seem to have taken to heart O'Brien's (2012, 116) claim that "[w]hat is needed are efforts to promote symbiosis, rather than friction." Modern translation tools have begun to incorporate interactive elements, where the translator is offered suggestions while they write, and adaptive machine translation systems, i.e., systems that learn from the changes a translator makes while they are translating. Such systems might be better suited to the translation of literary texts than the regular post-editing systems in use for the translation of, for example, technical documentation (Toral and Way 2015), although this has, to the best of our knowledge, not been tested in practice yet. Neither do we know to what extent Dutch literary translators are even aware of the existence of such technologies, or what their attitudes towards these tools would be. This is what we aim to explore with our survey.[1]

Method

Survey

The survey was created using Google Forms and was shared with potential respondents via email. Responses were collected from August to October 2019. In total, the survey consisted of seventy questions divided into the following subsections:

- respondent information (e.g., year of birth, language combinations, education, and experience);
- use of technology for non-literary translation if applicable (e.g., to what extent translators use technology for non-literary translation, which types of technology they use, why they decide to (not) use technology), with questions covering general technology and translation technology in separate sections;
- use of technology for literary translation (questions identical to the ones from the previous section but focusing on literary translation);
- types of translation technology (containing information on translation memory systems, terminology, and machine translation, questions related to translators' awareness of these translation technologies and whether or not they believe the translation technology in question could be useful for the translation of literary texts);
- translation technology and literary translation (to verify whether there are other types of translation technology the survey did not cover, and to identify the key shortcomings of current translation technology and the desired features of a potential translation tool for literary translation); and
- contact information (optional, to be able to inform respondents of the survey results and to contact respondents willing to participate in future experiments on translation technology for literary translation).

The questions in the survey were a mix of Likert scale questions (for example, "I … make use of this technology", with "never", "sometimes", "often", and "always" as possible answers) and open questions, giving respondents the chance to clarify their choices in more detail (for example, "Why do you use this technology during translation?"). Respondents were required to answer the multiple-choice questions, whereas some of the open questions were optional. Only completed survey results were saved, so no incomplete answers had to be removed before analysis.

Respondents

With this survey, we aimed to collect responses from literary translators working from or into Dutch. Potential respondents were found on the website of the Centre of Expertise for Literary Translation (Expertisecentrum

Literair Vertalen, ELV) and by contacting other Belgian and Dutch organizations that represent or work with literary translators (a list can be found in the Acknowledgements section). A total of 155 respondents completed the survey. Of those, 153 responses could be used for subsequent analysis (one respondent indicated they had yet to start work as a literary translator, another indicated that they did not translate literary texts).

For half of the respondents, literary translation is the main occupation, although for 62% of this group, literary translation is not their only occupation. Another 22% of respondents list non-literary translation as their main occupation and 20% list a different type of main occupation. The final 8% of respondents indicate that they took up literary translation upon retirement from other professions.

The survey managed to reach a diverse audience, with respondents' ages ranging from 25 to 88 years (mean 55, median 57). On average, respondents have eighteen years of experience working as literary translators, with the least experienced having just started their career as a literary translator and the most experienced having been working as a literary translator for 54 years.

Most respondents are Dutch (60%, of which 18% have dual citizenship) or Belgian (20%, of which one person has dual citizenship). One respondent has dual Dutch and Belgian citizenship. The other most common nationalities are German (6%), Spanish (3%), Czech (2%), Italian (1%), Swedish (1%), and American (1%). In total, responses were collected from seventeen different nationalities, and eighteen different native languages were mentioned. Of these, Dutch was the most common (70%, of which 4% with a dual native language), followed by German (7%), English (4%), French (4%), Czech (3%), Spanish (1%), Catalan (1%), and Swedish (1%).

Most translators (61%) work from another language into Dutch, 32% work in the other direction, and 7% indicate that they work in both directions.

A majority of respondents (92%) translates prose, but poetry (41%) and theatre texts (22%) were common as well. In addition to these three predefined options in the survey, respondents could add their own types of literary text. The most commonly mentioned text types were literary non-fiction, children or young adult literature, essays, and biographies.

Analysis

The collected responses were anonymized, and answers were processed using a combination of Microsoft Excel, the qualitative data analysis software NVivo, and the statistics software package SPSS. Excel was used to explore respondent characteristics and visualize the answers to the multiple-choice questions. To better understand the underlying reasons for the acceptance and use of technology, respondents' answers to open

questions were manually coded using NVivo, and effects were statistically verified using SPSS. A first round of coding in NVivo was exploratory: every argument mentioned in the text was assigned a code describing that argument quite literally. We then used the adapted Unified Theory of Acceptance and Use of Technology (UTAUT) (Dwivedi et al. 2019) as a framework to identify larger categories across individual codes. All arguments coded in NVivo were assigned to one of the five previously discussed factors that can influence the intention to use technology and actual technology use: performance expectancy, effort expectancy, social influence, facilitating conditions, and attitude.

Results

In the following sections, we highlight the key findings of the survey. We establish the degree to which respondents are aware of the existence of current translation technology tools, to what extent they make use of these themselves, whether or not they consider them to be potentially useful for literary translation, and what they consider to be the main limitations of existing technology for literary translation. We also report on the features that respondents felt a translation tool for literary translation should consist of.

Awareness

In order for a potential user to accept technology, they first need to be aware of its existence (Dillon and Fraser 2006). In the survey, respondents had to indicate whether or not they had been aware of specific types of translation technology before their participation. The distribution of the answers to this question can be seen in Figure 2.1.

The results show that, while the majority of literary translators seem to be aware of the existence of specific forms of translation technology (translation memories, termbases, and machine translation), they seem mostly unaware of more recent developments. In particular, the developments related to integration into translation environments and recent MT developments such as interactivity and adaptivity seem to be less familiar, and it is exactly these that could potentially be most relevant for literary translators (Toral and Way 2015).

We wanted to verify whether this lack of familiarity could be explained by a lack of technology in translation education. Education, like experience, has been shown to contribute to technology acceptance (Dillon 2001). Only 40% of respondents indicated that they had received some form of translation education, with another 13% having an educational background in languages or linguistics, and the final 46% having a different background. Of the respondents with a translation education, only 24% indicated that translation technology had formed a part of said education. A total of 44% of all respondents had attended classes

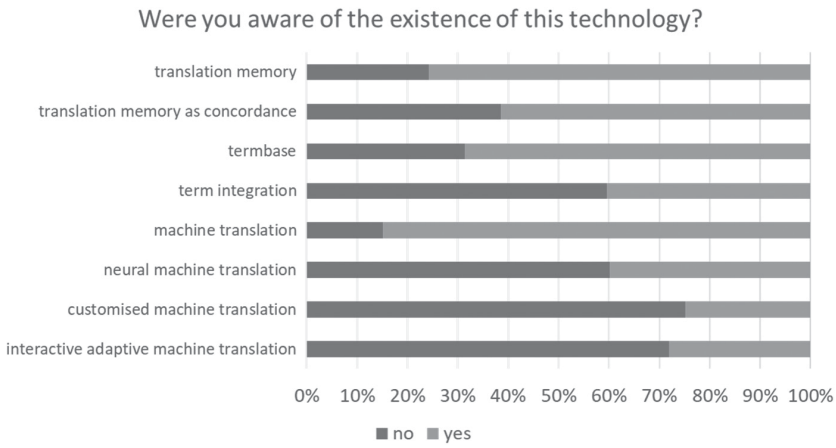

Figure 2.1 To what extent are literary translators aware of the existence of recent developments in translation technology?

or received an education specifically focusing on literary translation (of this group, 60% had received a general translation education as well). However, only 6% of respondents with a literary translation education indicated that translation technology had been included in said education. We would expect respondents' age to offer some explanation for the lack of integration of technology into translation education, as affordable personal computers were not available before 1990, by which most of our respondents would already have graduated. However, even among the younger generation of translators, very few received information on translation technology as part of their education (only 3 out of 12 respondents younger than 40).

Especially for terminology (integration) and translation memory (concordance), there is a clear relationship between education and awareness (Figure 2.2). Almost all respondents that received technology training as part of their (literary) translation education are aware of the existence of these translation technologies. Respondents that received a (literary) translation education which did not include translation technology have a higher awareness than respondents that did not receive any kind of translation education at all. The relationship is different for machine translation, where education seems to have less of an effect. Most participants seem to be aware of machine translation regardless of education, and a comparably small percentage of participants is aware of the existence of neural MT and customized MT. Education does seem to impact the awareness of interactive and adaptive machine translation, with participants that received translation technology training being somewhat more aware of its existence. This could mean that machine translation is included in translation education to a lesser extent than translation memories and

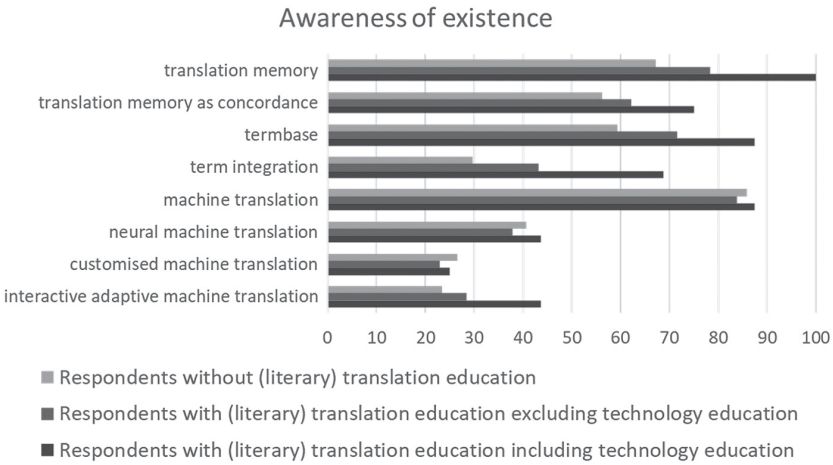

Figure 2.2 Relationship between awareness of translation technology existence and education (expressed in % of the number of respondents in the category under scrutiny).

terminology, or that machine translation technology simply evolves too quickly for translation courses to keep up with developments.

Use

In total, only 18% of respondents indicate they use a form of translation technology for literary translation. When asked about their main working environment, respondents indicated that they use MemoQ (7), Trados Studio (5), Wordfast (2), CafeTran Espresso (2), MetaTexis, and OmegaT. Two respondents mentioned they had developed their own software for literary translation.

In order to better understand the factors at play in the adoption of technology, we performed a binomial logistic regression using SPSS to verify whether or not age, experience, translation education, and translation technology education had an effect on the probability of respondents' using translation technology for literary translation. The model was statistically significant ($\chi^2(4) = 14.251$, $p = 0.007$) and correctly classified 81% of cases, but it explained only about 8% of the probability of respondents using translation technology (Cox & Snell $R^2 = 0.089$; Nagelkerke $R^2 = 0.147$). Only age ($p = 0.03$) and technology education ($p = 0.003$) were found to be significant predictor variables in this model, with younger respondents and respondents with technology training being somewhat more likely to use translation technology.

In a next step, we wanted to verify whether respondents that use translation technology for their regular translation work are also more likely to

use translation technology for their literary translation work. We added "uses translation technology for regular translation" as an additional predictor to the model. This model is statistically significant ($\chi^2(6) = 35.441$; $p < 0.001$) and correctly classified 85% of cases. It explains about 20% of the probability of respondents using translation technology (Cox & Snell $R^2 = 0.207$; Nagelkerke $R^2 = 0.341$). The only significant predictor in this model is whether or not respondents use translation technology for their regular translation work, with respondents who use translation technology for their regular translation work being far more likely to use translation technology for literary translation as well ($p < 0.001$).

In addition to knowing whether literary translators use translation technology or not, we were interested in determining to what extent they used specific types of translation technology (i.e., termbases, translation memories, and machine translation). Based on the "awareness" section, we can conclude that respondents are not always aware of the existence of certain types of translation technology. Given that awareness is a prerequisite for the potential use of technology, it is not entirely surprising that most respondents do not seem to use any of the abovementioned translation technologies for their literary translation work (Figure 2.3). Most respondents indicate that they never use these translation technologies for literary translations, with termbases and translation memories being used somewhat more frequently than machine translation systems.

Respondents could clarify why they chose (not) to use translation technology in an open question. An overview of the number of arguments per UTAUT category can be seen in Figure 2.4. The arguments listed by respondents that indicated they did not use translation technology for literary translation were mostly related to performance expectancy (49.62%)

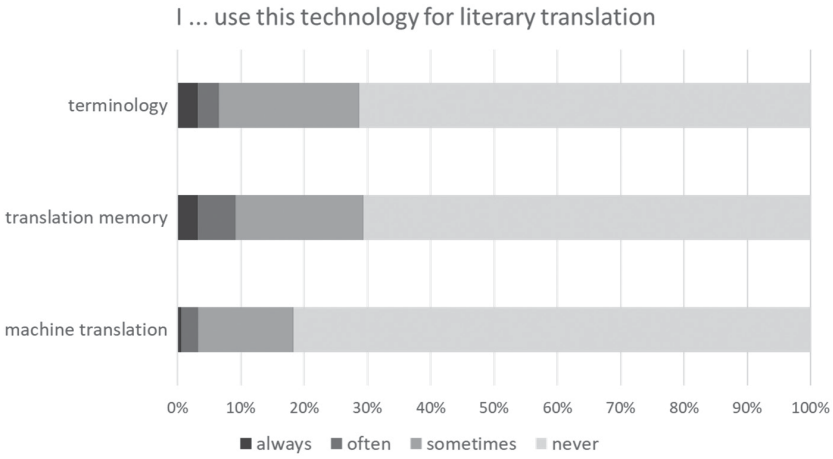

Figure 2.3 Percentage of respondents that always, often, sometimes, or never use certain types of translation technology for literary translation.

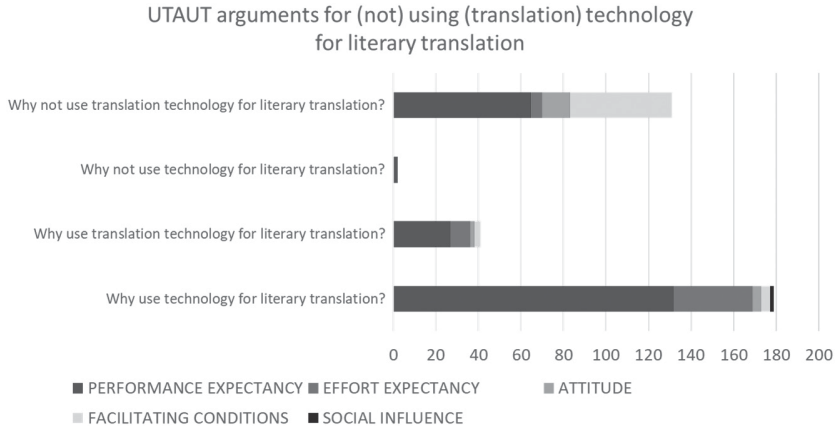

Figure 2.4 Arguments for (not) using (translation) technology for literary translation per UTAUT category.

and facilitating conditions (36.64%), followed by attitude (9.92%) and effort expectancy (3.82%). The bulk of the arguments related to performance expectancy mentioned ways in which respondents felt the technology would not support the translation process: they simply did not see the point, they did not see the benefit of certain features, they did not like that the software made them work on a sentence level, the technology is not compatible with their source text or not suitable for their text type because of its diversity and complexity. Other limitations related to performance expectancy were the fact that the software cannot capture style or humour and cannot take context or cultural background into account, which were all seen as key elements of literary texts. To a lesser extent, respondents argued that translation technology would have no or even a bad influence on quality and would not save them any time, or, rather, that literary translation requires time to be able to consider every word, making "speed" less important. Arguments grouped under facilitating conditions fell into three categories, with "lack of familiarity" being the main one. Respondents indicated that they had no idea about the possibilities or they had not received any education or information on translation technology. To a lesser extent, the price of technology was mentioned, with some respondents indicating that they do not believe the investment is worth it for their (often limited) needs. For attitude, the arguments related mostly to respondents' lack of trust of technology, or their lack of interest, and the feeling that using technology would be less fun, as they prefer to work with the text itself. Effort expectancy arguments were the fact that the software is not user friendly, the respondent had no technical skill, or it costs time to learn to work with the software.

The arguments listed by respondents that indicated they did use translation technology for literary translation were mostly related to performance expectancy (65.85%), followed by effort expectancy (21.95%), facilitating conditions (7.32%), and attitude (4.88%). The majority of performance expectancy arguments listed ways in which the technology supports the translation process: by offering inspiration (a good basic translation to start from, interesting alternative suggestions) or practical support such as concordance search, by providing the possibility to view source and target text together, and by helping them not to accidentally skip a sentence. Other performance expectancy arguments were related to an improvement in quality or an increase in productivity. The bulk of effort expectancy arguments were related to ease of use, facilitating conditions arguments were related to price and good customer service, and the attitude argument was that it made the process more fun.

The fact that most translators do not use translation technology for literary translation does not mean that they use no other forms of technology. On the contrary, almost all respondents use word processing tools such as Microsoft Word (96%) or Google Docs (5%) as their main working environment. In addition to these working environments, which were explicitly presented to respondents, seven respondents mentioned other text editors (LibreOffice, OpenOffice, Apple Pages) and four respondents listed the writing software Scrivener as their main working environment. Digital tools such as dictionaries and search engines are used by 99% of respondents. Only two respondents claimed not to use any technological support, as they did not see the added value.

The reasons for using general technology for literary translation follow a pattern comparable to that for translation technology: most arguments are related to performance expectancy (73.74%), followed by effort expectancy (20.67%), facilitating conditions (2.23%), attitude (2.23%), and social influence (1.12%). Most of the performance expectancy arguments are related to the way that the technology supports the translation process (it is more practical and efficient to look through digital resources than paper dictionaries, they are "the tools of the trade") and the way that it offers solutions or inspiration (the importance of comparing different resources to really understand the source text or a given word, finding additional background information for cultural elements, or even using image search or maps to better understand a text). The fact that it speeds up the translation process is another common performance expectancy argument; the impact on translation quality is mentioned to a lesser extent. For effort expectancy, most arguments relate to ease of use, with a few arguments explicitly mentioning accessibility or ergonomics (for example, Dragon NaturallySpeaking speech recognition software was said to reduce neck and shoulder aches).

Perceived usefulness of translation technology

In the previous section, "lack of familiarity" was one of the main reasons why respondents do not use translation technology for literary translation. It can already be derived from the survey itself that knowledge of translation technology can change people's perception about its potential usefulness. Despite the majority of respondents indicating that they never used translation technology for literary translation, most of them indicated that they thought translation technology could sometimes be useful for literary translation after reading the section giving them more information about specific translation technologies. Respondents are more positive about the potential of termbases and translation memory systems than about machine translation (see Figure 2.5).

Here, as well, respondents could choose to clarify their answer by responding to an open question. For termbases (see Figure 2.6), most respondents list reasons related to performance expectancy, regardless of how useful they believe the technology to be. Respondents who believe it can never be useful argue that it is dangerous to use a fixed list of terms and their translation, as literary translation is highly dependent on context and the texts require a different level of specificity. Respondents who believe it is always, often, or sometimes useful argue that they cannot remember everything and that it helps them save time and maintain consistency throughout. Specific cases mentioned by respondents where termbases could be useful are historical fiction or other specialized literary works with a lot of jargon, and works by the

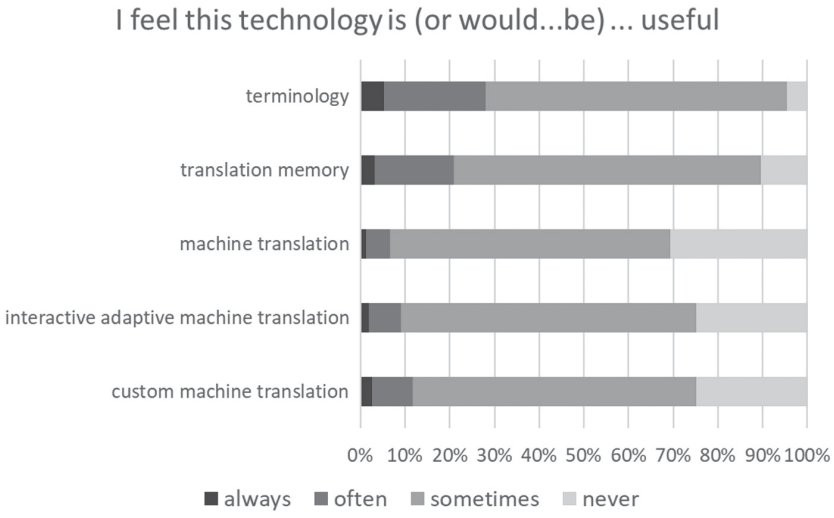

Figure 2.5 Literary translators' perceived usefulness of specific types of translation technology.

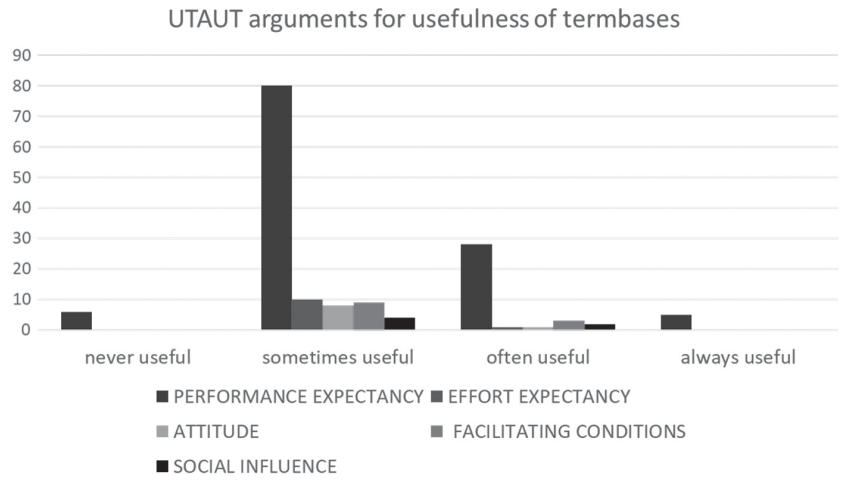

Figure 2.6 UTAUT arguments for usefulness of termbases per degree of perceived usefulness.

same author. Respondents who feel termbases are often or sometimes useful further mentioned reasons related to effort expectancy, with some assuming automatic term recognition would be easier than having to look things up online, and others feeling that it would only be useful if it was easy to create a termbase. Arguments related to facilitating conditions can be summarized as respondents feeling that they lack the experience or education to work with termbases. The few arguments related to social influence explicitly mentioned the potential of termbases for collaboration with other translators, or when another translator has to translate the next book in a series. As a point of reference, 72.55% of respondents indicated that they sometimes collaborate with another literary translator.

For translation memories, as for termbases, most respondents list reasons related to performance expectancy, regardless of how useful they believe the technology to be (see Figure 2.7). Those who think it will never be useful for literary translation argue that literary texts are so specific that there will rarely be sufficient repetition to justify using a translation memory system, and reusing the same sentences makes you lose the linguistic specificity and personality of the author. Those who feel translation memories will always, often, or sometimes be useful list "consistency in case of repetitions" and "concordance search" as potential benefits. Respondents agree that these features are more useful for longer texts, or texts by the same author. Reasons related to facilitating conditions were mentioned much less frequently, and most of these came down to lack of familiarity. Attitude arguments were rare, but they were

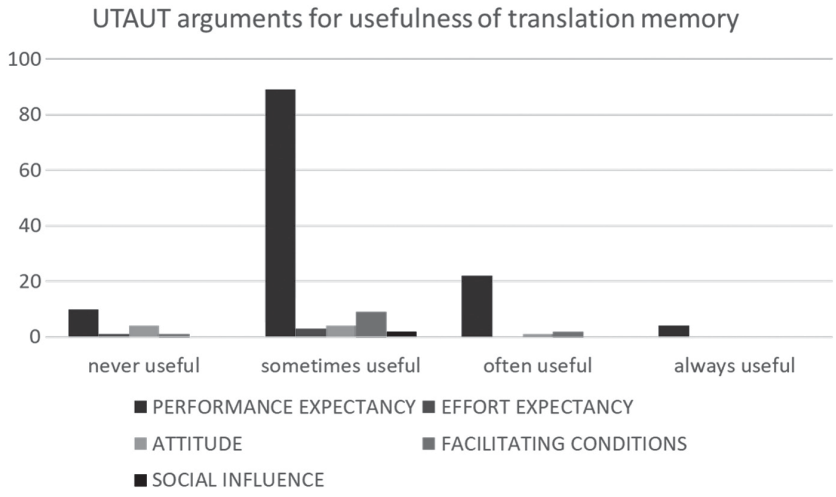

Figure 2.7 UTAUT arguments for usefulness of translation memory per degree of perceived usefulness.

more frequent among respondents that believe translation memories would never be useful. They indicate that they "don't believe in it" or "don't see the point".

The trend for machine translation is different from that for termbases and translation memory systems, as can be seen in Figure 2.8. While most respondents still mainly use arguments related to performance expectancy, there are no arguments related to effort expectancy or social influence, and there are more arguments related to facilitating conditions or attitude than there were for the other types of translation technology. Those who feel that machine translation can never be useful argue that it would not save time and forces the translator in a certain direction, whereas the nature of literary translation makes it crucial for a translator to keep different options open. The fact that a machine translation system cannot take voice, style, context, or nuance into account is mentioned explicitly. Some respondents go as far as to call machine translation dangerous, in the sense that its output contains so many errors that a translator might miss them or it might impair a translator's own linguistic knowledge. One respondent explicitly said that machine translation systems "destroy the craft" of literary translation (original NL: "Ze maken het ambacht kapot"). Arguments related to facilitating conditions mostly indicate a lack of familiarity (and a lack of desire to become familiar) with the technology. Arguments related to attitude reflect translators' scepticism about the potential of machine translation, or the feeling that they would be very annoyed when a system

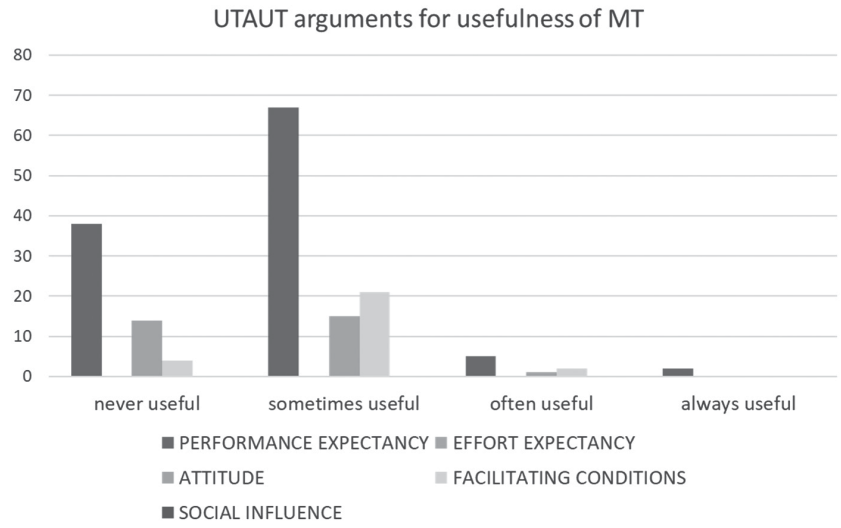

Figure 2.8 UTAUT arguments for usefulness of machine translation per degree of perceived usefulness.

presented them with ready-made translations, taking away their sense of control or potentially causing them to lose the translation they had formulated in their mind. Respondents who believe machine translation is always, often, or sometimes useful are more nuanced in their argumentation than for translation memories and termbases. Many respondents indicate that they see some potential for machine translation in the future, especially seeing how much it has evolved in recent years. Some respondents tentatively argue that they see the potential benefit for certain texts and languages, but they doubt it would be useful for more unique and creative literary works that require a more flexible and individual approach. Interactivity and adaptivity are mentioned as crucial factors if literary translators are to even consider using machine translation. The more outspoken positive translators indicate that they believe machine translation can save time or offer interesting solutions, or that it would be nice to start from a suggestion that they can then improve. Opinions on the potential of custom machine translation systems are mixed. Some respondents see a benefit of such systems, in particular when translating more works by the same author; others argue that literary translation is so diverse that it becomes impossible or useless to train custom MT systems for a text. A few respondents question the desirability of developing such systems altogether, fearing it might be "the end of the literary translation profession" (original NL: "dan is het met het vak van literair vertaler gedaan").

Limitations and future perspectives

Towards the end of the survey, we asked respondents what they felt the key limitations were of current translation technology, and which features they felt would be crucial in a literary translation tool if they had the opportunity to develop one themselves.

For the question related to limitations, 12% of respondents said they had no idea. The other 88% mainly listed arguments related to performance expectancy and, in particular, the limitations that translation technology puts on inspiration or creativity. Respondents argue that translation technology cannot capture author style or take the context or reader into account, and it has no feel for language, humour, metaphors, rhythm, culture, irony, layers, intertextuality, idiomaticity, dialogue, quotes, tone of voice, etc., all elements crucial to literary translation. They further feel that the existing translation software does not support the translation process enough, in the sense that it is limiting, it forces a translator to work on a sentence level, and it has little added value. Current translation software, respondents argue, makes the role of a translator more passive, which is the opposite of what is needed for literary translation, as literary translation is considered to be an art. Or, as one respondent argued, tools "get in the way of the literary translator (often someone with limited technical skills) and disrupt the 'appearance' of the literary text as art" (original NL: "ze zitten de literair vertaler (die vaak niet erg technisch geörienteerd is) te veel in de weg en verstoren de 'verschijning' van de literaire tekst als kunstwerk"). The quality of translation tools was found to be insufficient for literary translation, and there was a fear that the use of translation tools would lead to a reduction in creativity. To a far lesser extent, respondents mentioned limitations that can be related to attitude or facilitating conditions. The main attitude argument is related to the fact that technology is not human or even goes against human nature. Two respondents explicitly mention that it would take the fun out of translation work. Answers that can be linked to facilitating conditions come down to lack of experience and the assumption that technology would be too expensive.

The question related to the development of the ideal translation tool for literary translation seemed somewhat harder to answer. Most respondents indicated that they had no idea or did not want to think about such a thing. However, 30% of respondents proposed one or more ideas. An idea shared by seven respondents was that it would be useful to be able to look through a large database with previously made literary translations to find specific words in literary context. Such bilingual corpora exist, but they are generally created for research purposes and are not necessarily accessible to literary translators. There are some translator-driven attempts at creating a large literary translation memory ("Collectief Vertaalgeheugen"), but these are in the early stages (Bakker

and de Bok 2021). Additionally, respondents would like to be able to click a word and get a variety of information from different resources such as (synonym) dictionaries. The way translation tools force a translator to work on a segment level is perceived as too limiting, and respondents would like to be able to easily switch between the translation environment and a visualization of the final target text. This last requirement is especially important for poetry, where the formal aspect needs to be considered. It must be noted that many CAT tools today do offer a paragraph-based segmentation and include the option to view a translated segment in context, features of which the respondents seem to be unaware. One of the respondents explicitly made a comparison with the writing software Scrivener:

> "I really like the Scrivener environment, where it's possible to present texts side by side and you can switch from a single chapter to an entire book, with space for documents containing extra remarks, background information, and annotations. If this program would offer the possibility to switch to a sentence-by-sentence presentation, where it would be easier to recognize words and sentences that have been skipped, this would be perfect for me" (original NL: "Ik vind de omgeving van Scrivener erg prettig, waarbij men teksten naast elkaar kan weergeven en kan wisselen tussen een enkel hoofdstuk en een heel boek, met nog ruimte voor documenten met extra opmerkingen, achtergrondinformatie en annotaties. Als dit programma de mogelijkheid zou hebben om te wisselen naar een weergave per zin, waarbij het makkelijker zou zijn om overgeslagen zinnen en woorden te herkennen, zou het voor mij perfect zijn").

As far as the design of such a tool is concerned, most respondents seem to agree that it needs to be as user-friendly and as unobtrusive or even invisible as possible, although some respondents indicate that they want the tool to offer a lot of different options and possibilities, such as additional reference material, a social media element, highlights of keywords or quotes and references, footnote support, collaboration possibilities, and AI integration. Two respondents indicated that they themselves have developed or are developing a form of translation technology for literary translators. The first envisions a perfect writing and translation environment called Comtexxt: a browser-based application that would include features such as an advanced search through existing translations, information lookup from a variety of external resources, text analysis and prediction, bookmarks to mark sections in the translation to return to, collocation lookup, a customizable interface, and more (van der Ster 2021). The other believes that it is impossible or undesirable to create a CAT tool where everything is integrated, as this could get in the way of the creative process. They see more merit in a discreet solution, where

additional functionalities for translation support are added to the existing text processing tools and document viewers that literary translators are familiar with by means of plugins.

Conclusion and discussion

The survey results reveal that, while translators are generally aware of the most common translation technologies, they are less aware of the recent advances in the field and the integration of some functionalities into translation environment tools. Some respondents explicitly indicated that they found the information in the survey enriching, claiming that "this indeed looks like a useful tool, I was not aware of its existence and should probably reconsider my prejudice" (original NL: "Dit lijkt me inderdaad een waardevol hulpmiddel, ik was er niet van op de hoogte en zou mijn vooroordeel wellicht moeten overwinnen"). It is striking that lack of awareness of translation technology is still an issue more than fifteen years after it was established by Fulford and Granell-Zafra (2005) as one of the reasons for the non-adoption of translation tools.

Almost all respondents (99%) indicated that they used general technology such as word processing tools, dictionaries, and search engines for their literary translation work, whereas only 18% of respondents said they use some form of translation technology for literary translation. Translators that used translation technology for non-literary translation were far more likely to use translation technology for their literary translation work as well. Translators that had received technology training were also more likely to be aware of the different types of translation technology and were therefore more likely to use it. This highlights the importance of education (Dillon 2001) and, in particular, the inclusion of translation technology in said education. However, seeing how quickly translation technology evolves, "translation education must be understood as a lifelong process," as one of the reviewers of this chapter rightly noted.

General technology was felt by most respondents to support the translation process, by being more practical or efficient and by offering inspiration and solutions to problems. For translation technology, most of the reasons for (not) using it were also related to performance expectancy. Respondents who use translation technology say it supports their translation process by, for example, offering inspiration, ensuring they do not skip sentences, and increasing their productivity. Respondents who do not use translation technology argue that their translation process would not be supported by translation technology, as their texts are very diverse and require a level of creativity and awareness of, for example, culture and style that translation technology cannot capture. They also indicated that increased speed is not necessarily desirable when it comes to literary translation. The issue of productivity in relation to technology has been raised before by Teixeira and O'Brien (2017). They found that,

regardless of the quality of TM and MT, participants spent a lot of time consulting a variety of additional resources, yet they managed to maintain high levels of productivity. Teixeira and O'Brien therefore wonder "whether it is reasonable to expect the translation process to become any faster. Or should tool development efforts focus on making the tools and processes more ergonomic?" (2017, 98).

Although only 18% of respondents use translation technology for literary translation, between 70% and 90% believe translation technology can sometimes be useful upon learning more about it. Termbases and translation memory systems are perceived as more useful than machine translation. Translators who are more sceptical of translation technology mention the specificity of literary translation as a key reason why translation technology would not be useful. Respondents mostly see the potential of translation technology for longer texts, texts by the same author, texts where repetition is more likely to appear, texts where consistency is crucial (for example, in historical fiction), or when collaborating with another translator (which almost three out of four respondents indicated they do).

As in most translation research, there seems to be a lot of individual variation across translators, with some respondents categorically refusing to even think about what translation technology could look like for literary translation, and others actively developing their own translation technology for literary translation. This echoes the need for more personalized translation technologies as raised by O'Brien and Conlan (2018). Strikingly, the word "fun" was used both by respondents who did not want to use translation technology, believing it would take the fun out of their work, as well as respondents that did want to use it, believing it could make their work more fun. Similar answers were found among non-literary translators working with an interactive, adaptive environment, where participants who said they enjoyed solving puzzles were also more likely to say they enjoyed post-editing (Daems and Macken 2019). Respondents mentioned various limitations of existing translation technology, most of them related to a negative impact on inspiration and creativity and the fact that it makes the role of the translator more passive. To date, there is some evidence that post-editing machine translation can indeed negatively impact creativity (Guerberof Arenas and Toral 2020), but additional research is required. According to respondents, translation technology that could support literary translators would need to include a database of literary translations, provide easy access to a variety of resources, and offer ways of moving beyond the sentence level of a text.

Regardless of their attitude towards technology, respondents are eager to learn more about translation technology, with 85% of respondents wanting to be informed about the results of the survey and 56% of respondents potentially willing to participate in future experiments. Our main goal with the project is to study the impact of interactive, adaptive translation environments on literary translators' individual style. The

survey highlighted translators' fear that translation technology can get in the way of the process, and that the use of translation technology can lead to a loss of autonomy and creativity. We wish to explore the potential of interactive and adaptive translation environments, as these environments have been developed to give translators more control over the translation process, as such corresponding more to the *translator's amanuensis* envisioned by Kay (1980), and the integration of neural machine translation systems should allow the tools to generate more creative solutions than previous tools. Whether these translation environments truly meet the expectations and needs of literary translators as established by this survey remains to be seen, however.

From the arguments in the survey, it is clear that interactive, adaptive translation technology might be useful for literary translators that work in languages for which machine translation has achieved high quality and that have translated a number of works by the same author, particularly in genres such as historical fiction, where consistency and repetition are more likely to occur. We shall therefore attempt to recruit such translators first for the next steps in the project. In addition to the potential of interactive and adaptive environments, it would be interesting to explore the potential of translation environments that offer easy lookup of a variety of resources and allow translators to work on a document level instead of a sentence level.

While there does not seem to be a perfect translation environment for literary translation yet, there are some existing tools that offer at least some of the support literary translators seem to be looking for. For example, GT4T (https://gt4t.net/) allows translators to access machine translation and dictionaries of their choice in any environment on their computer, and Termsoup (https://termsoup.com/) explicitly claims to offer support for book translators by allowing them to work beyond the sentence level and making it easy to look up terms in a variety of dictionaries as well as create personal glossaries. These might be a good starting point for future empirical studies with literary translators open to using translation technology. In addition, collaboration could be sought between researchers, the literary translators that shared their thoughts for technology improvements, and industry partners. Since conducting this survey, we have been in touch with Nuanxed, a Swedish start-up company that is building an end-to-end translation service with a focus on translation technology. They explicitly welcome translator feedback in this process, and we are excited to see what the future holds for technology-supported literary translation.

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Note

1 Preliminary survey results have already been published in a Dutch online journal targeting literary translators (Daems 2021). While parts of the description in this chapter will naturally overlap with the online article, the analysis in the present chapter contains a much more elaborate and academically oriented analysis of the collected data. This extended work has been published with permission of the *Filter* editorial board.

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3 Human–computer interaction in pun translation

Waltraud Kolb and Tristan Miller

Introduction

Wordplay causes tremendous difficulties for translators and so is a widely studied phenomenon in the field of translation studies. Despite this, and despite the trend in recent years to technologize the translation process, little attention has been paid to the use of computers for the translation of wordplay. This is because most language technology, including machine translation (MT), has been developed for use with informational rather than literary and other creative texts. As such, existing digital tools and resources tend to ignore linguistic anomalies and ambiguities, or else treat them as imperfections to be eliminated rather than preserved.

Punning is a ubiquitous form of wordplay in which one word is used to evoke another word with a similar or identical pronunciation. Puns pose special challenges over many other types of wordplay in that they rely not only on surface-level features but also a relatively sophisticated understanding of lexical semantics and (usually) the complex pragmatic phenomenon of humour. It is for these reasons that puns are often held to be untranslatable. While this view is overly pessimistic with respect to human translation, it is true that puns are impervious to general-purpose MT. Nevertheless, recent advances in computational semantics have brought us to the point where language technology might now play a useful role in the translation of puns by providing specialized support to existing translation workflows. Of course, the idea of computer-mediated translation is by no means a new one (see Kay 1980), though the present chapter is the first time, to our knowledge, that it has been empirically explored with respect to wordplay, bringing together computational-linguistic and cognitive approaches.

This chapter presents and evaluates PunCAT, an interactive electronic tool for the translation of puns. Following the strategies known to be applied in pun translation (Delabastita 1996; Low 2011), PunCAT automatically translates each sense of the pun separately; it then allows the user to explore the semantic fields of these translations in order to help construct a plausible target-language solution that maximizes the semantic correspondence to the original. Our evaluation is based on

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an empirical pilot study in which the participants translated English puns into German, with and without PunCAT. We aimed to answer the following questions: Does the tool support, improve, or constrain the translation process? If so, in what ways? What are the tool's main benefits as perceived and described by the participants? Our analysis of the translators' cognitive processes gives us insight into their decision-making strategies and how they interacted with the tool. We find clear evidence that PunCAT effectively supports the translation process in terms of stimulating brainstorming and broadening the translator's pool of solution candidates. We have also identified a number of directions in which the tool could be adapted to better suit translators' work processes.

Background

Punning is a rhetorical device in which one word or phrase is used to evoke the meaning of another word or phrase with the same or slightly different pronunciation. The term *pun* can refer to the complete expression containing this ambiguity or, more specifically, to the particular word or phrase that carries the double meaning; the *target* is the latent word or phrase that is evoked. (This linguistic sense of *target* should not be confused with the translatological sense—i.e., the text that a translator produces.) For example, in the text "The sign at the nudist camp read, 'Clothed until April' ", the pun "clothed" evokes the target "closed".

Though the phonological and semantic mechanisms behind punning are well understood theoretically (Hempelmann and Miller 2017), the translation of puns is not straightforward (Delabastita 1996; Vandaele 2011; Knospe, Onysko, and Goth 2016). Puns are frequently what Angelone (2010, 18), in the context of cognition and uncertainty management in translation, has described as a problem nexus ("the confluence of a given textual property and level … intersecting with some sort of deficit in the translator's cognitive resources") where the natural flow of translation is interrupted or impeded. Nevertheless, there are a number of high-level strategies that translators have at their disposal. Delabastita (1996) presents a typology of eight methods, including PUN→PUN (replacing the source-language pun with a target language pun, possibly with different semantics, structure, or function), PUN→NON-PUN (substituting non-punning language that preserves one or both of the meanings), PUN→PUNOID (replacing the pun with some non-punning wordplay or rhetorical device), and PUN→ZERO (omitting altogether the language containing the pun). The choice of strategy for any given pun depends on various factors (Klitgård 2018), and while strategies that preserve wordplay are generally preferable, they are often the most challenging to pull off.

It is therefore reasonable to ask whether computers might play some role in the translation of puns. Indeed, researchers have been taking an increasing interest in the use of language technology in creative translation

in general, including the integration of MT systems into human translation workflows (Moorkens et al. 2018; Toral and Way 2018; Taivalkoski-Shilov 2019; Jiménez-Crespo 2020). However, since punning works by subverting linguistic conventions, puns are not suitable for off-the-shelf, end-to-end MT systems, particularly those based on the prevailing neural paradigm (Miller 2019). And while others have pointed out the potentials of digital tools to assist literary translation processes (Youdale 2019), no currently available tool specifically supports the translation of puns.

That said, there does exist a body of work in natural language processing (NLP), including some specifically concerned with puns, that could be leveraged to develop such a tool. This includes computational models of the phonological properties of puns; algorithms to determine whether a given passage contains a pun and, if so, to pinpoint its location; approaches for automatically interpreting puns by recovering the target word and identifying the double meaning (by referring to word senses listed in a given dictionary); and various other fundamental, general-purpose methods and resources, such as grapheme-to-phoneme models, multilingual semantic networks, and methods for measuring the semantic or phonetic similarity between words. Miller (2019) briefly surveys most of this work and outlines how it could be synthesized into a computer-assisted translation (CAT) tool for puns. Taking inspiration from Kay (1980), and consistent with a functional approach to translation (Reiß and Vermeer 1984; Nord 2018), the ultimate aim of such a tool would be to help translators produce a viable target text that performs its function in the target situation (i.e., creating a humorous effect), preferably without losing the wordplay.

Experiment

As we have shown, there exists a considerable amount of past work on puns in the fields of linguistics, NLP, and translation studies, as well as a proposal for how these hitherto separate channels of research might be applied to the construction of a real-world tool to support pun translation. In this section, we describe a prototype of such a tool and evaluate its usefulness in a user study.

PunCAT

PunCAT is the second author's partial implementation of the CAT tool proposed in Miller (2019).[1] As originally envisaged, the tool was to scan a complete source document to automatically locate all puns and then to interpret them, both lexically and semantically, by identifying the respective words and meanings with reference to an electronic dictionary. The tool would then present each interpreted pun in context, along with literal translations of the two meanings, and allow the user to interactively explore the lexical-semantic space to find pairs of words that might form

similar or equivalent puns in the target language. Since our interest lies in how human translators interact with such a tool to produce translations rather than in the accuracy of the pun detection and interpretation algorithms, in PunCAT we chose to fully implement only those parts of the tool concerned with finding translation candidates. While PunCAT's user interface (UI) does present the user with a list of interpreted puns to translate, we performed the selection and interpretation of these puns ourselves and hardcoded this data into the program's input files; the integration of fully automatic methods for these tasks (Miller, Hempelmann, and Gurevych 2017) is left for future development.

PunCAT's UI is illustrated in Figure 3.1, with four distinct regions of functionality labelled A through D:

A. **The source material** shows the pun in its original textual context, along with an associated illustration or movie clip in the case of (audio-)visual media. The word being punned on is automatically underlined by the system. Above the text are navigation buttons for browsing forward and backward through the list of source texts.
B. **The dictionary** contains "Source" and "Target" tabs. The former shows, at least initially, the two words used in the source-text pun along with the respective dictionary definitions for each of their possible senses; the two senses used in the pun are automatically highlighted by the system. The "Target" tab (not activated in Figure 3.1) has a similar appearance, except that it shows words and dictionary definitions in the target language. It is initially populated with the two words that are the direct translations of the selected senses of the two source-language words. Users can look up other source- or target-language words by typing them into the respective text fields and can select any of those words' senses. When a user selects a new sense in the "Source" tab, the system automatically populates the corresponding word and sense in the "Target" tab.
C. **The lexical-semantic network** shows two graphs of concepts in the target language. Each graph node corresponds to a concept and shows a list of synonymous target-language words for that concept. The nodes at the centres of the two graphs correspond to the senses currently selected in the two "Target" tabs of the dictionary. A concept may have more than one synonym; the currently selected one is highlighted in bold. The nodes are arranged into a tree structure, with hypernyms (more general concepts) of the central node connected with thick red lines and hyponyms (more specific concepts) with thin green lines. To avoid overcrowding the graph display, the system puts a limit on the number of hypernym and hyponym nodes displayed at once, but users can bring others into view by using the navigation buttons at the top of each graph. Users can also re-centre a graph by clicking on a word in one of the other nodes.

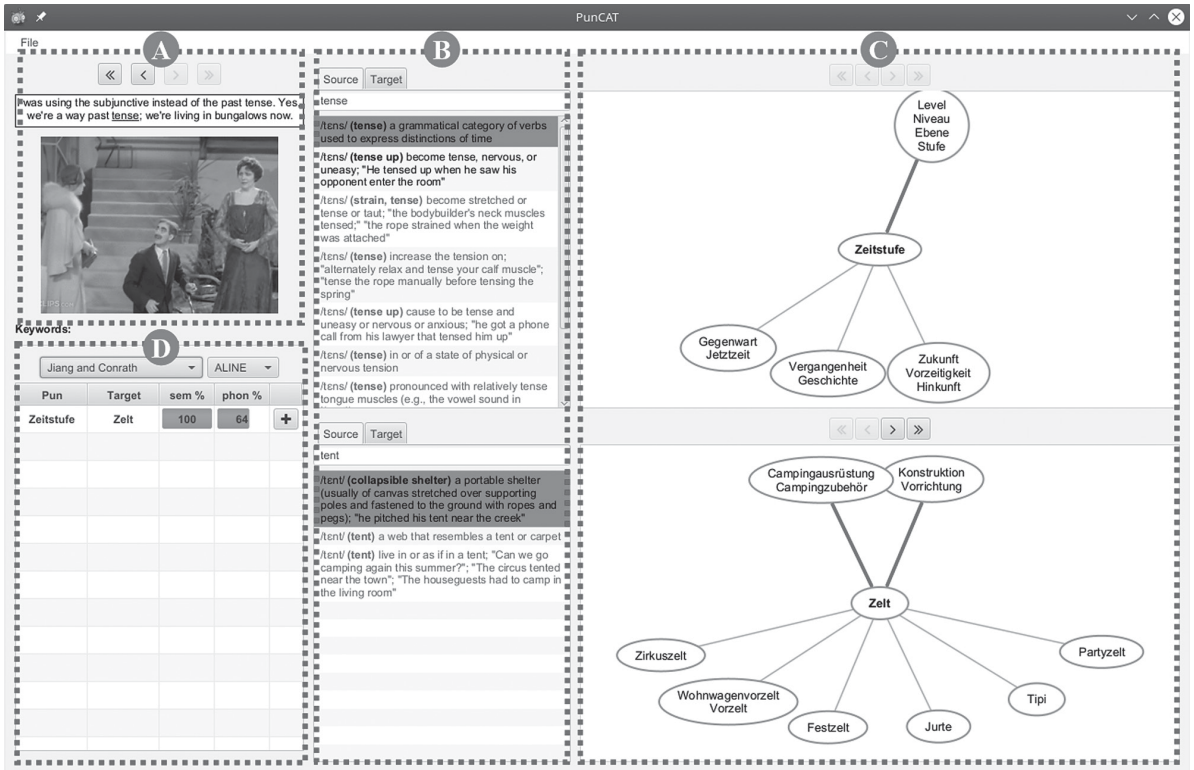

Figure 3.1 PunCAT's UI, showing (A) the source pun in context, (B) the words used in the pun and their meanings, (C) the lexical-semantic graphs of these meanings in the target language, and (D) the translation candidate list.

D. **The candidate list** always shows, at a minimum, the two currently selected target-language words (labelled "Pun" and "Target"), along with a measure of the phonetic similarity between them ("phon %") and a measure of the semantic similarity to the source-language pun ("sem %"). (More specifically, similarity is measured by calculating the semantic similarity between the sense that was initially selected in the upper graph—i.e., the sense that the system decided corresponded to one of the meanings of the source-language pun—and the sense that is currently selected in the upper graph, then adding to this the semantic similarity between the senses initially and currently selected in the lower graph and dividing the result by two.) By default, phonetic and semantic similarity are calculated using the ALINE (Kondrak 2000) and Jiang and Conrath (1997) metrics, respectively, though others may be selected. Whenever the user finds a pair of target-language words that they feel could form the basis of a punning joke, they can add them to the exportable candidate list.

PunCAT has been developed in a language-independent manner and so should, in theory, work with any pair of source and target languages for which there exist electronic lexical-semantic networks, interlingual links between the concepts of the two networks, and pronunciation information in the form of electronic pronouncing dictionaries or grapheme-to-phoneme models. For our experiments, we use WordNet (Fellbaum 1998) and GermaNet (Hamp and Feldweg 1997; Henrich and Hinrichs 2010) as the English and German semantic networks, and the grapheme-to-phoneme models are produced using Phonetisaurus (Novak, Minematsu, and Hirose 2016).

It should be noted that, although WordNet and GermaNet are among the largest lexical-semantic networks, they still have significant (and asymmetric) gaps in their coverage of words and concepts, and even among the concepts they share, many of the corresponding interlingual links are missing. If a PunCAT user enters a word in the "Source" tab that cannot be found in WordNet, the tool will inform the user of this and blank out the corresponding "Target" tab entry and semantic network. This will also happen if the user selects a sense in the "Source" tab that has no interlingual link to a GermaNet sense, or if the user enters a word in the "Target" tab that does not exist in GermaNet.

Source data

We aimed to test PunCAT with a variety of pun and source-text types. In selecting our examples, our overriding concerns were that (a) there should exist at least one published translation for each of them to serve as a basis of comparison, and (b) at least half of these known translations should use the PUN→PUN strategy, and the two senses of the target pun should exist in GermaNet. These conditions ensure that, for at least half

of our texts, the pun from a reference translation could in theory be "discovered" using PunCAT. We also imposed the requirement that, for all source-language puns, the two words and meanings exist in WordNet so that PunCAT would, at a minimum, provide the user with the complete and correct interpretation of the pun. However, for some of our examples, there was no concept in GermaNet that corresponded to either or both of the WordNet concepts, or else these concepts did exist in GermaNet but were not linked to the corresponding WordNet ones. We admitted these examples in order to see whether PunCAT can still lead to a viable translation under less-than-ideal conditions.

The six puns we selected, their glosses, and their immediate contexts are shown in Table 3.1. For each of these contexts, we manually located the pun, identified the corresponding words and senses in WordNet, extracted any corresponding illustration or film clip from the source material, then used this data to prepare an input file for PunCAT. Because these contexts are not long enough to allow for an accurate interpretation of the humour, we also prepared a hard copy that reproduced the six texts in a wider context—i.e., a few sentences before and/or after the text containing the pun, along with any corresponding film stills. The hard copy did not, however, mark up the location or meaning of the pun.

Experimental setup

The participants in this study were nine students from the Master's program in translation at the University of Vienna's Centre for Translation Studies. (These participants, coincidentally all women, had responded to a general call for volunteers sent to 170 students with English as one of their working languages.) The experiment took place at the Centre's media lab, which allowed us to exert a greater degree of control and oversight over the translation process but also meant that the participants could not work in their usual, authentic working environments. Each participant was provided with a workstation on which PunCAT, Microsoft Word, a web browser, and a keylogger (Inputlog) were preinstalled.

The experiment consisted of two 45-minute sessions, during each of which the participants translated three of the puns from Table 3.1. In Session 1, they translated three puns without the help of PunCAT, and, in Session 2, they translated three different puns with the help of PunCAT. In both sessions, participants were free to consult outside resources, including accessing the internet through the preinstalled web browser. However, we requested that they not seek out existing translations of the source texts. The participants were divided into two groups: Group A translated Puns 1–3 without the tool and Puns 4–6 with it, while Group B translated Puns 4–6 without the tool and Puns 1–3 with it. This way, each participant worked in both modes (with and without PunCAT), and, for each pun, target texts that had been produced with and without the tool were available for analysis. Participants were encouraged to produce

Table 3.1 Puns used in our pilot study

#	*Text*	*Pun gloss*	*Source*
1	"And how many hours a day did you do lessons?" said Alice… "That's the reason they're called lessons," the Gryphon remarked: "because they lessen from day to day."	lessons: classes lessen(s): diminish(es)	*Alice's Adventures in Wonderland* (1865 novel by Lewis Carroll)
2	When they operated on him she prepared him for the operating table; and they had a joke about friend or enema.	enema: rectal injection enemy: adversary	"A Very Short Story" (1924 short story by Ernest Hemingway)
3	"Hold on, everyone. This ain't gonna be no picnic."	picnic: outdoor meal picnic: easy task	*Cloudy With a Chance of Meatballs 2* (2013 screenplay by Erica Rivinoja)
4	Nemo: "What's that?" Nemo spots a dive boat… Tad: "I know what that is. Sandy Plankton saw one. He said it was called… a butt!" Pearl: "Wow. That's a pretty big butt."	butt: hindquarters boat: seagoing vessel	*Finding Nemo* (2003 screenplay by Andrew Stanton, Bob Peterson, and David Reynolds)
5	"Then we play somewhere where the Guild won't find us," said Glod cheerfully. "We find a club somewhere—" "Got a club," said Lias proudly. "Got a nail in it." "I mean a night club," said Glod. "Still got a nail in it at night."	club: discotheque club: bludgeon	*Soul Music* (1994 novel by Terry Pratchett)
6	"I should say you are intruding! I should say you WERE intruding, pardon me. I was using the subjunctive instead of the past tense. Yes, we're a way past tense; we're living in bungalows now."	tense: verb form tents: portable shelters	*Animal Crackers* (1930 screenplay adapted by Morrie Ryskind)

target solutions consistent with the general function of the selected passages (i.e., creating a humorous effect). We indicated that producing target solutions that were themselves puns was preferable but not necessary.

Before the first session, we explained to participants the aims and setup of the study and presented Delabastita's (1996) typology of pun

translation strategies. Having the participants work without the tool in Session 1 had the advantage of allowing them to get accustomed to pun translation without the additional pressure of learning to use any new technology. PunCAT was introduced before the start of Session 2, and participants had some time to test-drive it on an example pun (not one of the six from Table 3.1). Participants were aware that the second author, with whom they had no prior relationship, had implemented the system.

In both sessions, the participants wrote their translations in Word, with the keylogger recording all keyboard activity, mouse movements, and access to outside resources (internet and PunCAT). PunCAT itself also logged all interactions, including the text of all "Source" and "Target" tab dictionary lookups and which concept nodes and words were hovered over or clicked on in the lexical-semantic networks. At the start of each session, participants were given their three source puns on hard copy along with a few sheets of blank note paper; they were encouraged to make whatever annotations and notes they wished and were asked to submit these at the end of the experiment. After Session 2, participants filled out a questionnaire (Q1) containing questions on their background and their experiences working on the puns with and without PunCAT. Three days after the experiment, they answered a second questionnaire (Q2) in which they listed any further solutions that had occurred to them and commented on the published translations of the puns they had worked on, comparing these versions to their own.

Analysis and discussion

The triangulation of logging data from the keylogger and PunCAT, together with the answers to the two questionnaires and the handwritten notes and annotations, allows us to trace the participants' working processes in great detail. Given the aims of this study, the focus here will be on the participants' interactions with PunCAT and the role these interactions play in the context of the overall translation process. In this section, we will first give a brief overview of the logging data before discussing the participants' working strategies and decision-making processes in detail, bringing together temporal and cognitive aspects. As it will be impossible to discuss all 62 translations that were produced in the course of the experiment (some participants having produced more than one translation for some puns) and all the published translations, we will refer to them only where relevant.

Our setup imposed certain restrictions, first and foremost that the participants worked at the university's premises and not in their usual working environments, and that each session was limited to 45 minutes. Participants were therefore not fully free to set their own pace of work, although within each session they were able to follow their own rhythms. Figure 3.2 shows how the participants distributed their work time. Nearly all participants spent less time on research during Session 1 than during

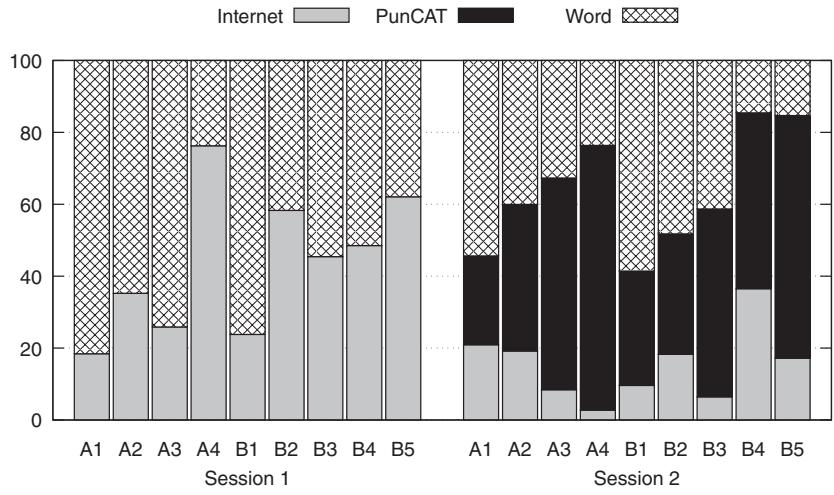

Figure 3.2 Percentage of participants' total work time by session and computer activity.

Session 2, which is not surprising given that during Session 2 they had both PunCAT and the internet at their disposal. Comparing internet use only, eight out of nine participants spent (in some cases much) less time on the internet during Session 2, when they also used PunCAT, than during Session 1, when the internet was the only outside resource. However, both internet and PunCAT interaction times vary greatly across participants. In the case of the internet, interaction times ranged from 18.4% (A1) to 76.3% (A4) of the participants' total work time during Session 1, and from 2.7% (A4) to 36.5% (B4) during Session 2; in the case of PunCAT, interaction times ranged from 24.7% (A1) to 73.7% (A4). This variation is an indication of very different working styles, something that will also emerge below.

Figure 3.3 shows the total work time participants spent on each pun and Figure 3.4 the average work time across all puns translated with or without PunCAT. As previously mentioned, the passages given to the participants on hard copy included somewhat wider contexts, and the participants were told that they did not necessarily need to translate the full texts, but rather just the passages containing the puns. Though some translations include the whole text, Figures 3.3 and 3.4 report only those periods where the translator was working on the pun and its immediate context. Both figures are inconclusive in that there is no clear indication whether using PunCAT speeds up or slows down the translation process. Six out of nine participants were slower on average when they translated with the tool than without (Figure 3.4). However, this needs to be interpreted against a number of other factors. For one,

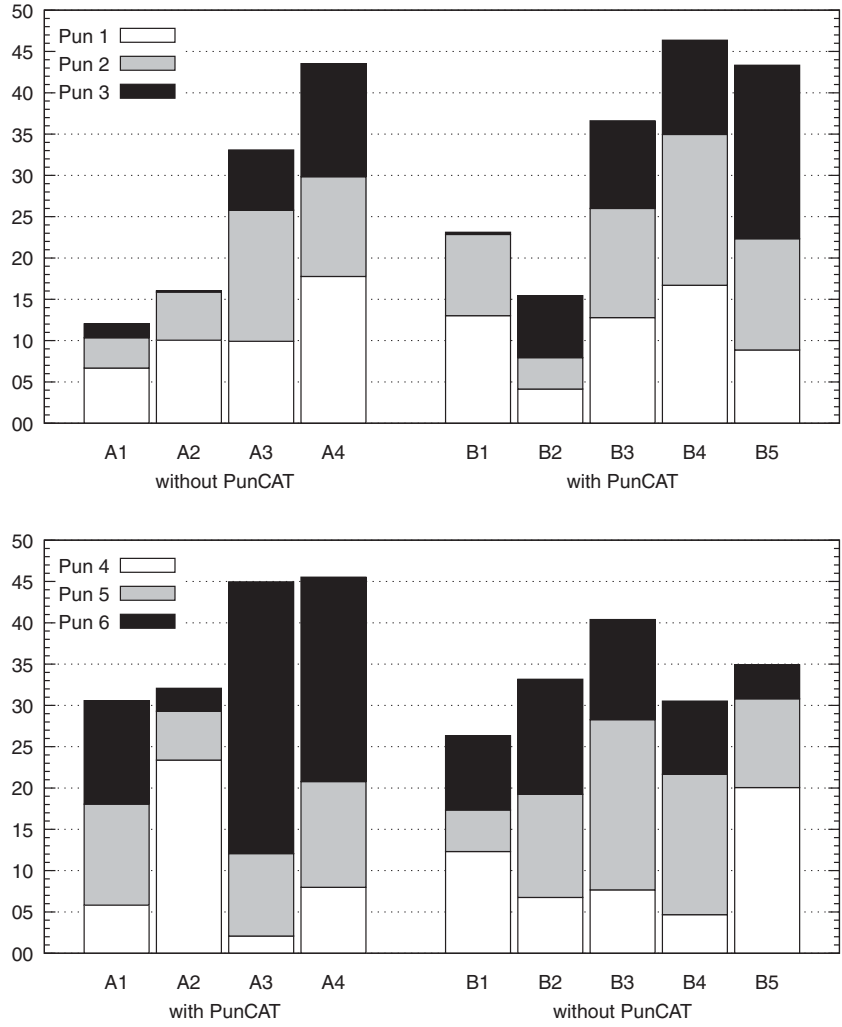

Figure 3.3 Participants' total work time per pun, in minutes.

the participants were not yet well acquainted with the tool (see below), and the exploration that it afforded might have led some to do more brainstorming than would have been absolutely necessary in order to come up with at least one solution. Another factor is that not all puns posed the same level of difficulty, and even the level of difficulty of a pun will differ from translator to translator. What the numbers and the high degree of intersubject variability do underline, though, is again the role that personal working styles and profiles play in the translation process.

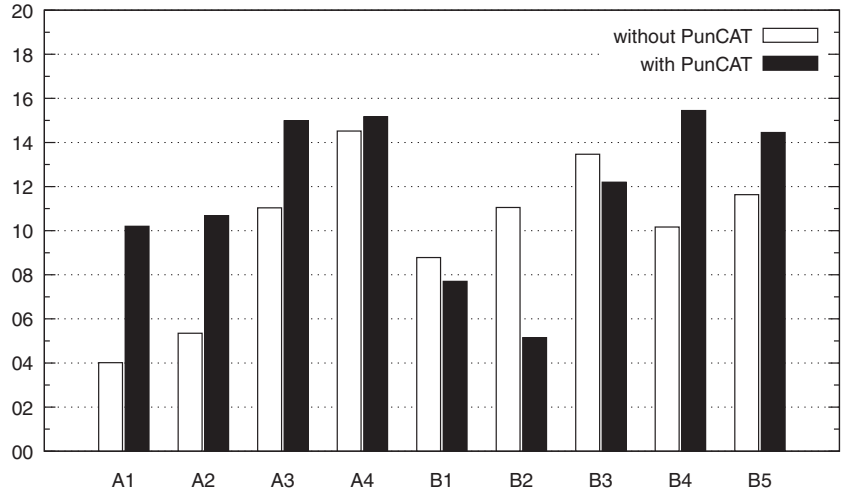

Figure 3.4 Participants' average work time per pun, in minutes.

Figure 3.5 illustrates the participants' interactions with PunCAT: the numbers of graph nodes they hovered over and clicked (the latter implying a somewhat deeper engagement with a particular term or concept) and the numbers of additional source or target language terms manually typed in. Again, we can see that these indicators of interaction with the tool vary greatly. While some participants hovered over very high numbers of nodes for a particular pun, others accessed only a handful of nodes throughout.

As this study's focus is on interaction with PunCAT, in the following sections we present some fine-grained observations and analyses of the translators' cognitive processes, working styles, and outputs based on the logging data; recourse will be made to verbal data from the two questionnaires and handwritten notes where appropriate. First, we will look at how participants from Group A (who translated Puns 4, 5, and 6 with PunCAT) made use of the tool; second, we will explore Group B, which translated Puns 1, 2, and 3 with the tool.

Group A

Participants from Group A spent a greater proportion of Session 2 working with the tool than Group B did (49.5% vs. 46.8% on average; Figure 3.2). We will start our observations with participant A4, who interacted longer with PunCAT than anyone else (73.7% of Session 2). Her overall working style can be described as highly systematic—more so than that of her colleagues. (By comparison, the working processes of B4 and B5 were highly fragmented, with frequent switches between puns

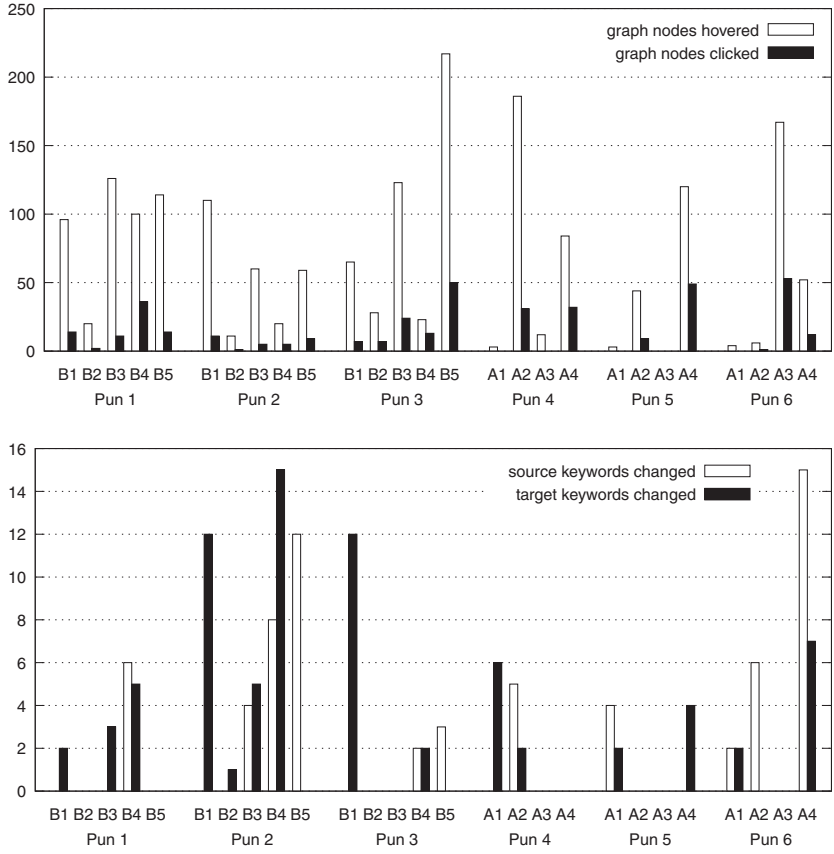

Figure 3.5 PunCAT interaction statistics by participant and pun.

and between applications.) In both sessions, she first spent a long, contiguous period doing research and brainstorming, whether on the internet (Session 1) or in PunCAT (Session 2). Then, once apparently satisfied with the target candidates she had found, she proceeded to speedily type her translation; she made some local revisions while producing the target sentences but did not switch back and forth much between the writing and research modes. Her mind, it seems, was largely made up at the end of her research phase. The greatest part of her overall time went into research and brainstorming, while she spent relatively little time in Word. Our data do not always show exactly what a participant did at any given moment; for instance, we cannot precisely allocate periods of source- or target-text reading or general reflection, something that could be studied with eye-tracking software or think-aloud protocols.

However, our data do indicate that she did most of her brainstorming and deciding during her research phase; that this seems to be her preferred

working style is also reflected by the fact that, in both sessions, she distributed her efforts almost identically between the applications (Word: 23.7% and 23.6%, respectively; research tools: 76.3% and 76.4%, respectively). During Session 1, she consulted a very large number of outside resources (96 task bar clicks) and spent more time than anyone else on the internet; during Session 2, she spent more time than anyone else in PunCAT. What is particularly interesting is that, with the exception of looking up the meaning or possibly spelling of a German term in an online dictionary while working on Pun 6, she did not consult any other outside resources during Session 2. As a consequence, out of the five target puns she produced in this session (including three versions for Pun 6), four were exclusively retrieved from or prompted by her search in PunCAT; only one was unrelated. (In Session 2, when the participants worked with PunCAT, all except B4 and B5 translated at least one pun without any internet resources—i.e., relying exclusively on PunCAT and their own skills.) In all five cases, A4 adhered to the PUN→PUN strategy and came up with viable solutions, so it is worthwhile to take a closer look at how she made use of the tool.

In the case of Pun 4, the first one she translated with PunCAT, the tool offered a large number of names of different types of boat and different parts of the human body; all in all, she hovered over 84 graph nodes, clicked on 32 (Figure 3.5), and finally selected two pairs of words from this pool for her candidate list: *Arsch/Arche* and *Po/Boot*. Per her handwritten notes, the reason she eventually discarded the first pair ("arse"/"ark"), despite the good phonetic overlap, was that she judged *Arsch* to be too vulgar for the film's young target audience. *Po*, on the other hand, is an inoffensive colloquial term for "butt" (and *Boot* is "boat" in German). Her final version reads:

TAD: "Er sagt, es heißt … Po… po… Boot!"
PEARL: "Wow, das ist ein richtig großes Popoboot."

PunCAT had given her both *Po* and *Popo*, the reduplicative variant being very much part of the language of children. She creatively combined the two proposed words so that Tad's "*Po… po… Boot*" is as hesitant as it is in the original, and the logic of Pearl's answer is arguably even more humorous than in English. The English terms are incidentally phonetically very similar to their direct German counterparts, which might be responsible for the fact that, with three exceptions, all nine participants worked with some variation of *Po*, as did the German translators of the distributed film.

When she worked on Pun 5, she looked at even more words offered by PunCAT for buildings and weapons (120 nodes hovered, 49 clicked; Figure 3.5) and added four target keywords of her own (also referring to buildings and weapons), thereby exploring the semantic fields of "club" used in the source text. PunCAT did provide her with two building/weapon

pairs she liked well enough to enter into her list of candidates: *Schuppen/Knüppel* and *Kneipe/Peitsche*; in both cases, the phonetic overlap is at best modest, which is probably what made her continue her search. The third candidate pair on her list, which she eventually used for her final target pun, contains perfect homonyms: *Schuppen/Schuppen*. The first of these is a colloquial term (in the singular) for a pub or a bar, and the second (plural) means "dandruff". The homonymy makes it a very convincing solution that nicely fits the scene, though it does not fully preserve the semantics of the original pun. Just as with Pun 4, we can observe how a word proposed by PunCAT seems to have stimulated a burst of creativity: Although the "dandruff" sense of *Schuppen* is not given in GermaNet (and therefore in PunCAT), the "pub" sense is, and this is evidently what prompted her to come up with the missing homonym herself. A gloss of her translation would read:

> "We will look for a *Schuppen*$_1$ somewhere—"
> "I've got *Schuppen*$_2$," Lias said proudly. "Quite a lot, actually."
> "I meant a *Schuppen*, a building where we can play," Glod said.
> "I can play in a building also with my *Schuppen*$_2$."

While A4 spent nearly eight minutes on Pun 4 and nearly thirteen on Pun 5, she spent considerably longer on Pun 6 (almost 25 minutes; Figure 3.3). This might have to do with the fact that she had extra time on her hands completing the first two puns, and she did, in the end, produce three different target versions for Pun 6. Of the three target solutions, two were retrieved from the PunCAT pool, while she came up with the third herself. She did, however, subsequently check whether the tool contained the words she had used, and she found that it did. The version she came up with herself was the one she liked best and ranked first. This solution is again a homonym pair that works well in the context, as it preserves the original's allusion to the passage of time, it reads (in back-translation), "I should have used the *Perfekt*. Yeah, nowadays everything needs to be *perfekt*," the first term being a grammatical term for the present perfect tense, and the second meaning "without defect".

The answers she gave in her Q1 indicate that working with the tool was a positive experience for her: She "agreed" that the tool was easy to use and "strongly agreed" that she found it useful and could imagine using it in the future. Also, her satisfaction with her target texts is somewhat higher for the PunCAT group of puns than for those she had translated without the tool. All in all, she found the tool "pleasant to use" and "quite intuitive". She also thought she had saved time using the tool "because no notes, no extra searching for synonyms etc." was necessary. In fact, the average time she spent per pun in Session 2 was slightly longer than in Session 1 (15 min. 10 sec. compared to 14 min. 31 sec.; Figure 3.4), but this must be interpreted in light of the fact that she produced three versions for Pun 6. If we disregard the time she spent

working on the two additional versions for Pun 6, the average would indeed be lower for Session 2 (12 min. 49 sec.), thus confirming her own intuitive impression (but, as pointed out above, no general conclusions can be drawn about time savings).

While A4 spent 73.7% of her total work time in Session 2 in PunCAT, another participant from the same group, A1, was the one whose PunCAT time was the lowest of all (24.7%; Figure 3.2). What makes her use of PunCAT exceptional is that she hovered over no more than three or four nodes for each pun and did not click on a single node (Figure 3.5). She did explore a handful of source and target words that she herself fed into PunCAT, but not more than most other participants. Asked to describe her experience with the tool, she said, "It was interesting. I might need to use it more often, so it gets second nature, though. It was still quite foreign to me and I was faster translating without it." During Session 2, she did most of her research on the internet (20.9%). She also spent roughly the same amount of internet time during Session 1 (18.4%), by far the lowest amount, which indicates that she tends to rely extensively on her own internal linguistic knowledge. This assumption is also confirmed by her statement in Q1, "I came up with quite the ideas on my own" [*sic*]. She also said that none of her target puns made use of a term found through the tool. While the data confirm this statement for Puns 4 and 6, one of the three German terms she hovered over for Pun 5 (*Welthit*: "worldwide hit") might well have prompted the term *Schlager* (a general colloquial term for a pop song and/or a particular type of German popular music), which she then entered herself into PunCAT for further exploration and eventually used in her target text. In her final version, she combined it with the German *Schläger* (meaning "bat" or "club"), which did not come up in her PunCAT search but is part of the original pun's semantic field. A gloss of her translation reads:

> "We will go look for a *Schlager*—"
> "I've got a *Schläger*," Lias said proudly. "Got a nail in it."
> "I meant a *Schlagerclub*," Glod said.
> "Still got a nail in it at night."

In other cases, too, the participants' personal impression of the role PunCAT played in their decision-making was not borne out by the data. A3, for instance, also said in her Q1 that she did not find the two target versions for Pun 6 through the tool, when, in fact, the words she used in both, the phonetically similar nouns *Zeit* ("time" or "tense") and *Zelt* ("tent"), were among the nodes she accessed. (She hovered over 167 nodes and clicked on 53.)

A1's reluctance to use the tool might have had to do with her confidence in her own personal resources and, as she mentioned in Q1, her unfamiliarity with the tool. Other participants also commented on their unfamiliarity with the tool. A2, for instance, said in her Q1 that she

found working with the tool more stressful than without because she was not used to it. However, she found this was counterbalanced by the tool's functionality:

> [It] did provide useful input and even if I didn't choose one of the offered options/translations, it made me think in different directions than I usually would have.

Her process data confirm her personal impression. Working on Pun 5, for example, she explored the semantic fields of the different meanings of the original "club", and we can assume that its sense of "an association of members for some common purpose" that came up in her PunCAT search, together with "club house", by extension led her to consider "membership", an avenue which, as she stated in Q1, she might not have taken without the tool's help. Her translation reads in an English gloss:

> "We will go look for a club—"
> "Am in a club," Lias said proudly. "Got a membership card, too."
> "I meant a nightclub," Glod said.
> "Am a member at night, too."

Group B

As mentioned above, the participants of Group B spent, on average, slightly less time in PunCAT than Group A. The participant who spent less time in PunCAT than anyone else from this group was B1 (31.8% of her Session 2 time, with 58.6% in Word and 9.6% on the internet; Figure 3.2).

Regarding Pun 1, B1 made use of the same punning words as another participant who worked with the tool (B3) as well as A4, who translated this pun without PunCAT. (At least one published translation of the book also used the same words.) Their punning words, *Lehre/leer*, show a high degree of phonetic similarity, the first term being a noun meaning "teaching" and the second an adjective meaning "empty", which is semantically close to the English source verb "lessen". Both participants who worked with the tool spent less time on the pun than A4 (17 min. 46 sec.; Figure 3.3), with B3 even producing two target versions. A gloss of B1's version, for example, would read, " 'That's why it's called *Lehre*', the Gryphon explained, 'because the schedule gets more *leer* by the day'."

B2, who came up with a different solution for Pun 1, just like B1, did not use any internet resources for this pun but relied exclusively on PunCAT. She quickly zoomed in on the term *Kurs* ("course") offered by the tool, subsequently exploring some verbs in the semantic neighbourhood of *verkürzen* ("shorten"). For her final target text, she then used the phonetically very close pair *Kurs/kurz* ("course"/"short"). The adjective

kurz was not directly provided by PunCAT as such, but we can assume that the related verbs she accessed were enough of a prompt to make her come up with the adjective herself. The fact that she spent only 4 min. 08 sec. (Figure 3.3) on the translation of Pun 1, the fastest of all the participants, seems to indicate that she was soon satisfied with this solution, and indeed her target pun can be seen as a valid translation, given its semantic correspondence with the original and the phonetic similarity. Interestingly, her answers in Q1 seem to somewhat contradict this conclusion, as she stated that she found translating Pun 1 "difficult" and was "not satisfied" with her target text.

After B1 had translated Pun 1 only drawing on PunCAT, she consulted various internet resources for Puns 2 and 3. For Pun 2, she searched online for words rhyming with the German word for "enemy" (*Feind*); the greatest part of her research time, however, was spent in PunCAT (7 min. 53 sec., compared to 1 min. 09 sec. on the internet). One candidate pair she retrieved from PunCAT was the phonetically similar *Niere/verlieren*, the first word meaning "kidney", the second being the verb "to lose". In her final version, she retained *Niere* but replaced the verb with the nominalized form of its antonym (*Gewinnen*: "winning"), thus losing the phonetic overlap but still preserving the original semantic fields of medicine and battle: "They had a joke about *Gewinnen* and *Niere*."

B2, who had not been that satisfied with her translation of Pun 1, found translating Pun 2 "very easy" and pronounced herself "very satisfied" with the result. Translated back into English, it reads: "…they joked that they had more intimate things behind them than an enema." Here, she has made a subtle but effective pun on *hinter* ("behind"), which is used in both a figurative/temporal and a physical sense. All other participants who worked with PunCAT also managed to come up with some play on words. For example, B4 played with German prefixes in *Einlauf/Auslauf*, the first term meaning "enema", but literally "running in", and the second one having a multitude of meanings, including a run area, as in a chicken-run, but also a device that a fluid can "run out" of. By contrast, the only published German translation of the original story, dating back to the 1930s, unceremoniously states that "they laughed about a pun". (See Kolb [2013] for strategies used by professional translators in a previous process study.)

While several participants particularly appreciated that PunCAT pointed out the intended pun, B1, in the case of Pun 3, was convinced that the tool had made a mistake, commenting in a handwritten note: "PunCAT erroneously identified picnic as the pun." Her overall experience she described as follows: "While the tool wasn't bad and I enjoyed working with it, my personal choice of pages (dictionaries, rhyming pages etc.) proved to be more useful." Her impression is not quite borne out by the actual data, which indicate that, in the case of Puns 1 and 2, her solutions were not prompted by any internet resource she accessed. In the case of Pun 3, no conclusions can be drawn, as she focussed all her

efforts not on the intended pun but on other parts of the passage, which also explains the extremely short time of 16 seconds that she devoted to the "picnic" phrase.

Regarding Pun 3, most participants, like B1, opted for either a direct translation, using the German word *Picknick* (the English idiom having become a truly translingual phrase and quite common in German), or worked with *Honigschlecken* or *Zuckerschlecken*, which literally mean "licking honey" or "licking sugar" but have the same double meaning as "picnic". Compared with her colleagues, B5 explored a wider range of possibilities, including the semantic fields of "play" and "meal(time)", and also terms such as "rescue" (suggested by the broader scene). She also jotted down notes and candidate pairs on paper, from which we can conclude that she was envisioning a pun involving the German homophones *Mal/Mahl* ("occasion"/"meal"), and she did make use of them in one of her two target versions. The other target version used a non-punning colloquialism.

User satisfaction, translation strategies, and translation quality

Participants in both groups appreciated PunCAT's support with brainstorming and stimulating creative thinking and felt that it reduced the level of stress. For example, B2 said in her Q1:

> For me, translating without the tool was more stressful. Even though I didn't use the exact candidates proposed by PunCAT, the tool made it a lot easier to come up with ideas … I used the tool mostly for inspiration. It felt like assisted brainstorming.

However, for some participants the experience was less positive, especially for B3, who explained that:

> I felt like it limited my thinking. There are so many directions you could think in but the tool only gives you synonyms … Working with the tool stressed me, when I had my own ideas because I felt like my mind was going to be biased.

All told, the participants produced a total of 62 target texts, of which 32 were produced with PunCAT and 30 without. Regarding translation strategies, PUN→PUN was chosen slightly more often with the tool than without it (25 vs. 21 translations). That this strategy was used so frequently probably also has to do with the study's setting and the fact that participants were encouraged to produce puns whenever possible. This necessarily entails that not all target puns can be considered successful solutions that fit all aspects of the broader context or scene, and, in some cases, the participants might have used different strategies in a non-academic setting (such as PUN→NON-PUN or PUN→ZERO). In both modes,

the strategy PUN→NON-PUN was used in only four instances. In all other cases, participants made use of related rhetorical devices that could also achieve a whimsical effect (PUN→PUNOID), such as assonance, alliteration, or homoeoteleuton. Interestingly, two participants used irony as a rhetorical device when working without the tool on Pun 2, while this device was never used when they worked with PunCAT.

The target texts were evaluated by three external evaluators, who are experienced literary translators and teachers of literary translation. They were asked to rate the target texts using a three-level scale (fully acceptable, acceptable with some reservation/need for some revision, not acceptable). While we did expect some measure of disagreement, it still came as a surprise that only one target text (produced with PunCAT, incidentally) was rated by all as fully acceptable; seven were rejected by all as unacceptable (four produced with PunCAT, three without). Interrater reliability (Landis and Koch 1977) between two of the evaluators was fair (Cohen's $\kappa = 0.24$), while it was very poor between each of these two evaluators and the third, whose evaluations were in general much less favourable ($\kappa = 0.00, -0.28$).

Out of the 32 target texts produced with PunCAT, Evaluator 1 considered fifteen solutions fully acceptable or even successful solutions that generated a humorous effect comparable to that of the original and also fit the broader context or scene, ten as partially acceptable, with the potential of developing a satisfactory solution with some revision, and seven as not acceptable; the respective numbers for Evaluator 2 are thirteen, eleven, and eight, while Evaluator 3 fully accepted only four solutions, rating five as partially acceptable and rejecting 23.

The numbers for the mode without the tool (a total of 30 target texts) are comparable, with Evaluator 1 rating again fifteen solutions as fully acceptable, seven as partially acceptable, and eight as not acceptable. Evaluator 2 fully accepted ten solutions, accepted thirteen with reservations, and rejected seven. Evaluator 3 again rejected the highest number (nineteen), fully accepting only three solutions, with eight being rated as partially acceptable.

Conclusion

Following Low (2011, 64, 59), who argued for a "combined exploration and intuition" approach as "a systematic way to proceed instead of just waiting for inspiration", PunCAT provides users with a specialized environment intended to structure the pun translation process without unduly constraining it. Our user study appears to bear this out: We find good evidence that PunCAT can effectively support the translation process in terms of facilitating brainstorming, stimulating creative thinking, providing inspiration, and broadening the translator's pool of solution candidates by opening up larger semantic fields than traditional dictionary searches. That said, the study also shows that working styles and

processes differ considerably between individuals, and PunCAT might be more suitable for some working styles than others. This may also go some way towards explaining why participants disagreed over the utility of the tool; while some valued the open exploration it afforded, others considered this feature a hindrance. A further impediment noted by the participants was their unfamiliarity with PunCAT, though this was not unexpected given the experimental setting.

The participants managed to come up with creative and valid solutions for all six puns, but in some cases ran up against gaps in the coverage for both languages' lexical-semantic networks. Regarding the future development of PunCAT, two functions stand out as particularly salient and desirable: the integration of rhyming dictionaries and/or similar resources that allow users to more easily explore and retrieve phonetically matching terms (our data showing that participants tended to focus on phonetic pairs rather than semantic pairs), and the automatic location and interpretation of punning words in the source material. This latter function, which was only simulated in PunCAT in our study, emerged as one of the features that participants appreciated most.

The triangulation of software logs, questionnaires, participants' notes, and target texts provided a robust basis to trace the users' interaction with PunCAT. Similar future experiments could use different setups and include, for instance, concurrent or retrospective verbalization protocols or eye-tracking software to dig even deeper into the process. Recruiting professional translators as participants may also yield somewhat different findings, though intersubject differences in working styles are also prevalent among professionals (Kolb 2019). In bringing together NLP and cognitive approaches, we also aimed to answer the clarion call that the development of computer aids for translators take more account of users' actual working processes and practical needs (O'Brien 2020), and we consider the (further) integration of the two fields as a promising way forward to support translation in general and this rather exceptional class of translation problems in particular.

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Note

1 We have released the source code for PunCAT at https://punderstanding.ofai.at/puncat under a free software licence.

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4 Bilingual e-books via neural machine translation and their reception

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Introduction

InLéctor[1] is a collection of bilingual e-books published with the aim of promoting the reading of novels in the language in which they were written for learners of that particular language. Books are published in several electronic formats (EPUB, MOBI, and HTML) and can be read on a range of devices (e.g., computer, tablet, e-book reader). The text of the original work and the translation is segmented; paragraphs are split into smaller units, usually sentences. Each segment of the work in the original language is linked to the corresponding segment in the target language. In this way, readers can switch from the original to its translation as they please.

This research targets a specific set of L2 readers, namely those with an intermediate or high level of proficiency in a foreign language and a desire to read books originally written in that language. Despite their language level, they might need to frequently stop reading to search for unknown words in dictionaries, and, even with this help, some passages may still remain hard to understand. This makes following the book difficult, and, after some time invested in this highly demanding cognitive activity, some of these readers might abandon the book and start reading a book in their mother tongue. Some researchers (Nuttall 1996) state that reading is a very important activity when studying a foreign language, and that the level of difficulty should be such as to not discourage the L2 reader. A bilingual e-book, such as those published in the InLéctor collection, aims to help these readers to access literary works in the original language.

InLéctor has already published several works in English, French, and Russian with existing translations in Spanish and Catalan. This collection only publishes original works in the public domain. Literary works enter the public domain a given time after the death of the author. This period depends on the country and typically ranges from 70 to 100 years. The same criterion applies to translations (List of Countries' Copyright Lengths, n.d.). For this reason, finding good translations in the public

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domain to create bilingual e-books has proven to be quite demanding and has led to a bottleneck in the publication of works in the InLéctor collection.

To speed up the process of publication, and given the great improvement in quality achieved by the recent approach to machine translation based on artificial neural networks (Bahdanau, Cho, and Bengio 2015; Vaswani et al. 2017), we started to experiment with the use of neural machine translation (NMT) systems for the creation of bilingual e-books. The main hypothesis is that the quality of the output from an NMT system specifically trained for novels would be sufficient to understand difficult segments or paragraphs. We would expect the reader to read most of the book in the original language (their L2) and then use the machine translated version (their L1) to understand difficult sections in the original version. In this way, the reading experience would come primarily from the source text, while the target text would be used to help the reader to understand without having to leave the book and look up difficult words in a dictionary.

In the following sections, we present this process and the results of a reading experiment. We published a short story written in English by the American writer Kate Chopin in two versions: a monolingual English e-book and a bilingual English-Catalan e-book, the latter using our NMT system trained specifically in the literary domain. The aim of the experiment was first and foremost to check our methodology by including readers in the reception of texts mediated by NMT, but also to explore whether the quality of the NMT system was sufficient to help readers understand difficult segments and paragraphs in the short story.

In the research presented in this chapter, we try to answer the following research questions:

- RQ1. Is the reading experience different in monolingual and bilingual e-books?
- RQ2. Is the translation quality provided by an NMT system good enough to help the reader understand a difficult sentence or paragraph?
- RQ3. Can bilingual e-books created using NMT help second-language readers understand and enjoy a text?

Bilingual books in language learning

Reading is an important task in language learning. Two kinds of reading, with different purposes, are usually considered in the context of language learning (Elturki and Harmon 2020): intensive reading and extensive reading. The goal of intensive reading is to find the main idea, supporting details, and discrete information, whereas extensive reading, also known as "for pleasure reading" (Bamford and Day 1997), has the goal of

reading as many texts as possible in a foreign language for enjoyment and with minimal mental effort. Extensive reading enhances both receptive and productive language skills (Hafiz and Tudor 1989). Prowse (2002) highlights ten principles for teaching extensive reading and cites Krashen (1993) to point out the importance of free voluntary reading. In addition, he does not recommend the use of dictionaries, as this prevents the extensive reader from developing valuable guessing skills. Chen et al. (2013) state that the integration of e-books in extensive reading activities helps to improve students' reading attitude, reading comprehension, and vocabulary.

A parallel book published on paper is a bilingual book (Ernst-Slavit and Mulhern 2003) where the original is on one side and the translation on the other side. The texts are aligned, usually at paragraph level. With these parallel books, the reader can choose to read the original or the translation and can switch from one to the other simply by looking at the left or right page. Semingson, Pole, and Tommerdahl (2015) point out the importance of the quality of the translation in the creation of bilingual books. With this in mind, the first published books in the InLéctor collection were created using published human translations, avoiding the use of machine translation (MT) systems. As already mentioned, it is difficult to find good translations in the public domain; therefore, given the improvements in translation quality achieved by NMT systems, we decided to explore the use of this technology to create bilingual e-books.

A key challenge in MT for literary texts is preserving not only the meaning but also the reading experience (Toral and Way 2015). This is undoubtedly true when the MT text is produced in order to be read in its entirety. This is not, however, the case with the InLéctor collection, where the reader is expected to read the original text and only consult the translation sporadically, when a passage is not fully understood. In the books in the collection, the reading experience still comes primarily from the original work.

Methodology

This section offers a description of the MT engines used, the creation of the bilingual e-books, the literary text chosen, the reading experience survey, and, finally, a brief description of the participants in the survey. We have tried to give a clear and extensive overview of the technical process because we believe that it is necessary to understand the work that is required behind the scenes to create a tailored NMT system, and how these systems might be better at improving the reading experience as opposed to off-the-shelf solutions. This information may be useful to researchers outside the specific field of MT who use public engines for their experiments and who might not be fully aware of this specific translation process. Likewise, this process may be of interest to other researchers looking to replicate our methodology.

Description of engine and translation process

The MT system in this research uses the latest technology in this area: the Transformer architecture based on artificial neural networks (Vaswani et al 2017), building on the English-to-Catalan MT system tailored to literary texts by Toral, Oliver, and Ribas Ballestín (2020). This represents the state of the art for current NMT systems for translating fiction in this language pair. In the rest of the chapter, we refer to two systems: the previous system, i.e. that by Toral, Oliver, and Ribas Ballestín (2020) (system A), and the new system trained for this study (system B). The main differences between system A and system B have to do with the training data used and the way the data are pre-processed.

In terms of pre-processing, in system A, following the typical conventions followed in MT research, data were tokenized[2], truecased,[3] and normalized[4] with a commonly used set of tools: Moses' scripts (Koehn et al. 2007). In addition, system A made use of subword units[5] by means of the byte-pair encoding algorithm (Sennrich, Haddow, and Birch 2016), performing 32,000 operations jointly on both the source and target languages. System B had considerably simpler pre-processing; it only used character normalization and Sentence Piece (Kudo and Richardson 2018) for joint tokenization and subword units (48,000 operations). More operations were performed than in the previous system (48,000 instead of 32,000) because the amount of training data was considerably greater (see Table 4.1).

With respect to the training data, system A was a purely in-domain system, i.e., it was trained solely on literary texts: 133 parallel novels (original in English and their human translation in Catalan), and around 1,000 monolingual books in the target language (Catalan). The latter dataset was back-translated (Sennrich, Haddow, and Birch 2015) into English[6] using a phrase-based statistical MT system (see Toral and Way [2018] for additional details). System B added out-of-domain training data, namely parallel data collected by Softcatalà[7] to the aforementioned in-domain datasets. In line with Caswell, Chelba, and Grangier (2019),

Table 4.1 Number of sentences and tokens (source and target sides) in the training data sets

Dataset	*Number of sentences or sentence pairs*	*Number of tokens*[a]	
		English	*Catalan*
In-domain parallel	1,086,623	14,032,080	15,501,197
In-domain monolingual	4,194,347	57,209,987	61,431,184
Out-of-domain parallel	4,503,523	84,076,423	88,397,036

a These do not match the number of tokens reported by Toral and Way (2018), as they tokenized the corpora.

each source sentence in two corpora was preceded by a tag: <G> for the out-of-domain corpus and <B> for the in-domain back-translated corpus. We expected the addition of large amounts of out-of-domain data, when considered as a different subset by the NMT model (thanks to the use of a tag), to result in an improved performance.

Table 4.1 shows the number of sentences and tokens in each of the corpora used for training. As can be seen, system B was trained on roughly double the amount of data than system A.

We used the aforementioned training data to train three MT systems with different seeds until convergence using an early stopping criterion of 5 iterations, which means that the training process is stopped after 5 training iterations that do not achieve any improvement for a given automatic evaluation metric. We used the BLEU[8] metric (Papineni et al. 2002) to evaluate the performance of the resulting model after each training iteration. To do so, the development set was translated with the resulting model for each iteration and the reference translation of this development set was used to calculate the BLEU score. Once the three MT systems were trained, they were fine-tuned—that is, the training process was resumed using the in-domain parallel data, again until convergence with the same criterion. The final MT system was an ensemble of the three fine-tuned models.

Description and selection of the text

To create a bilingual book and test the usability of this system, we needed to select a suitable text. Due to the experimental conditions and the budget, the following prerequisites were established:

- That it was publicly available so as not to infringe copyright laws.
- That the story was not included in or taken from a book used to train the customized engine (otherwise, the quality of the raw output would have been artificially augmented).
- That it had a reasonable text length so that participants in the usability test could read the text and complete a questionnaire in around 30 minutes.
- That the story was not from a specific genre and that it was engaging enough to reach a wide audience.
- That the English language used was not so complex as to prevent participants with lower levels of English as a second language from understanding the story.
- That the story could be included in a book with other stories from the same author for future projects.
- That the text would give visibility to women authors.

With these prerequisites in mind, we searched for a text in the Gutenberg Project Library (Project Gutenberg, n.d.) and finally opted for *A Pair*

of Silk Stockings by Kate Chopin (Saint Louis, USA, 1850–1904). The story was first published in *Vogue* in 1896, but we found the language and topic quite contemporary. The text tells the story of a woman (Mrs Sommers) who comes into a certain amount of money and decides to go shopping for her children; instead, she ends up treating herself to an afternoon in the city, during which she buys a pair of black silk stockings that serves as a trigger for the plot and gives the story its title. Through her shopping spree, the reader realizes that there is a certain uneasiness with her life choices and that she is, in fact, trying to escape her daily routine and, perhaps, longs for something different.

The text has 1901 words, 26 paragraphs, and 104 sentences. The readability scores in MS Word are Flesch Reading Ease 74.3 (Fairly Easy to Read) and Flesch-Kincaid Grade Level 6.7 (Easy to Read) for native speakers.

Description of the e-book creation process

Bilingual e-books are created by linking each segment of the work in the source language with the corresponding segment in the target language. The first books published in the InLéctor collection used published human translations, and the process of creation of the bilingual e-book involved the automatic alignment of source and target segments. The full process of creation of such bilingual e-books is described in Oliver (2017).

The creation of bilingual e-books using an NMT system, which is the case in this study, is much simpler, as the segment alignment step is not necessary.[9] All the scripts for the creation of bilingual e-books using MT systems are released as free software and can be found on GitHub (Oliver 2021). The full process can be divided into the following steps:

- Obtaining the source text
- Conversion of the source text to DocBook
- Creation of the bilingual DocBook
- Creation of the bilingual e-book in the final format: EPUB and HTML

These steps are explained in the following subsections.

Obtaining the source text

Since the InLéctor collection only publishes works in the public domain, the main source for our books is the Project Gutenberg library. We have also used Wikisource (Wikisource, n.d.) to find works in the public domain. Both sites allow us to download the works in several formats. We can use two formats for the source text: an EPUB file (a common file format for e-books) and a plain text file. When using a text file, a minimum markup[10] is needed to identify the different elements of the book

(e.g., titles, author, chapters, etc.). When using EPUB files, some of these markup elements can be inferred from the EPUB file itself.

Conversion of the source text to DocBook

We use DocBook (DocBook.org, n.d.), an XML standard format for the representation of books and other types of documents, as the primary file format for working with books in the InLéctor collection. As it is a standard format, there are many tools available that handle DocBook files. We have two scripts to convert EPUB and text files into DocBook.[11]

Creation of the bilingual DocBook

A bilingual DocBook has both source and target texts and each source segment is linked to the corresponding target segment, as in the following example:

```
<para>
<phrase id="ss-99"><link linkend="ts-99">The play
was over, the music ceased, the crowd filed out.</
link></phrase>
<phrase id="ss-100"><link linkend="ts-100">It was
like a dream ended.</link></phrase>
</para>
…
<para>
<phrase  id="ts-99"><link  linkend="ss-99">L'obra
s'havia acabat, la música havia cessat i la multitud
s'havia dispersat.</link></phrase>
<phrase id="ts-100"><link linkend="ss-100">Va ser
com si s'acabés un somni.</link></phrase>
</para>
```

Each paragraph is divided into segments—i.e., sentences—and each source segment (ss) is linked to its corresponding target segment (ts).

The project developed a script[12] to create bilingual e-books using the MTUOC machine translation server (Oliver 2020) or a tab delimited file (tsv) containing the source text and the machine translated text.

Creation of the bilingual e-book in the final format: EPUB and HTML

Once we have the bilingual DocBook, we can create the e-book in the final format using the scripts[13] provided. Alternatively, other freely available tools[14] can be used for this conversion.

Figure 4.1 shows the EPUB edition of the short story by Kate Chopin. While reading the HTML version of the short story, clicking on a given

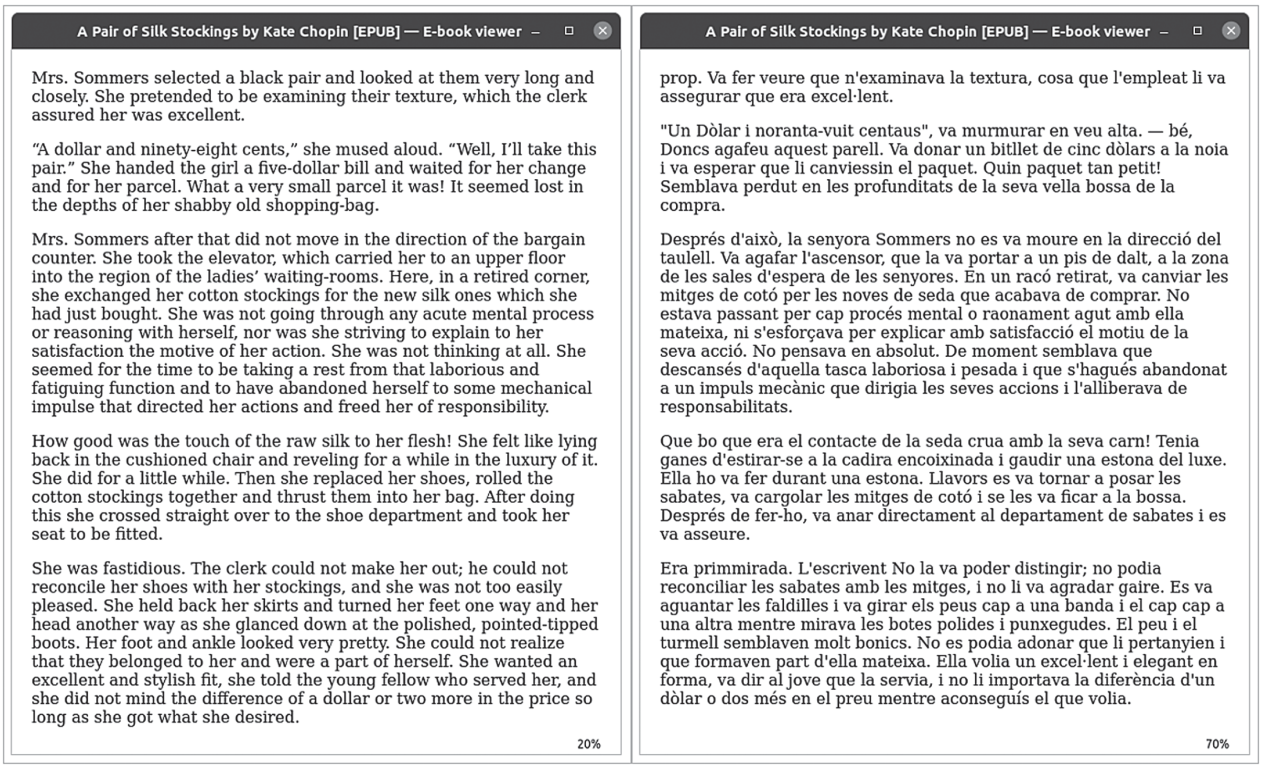

Figure 4.1 EPUB version of the short story.

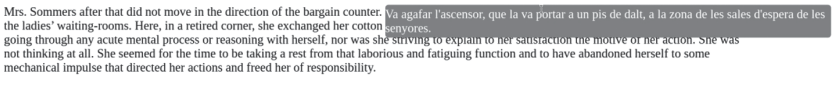

Figure 4.2 HTML version of the short story.

sentence will bring up the translated sentence as a pop-up text, as Figure 4.2 illustrates.

Description of the survey

To test the bilingual book against a monolingual version (our two experimental conditions), we created an online questionnaire consisting of four different sections with 37 items in total (each condition had a different number of items to respond to since some of the items were specific to each condition). It was distributed online to participants using Qualtrics software. The questionnaire was completely anonymous. We did not gather any personal information from the participants, which, in turn, limited our research somewhat, as will be explained in the Limitations of the Survey section. The participants were randomly assigned to one condition in Qualtrics, either to the Bilingual or the Monolingual version of the story. The other sections of the questionnaire were:

- Demographics and reading patterns (11 items). This section of the questionnaire contained five questions on demographics (gender, age, education, occupation, and mother tongue), five questions on reading patterns, e.g., "How much do you like reading?" or "How frequently do you read?", and one question on their English level.
- Comprehension questions (10 items). After reading the text, the participants answered 10 four-choice questions to explore their basic comprehension of the story. We did not eliminate any participant according to their comprehension level, as we wanted to see if the reading condition (Bilingual or Monolingual) would influence their comprehension.
- Reading experience
  - Bilingual reading experience (8 items). Participants were then asked to answer questions designed to address their reading experience. The readers of the bilingual text were asked eight questions, e.g., "How much did you enjoy reading the text?" or "Would you recommend this text to a friend?".
  - Monolingual reading experience (5 items). The readers of the monolingual text were asked five questions related to their experience, e.g., "How much did you enjoy reading the text?" or "Would you like to read a bilingual edition of this text?".

    - There were two questions that were common to both versions. These were "How much did you enjoy reading the text?" and "How easy was the text to read?", as we wanted to compare the two conditions regarding ease of reading and enjoyment.
- Technical questions (3 items). All participants were asked which device they had used to read the text, if they had experienced any issues during the experiment, and if they wanted to make further comments.

The specific measurements and values will be explained fully in the Results section.

Participants

The criteria for the inclusion of the participants were that they were studying English as a second language in Catalonia and that they were willing to take part in the survey. We were looking for English readers or students who might read in English for pleasure, but also for language students that had to read as part of their English lessons, in line with our research goals. In Spain, learning English starts in primary school and can go on to university level. Of course, studying a language is not necessarily part of formal education—many language students just want to learn a language. Therefore, our criteria for participants were quite open in order to test the system.

To recruit the participants, we distributed the survey among the students of English with Catalan as a first language from the Centre for Modern Languages at the Universitat Oberta de Catalunya (UOC). A call for participation and the survey were also distributed in the mailing list of the APAC (Associació de Professors d'Anglés de Catalunya [Association of Teachers of English of Catalonia]). We also targeted the reading site Goodreads for readers in Catalan (Lectura en català). We posted the advertisement at intervals during December 2020 and January 2021.

The Qualtrics link to the questionnaire was opened by 146 participants, but only 57 of those fully completed the questionnaire. Of those 57 participants, we had to eliminate nine for the following reasons:

- The participants who said they had display problems. Most of them scored very low in comprehension, which seemed to indicate that they had not read the text. This could be because they were using mobile phones.
- All the participants who read the text and completed the survey in under 300 seconds, as this also seemed to indicate that the participants had not read the text.
- Spurious responses, i.e., responses of a humorous nature.
- The participants who completed the questionnaire without responding to the questions on the reading experience.

Table 4.2 Distribution of data according to gender, mother tongue, education, and age

	Women	*Men*	*Rather not say*
Gender	27 Catalan	19 Catalan and Spanish	3 Spanish
Mother Tongue	30 Primary	9 Secondary	9 Higher education
Education	27 Under 18	10 25–54	16 55–84
Age	27	15	6

Table 4.3 English level as reported by the participants

A1	*A2*	*B1*	*B2*	*C1*	*C2*
2	8	13	9	9	7

- The participants who indicated having problems with the text links and who seemed to indicate that they had not read the text either.

The final analysis was done with 48 participants: 21 for the Bilingual and 27 for the Monolingual condition. Table 4.2 shows the distribution of data according to gender, mother tongue, education level, and age.

We asked the participants to estimate their English level according to the European Framework of Reference for Languages.[15] These levels are A1, A2, B1, B2, C1, and C2, ranging from basic to very advanced. Table 4.3 shows these responses.

Limitations of the survey

The survey had several limitations. First, the survey was conducted online without direct access to the participants. When trying to measure completeness of a questionnaire and when measuring reading comprehension and enjoyment, direct access to the participants might be preferable. Nevertheless, the ease of online distribution and, most importantly, the fact that the survey was carried out during the COVID-19 pandemic meant that this was also the safest and only possible way of doing it.

Second, the participants were not paid to take part in the survey, and it was anonymous. This meant that some participants had little motivation to do it or to do it well, resulting in incomplete or inaccurate entries. The number of valid results was not as high as we had expected; this could also be, in part, due to the pandemic, as the participants might have had to prioritize their other online activities.

Third, since the participants were not paid, we felt constrained as to the amount of time we could ask the participants to spend on the questionnaire and, therefore, we did not include an English level test and limited the length of the questionnaire to the final 37 items.

Finally, there were more primary school students than we had anticipated, and perhaps the story was not as suitable to this age group as would be desirable, hence possibly resulting in lower levels of participation and enjoyment.

Results

NMT evaluation results

We conducted automatic evaluations with the BLEU metric (Papineni et al. 2002) on different variants of our previous and current NMT system (see the Description of Engine and Translation Process section). First, we will report results on the development set and then on the test set.

Table 4.4 shows the automatic evaluation scores on the development set of different variants of the MT systems developed. In the first two rows we compare the base versions of system A and system B. System B outperforms system A by almost 1 BLEU point (38.62 versus 37.86), which can be attributed to the different pre-processing and the addition of sizable amounts of out-of-domain training data (see Table 4.1).

The remaining three rows in the table present the results of adding additional features to the base variant of our current system. We can see that all three additions (tags, fine tuning, and ensembling, as explained in the Description of Engine and Translation Process section) result in improved scores of around 0.73, 0.7, and 1.4 points, respectively. As to the reasons why these additions result in improved scores, it seems that, first, adding tags to each sentence pair in the training data according to the corpus it comes from allows the system to treat those sentence pairs differently. Second, the fine tuning also yields high quality: once the training with the whole data is completed, we keep training with

Table 4.4 Automatic evaluation of different variants of the MT system on the development set

System	*BLEU score*
Base system A (in-domain corpora from Table 4.1)	37.86
Base system B (all the data from Table 4.1)	38.62
Tags	39.35
Fine tuning	40.05
Ensembling	41.45

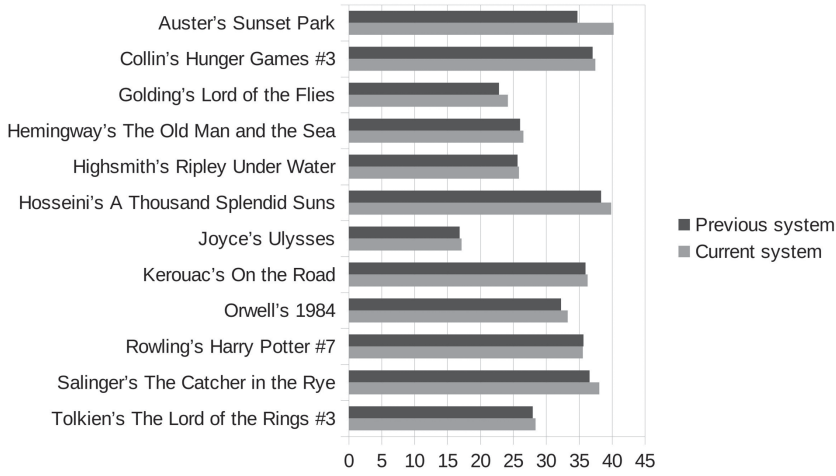

Figure 4.3 BLEU scores on 12 novels by the best previous system from Toral et al. (2020) and the best system from this chapter (see Table 4.4). The results are not comparable to those reported in Toral and Way (2018) or Toral et al. (2020), as their results are on tokenized text.

just the parallel in-domain data. Third, combining multiple independently trained systems by means of ensembling is known to lead to improvements.

We evaluated the best variant of system A (ensemble of 4 fine-tuned models) and the best variant of system B (last row in Table 4.4) on a test set of 12 novels previously used by Toral and Way (2018) and Toral, Oliver, and Ribas Ballestín (2020). The results are shown in Figure 4.3. Overall, the new MT system resulted in an improvement of 1.08 BLEU points: the average score for the 12 books was 31.91 with the new system compared to 30.83 with the previous one. We can observe that the scores with the new system are higher than with the previous one for all books except one: Rowling's Harry Potter #7. This is an interesting case, since the previous 6 books in this series are contained in the in-domain training data. They amount to 50,000 sentence pairs (cf. Table 4.3 in Toral and Way 2018). Therefore, it is not surprising that having additional out-of-domain data does not improve the BLEU score for this book.

In addition to this automatic evaluation, the machine translated text for the short story used in our reading experiment (see the Description and Selection of the Text section) was post-edited by one of the authors of this chapter. The post-editing made minimal changes in order to obtain a correct translation that is fully understandable and fluent enough in Catalan, i.e., light post-editing. This post-editing was done solely for evaluation purposes, and the bilingual edition of the text was created using the raw machine translated text.

Table 4.5 Levels of required post-editing effort

Required post-editing	*Perception of MT output*
None	No post-editing required. No errors were found in the MT output.
Minimal	Easy to solve in parts of words, e.g., inflection and concordance errors.
Limited	Up to one word, e.g., lexical errors.
Moderate	More than one word, e.g., syntactical errors.
Considerable	More than one word, e.g., semantic, cognitive errors.
Retranslation	Rather than post-editing, a new translation is required.

Table 4.6 Results of the classification of the post-edited segments by required post-editing effort

Required post-editing	*Segments*	*Percentage*
None	47	42.99
Minimal	17	15.89
Limited	20	18.69
Moderate	13	13.08
Considerable	8	7.48
Retranslation	2	1.87
Total segments	107	100

Each segment was classified into one of six levels of required post-editing effort, according to the number and type of errors encountered, as in Toral, Oliver, and Ribas Ballestín (2020). These levels of required post-editing effort are shown in Table 4.5.

Analysis of the light post-editing led to the figures shown in Table 4.6. 42.99% of the segments (47 out of 107) required no post-editing. These segments account for 34.12% of the tokens[16] in the source text (782 out of 2,290). Only two segments (1.87%) needed full retranslation, while 8 (7.48%) required a considerable amount of post-editing. Given that over 75% of the segments required from none to limited post-editing, we hypothesize that the quality of the translation is sufficient for L2 readers.

Using the post-edited text as reference, we calculated several automatic evaluation metrics. We will focus on HTER,[17] as it is a common metric used in post-editing experiments to assess the use of raw MT output and hence its quality. The overall HTER for this text was 12, which means that few changes were required to bring the raw output to a comprehensible level. Table 4.7 shows the number and type of post-editing operations. As can be seen, the most common operation was substitution, representing 52.70% of the operations. This means that new words were required to achieve this level of acceptability.

Table 4.7 Number of post-edits per operation type. The percentage is with respect to the total number of operations

Type of operations	*Number of operations*	*Percentage*
Insertions	52	17.57
Deletions	50	16.89
Substitutions	156	52.70
Char shifts	18	6.08
Word shifts	20	6.76

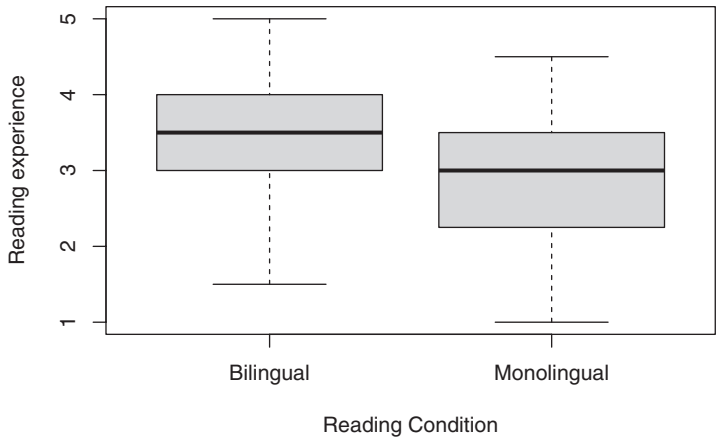

Figure 4.4 Reading experience by condition.

Reception: survey responses

In this section, we analyse the responses from the 48 participants. We have grouped these into five different subsections to see the results more clearly: Reading experience, Comprehension, Reading patterns, English level, and Additional data.

Reading experience

From the 48 valid responses obtained, we plotted two common questions according to the Bilingual (21 participants) and Monolingual (27 participants) conditions. These questions were "How easy was the text to read?" (1 = Not at all easy to understand and 5 = Very easy to understand) and "How much did you enjoy reading the text?" (1 = I didn't like it at all and 5 = I liked it a lot). Figure 4.4 shows the results by condition.

As we can see, the reading experience was better in the Bilingual condition (M = 3.38) than the Monolingual (M = 2.85), but the mean for both

reading experiences was above the overall mean value of the scale of 5. In order to see if there was a statistically significant difference between the two conditions, a nonparametric Man-Whitney U test was used. The test showed significant differences between the two groups: $U = 385$, $p < 0.03$. The effects size $d = 0.36$ is medium. The readers of the bilingual version found it significantly easier to read and they enjoyed it significantly more than the readers of the monolingual version.

As mentioned in the Description of the Survey section, we asked the participants in the Bilingual condition further questions about their reading experience. There was a total of eight questions in this condition (see Table 4.9). The participants were asked to rate all of these questions on a 5-point Likert scale, with 1 always corresponding to an unfavourable value (e.g., 1 = the Catalan translation was not useful at all) and 5 to a favourable value (e.g., 5 = the Catalan translation was very useful). The maximum score for these eight questions was therefore 40. Table 4.8 shows the descriptive statistics for the sum of all values in the 8 questions.

Although the range of responses is wide, the mean value of 24.67 over the maximum possible value of 40 suggests that participants' reactions were, on average, quite favourable towards the Bilingual condition.

Table 4.9 shows the descriptive values for each of these questions. From these questions, we can see that, although the participants did not always use the Catalan translation, their opinions were, on average, favourable towards this bilingual edition.

Further, we asked the monolingual readers five questions: 1) "How easy was the text to read?", 2) "While reading, which of these tools did you use?", 3) "How frequently did you use these tools?", 4) "Would you like to read a text in a bilingual edition?", and 5) "How much did you enjoy reading the text?". Apart from questions 1 and 5, which were used to compare the reading experience according to the two conditions, we also looked at the responses to the remaining three questions. Out of the 27 respondents, 15 did not use any tools to read the text, 11 used Google Translate, 4 used online dictionaries, 1 asked a class colleague, and 1 used a printed dictionary, with an average frequency of 3.

It is interesting to see the number of participants that used Google Translate to understand the text even in this Monolingual condition. When asked if they would like to read a bilingual edition (1 = No, I wouldn't like it at all and 5 = Yes, I would like it a lot), the average response was 2.92.

Table 4.8 Descriptive values for Bilingual experience responses

Participants		*Min.*	*1st Q*	*Median*	*Mean*	*3rd Q*	*Max.*
N	21	9	20	26	24.67	30	37

Table 4.9 Descriptive values for 8 questions in Bilingual reading

Question	*N*	*Min.*	*1st Q*	*Median*	*Mean*	*3rd Q*	*Max.*
How easy was the text to read?	21	1.00	3.00	3.00	3.29	4.00	5.00
While you were reading, did you use the Catalan translation?	21	1.00	2.00	3.00	2.38	3.00	4.00
If you used the Catalan translation, was it useful?	16	1.00	3.00	3.00	3.44	5.00	5.00
If you used the Catalan translation, how did you find it?	18	1.00	2.25	3.00	3.00	3.75	5.00
Would you like to read more books in this bilingual edition?	20	1.00	1.75	3.50	3.15	4.25	5.00
Would you recommend this bilingual edition to your friends?	21	1.00	3.00	4.00	3.95	5.00	5.00
If you searched for the translation of a word, did you save time with the bilingual edition?	18	1.00	3.00	4.00	3.95	5.00	5.00
How much did you enjoy reading the text?	21	1.00	3.00	3.00	3.48	4.00	5.00

Comprehension

After reading the text, the participants were asked to answer 10 comprehension questions. Each of these questions had 4 options with only 1 possible correct answer so that the total number of points, if all the answers were correct, was 10 points. Figure 4.5 shows the comprehension results according to each condition.

As we can see, comprehension was very similar between the Bilingual condition (M = 5.29) and the Monolingual condition (M = 5.37), although the latter shows slightly higher values overall. There were no statistically significant differences between these two conditions. Therefore, even if the participants in the Bilingual condition found the text significantly easier to read, this was not reflected in their comprehension of the text. Obviously, participants may have the perception that it is easy to read and still have comprehension issues.

Reading patterns

Before reading the text, the participants were asked to answer 5 questions about their reading habits: 1) "How frequently do you read?" (a range between 1 = I do not read and 5 = Every day), 2) "How long do you read on these occasions?" (a range between 1 = Less than 15 minutes and 5 = More than 90 minutes), 3) "From all the books that you read in

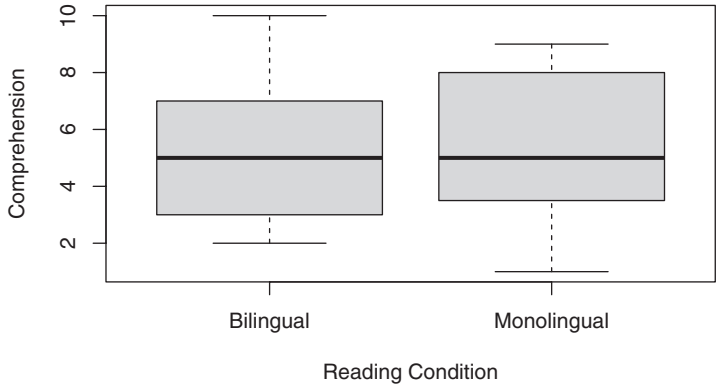

Figure 4.5 Reading comprehension by condition.

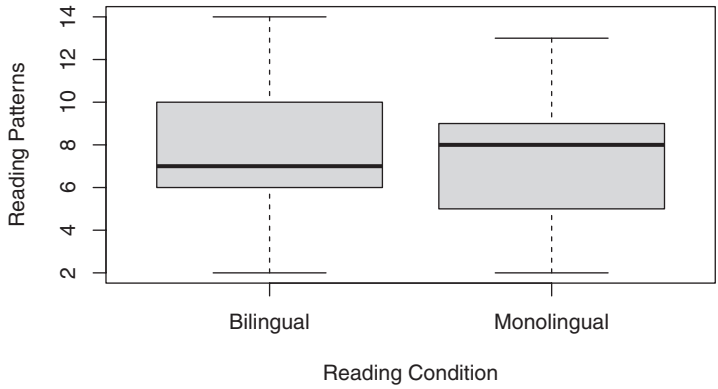

Figure 4.6 Reading patterns according to condition.

a year, which percentage would you say are books in English?" (a range between 1 = 0% to 25% and 5 = 86% to 100%), 4) "Specify the genre or genres that you read most frequently in English" (to be selected from multiple options), and 5) "When you read a word that you do not understand in English, which tool do you use?" (to be selected from multiple options).

In order to rule out the possibility that the participants in the Bilingual condition showed a better reading experience (see the Reading Experience section) because they had different reading habits (read more frequently) to the Monolingual condition, we looked at the sum of questions 1, 2, and 3 (the maximum value being 15). Figure 4.6 shows the reading pattern results according to each condition.

As we can see, the reading patterns were very similar between the Bilingual condition (M = 7.43) and the Monolingual condition (M = 6.89).

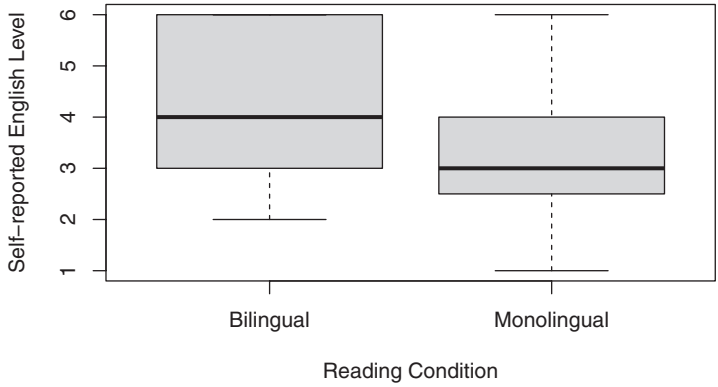

Figure 4.7 Self-reported English level by condition, where 1 corresponds to A1 and 6 to C2.

There were no statistically significant differences between these two conditions. Therefore, the fact that participants in the Bilingual condition enjoyed the text significantly more than the Monolingual would not seem to be caused by their pre-existing reading habits.

Self-reported English level

We thought it was important to look at the participants' self-reported English levels to see if this could be a factor that influenced the others. Before reading the text, the participants were asked to define their English level according to the Common European Framework of Reference for Languages (see the Participants section). Figure 4.7 shows the results per condition.

As we can see, the self-reported English level was higher for the participants in the Bilingual condition (M = 4.29) than in the Monolingual condition (M = 3.33). In order to see if there was a statistically significant difference between the two conditions, a nonparametric Man-Whitney U test was used. The test showed significant differences between the two groups $U = 386.5$, $p < 0.03$. The effects size $d = 0.36$ is medium. The readers in the Bilingual condition reported having a significantly higher English level than the readers in the Monolingual condition.

This is relevant as it could indicate that the participants in the Bilingual condition had a higher reading experience because their English level was also higher than that of the participants in the Monolingual condition, and not necessarily because they were provided with the Catalan translation. However, the comprehension level and reading patterns were not significantly different between the two conditions, and this means that we have to be cautious when considering the self-reported English levels.

Table 4.10 English level according to reading condition

English level	*Bilingual*	*Monolingual*
Low	7	16
High	14	11

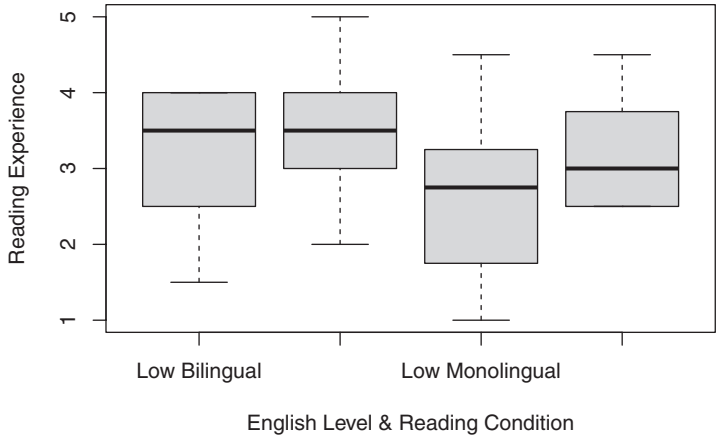

Figure 4.8 Reading experience according to 'Low' and 'High' English level, and condition.

It could be that the participants indicated a given English level when, in fact, their comprehension level was lower (as this was not significantly different from the one in the Monolingual condition). Nevertheless, it is an important outcome, and we would need further data (for example, an English test prior to the survey) to assess this more accurately.

To explore this potentially confounding variable further, we divided the participants into two levels: Low, including levels A1, A2, and B1; and High, including levels B2, C1, and C2. A total of 23 participants were classified as Low and 25 participants as High according to their English level. Table 4.10 shows the distribution per condition.

As we saw initially, there are more participants with a higher self-reported level in the Bilingual condition than in the Monolingual one. Figure 4.8 shows the reading experience results according to the participants' English level and condition.

The participants in the Bilingual condition with different English levels have a similar reading experience if the average is considered (Low Bilingual M = 3.14 and High Bilingual M = 3.5), while the participants in the Monolingual condition with a low English level have a lower reading experience than the Monolingual readers with a higher English level (Low Monolingual M = 2.53 and High Monolingual M = 3.23).

This could indicate that the Bilingual books did indeed increase the reading experience of participants with a low level of English. With more participants, an English test, and inferential statistics, we could explore this relationship further. At the moment, we can say that the English level was a contributing factor to the reading experience. Likewise, we have sufficient data from the participants in the Bilingual condition to indicate that the experience with the Catalan translation was well received by the readers.

Additional data

To finalize this section, we would like to provide data on a couple of additional variables that we examined. First, we wanted to know if the time invested varied depending on the condition and, in turn, if the other variables might also be affected. Figure 4.9 shows the duration in seconds by condition.

As we can see, the duration, albeit with certain outliers, is higher in the Bilingual condition (M = 1868 seconds [31 minutes]) than in the Monolingual condition (M = 1395 seconds [23 minutes]). However, there are no statistically significant differences between these two conditions. Therefore, even if the participants in the Bilingual condition enjoyed the text significantly more than the monolingual, this does not appear to be because of the time they invested in reading the text.

We also looked at the type of device used by the participants to explore if this was a factor in the duration of the activity. Figure 4.10 shows the duration in seconds according to the device.

It is interesting to see that the participants who read on a tablet took much longer (M = 5127.33) to read than those on a computer screen

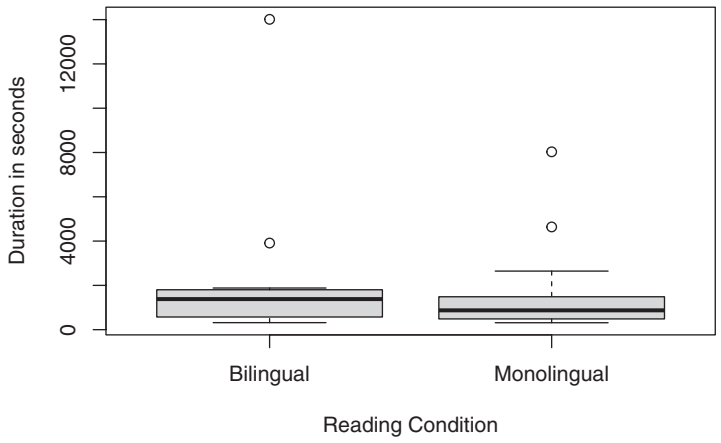

Figure 4.9 Duration in seconds by condition.

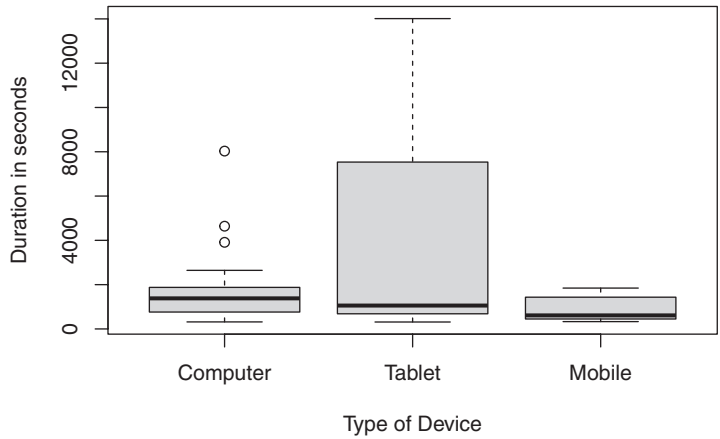

Figure 4.10 Duration in seconds according to the device.

Table 4.11 Distribution of device per condition

Device	*Condition*	
	Bilingual	*Monolingual*
Computer	9	14
Tablet	2	1
Mobile phone	10	12

(M = 1815.04) or mobile phone (M = 897.45). Although, as we saw before, the duration was not significantly different according to condition, we wonder if reading faster, for example, on a mobile phone might not have an indirect effect on the reading experience. Table 4.11 shows the distribution of devices per condition.

Table 4.11 shows that there were only 3 participants using a tablet, so it is difficult to generalize with these results; also, our sample size was relatively small. Nevertheless, the device seems to influence the time dedicated to the experiment. Perhaps it would be advisable to ask participants in the future to read on a tablet to make sure that the reading experience is longer and possibly more intense, leading to more reliable results.

Conclusions and future work

The analysis of the survey answers from readers of the bilingual and monolingual editions of the short story allowed us to answer the research questions presented at the beginning of this chapter.

Regarding RQ1 (Is the reading experience different in monolingual and bilingual e-books?), we can conclude that:

- Readers of the bilingual version had a significantly better reading experience. In other words, they found it easier to read and enjoyed it more. We ruled out the possibility that this could be attributed to their pre-existing reading habits. Readers of the bilingual version, on average, reacted quite favourably to the bilingual edition.
- English level is an important factor when looking at the reading experience, i.e., readers with a higher English level tended to enjoy reading more. However, bilingual versions appeared to level the reading experience between participants with low and high English levels.

We can clearly see that bilingual e-books do not hinder the reading experience of original work but instead improve it.

As for RQ2 (Is the translation quality provided by an NMT system good enough to help the reader understand a difficult sentence or paragraph?), we can see that:

- Regarding the readers of the monolingual version, a significant percentage of them used Google Translate to understand the text, and they expressed interest in reading a bilingual edition.
- However, there are no significant differences in comprehension between readers of the monolingual and bilingual editions.

Two questions from the survey answered by the readers of the bilingual edition can also help clarify this question:

- *If you used the Catalan translation, was it useful?* The mean was 3.44 (where 5 is the highest), so, in general, readers of the bilingual edition found the translation useful.
- *If you used the Catalan translation, what did you think of it?* The mean was 3 (where 5 is the highest), so the quality of the translation can be considered satisfactory, but there is still room for improvement.

Finally, with respect to RQ3 (Can bilingual e-books created using NMT help second-language readers understand and enjoy a text?), our answer to RQ1 shows that Bilingual readers had a better reading experience and enjoyed the text more, although our answer to RQ2 shows that they did not necessarily understand it better than the monolingual readers. The following questions for the readers of the bilingual edition also show that the readers liked this version:

- *Would you like to read more books in this bilingual edition?* The mean was 3.15 (where 5 is the highest), indicating a slightly positive predisposition to read such bilingual e-books.

- *Would you recommend this bilingual edition?* The mean was 3.95 (where 5 is the highest), a clear indication of satisfaction with the bilingual editions.

Therefore, as an overall conclusion, it seems clear that the opinion of our participants concerning bilingual electronic editions created using NMT was positive and quite favourable.

As future work, we plan to extend this experiment to more readers, but we want to know more about the level of English of the participants. One idea to achieve this would be to collaborate with schools of English to distribute the survey to their students, grouped according to the level they are studying. Likewise, we would like to provide different bilingual texts suited to different age groups.

We also plan to publish several complete works using the NMT system and make them freely available in the InLéctor collection. When a user downloads the book, we will ask him or her to participate in a survey after reading the text. We also plan to keep improving the quality of the NMT system for English-Catalan and to train systems for other language pairs, such as English-Spanish, French-Spanish, and Russian-Spanish.

Notes

1 https://inlector.wordpress.com/
2 Split into smaller units, as words, numerical expressions, and punctuation marks.
3 Writing the words in their natural case (that is, whether the first letter is uppercase or lowercase) independently of their position in the text.
4 Converting different variants of a given character into a single equivalent symbol, e.g., all the variants of a double quote (“, ”, « and », etc.) are converted into ".
5 Text representation, smaller than a word and bigger than a character that has been shown to lead to better results in NMT.
6 Back-translation is a popular technique in NMT to increase the amount of parallel training data, whereby monolingual data in the target language are translated into the source language using an MT system. The resulting parallel data, whose source side is synthetic, can then be used for training an MT system that translates from the source language into the target language.
7 https://github.com/Softcatala/en-ca-corpus
8 The most widely used automatic metric in the MT research community to date. The higher the value, the better, in theory, the translation. Its lower bound is 0 and its upper bound is 100. This means that a value of 100 is a perfect translation as compared to a human reference.
9 The input given to the MT system is the text in the original language with one segment per line. The system then generates the translation, which contains the same number of segments, hence segment alignment is not necessary.
10 Markup is a set of symbols that indicate the formatting and structure of a text.
11 epub2docbook.py and text2docbook.py

12 docbook2bildocbook.py
13 bildocbook2epub.py and bildocbook2html.py
14 For example, using dbtoepub and specifying a stylesheet to avoid having all the sentences underlined (as they are all links). For the creation of the HTML edition, xlstproc can be used (Oliver 2017).
15 www.coe.int/en/web/common-european-framework-reference-languages/level-descriptions
16 token in NLP corresponds to a word or a punctuation mark.
17 HTER is an automatic score that reflects the number of edits performed on the MT output normalized by the number of words in the sentence. The closer HTER is to 0, the fewer the changes performed.

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5 Catching the meaning of words

Can Google Translate convey metaphor?

Alicja Zajdel

Introduction

The machine translation (MT) research field has made considerable progress in recent years, having advanced from the phrase-based Statistical MT (PBSMT) to the Neural MT (NMT) paradigm (Castilho et al. 2017, 109). This has opened new opportunities in the translation industry. NMT has been offering more accurate output than PBSMT, and MT systems are now being widely used by professional translators. However, although MT has been a useful tool for technical and commercial texts, its potential for literary texts remains a subject of debate (Toral and Way 2018; Youdale 2020; among others). Many argue that the process of translating literature is too subjective and cognitively complex for a machine to ever replace human translators. Nevertheless, despite the scepticism towards these technological advances, artificial intelligence is becoming increasingly innovative, showing promising results in areas that have traditionally been considered distinctly human. AI has produced its own music, poetry, and visual art—and recently an entire article for *The Guardian* newspaper (2020)—proving that creativity might not be an exclusively human ability. Perhaps soon we can expect AI to outperform humans in creative endeavours.

This study aims to put Google Translate (GT) to the test by analysing its translations of metaphors in Oscar Wilde's *The Picture of Dorian Gray*. The primary aim of the analysis is to determine whether GT is capable of conveying metaphor and, if so, with what frequency as compared to human translators (HTs). A secondary aim is to measure how the solutions provided by GT compare to those offered by the HTs. For example, will GT tend to translate more literally, or will it be able to offer idiomatic solutions? Will there be many similarities between the MT output and the choices made by the HTs? The hypothesis is that MT will tend to translate more literally, showing fewer instances of creativity, as compared to the HTs. Another hypothesis is that the results will vary depending on the type of metaphor, and idiomatic and dead metaphors will be translated most accurately by MT, as they are a common feature

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of language beyond the literary sphere and will have therefore appeared more frequently in the corpus used to train GT.

Metaphor has traditionally been viewed as an artistic device that features in literary writing, particularly poetry; a device of poetic imagination and rhetorical flourish. However, in their seminal work *Metaphors We Live By*, Lakoff and Johnson demonstrate that metaphor is not just "a matter of extraordinary rather than ordinary languages," as is commonly believed (1980, 3). They argue that metaphor is both a property of language—a linguistic phenomenon—and a property of thought—a cognitive phenomenon (1980, 5). Furthermore, they explain how collective conceptual metaphors shape the way we think about the world, depending on the culture we happened to grow up in. For example, in the West, our conceptual metaphor for *argument* is *war*. This is reflected in the way we use language, as we talk about *winning* an argument, *attacking* a position or *shooting down* arguments (1980, 4). We use this language in a non-poetic way; we simply describe an argument that way because we conceive of it that way. The metaphor is, therefore, conceptual rather than linguistic. This idea continues to be supported in recent scholarship, for example by Shutova, Teufel, and Korhonen, who claim that:

> Metaphor is not limited to similarity-based meaning extensions of individual words, but rather involves reconceptualization of a whole area of experience in terms of another. Thus, metaphor always involves two concepts or conceptual domains: the target (also called the topic or tenor in the linguistics literature) and the source (also called the vehicle).
>
> (2013, 304)

The idea of "reconceptualization" becomes problematic in translation, as the metaphor poses a challenge both on a linguistic and conceptual level. This is particularly problematic when translating between languages of cultures that do not share common conceptual metaphors, as the way they describe and understand certain concepts will differ significantly. The translation of metaphor is an equally contested issue that has been discussed in Translation Studies primarily with respect to equivalence and translatability (see Dagut 1976 and Van den Broeck 1981). The idea of equivalence becomes crucial in the translation of metaphor, since transferring a metaphor from one language to another may be hampered by both linguistic and cultural differences. However, just as there are different views on the issue of equivalence, so there are on the topic of metaphor translation. In the second half of the twentieth century, there were several papers in Translation Studies that touched on the subject in one way or another (Nida 1964; Reiss 1981; Dagut 1976; Van den Broeck 1981; Snell-Hornby 1988; and others). As Burmakova and Marugina point out

(2014, 528), some contradictory views on the limits of metaphor translatability have emerged from these studies:

- Metaphors are untranslatable (Nida 1964; Dagut 1976)
- Metaphors are fully translatable (i.e., metaphor translation is no different from translation in general) (Reiss 1981; Mason 1982)
- Metaphors are translatable but pose a considerable degree of inequivalence (Van den Broeck 1981; Newmark 1988)

Metaphor translation has also been examined from the perspective of cognitive linguistics, where recent studies have investigated the cognitive effort required by the task (Sjorup 2013; Hegrenaes 2018) and the notion of translation competence (Jensen 2017; Hegrenaes 2018). While these studies help us to understand the cognitive processes behind metaphor translation in the human brain, metaphor remains under-researched in the fields of MT and Natural Language Processing (NLP), with limited studies on the translatability of metaphor by MT systems. Shutova, Teufel, and Korhonen point out that "despite the importance of metaphor for NLP systems dealing with semantic interpretation, its automatic processing has received little attention in contemporary NLP and is far from being a solved problem" (2013, 303). This study aims to address the gap in current research from a Translation Studies perspective, and the results could potentially be used to inform further computer science research to improve the performance of MT systems. Another objective of this study is to provide an indication of how much post-editing is needed when translating literary texts using MT, and thus consider the time and cost efficiency of using this technology in the future.

Methodology

This study will analyse a database of 50 metaphors identified in the first six chapters of *The Picture of Dorian Gray*.[1] This text has been chosen as the focus of the study for several reasons. First, it was selected for its descriptive narrative, rich in metaphorical language. Second, it has been translated into most major languages, often in multiple versions produced by different translators. This study will analyse translations into Spanish, comparing two different translations as outlined in Table 5.1. Another factor that contributed to the choice of these materials has to do with the accessibility of the texts. Since *The Picture of Dorian Gray* was published in 1890, it is now available in the public domain,[2] and its translations into Spanish are easily accessible on Google Books.

The experiment will consider 50 metaphors in the order they appear in the source text (ST), which encompasses Chapters 1 to 6. These metaphors will be compared with translations produced by human translators (HTs) and MT output produced by Google Translate (GT).[3] GT has been chosen as it is arguably the most well-known and widely used

Table 5.1 Publication details of the translations of *The Picture of Dorian Gray* used in this study

Target language	*Code name*	*Name of the translator(s)*	*Year of publication*	*Publishing house*
Spanish	SP1	Alfonso and José Sastre	1984	EDAF
Spanish	SP2	Mauro Armiño	2012	Grupo Planeta

MT system worldwide, currently supporting 103 languages (Turovsky 2016). Its accuracy improved significantly in 2016 when it switched from Statistical to Neural MT (NMT) technology, which is currently applied to most of the languages supported by GT, including Spanish (Turovsky 2016). In their 2016 study funded by Google, Wu et al. concluded that "compared to the previous phrase-based production system, this NMT system delivers roughly a 60% reduction in translation errors on several popular language pairs" (Wu et al. 2016, 20). Numerous other studies have also examined the quality of NMT systems, reporting promising results when comparing NMT to other MT paradigms using automatic metrics (Bojar et al. 2016; Wu et al. 2016; Castilho et al. 2017).

Types of metaphor

In order to analyse the metaphors identified in the ST, several categories will be used to organise the dataset and supply parameters for analysis. First of all, the metaphors will be grouped by type, using the model suggested by Shutova, Teufel, and Korhonen (2013, 304). They identify three types of linguistic metaphor:

- lexical metaphor (metaphor at the level of a single word sense)
- multi-word metaphorical expressions
- extended metaphor (metaphor that spans over longer discourse fragments)

This study will apply this typology to its own dataset. It will, however, also consider the categories of *dead metaphor* and *idiomatic phrase*, as identified by the Oxford Dictionary of Literary Terms. These will be included to act as a control group for the experiment, as idiomatic expressions and dead metaphors are more likely to appear in non-literary texts, and thus there is a stronger possibility of finding examples of such language in the corpus used to train GT. This categorisation of metaphors has been discussed by previous scholars, for example by Charteris-Black (2004), who distinguishes between conventional and novel metaphors. While a conventional metaphor is "a metaphor that is frequently used and is taken up in a language community," a novel metaphor is its opposite (2004, 21–22). The assumption here is that the corpus used to train GT

will already include examples of conventional metaphors present in journalistic writing, political speeches, business communications, and other types of non-literary texts. However, metaphors found in the ST are more likely to be novel, and thus perhaps more difficult for GT to translate. The hypothesis is, therefore, that dead metaphors and idiomatic expressions (both considered conventional metaphors) will be recognised by the MT system with higher frequency as compared to other metaphor types. It is predicted that dead metaphors and idiomatic expressions will either be replaced by a target-language specific expression or rendered using non-metaphorical language. Organising data in these categories will allow us to find out whether certain types of metaphor are more challenging for MT (or HTs) based on the frequency with which each type of metaphor has been rendered into the target language (TL).

Translation procedures

This study will also examine translation procedures to understand how these metaphors were translated by MT and the HTs, and to observe patterns that might emerge in the type of procedures applied by each category of translator. The concept of translation procedure was first introduced by Vinay and Darbelnet in their 1958 work *Comparative Stylistics of French and English: A Methodology for Translation*. They identify seven translation procedures (also called methods) that a translator can use to render the ST into the TL: borrowing, calque, literal translation, transposition, modulation, equivalence, and adaptation ([1958] 1995, 31–39).

As translating metaphorical language is considered to pose a specific problem in translation due to the frequent lack of equivalence between languages, specific procedures have been suggested to overcome this translation problem. In 1981, two scholars proposed a set of procedures to translate metaphors. First was Raymond van den Broeck, who suggested the following three procedures (1981, 77):

1. Translation "sensu stricto" (i.e., transfer of both SL tenor and SL vehicle into TL)
2. Substitution (i.e., replacement of SL vehicle by a different TL vehicle with more or less the same tenor)
3. Paraphrase (i.e., rendering a SL metaphor by a non-metaphorical expression in the TL)

These procedures were then expanded by Newmark, who proposed a total of seven procedures to translate metaphor (1988, 88–91):

1. Reproducing the same image in the TL
2. Replacing the image in the SL with a standard TL image that does not clash with the TL culture

3. Translating metaphor by simile, retaining the image
4. Translating metaphor (or simile) by simile plus sense (or occasionally a metaphor plus sense)
5. Converting metaphor to sense
6. Deletion, if the metaphor is redundant
7. Using the same metaphor combined with sense

Newmark's is the most comprehensive set of translation procedures to date; therefore, this study analysed the translation procedures using Newmark's typology. They will be, however, renamed for the purposes of inserting these categories into a database. Moreover, the fourth and seventh categories will be combined into one procedure named *metaphor plus sense* in order to simplify these almost identical categories. Based on this, the classification system used in this study is as follows: reproduced metaphor, replaced metaphor, metaphor to simile, metaphor plus sense, metaphor to sense, and deletion. Additionally, an *N/A* category will be used to identify metaphors that were not translated successfully due to a translation error. For example, this could include ungrammatical phrases, wrong word choice, or incoherent translations of multi-word and/or extended metaphors. This category will be applied to MT output only, as no such errors have been found in the translations produced by the HTs.

Findings

The database of results consisted of 50 metaphors found in the ST, 19 of which were lexical, 13 multi-word, 7 extended, 6 idiomatic, and 5 dead. The first step in this study was to identify how many of these metaphors were translated metaphorically (either as reproduced or replaced metaphor, metaphor to simile, or metaphor plus sense) by each category of translator. Figure 5.1 illustrates these findings, showing the total number of metaphorical translations for each type of metaphor across both Spanish translators (SP1 and SP2) and MT. The total number of metaphors found in the ST is also included for reference. The remaining metaphors were classified as either metaphor to sense, deletion, or N/A and have not been included in the total here, though these procedures will be discussed further in the Translation Procedures section later on.

Lexical metaphors

Lexical metaphors (i.e., metaphors at single-word level) were the most common, constituting 38% of all metaphors found in the ST. Out of the total of 19 lexical metaphors, 13 were translated by SP1 (68%), 8 by SP2 (42%), and 16 by MT (84%) (Figure 5.1). These results support the hypothesis that MT would perform best in this category (i.e., preserving more metaphors in the translation), as it is more likely than HTs

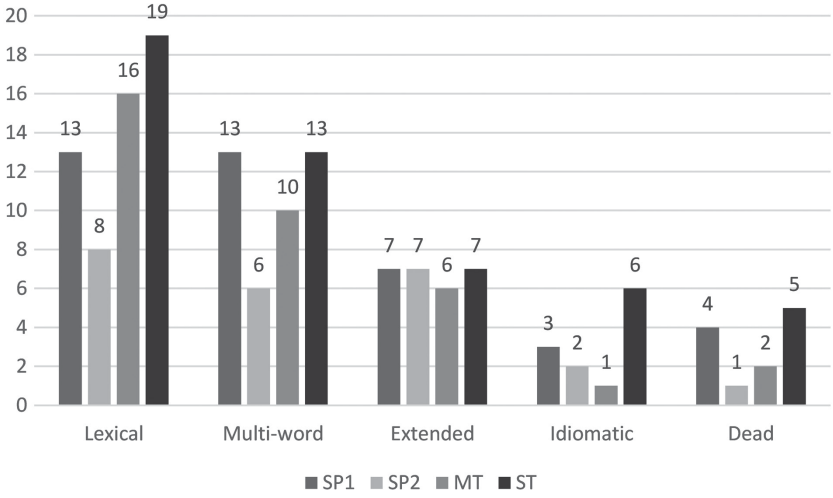


Figure 5.1 Number of translated metaphors by metaphor type and by category of translator.

to translate literally. Rendering metaphors word for word worked well in this type of metaphor, as exemplified below:

ST: "the **sunlight slipped** over the polished leaves" (Chapter 1, page 7)
SP1: "**la luz del sol resbalaba** por las brillantes hojas"
[the sunlight slipped over the shiny leaves]
SP2: "**los rayos del sol chocaban** sobre las hojas"
[the rays of sun collided with the leaves]
MT: "**la luz del sol** se **deslizaba** sobre las hojas pulidas"
[the sunlight slid over the polished leaves]

In this example of a lexical metaphor, the tenor *sunlight* (a natural phenomenon) is being described through the vehicle of *to slip* (verb of motion), thus personifying the sunlight. The three translations have all maintained this personification, though each translation opted for a different verb. SP1 chose the verb "resbalar" [slip/slide], thus reproducing the original metaphor. SP2, on the other hand, used the verb "chocar" [crash/collide], which maintains the personification but replaces the original metaphor. MT opted for the verb "deslizar" [slide/slip], a synonym of the verb used by SP1, thus also reproducing the metaphor.

Figure 5.2 visualises the proportion of lexical metaphors that were either reproduced or replaced by each category of translator. The results suggest that the two Spanish translators might have applied a different translation strategy. While SP1 remains quite faithful to the ST, reproducing most lexical metaphors, SP2 shows a tendency to replace metaphors

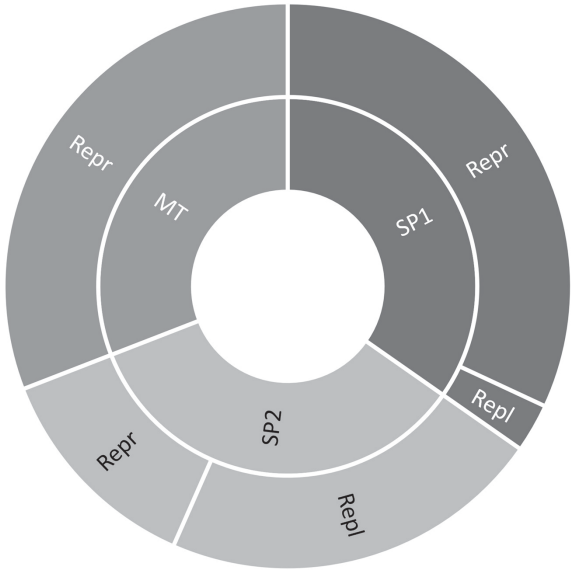


Figure 5.2 Translation procedures in lexical metaphors.

more frequently. The two translations were published almost 30 years apart, which could be the reason for the translators' varying approaches. MT, on the other hand, reproduced all of the lexical metaphors, suggesting that, although MT demonstrates a higher rate of "efficacy" as compared to the HTs, it does not show evidence of making creative decisions such as replacing one metaphor with another.

Multi-word metaphors

The next type of metaphor analysed in this study is multi-word metaphorical expressions, as termed by Shutova, Teufel, and Korhonen, who define both multi-word metaphorical expressions and extended metaphors as "metaphor that spans over longer discourse fragments" (2013, 304). For the purpose of this study, the two types were differentiated in the following way: metaphors that span multiple words within the same sentence were considered *multi-word metaphorical expressions*. On the other hand, metaphors that go beyond one sentence were classified as *extended metaphors*. This allowed us to see how MT handles metaphors both at sentence level and across a longer utterance.

As illustrated in Figure 5.1, there were 13 multi-word metaphors in the ST. The results demonstrate that SP1 and SP2 continue to display disparity in their approaches to translating metaphor, with SP2 translating multi-word metaphors considerably less frequently. MT, on the other

hand, positions itself between these two translators, having translated 10 out of 13 (77%) of the multi-word metaphors. This represents a decrease in MT efficacy as compared to lexical metaphors, where it translated 16 out of 19 metaphors (84%) and surpassed SP1. However, in extended metaphors, MT performs similarly to the HTs, translating six out of seven (86%) metaphors. While these results might suggest a lack of correlation between MT efficacy and the length of metaphor, the limited pool of extended metaphors must also be considered. To gain further insight into the translations of these types of metaphor, let us analyse some examples and the translation procedures.

ST: "Don't squander the gold of your days" (Chapter 2, page 21)
SP1: "No dilapide el oro de sus días"
[Don't squander the gold of your days]
SP2: "No desperdicie el oro de sus días"
[Don't waste the gold of your days]
MT: "No desperdicies el oro de tus días"
[Don't waste the gold of your days]

In this example, the expression *the gold of your days* refers to the best part of a person's life—presumably, youth. Here, all translations remain literal, and the original metaphor is reproduced across all translations. Similar to lexical metaphors, a word-for-word translation works well in this example. However, while both HTs opted for the formal use of "your," MT used the familiar tone, suggesting that identifying appropriate register might be challenging for GT.

ST: "Every impulse that we strive to strangle broods in the mind and poisons us." (Chapter 2, page 18)
SP1: "Todos los impulsos que nos esforzamos en ahogar incuban en nuestra mente y nos envenenan."
[All the impulses that we try to strangle/choke incubate in our mind and poison us]
SP2: "Todos los impulsos que queremos desechar toman fuerza en nuestra mente y la envenenan."
[All the impulses we want to get rid of become stronger in our mind and poison it]
MT: "Cada impulso que nos esforzamos por estrangular las crías en la mente y nos envenena."
[Every impulse we try to strangle the offspring in the mind and poisons us]

In this example, the phrase is slightly longer and syntactically more complex. The verbs *strangle*, *brood*, and *poison* are all being used metaphorically to refer to *impulses*. SP1 reproduced this metaphor by translating

Figure 5.3 Translation procedures in multi-word metaphors.

quite literally, while SP2 explicitated the meaning of *strangle* and *brood*, maintaining only the final metaphor—*poison*. While MT stayed close to the ST lexically, there is an issue of agreement in its output. The verb *brood* was translated as the noun *las crías* [the offspring], thus making the phrase unintelligible.

As shown in Figure 5.3, the translation procedures applied by each category of translator remain consistent across both multi-word and lexical metaphors. SP1 displays a preference for reproducing metaphors, replacing only a small proportion, while SP2 uses a more varied approach, although, in multi-word metaphors, this tendency is reversed, and a larger proportion is reproduced instead of replaced. MT, on the other hand, reproduced all metaphors, so far supporting the hypothesis that it is unable to make more creative translation choices.

Extended metaphors

As can be observed in Figure 5.1, the results in the extended metaphor category are fairly consistent across each type of translator. Here, both HTs outperformed MT, having translated all seven metaphors, compared to six out of seven (86%) achieved by MT. As mentioned before, the pool of these metaphors is limited, so further research is needed to reach any conclusions. In this category, MT continued to reproduce the majority of metaphors, as can be observed in the following example:

ST: "The common hill-flowers wither, but they blossom again. The laburnum will be as yellow next June as it is now. In a month there will be purple stars on the clematis, and year after year the green night of its leaves will hold its purple stars." (Chapter 2, page 22)

MT: "Las flores comunes de la colina se marchitan, pero vuelven a florecer. El laburnum será tan amarillo el próximo junio como lo es ahora. En un mes habrá estrellas púrpuras en la clemátide, y año tras año la noche verde de sus hojas sostendrá sus estrellas púrpuras."
[The common hill-flowers wither, but they blossom again. The laburnum will be as yellow next June as it is now. In a month there will be purple stars on the clematis, and year after year the green night of its leaves will hold its purple stars.]

MT reproduced this metaphor by translating word for word, as was also done by the HTs, which have not been included here due to the length of the metaphor and the high degree of similarity to the MT output. The extended metaphor category also revealed one example of replacement on the part of MT, as exemplified below:

ST: "The few words that Basil's friend had said to him had touched some secret chord that had never been touched before, but that he felt was now vibrating and throbbing to curious pulses." (Chapter 2, page 19)

SP1: "Las pocas palabras que el amigo de Basil le había dicho habían tocado alguna cuerda secreta que nada hasta entonces había tocado nunca, pero que ahora sentía vibrar y provocar extrañas palpitaciones."
[The few words that Basil's friend had said to him had touched some secret chord that nothing until then had touched before, but now he felt vibrating and provoking strange palpitations.]

SP2: "Las pocas palabras que el amigo de Basil le había dicho habían tocado en él un secreto resorte al que antes nadie había llegado, pero que ahora le hacía vibrar y palpitar de una forma extraña."
[The few words that Basil's friend had said to him had touched in him a secret spring where no one else had arrived before, but now made him vibrate and palpitate in a strange way.]

MT: "Las pocas palabras que el amigo de Basil le había dicho habían tocado un acorde secreto que nunca antes se había tocado, pero que sentía que ahora estaba vibrando y palpitando pulsos curiosos."
[The few words that Basil's friend had said to him had played a secret chord that had never been played before, that he felt was now vibrating and palpitating strange pulses.]

In this example, the metaphor of a chord is being used to represent the new ideas and feelings that Dorian Gray was experiencing following his conversation with Lord Henry. What is interesting about this metaphor is that "chord" can refer to a musical chord (a group of notes played

together) or a string on a musical instrument. Additionally, in Spanish, the verb "tocar" translates as both "to touch" and "to play" (a musical instrument). Each translator suggested a different solution for this metaphor. SP1 translates it quite literally—"habían tocado una cuerda secreta" [they had touched some secret chord]. SP2 alters the metaphor slightly, referring to "un secreto resorte" [a secret spring/mechanism]. The most interesting solution is suggested by MT—"han tocado un acorde secreto" [they played a secret chord]—in which the metaphor no longer refers to a physical chord but rather to something more abstract—a musical chord. Although this process is undoubtably unintentional on the part of MT, it is an example of the replacement of imagery by MT, the only one found in this study.

As can be observed in Figure 5.4, MT tended, overall, to reproduce most extended metaphors, as was also the case in previous categories, with the one exception of the replacement we have just discussed. SP2 displayed a similar pattern of translation procedures, reproducing the majority of extended metaphors. SP1, on the other hand, displayed a wider range of procedures, including metaphor plus sense. The overall trends in translation procedures will be discussed at the end of the chapter.

Idiomatic expressions

Idiomatic expressions, alongside dead metaphors, were used as a control group in this study, as it was predicted that examples of idiomatic

Figure 5.4 Translation procedures in extended metaphors.

expressions would have been present in the corpus used to train GT, since their use is not limited to literary texts. Thus, the hypothesis was that GT would be able to recognise idiomatic expressions and would avoid translating them literally. However, as can be observed in Figure 5.1, this hypothesis has been proved wrong, as only one out of six (17%) idiomatic expressions was translated by this MT system. The six idiomatic expressions found in the ST were as follows:

1. "I am all expectation" (Chapter 1, page 8)
2. "He always said the country was going to the dogs" (Chapter 3, page 28)
3. "I want to get something out of you" (Chapter 3, page 28)
4. "[…] had set loose a train of horrible thoughts" (Chapter 5, page 55)
5. "It would be absurd for him to marry so much beneath him" (Chapter 6, page 60)
6. "Life had come between them" (Chapter 6, page 65)

All these expressions are metaphorical, as their meaning is not literal and they cannot be translated word for word. The translator, therefore, must decide whether to replace the idiom with a similar target language expression or render the meaning of the phrase using non-metaphorical language. Figure 5.5 shows a breakdown of the choices each category of translator made in the process.

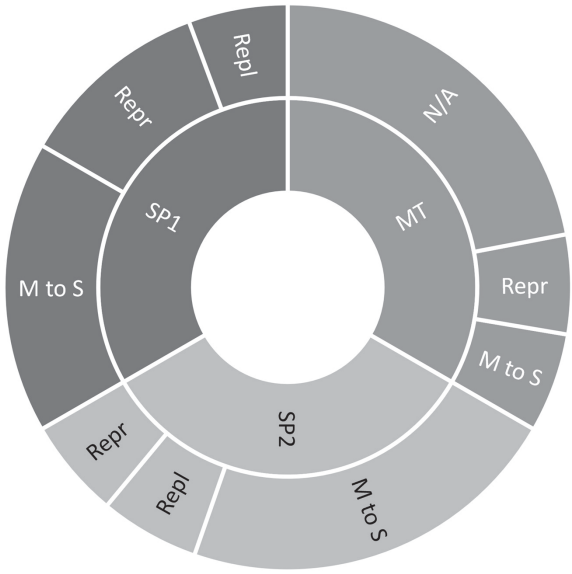


Figure 5.5 Translation procedures in idiomatic expressions.

This category of metaphor introduces a new translation procedure—metaphor to sense—which, as has been discussed in the methodology section, takes place when the meaning of a metaphor is explained in non-metaphorical language. We can observe in Figure 5.5 that both HTs applied this procedure; SP2 to a slightly greater extent than SP1. The remaining metaphors were either replaced or reproduced. As already mentioned, MT translated only one idiomatic expression by reproducing the metaphor. It also translated one idiom as metaphor to sense and the rest were classified as N/A, meaning that the phrases produced were meaningless. The two examples of metaphor to sense and reproduced metaphor are as follows:

ST: "[…] had set loose a train of horrible thoughts" (Chapter 5, page 55)
SP1: "[…] habían puesto en marcha un tren de pensamientos horribles"
[had set in motion a train of horrible thoughts]
SP2: "[…] y que originó en su mente horribles pensamientos"
[and which started in his mind horrible thoughts]
MT: "[…] había desatado una serie de pensamientos horribles"
[had unleashed a series of horrible thoughts]

In this example, MT recognised the idiomatic meaning of the expression and explicitated this meaning by producing the phrase "una serie de pensamientos" [a series of thoughts] rather than a train of thoughts. Interestingly, a literal translation would have worked here as well, as the same expression exists in Spanish, and SP1 reproduces the metaphor in their translation. SP2, on the other hand, also explicitates the meaning and removes the metaphor in their translation. These results suggest that MT might have encountered this metaphor in its corpus and learned to replace it with a non-metaphorical expression.

ST: "Life had come between them" (Chapter 6, page 65)
SP1: "Entre ellos se había interpuesto la vida […]"
[between them life had stood]
SP2: "La vida se había interpuesto entre ellos […]"
[life had stood between them]
MT: "La vida se había interpuesto entre ellos."
[life had stood between them]

In this example, the idiomatic expression was reproduced by each category of translator, as the same idiomatic expression exists in the TL. Both HTs and MT produced almost identical output, maintaining the original metaphor. The findings from this section suggest that idiomatic expressions are not easier for MT to identify and translate successfully as compared to other types of metaphor, despite the fact that this type of metaphor is likely to appear in non-literary texts, for example

in journalism. This, however, is not the case in dead metaphors, which MT was able to translate more accurately, as discussed in the following section.

Dead metaphors

According to Nunberg, all metaphors emerge as novel, but over time they become part of general usage and their rhetorical effect vanishes, resulting in conventionalised metaphors (Nunberg 1987, as cited in Shutova, Teufel, and Korhonen 2013, 308). He calls such metaphors "dead" and claims that they are not psychologically distinct from literally used terms (ibid.). In other words, dead metaphors refer to metaphorical uses of words that have become so common that most speakers would no longer consider them metaphorical. Referring back to Figure 5.1, MT performs comparably to the HTs in this category, having translated metaphorically two out of five dead (40%) metaphors, compared to four (80%) translated by SP1 and one (20%) by SP2.

However, what can be observed in this type of metaphor is that MT applied the metaphor to sense translation procedure more frequently than in idiomatic expressions (Figure 5.5 versus Figure 5.6). Therefore, four out of the five translations produced by MT are actually viable and usable options, as highlighted in Table 5.2.

In examples 1 and 4, we can observe cases of reproduced metaphors, which are very close to the translations produced by the HTs, often

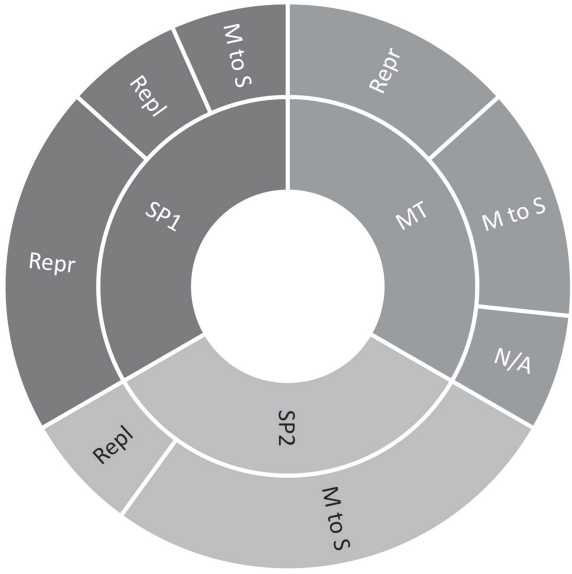


Figure 5.6 Translation procedures in dead metaphors.

Table 5.2 Dead metaphors and their translations by category of translator

Number	*Location*	*Metaphor*	*SP1 translation*	*SP2 translation*	*MT translation*
1	Chapter 2, page 23	"not catching the meaning of his words"	"incapaz de captar el sentido de sus palabras" [unable to catch the meaning of his words]	"sin darse cuenta del significado de sus palabras" [without realising the meaning of his words]	"sin captar el significado de sus palabras" [without catching the meaning of his words]
2	Chapter 2, page 24	"a sharp pang of pain struck through him like a knife"	"una aguda punzada de dolor lo atravesó como un cuchillo" [a sharp jab of pain went through him like a knife]	"un agudo dolor penetró en su alma como un cuchillo" [a sharp pain penetrated his soul like a knife]	"una punzada de dolor lo golpeó como un cuchillo" [a jab of pain hit him like a knife]
3	Chapter 4, page 39	"the same nervous staccato laugh broke from her thin lips"	"la misma risa nerviosa y entrecortada escapó de sus delgados labios" [the same nervous and intermittent laugh escaped her thin lips]	"la misma risa nerviosa apareció en sus labios" [the same nervous laugh appeared on her lips]	"la misma risa nerviosa y entrecortada salió de sus delgados labios" [the same nervous and intermittent laugh came out of her lips]
4	Chapter 6, page 60	"I don't want to see Dorian tied to some vile creature"	"No me gustaría ver a Dorian atado a una criatura infame" [I wouldn't want to see Dorian tied to a vile creature]	"No quiero ver a Dorian unido a una vil criatura" [I don't want to see Dorian united with a vile creature]	"No quiero ver a Dorian atado a una criatura vil" [I don't want to see Dorian tied to a vile creature]
5	Chapter 6, page 62	"Of course, our engagement is a dead secret"	"Por supuesto, nuestro compromiso es un secreto absoluto" [of course, our engagement is an absolute secret]	"Desde luego, nuestro compromiso es un secreto absoluto" [of course, our engagement is an absolute secret]	"Por supuesto nuestro compromiso es un secreto muerto" [of course, our engagement is a dead secret]

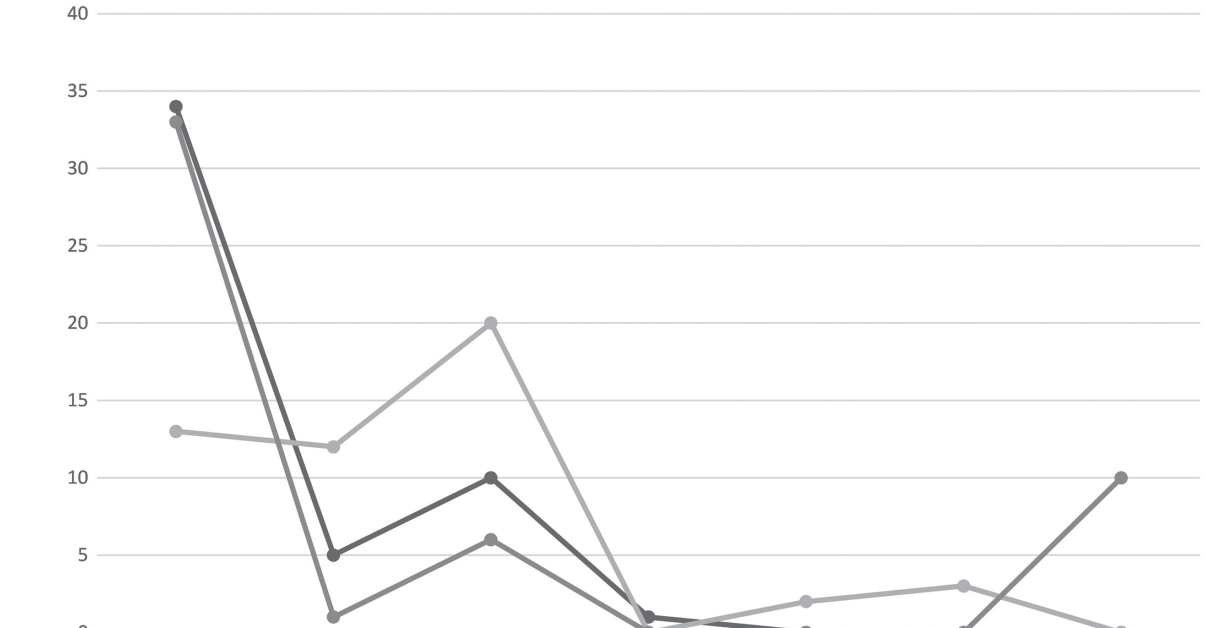
mixing elements of both. Examples 2 and 3 show instances of metaphor to sense, but here, MT opts for different lexical choices from those used by the HTs. Finally, in the last example, MT translated the metaphor literally, producing a calque that does not exist in Spanish and which has, therefore, been classified as N/A. On the other hand, both HTs rendered the phrase as metaphor to sense, replacing "dead secret" with "absolute secret." This, however, raises issues of what can (and should) be considered an acceptable translation and by whom such decisions are made. This is particularly pressing in the realm of literature, where fixed linguistic constraints are often intentionally broken by writers as a way of expressing their creativity through innovative use of language. It is, therefore, debatable whether "un secreto muerto" could be a possible translation into Spanish.

Translation procedures

Figure 5.7 illustrates the total number of instances in which each translation procedure was applied by both HTs and by MT. The results reveal that MT displays a similar pattern to SP1, particularly in reproducing metaphors, a procedure that both SP1 and MT applied much more frequently than SP2. The overall pattern continues throughout the graph, although the gap between SP1 and MT is greater in replaced metaphors and metaphor to sense. These results also show that, while HTs are more likely to apply more manipulative procedures, for example by supplying additional information, altering, or omitting a passage altogether, there are few instances of such decision-making processes in MT. The procedures *metaphor plus sense*, *metaphor to simile*, and *deletion* require cognitive processes that extend above the word and sentence level of the text and require some degree of creativity. These procedures might be used by translators purely for aesthetic reasons or as a way of adapting the text to suit the target culture and its literary tradition. They might, therefore, be translating the text with a different strategy, perhaps adhering to distinct translation norms or the target audience. This could be the potential reason for the disparity between the procedures employed by the two HTs. While SP1 appears to remain closer to the ST, SP2 takes a different approach, replacing rather than reproducing a higher percentage of metaphors. The fact that multiple translations have been published also suggests that the two versions must vary significantly, especially considering that they were published almost thirty years apart.

Nevertheless, there were six instances in this study of MT translating metaphor to sense, which suggest that MT was able to recognise the meaning of a metaphor and replace it with a non-metaphorical equivalent in the TL. Below are two examples of this procedure in practice:

ST: "a **smile** of pleasure **passed** across his face, and seemed about to linger there" (Chapter 1, page 5)



	Reproduced metaphor	Replaced metaphor	Metaphor to sense	Metaphor plus sense	Metaphor to simile	Deletion	N/A
SP1	34	5	10	1	0	0	0
SP2	13	12	20	0	2	3	0
MT	33	1	6	0	0	0	10

Figure 5.7 Translation procedures across types of metaphor and category of translator.

MT: "una sonrisa de placer se dibujó en su rostro y pareció quedarse allí" [a smile of pleasure appeared on his face and seemed to stay there]

In this example there is a lexical metaphor, which personifies the smile by using a verb of motion. This, however, has disappeared in the translation, where the verb "dibujarse" [to appear/to become visible] is used instead.

ST: "the same nervous staccato **laugh broke** from her thin lips" (Chapter 4, page 38)
MT: "la misma risa nerviosa y entrecortada salió de sus delgados labios" [the same nervous and intermittent laugh came out of her lips]

This example shows a dead metaphor, which in the translation is replaced by a non-metaphorical expression. The laugh no longer "breaks" from the lips but rather "comes out." These examples demonstrate MT's ability to process a metaphorical expression and express it in other words, although this occurred somewhat irregularly in this study. For example, MT was not able to apply this procedure to idiomatic expressions, as has been discussed in previous sections, leading to nonsensical, word-for-word translations in that category. Another aspect worth mentioning is the N/A category. These were translations that produced incoherent or meaningless phrases and could not be classified as successful translations. MT produced 10 such phrases, which represents 20% of all its translations. The main problems with these translations were wrong word choice and lack of coherence. As can be seen in Figure 5.8, this was most prominent in idiomatic expressions, followed by multi-word metaphors and dead metaphors.

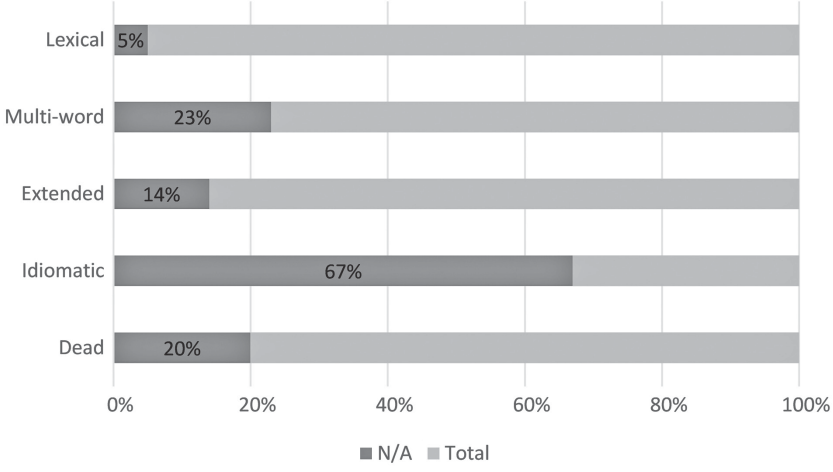


Figure 5.8 Proportion of N/A translations for each type of metaphor.

In lexical metaphors, one out of nineteen (5%) translations was classed as N/A, in multi-word it was three out of thirteen (23%), in extended one out of seven (14%), in idiomatic four out of six (63%), and in dead metaphors one out of five (20%). These results show that the initial hypothesis that MT would convey idiomatic expressions most frequently was incorrect. As has been shown in this study, MT tends to translate metaphors quite literally, which does not work for idiomatic expressions. However, MT shows promising results for lexical metaphors, as the proportion of erroneous translations (N/A) is very low in this category. In addition, these findings reveal a lack of correlation between MT accuracy and the length of metaphor, as MT accuracy dropped in multi-word metaphors, but then picked up again in extended metaphors.

Conclusions

The results of this study have shown that GT is capable of conveying metaphor, although the frequency and accuracy of the output varies across types of metaphor. MT offered the most promising results in the category of lexical metaphors, reproducing a larger proportion of metaphors than either HT. However, the HTs were able to translate longer metaphors with higher frequency than GT, as MT performance was lower in the categories of multi-word and extended metaphors. It is difficult to draw any conclusions regarding the impact of metaphor length on translation quality, as the results decreased in multi-word metaphors but then increased in extended metaphors. However, the limited pool of extended metaphors must also be considered; therefore, further research is needed to establish such a correlation. The results of this study also revealed that the initial hypothesis regarding idiomatic expressions and dead metaphors was partially incorrect, as MT performance was lowest in idiomatic expressions. This was a surprising finding, as the hypothesis was that MT would have come across idiomatic expressions more often, as they are likely to have occurred in other types of texts in its training corpus. MT displayed a tendency to translate these expressions literally, producing meaningless phrases in the TL. On the other hand, MT was able to translate dead metaphors by means of non-metaphorical language, suggesting that the meaning of these metaphors was easily processed and conveyed by GT.

The secondary aim of this study was to identify similarities and differences between translation solutions provided by HTs and MT. The results showed that the HTs used six procedures overall, while MT used three, with the addition of the N/A category, which classified MT output that failed to produce grammatical or meaningful translations. MT reproduced 66% of the metaphors, making this the most commonly used translation procedure. The other two procedures—*metaphor to sense* and *replaced metaphor*—were used significantly less frequently, with rates of 12% and 2% respectively. The remainder of the metaphors were classed

as N/A, constituting 20% of all metaphors. These results demonstrate that MT and HTs make different decisions in the translation process, and HTs do not rely on literal translation to the same degree as MT. This can be observed in the lower rate of reproduced metaphors in the HT data and higher rates of procedures such as replaced metaphor or metaphor to sense. Moreover, HTs occasionally applied procedures such as *metaphor to simile*, *metaphor plus sense*, and *deletion*, which MT was not able to do. However, it should be noted that, although the instances of *replaced metaphor* and *metaphor to sense* were not frequent in MT, they do show promising results. The results for the *metaphor to sense* category also demonstrate that MT can explain the meaning of a metaphor in non-metaphorical language, which suggests an in-depth processing of semantics. Considering the scope of this study, these results suggest potential for further progress in MT and its metaphor-processing capabilities as the quality of MT systems increases and studies of a similar kind are carried out on a larger scale.

This study also reveals the need for further study into MT translations of metaphor that include aspects of quality assessment, and ideally human reception studies. Previous research on MT quality has relied heavily on automatic assessment scales, but, particularly for literary texts, it is necessary to engage with readers in order to understand how machine-translated literature is perceived by potential customers. Another way to approach quality assessment is to measure the amount of post-editing required. While this is a widely explored area of research in MT, few studies have focused exclusively on translations of literary texts. A recent study by Koglin and Cunha (2019) has investigated the post-editing effort associated with machine-translated metaphors, though their experiment was performed on hybrid and Statistical MT rather than NMT. Further process research into the post-editing of specific literary devices will allow us to gain further insights into the cognitive decision-making processes behind these tasks, ultimately also giving us a better indication of MT output quality for literary texts.

Notes

1 This study will use the 1992 Wordsworth Classics edition of *The Picture of Dorian Gray*, with the 2001 introduction and notes by John M. L. Drew.
2 www.gutenberg.org/ebooks/174
3 The experiment was performed in 2019.

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6 Pragmatic and cognitive elements in literary machine translation

An assessment of an excerpt from J. Polzin's *Brood* translated with Google, DeepL, and Microsoft Bing

Paola Brusasco

Introduction

It is fascinating and frightening at the same time to think that a quality so inherently human as creativity, and its manifestations in thought and language, can be found in machine output as well. And while the rational mind tells us that technology is neither good nor bad, since it is the use that it is put to by humans that determines its effects, one may worry at the idea that, once a machine is able to write and translate texts, it may replace human beings as has happened in other domains, with an impact on the real world that might extend beyond what it was originally conceived for. Such fear is allayed by the contention that machines can only carry out tasks as they are instructed to, which is the objection that mathematician Ada Lovelace made to Charles Babbage's 1837 Analytical Engine: "[it] could not originate anything and could only do whatever we know how to order it to do" (Dietrich et al. 2021, 39). Almost two hundred years later, a much more sophisticated machine expressed a similar view about itself: "I only do what humans program me to do. I am only a set of code, governed by lines upon lines of code that encompass my mission statement" wrote GPT-3, an OpenAI language generator, in an editorial in *The Guardian* online.[1] The disturbing thought, however, is that these words appear in an essay that was not only correct from the point of view of form but was also cohesive and coherent, although perhaps a little naïve in some of its statements.

The evolution of Natural Language Processing entered a new phase with the recent developments in neural networks and deep learning. In the field of Machine Translation (MT), which had already benefitted from the statistical turn with its attempts to accommodate progressively longer sequences such as phrases and local dependencies (Koehn, Och, and Marcu 2003; Hardmeier 2012; among others), neural networks have brought about such advancements that even creative texts—traditionally

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considered a human precinct—are now included among the potential applications of MT. A few studies have explored the potential of statistical MT for literature: Voigt and Jurafsky (2012) focused on cohesive reference and found that MT showed greater difficulty with literary texts than with news due to the former's denser reference chains; Besacier (2014) tested the translation of a short story from English into French followed by post-editing and revision by non-professional translators with a view to creating a community of readers-editors; and Toral and Way (2015) compared a novel translated with a generic web-based system and one trained for literary texts. Neural MT has spurred new studies in which its output is compared with that of statistical MT, revealing significant improvement both as measured by automatic evaluation metrics such as BLEU (Papineni et al. 2002) and as reported by human readers (Toral and Way 2018). The performance of systems trained specifically on literary texts has been studied by Kuzman, Vintar, and Arčan (2019) and Toral, Oliver, and Ballestín (2020), among others. The former focused on the translation of excerpts of novels from English into Slovene using both Google Translate and models trained on a small parallel literary corpus; the results showed increased productivity but an overall better performance by Google, probably due to the small size of the specialised corpus. The suggestion was made that tailoring the system to a specific author rather than a diverse literary corpus may yield more adequate output. A wider study was conducted by Toral, Oliver, and Ballestín (2020), who trained two MT systems from English into Catalan on domain-specific and out-of-domain parallel and monolingual corpora amounting to millions of sentence pairs, then compared their outputs both with each other and with Google Translate. The assessment relied on both automatic evaluation metrics and human evaluation by translators, who were given a reference human translation. Although the annotators perceived human translation as superior to MT, there was an increase in the perception of equivalent quality, which proved to be higher for the system trained on domain-specific data, i.e., parallel and monolingual novels. Research continues also involving readers' perceptions (Guerberof Arenas and Toral 2020) and envisaging the automatic creation of bilingual e-books (Oliver González, Toral, and Guerberof Arenas 2019).

While taking into consideration previous studies, this essay analyses the outputs of three MT systems from the perspective of a literary translator: an excerpt from the novel *Brood* by J. Polzin (2021) is translated using Google Translate, DeepL, and Microsoft's Bing Translator, and the resulting Italian versions are assessed in terms of their usability. Therefore, different to other studies on errors (e.g. Fonteyne, Tezcan, and Macken 2020), the focus is on (1) the solutions provided to specific challenges posed by the source text's ambiguity and reliance on context or background knowledge, and (2) an assessment of the adequate parts and hence the extent of editing or rewriting needed. The following section explores the notion of creativity, its manifestations in language, and the

role of pragmatics and cognition in reading and translating. Then, the text chosen for MT is analysed in its linguistic and pragmatic aspects. Subsequently, the outputs produced by Google Translate, DeepL, and Bing Translator are discussed with particular attention to the challenges previously highlighted—cohesion, implicature, and wordplay. Finally, conclusions are drawn based on the findings.

Creativity, language, translation, and the machine

Creativity is an unstable notion. Traditionally framed as "creation" and hence as "a secularised form of the sacred" (Nelson 2015, 170), it has often been conceptualised as inspiration visiting a select few. However, as Nelson (2015) contends, views and discourses of creativity have shifted in time and in different cultures, gaining growing visibility after industrialisation and including more rational forms such as craftsmanship. Defining creativity as "the ability to come up with ideas of artefacts that are *new, surprising and valuable*" Boden (2004, 1; emphasis in original) sees it as a property everyone has, albeit to different degrees and in different fields. Hence, creativity can be combinatorial, i.e., combining known elements in previously unknown ways; exploratory, when a new idea or element emerges from a well-travelled conceptual space; and transformative, producing something that changes the conceptual space or thinking style (Boden 2004). In art and literature, the sacralised notion of creativity has been challenged by works that are examples of combinatorial creativity and posit the artist as a re-creator of meanings, as was the case with Marcel Duchamp's urinal or William Burrough's *collage*, "in which a linear text is sliced, diced, and randomly spliced together into new texts that give rise to new and unexpected meanings" (Veale 2015, 354).

Creativity in language is traditionally found in literature, journalism, and, more recently, advertising. Its distinguishing features used to be seen in terms of linguistic deviation from standard language, resulting in neologisms, double meanings, unexpected collocations, original metaphors, and sound patterns (Widdowson [1975] 2013), but data-driven research has shown that such features are present in other texts too, while many contemporary literary works do not differ much from everyday language use. Literariness, however, is considered an inherent quality of the human mind (Boase-Beier, Fawcett, and Wilson 2014) because of the latter's ability to resort to metaphors, ambiguity, and iconicity. Not too dissimilarly, Miall (2015) sees the mind as the site where literariness is co-constructed as "a product of the interaction between a literary text, characterised by stylistic or narrative features, and an attentive reader, who is led to experience empathy or absorption" (Miall 2015, 191). The literariness of a text, then, can be measured by the synergy resulting from its fictional nature, stylistic devices, and potential emotional impact on readers (Boase-Beier, Fawcett, and Wilson 2014). Literary language is vast and polyphonic—"language writ large […]

exemplifying the full range of the linguistic phenomena and capacities of a particular human language" (Tymoczko 2014, 15). Literary texts, as representations of portions of the world, or microcosms in themselves, feature language varieties characterising space and time, as well as social status, gender, age, and profession. According to Tymoczko (2014), it is precisely this openness and the coexistence of different registers, lexicons, and language varieties, as well as the presence of both marked and unmarked syntax and morphology, and direct and indirect speech acts, that makes literary texts foundational models for translation theory and practice. And while in translator training a line is usually drawn between literary and non-literary translation, Tymoczko's favouring of literary texts is supported by the fact that their representations of human experience are likely to contain languages for specific purposes too, which force translators to look at scientific, technical, or specialised comparable texts in order to become familiar with notions, terminology, and domain-specific conventions.

During the translation process, the ever-renewing form and content that characterise literary texts are negotiated in the light of the syntactic and semantic constraints of the target language and culture. Therefore, translation can be envisaged as a dynamic puzzle, one where any translational choice may have to be altered during the process in the light of the global ecology of the text in terms of cohesion, coherence, style, and desired effect. It is thus often conceptualised as problem solving, whereby finding a path between a given situation and a desired outcome involves logical thinking, imagination, and the ability to gauge the complexity and interrelatedness of the variables involved (Nitzke 2019). In translation, linguistic creativity is part of such a path, and it involves not only resorting to unusual lexical matches or structure patterns but also visualising the scene described while mentally hearing the words that might be uttered in that situation in the receiving culture, i.e., submitting the text to a dynamic process of interlingual and intercultural pragmatic recontextualisation. A series of operations and considerations are activated that go beyond the mere selection of an option among many, because each translational choice is rooted in the source text but contributes to shaping the whole of the target text, building connections and reverberations within it.

Seen in this light, MT is bound to fall short. First, it still works mainly on segments or sentences, thereby missing the very notion of text(ure)—the weaving of lexical items meant to produce narrative networks of meaning. Recent studies have focused on MT performance at document level by training the system on multisentence sequences meant to provide additional context in order to reduce lexical mismatches and reference errors (Popel 2020). Cross-sentence context was also introduced in the evaluation of MT texts for the language pair English-Czech (Popel et al. 2020): in news translation, the system tested, CUBBITT, seemed to match and even outperform professionals at the level of adequacy,

but fluency remained inferior. Second, MT works by selection, not by interpretation, and while it is likely to detect instances of intertextuality given the huge quantity of texts fed into the software, it may not be able to rework them as effectively contributing to the narrative. However, MT can offer unexpected solutions, that, if not altogether illogical or incorrect, may provide interesting matches or open new interpretive possibilities for the reader. Such matches can be considered instances of combinatorial creativity as defined by Boden (2004) so that, by analogy with the previously mentioned notion of creativity as re-creation of meanings, computer output *can* be creative, albeit arguably as the result of a happenstance selective procedure. In this study, two examples of creative language are *stufato stivato* (Bing) and *l'ultimo mozzicone di formaggio* (DeepL). Though apparently nonsensical, the former not only creates a rhyming pair that enhances the alliteration of the source "stodgy stew" but also retrieves a rare meaning of *stivare* as "fill" or "cram" that may be associated to "heavy" or "ponderous," both synonyms of "stodgy."[2] Thus, the description of a mix of straw and pellets produces an almost cartoonish effect in Italian that is not altogether misplaced in the context. The second example, referring to a piece of cheese, is unusual, since *mozzicone* typically refers to a cigarette butt, but it fits the passage, as the cheese had already been described as an old remainder, therefore somewhat unpleasant and ready to be binned. Both phrases meet the requirement for unfamiliar combinations to be considered creative, i.e., the reader's/viewer's ability to appreciate them so that, however unlikely a match is, they can still recognise or imagine a conceptual association between the items. Despite the examples just provided, a recent study (Guerberof Arenas and Toral 2020) found that out of the three versions of a short story—human translation, raw MT, and post-edited MT—the first scored the highest in terms of creativity, narrative engagement, and translation reception, while MT ranked the lowest. Post-edited MT came close to human translation, thus confirming that the human factor contributes significantly to creativity and its appreciation. On a related note, Popel et al. (2020) found that context-trained CUBBITT performed the best with texts on politics and business and the worst with art, entertainment, and sport news, i.e., fields characterised by more creative and figurative language.

Pragmatics, cognition, and literary (machine) translation

The connection between pragmatics—the study of "what people mean by their utterances rather than what the words and phrases in those utterances mean by themselves" (Yule 1996, 3)—cognition, and literary translation may not be immediately apparent, and even less so when MT comes into play. However, both pragmatics and the multidirectional interpretive processes that it studies, and cognitive science with its focus on the mind's processing of language(s), have been increasingly called on

by translation scholars. Nida and Taber's "dynamic equivalence" (1969), *Skopos* theory (Reiss and Vermeer 1984), Newmark's "communicative translation" (1981), and the Critical Discourse Analysis-informed translation studies of the 1990s (Hatim and Mason 1990; Baker 1992; among others) have shifted attention to the receptor of the target text. If we consider the translated literary text as a piece of written, prepared, interlingual, and intercultural communication, we cannot but draw into the process pragmatic features such as cooperation, inference, implicature, speech acts, and deixis, as well as more cognition-dependent aspects such as the ways in which language is used to organise and mediate the information provided by the world around us. A literary text creates a microcosm of its own, often, but not necessarily, drawing on the material world. Its translation, therefore, involves activating inferential processes and informational structures that work within the text, negotiating them with the knowledge of the real world of the source culture and then re-experiencing the knowledge and insights thus gained in the action of rewriting a target text that should activate analogous inferring and recourse to world knowledge in its reader. However, since every language provides the means to organise knowledge of the world according to personal and collective experience and needs, in interlingual translation, the same inferring processes may not be effective or even possible. This is where explicitation or adaptation may happen: in order not to deprive the target reader of an implied meaning or a situated sequence, the translator may choose to provide some additional information or set a certain image against the backdrop of a target culture framework that is perceived as functionally equivalent.

Since in human interaction, and in written texts, more is communicated than what the actual wording denotes, "translation semantics needs to be complemented by translation pragmatics" (Morini 2019, 194). Therefore, when translating a dialogue in a fictional text, a double interpretive action is required: from the surface wording to the intrinsic illocutionary force or perlocutionary effect that is meant within the situation depicted, and finally to a formulation in the target language which, even if departing from the source utterance, is culturally adequate to the context and apt to both perform the same action on the fictional participant(s) and allow the reader to perceive it.

Communication relies on two competing properties of the human mind: the ability to use language creatively and a tendency toward routinisation and standardisation. To avoid cognitive overload, participants in an interaction focus mainly on what is new, while familiar information gets processed through cognitive procedures based on routines developed by the mind (Vega Moreno 2007). In a way, this mechanism is similar to what happens with translation memories: previously translated chunks are retrieved so as to speed up the process, while real translation is reserved for the new parts. Describing the computer-assisted translation process as a "dialogue with an anthropomorphised technological

environment," Jakobsen (2017, 41) talks about a human-machine interaction that relies on distributed knowledge and cognition, resulting in "translation that is distributed or extended rather than contained within the head of a translator" (ibid.). Since cognition, however, also develops in and through the physical body and in social interactions, Jakobsen concludes that it is "embedded in bodies and environments as much as in brains" (ibid.). As machine translation is produced by a system that cannot draw on embodied and situated cognition, one may question its ability to recognise and render certain aspects of human experience.

The source text

The text selected for MT is an excerpt from *Brood*, a 2021 novel by American author Jackie Polzin. Drawing on Nord's translation-oriented text analysis (2005), and applying close reading strategies focusing on details, nuances, and the context-based interpretive processes described above, the current section highlights the main characteristics of the passage as well as the potential challenges in translation.

The 2,032-word-long passage includes two subsequent sections, loosely related in meaning and graphically separated by an asterisk, which is the symbol used throughout the book to signal interruptions in the flow of the story. The first section describes the considerations made by the protagonist (and first-person narrator) and her husband about the desirability of moving home; it ends with a short, almost decontextualised dialogue suggesting that they have gone through the various pros and cons without really making a decision. The second section, again alternating descriptive passages and short dialogues, talks about the protagonist taking one of their hens to her mother for the weekend to see how the woman would get on with it in the hope of entrusting her with the whole flock.

The register is fairly informal, as can be seen by the presence of contracted verb forms, phrasal verbs, direct address, and colloquialisms. The text shows a high degree of lexical cohesion (Halliday and Hasan 1976), mainly through repetition, lexical chains revolving around the main topics—chickens (e.g., egg, feather, gizzards, beak), food (e.g., fish, cheese, lettuce), domestic environment (e.g., kitchen, door, freezer, driveway, backyard)—and pairs related by opposition, e.g., "In the end […] in the first place," "old—new." Cohesion is also realised through reference, as in "chickens […] they" or "My mother […] her […] she"; substitution, i.e., replacements at syntactic level, as in "'If you break the egg on the counter, that won't happen.' *So* I *did* […]" (179);[3] and ellipsis, as in "'What do you think about the chickens?' 'I've tried not to.'" (173). Conjunctions are rather sparse, which results in limited explicit guidance to the reader/translator on how to connect the facts, thoughts, and dialogues forming the narrative; considering MT, this might increase post-editing because interpretation is needed in order to relate information that is not always explicit or adjacent. There are a few collocations, such as "pros and cons," "fast

lane," "test run," "outdoor run," and a few idioms such as "on second thought," "as [rich] as they come," "make a living," "at heart," but they all belong to standard English and may be translated adequately by the MT systems. Culture-specific terms are rare and well known, such as "eggs and toast," "porridge," and "backyard." Generally speaking, today there is a tendency to maintain some language items representing cultural foreignness in translated texts, even if different degrees of explicitation may be needed on the basis of the importance of the information in the passage, or even in the whole novel, and the assumed background knowledge of the target text reader. None of those found in the passage, however, require any particular intervention on the translator's part.

Sentences are often fairly short, averaging at 11.95 words per sentence; the longer ones usually rely on coordination, while subordination is rare. Thematic progression is mainly unmarked, with a few exceptions where place and time adjuncts are fronted—the former during the car trip to the protagonist's mother so as to highlight movement in space, the latter to describe the various steps in the preparation of food or to signal a change in the time setting. Slightly more marked is an exclamation reported as free indirect thought, "*What a small wasted miracle* when one egg would have done just fine" (179), and an instance of fronting with a subject/verb inversion to convey the swiftness of the action and dramatic effect: "*Into the pan went another Grade A specimen* […]" (ibid.).

From the point of view of pragmatics, the main feature is implicature (Grice 1989), the result of flouting one or more of the maxims of quantity, quality, relation, and manner. Dialogues and lines written as direct speech are presented as parts of conversations of which only glimpses are caught; they are often reported in *medias res* and do not reach a conclusion; rather, they seem to provide bridges between the narrator's thoughts and actions and the scene that is unfolding. For example, an apparently disconnected remark gives the reader insight into the narrator's mind, revealing the association prompted by the gritty salad she is eating and her mother's comments on the chicken. The conversational implicature is interpreted on the basis of the situational context and conveniently shared with the reader by way of free indirect thought. Similarly, the first dialogue appearing in the passage—its elliptical lines mimicking real-life exchanges—forces the reader/translator to refer back to the "list of pros and cons" (171) mentioned at the beginning of the paragraph in order to interpret the man's first answer and the subsequent lines, which, apart from the close, are rather elliptical and need to be read as contributing to the dialogue's *gestalt*.

> "What about regret?" I asked.
> "Put it down," Percy said.
> "Which side?"
> "Both."
> "Cost of living?"

"Prorated."
"I can't think of anything else."
"What do you want?" Percy asked.
I could not tell him what I want exactly. I want something that will not end in disappointment.
"I'm excited to spend my life with you," he said. "No matter what happens."

(171)

In Gricean terms, the first two questions and answers violate the maxims of relation, quantity, and manner, but the reader/translator will assume that every utterance is relevant and contributes to the conversation (Morini 2019). Imagining that the translator does not render each line—or the relation between them—more explicit than it is in the source text, the question remains as to whether or not the target culture is familiar with the habit of making lists of pros and cons when a decision needs to be made. In other words, the situational context can be recreated in the target text, but it is the translator's intercultural knowledge that determines whether that will work for the target reader. While interpretation is an intrinsic phase of the translation process carried out by humans, it must be acknowledged that machine-translated segments sometimes do result in speech acts that are understandable and suitable in the target language and culture if their surface realisations work in similar ways.

Humour is present in the passage, both in direct exchanges and in descriptions resorting to unusual collocations or hyperbolic phrases. Upon seeing her mother hide a piece of chicken, the narrator tries to reassure her by saying that they do eat chicken meat, but, while the mother's answer sounds like a concern that her food may not be suitable for guests, her reference to hospitality turns out to be uneasiness, since the hen is supposed to be a pet. The potentially ambiguous utterance—the punchline of the joke—works according to the General Theory of Verbal Humour (Attardo and Raskin 1991, in Chiaro 2017, 421): the exchange, which contains two different personal scripts related to the main object in an opposite way, initially follows one, but then the punchline represents a switch to the other; the sudden disclosure of the hidden script reveals the incongruity, which is one of the main sources of humour.

A passage that is likely to create translation problems, instead, is an instance of wordplay where the term "blackhead" creates a misunderstanding between the two women:

"Have the chickens ever had poultry rot?" she asked.
"I don't think so."
"What about blackhead?"
"You mean Darkness?"
"No. I mean blackhead—the disease."

(175)

Showing her newly acquired knowledge, the mother enquires about the chickens' health, referring to typical illnesses with the common names "poultry rot" (presumably gangrenous dermatitis) and "blackhead" (histomoniasis). The latter triggers a misunderstanding based on the fact that "Darkness" is the name of the hen that the narrator has taken over to her mother, who immediately said she would change it because it was too sad. This previous piece of information is crucial to justify the narrator's request for clarification in the dialogue "You mean Darkness?," as if the mother were already referring to the chicken with a less sinister—yet semantically related—name. In translation, while the name swap is easily solved, the term referring to the illness would have to include a reference to black, a challenge further compounded by the other meaning of the word "blackhead," i.e., a clogged skin pore.

Finally, as is often the case with creative texts, the main semantic field reverberates through marked lexical choices, a feature that enriches the reading experience by allowing the reader to "discover" connections. Here, one such example is the echoes found in the crowing of a chicken entering the protagonist's sleep and becoming the voice of her friend Helen, later referred to as "squawk" and "crowing," and also in "downy cheese," "birdy heart," "made a nest of her hand." Ideally, the same ricocheting should be reproduced in translation, finding creative solutions if the direct translatant does not work.

The outputs

Translation quality assessment is a debated issue that, despite the development of metrics for MT, relies on human perception (O'Brien 2017). As far as literary texts are concerned, the problem is amplified because the degree of linguistic or situational unpredictability is compounded by the creativity and intertextual knowledge needed and by the reader's expected enjoyment. In assessing the Italian versions by Google Translate (TT_1), DeepL (TT_2), and Bing Translator (TT_3),[4] I am neither formulating a typology of errors nor am I strictly applying the criteria of adequacy and fluency (Koehn 2010, in O'Brien 2017) or accuracy and fluency (Fonteyne, Tezcan, and Macken 2020). Rather, I am focusing on previously highlighted aspects that rely on context for disambiguation and idiomaticity, and on suitably translated segments. Subjectivity, which is always a feature of evaluation, is, in this case, at its maximum, but, as a practising literary translator, I will consider the degree of usability of these TTs. An initial comparison of the source text and its Italian versions takes into consideration some quantitative information obtained by feeding the texts into Sketch Engine[5] and Voyant Tools.[6] Table 6.1 summarises data regarding text length and lexical variety.

In terms of word count, the Italian versions are slightly longer than the source text, which was expected, since Italian often inserts prepositions to render pre- or post-modification, uses articles where English does not,

Table 6.1 Text length and most frequent lexical items in the ST and its Italian versions

Text	*Word count*	*Type/ Token ratio*	*Average sentence length*	*No. of sentences*	*First 12 most frequent words + no. of occurrences [English translation]*
Source text	2,032 (type: 783)	0.385	11.95	170	chicken* (25) mother (22) think* (20) darkness (17) egg* (14) say* (11) feather* (9) mak* (7) meal (7) Percy (6) plastic (6) when (5)
TT_1: Google	2,051 (type: 857)	0.418	12.06	170	madre (22) [mother] poll* (21) [chicken*] pens* (19) [think*] uov* (15) [egg*] dire* (12) [say*] far* (11) [make/do] oscurità (10) [darkness] pium* (8) [feather*] casa (7) [house/home] cielo (7) [sky] mentre (7) [while/as/whereas] quando (7) [when]
TT_2: DeepL	2,036 (type: 864)	0.424	11.84	172[a]	madre (22) poll* (20) pens* (19) uov* (15) far* (12) tenebra (11) [darkness] pium* (10) casa (8) mentre (7) Percy (7) quando (7) plastica (6) [plastic]
TT_3: Bing	2,043 (type: 841)	0.412	12.16	168	poll* (26) madre (22) pens* (19) uov* (14) far* (12) darkness (11) pium* (10) casa (8) Percy (7) quando (7) plastica (6) mentre (6)

a The slight differences in sentence count are due to the wrong break after the word "vs." (DeepL), the omission of the translation of "she asked" after a question, and a missing break after a "No" (Bing).

and cannot omit object pronouns in relative clauses. Generally speaking, however, in translating from English into Italian, the total word count is partly counterbalanced by two typical properties of fusional languages, i.e., the possibility of omitting subject pronouns, as they are identified through inflected verb forms, and the incorporation of object pronouns at the end of verbs. The slightly longer sentences in two of the TTs are probably due to lexico-syntactic characteristics such as those mentioned.

All TTs contain 6 or 7 occurrences of the conjunctions *mentre* and *quando* (in English, "while/whereas/as" and "when," respectively), which in the ST rank lower. While translators may choose to join sentences through subordination to render them more fluent according to Italian conventions, in this case *mentre* and *quando* are also used to render "since," "by the time," and "on our way."

As for content words, the wildcard "*" was used in the search to include any inflectional morpheme that may have been added to the base, or irregular verb forms when applicable. The translated texts show a higher lexical variety, resulting in 857, 864, and 841 word types respectively against 783 in the source text. In human translation, this may happen because Italian writing conventions discourage repetition (which is nonetheless accepted in literary translation if it is a feature of the ST); here, it derives from inconsistent lexical choices in different segments. Looking at the first word in the lists, it can be noticed that "chicken*" and its Italian translatant *poll** appear 26 times in both the ST and TT_3, while in TT_1 and TT_2 the figures are lower. Checking the latter texts, one sees that the near-synonym *gallin** ("hen*") has also been used, which is actually a much better choice when referring to egg-laying fowls because it is feminine and mainly denotes the animal, while *pollo* refers to meat too. Substantial differences concern the verb *far** ("mak*/do*"), which in the TTs almost doubles since it is also used to substitute for other verbs (e.g., "lay eggs"/*fare le uova*, "so I did" [break]/*così ho fatto*, "I've tried not to" [think]/*Ho cercato di non farlo*); *casa*, which as an equivalent for both "house" and "home" ranks high in the TTs but is not among the first twelve words in the ST; *cielo*, which translates as "sky" (five occurrences in the ST) appears seven times in TT_1 because it is used as an exclamation to render "Oh dear." The translatants of "meal" rank lower in the TTs lists because its meanings—"ground grains" and "food eaten in one sitting"—require two separate terms in Italian. The most striking difference concerns the word "Darkness," the chicken's name, which in the TTs alternates between the English term and three different translations (*oscurità*, *tenebra*, *buio*), thereby generating a number of errors at the level of sentence meaning.

Reference will now be made to the analysis carried out in the previous section, which highlighted the main features of the ST with reference to interpretation. The first aspect mentioned was register, which, overall, remains fairly informal in the three TTs, both in dialogues and descriptive passages. The only relevant difference is found in the first paragraph

of TT_1, where a few lexical items are slightly more elevated versions of the standard translatants appearing in TT_2 and TT_3: *stilare un elenco* as against *fare una lista* for "make a list," *trasferirci* as against *andare a vivere* for "taking up elsewhere," and *in primo luogo*, a calque of "in the first place," which, in an informal narrative, would usually be rendered as *all'inizio*.

The three TTs show different degrees of cohesion, which, as a surface property, is largely reproduced by interlingual equivalents. Repetitions are frequent, although less so than in the ST as Table 6.1 showed, because some words were translated inconsistently throughout the text. Similarly, the lexical chains revolving around chickens, food, and the domestic environment are traceable throughout the TTs, and pairs related by opposition ("in the end—in the first place," "old—new") show the same relation in Italian. More problematic, instead, are the cohesive devices of reference, substitution, and ellipsis, which rely on interpretive processes. Some examples are shown in Table 6.2, with the relevant items in bold and errors underlined.

In the first example, the feminine plural pronoun that should replace "hands" is in the masculine, a mistake that disturbs reading but does not hinder comprehension and is easily edited, whereas the greater complexity of a double pronoun in the second example results in almost

Table 6.2 Instances of reference, ellipsis, and substitution in the ST and in the TTs

Source text	*TT_1*	*TT_2*	*TT_3*
Reference			
[…] my outstretched hands filled with feathers. I pulled **them** close. (173)	[…] le mie mani tese si riempirono di piume. **Li** ho **avvicinati**.	[…] le mie mani tese si riempirono di piume. **Le avvicinai.**	[…] le mie mani tese piene di piume. **Li** ho **avvicinati**.
[…] she cradled **it** to **her.** (179)	[…] **glielo cullò**.	[…] **lo cullò** a sé.	[…] **a lei la culla a lei**.
Ellipsis			
"What do you think about the chickens?" "**I've tried not to,**" she had said. (173)	"Cosa ne pensate dei polli?" "**Ho cercato di non farlo,**" aveva detto.	"Cosa ne pensi dei polli?" "**Ho cercato di non farlo,**" aveva detto lei.	"Cosa ne pensi dei polli?" "**Ho cercato di non doverti fare,**" aveva detto.
Substitution			
"If you break the egg on the counter, that won't happen." **So I did,** […] (179)	"Se rompi l'uovo sul bancone, non succederà." **Così ho fatto,** […]	"Se rompi l'uovo sul bancone, non succederà." **Così lo feci,** […]	"Se rompi l'uovo sul bancone, ciò non accadrà." **Così ho fatto,** […]

incomprehensible translations, which in TT_1 and TT_3 are also syntactically wrong; all three, however, need to be reformulated because the verb used denotes a physical movement that is not suitable in the context. Ellipsis and substitution, which involve syntax, may require different devices when working between languages. In the dialogue above, the elliptical sentence in the ST has to be rendered through substitution in Italian by replacing the Ø verb with *fare* ("make/do"), which, especially in informal language, can replace any previously mentioned action. In TT_3, however, *doverti* ("must you") is added, thus resulting in a meaningless sentence. As for the last example, all the translations are grammatically correct, but TT_2, besides the inconsistency in verb tense, changes the meaning of the sentence: by adding the particle *lo*, the focus is no longer on how to break the egg but on the whole action, as if the speaker had initially not wanted to break any egg but was persuaded by her mother's advice and (reluctantly) did so.

The few culture-specific terms were mainly translated adequately or left in English, such as "porridge," while collocations proved less successful due to literal translations or unsuitable contexts. Table 6.3

Table 6.3 Collocations and idioms

Source text	*TT_1*	*TT_2*	*TT_3*
[…] made a list of the **pros and cons** […] For every **pro**, there is an **equal and opposing con**. (171)	[…] abbiamo stilato un elenco **dei pro e dei contro.** […] Per ogni **professionista** c'è **una contro uguale e opposta** e viceversa.	[…] abbiamo fatto una lista **dei pro e dei contro.** […] Per ogni **pro**, c'è un **contro uguale e contrario** e viceversa.	[…] abbiamo fatto una lista **dei pro e dei contro**. […] Per ogni **professionista** c'è un **con** e viceversa **uguale e opposto.**
I opened the **top flap** of the **outdoor run**. (173)	Ho aperto il **lembo superiore** della **corsa all'aperto**.	Aprii lo sportello **superiore** del recinto esterno.	Ho aperto **il lembo superiore** della **corsa all'aperto**.
Economists **make a living** by transcribing […] (171)	Gli economisti **si guadagnano da vivere** trascrivendo […]	Gli economisti **si guadagnano da vivere** trascrivendo […]	Gli economisti **si prendono da vivere** trascrivendo […]
Percy loves dichotomy, and this one in particular […] is **as rich as they come.** (176)	Percy ama la dicotomia, e questa in particolare […] **è ricca come vengon**o.	Percy ama le dicotomie, e questa in particolare […] **è ricca come lo sono.**	Percy ama la dicotomia, e questa in particolare […] **è ricca come vengono.**

shows some collocations and idioms, with relevant items in bold and errors underlined.

While the pair "pros and cons" was correct in all the TTs, the subsequent disjointed occurrence was only recognised by DeepL; in TT_1 and TT_3, "pro" becomes "a professional" and "con" in TT_3 is left untranslated, so, in both cases, meaning is lost and the sentence needs fully rewriting also due to the imperfect rendering of the adjective pair referring to Newton's third law, *uguale e contrario*. "Outdoor run" in the context of farming denotes a netted area where chickens can safely graze: TT_2 is correct but for *superiore*, which conjures an image of two vertical doors, one over the other, while they are at the two ends of the enclosure; in the other two TTs, the enclosure was rendered as a "jog in the open air" which has a "top tag end," resulting in total nonsense. In the third example, only TT_3 fails: the sentence is probably understandable, but the collocation needs to be corrected. The closing idiom of the last example, instead, does not have a frozen equivalent and needs to be adjusted to the context. The literal or quasi-literal translations in all the TTs are meaningless and deprive the sentence of its conclusion: to a lover of dichotomy, chicken as pet versus chicken as food would serve as *un caso da manuale* ("a textbook example").

The marked themes discussed earlier are rendered literally in all the TTs (Table 6.4). The sentences are correct except for the end of the second one in TT_3, which is a mistranslation. However, fronting and subject-verb inversion in Italian are standard, so the markedness of the ST is lost. To convey such dynamism, in the former a human translator might begin the sentence with an additional *e voilà* ("and *voilà*") or change *andò* ("went") into *finì* ("ended up"). The latter should be reformulated in order to reproduce the exclamative phrase: *Che spreco quel piccolo miracolo! Uno sarebbe andato benissimo*. ("What a waste that small miracle! One would have done just fine."). Also, replacing *un uovo* with the pronoun *uno* ("one") would at the same time enhance naturalness and imply "not more than one."

Table 6.4 Marked themes

Source text	*TT_1*	*TT_2*	*TT_3*
Into the pan went another Grade A specimen […] (179)	**Nella padella è andato** un altro esemplare di grado A […]	**Nella padella è andato** un altro esemplare di grado A […]	**Nella padella è andato** un altro esemplare di grado A […]
What a small wasted miracle when one egg would have done just fine. (179)	**Che piccolo miracolo sprecato** quando un uovo sarebbe andato bene.	**Che piccolo miracolo sprecato** quando un solo uovo sarebbe andato benissimo.	**Che piccolo miracolo sprecato** quando un uovo avrebbe fatto bene.

Table 6.5 Implicatures in dialogue

Source text	*TT$_1$*	*TT$_2$*	*TT$_3$*
"What about regret?" I asked.	"E il rimpianto?" Ho chiesto.	"E il rimpianto?" Chiesi.	"E il rimpianto?" Ho chiesto.
"**Put it down**," Percy said.	"**Mettilo giù,**" disse Percy.	"**Mettilo giù**," disse Percy.	"**Mettilo giù**," disse Percy.
"**Which side?**"	"**Quale lato?**"	"**Da che parte?**"	"**Da che parte?**"
"Both."	"Entrambi."	"Entrambi."	"Entrambi."
"Cost of living?"	"Costo della vita?"	"Costo della vita?"	"Costo della vita?"
"**Prorated.**"	"**Proporizzato**."	"**In proporzione.**"	"**Proporzionale.**"
"**I can't think of anything else.**" (171)	"**Non riesco a pensare a nient'altro**."	"**Non riesco a pensare ad altro**."	"**Non riesco a pensare a nient'altro**."

The main implicatures have not resulted in major sense loss, apart from the first dialogue, as shown in Table 6.5, with relevant items in bold and errors underlined.

Here, context is necessary to situate the exchange and provide implied information to guide the interpretive process. The dialogue follows the reference to a list of pros and cons of moving home and related reflections. So, "put it down" means "write it," but in all the TTs it is rendered literally, which immediately loses the reference to the list. "Which side?" also refers to the columns in the list, but the words in the TTs—*lato* and *parte*, which are correct per se—do not collocate with "list." "Prorated" is translated with an invented word in TT_1 and literally in TT_2 and TT_3, which would work if the previous section had been adequately rendered. The closing line is translated literally in all the TTs, resulting in two correct and idiomatic versions of the same sentence. However, this translation unexpectedly has the woman in distress because her utterance in Italian is a functional equivalent of "The thought is haunting me." In order to convey the intended meaning, "think" needs to be read as "come to mind" or "occur" (*non mi viene in mente altro)*. This mistake could be overlooked, as the outputs read well and seem to make sense (although an attentive reader would wonder about the change in her mood), but the meaning thus rendered foreshadows worry or fear and triggers different expectations.

As expected, since the humorous exchange about hiding chicken meat out of sight of the guest hen was semantically transparent, it works in translation too. However, the opening line should have reproduced what one would actually say in such a situation. "We eat chicken" (176) is correctly rendered as *Mangiamo pollo* (TT_1 and TT_3) and *Noi mangiamo il pollo* (TT_2), but what is missing is the situatedness of the utterance, the intonation and/or the information flow that the narrator would use to assuage her mother's concern. An

Table 6.6 Wordplay in dialogue

Source text	*TT_1*	*TT_2*	*TT_3*
"Have the chickens ever had **poultry rot**?" she asked. "I don't think so." "**What about blackhead?**" "You mean **Darkness**?" "No. I mean **blackhead**—the disease." (175)	"I polli hanno mai avuto **la putrefazione del pollame**?" lei chiese. "Non credo." "**E i punti neri?**" "Intendi **l'oscurità**?" "No. Intendo **punto nero**, la malattia."	"I polli hanno mai avuto **il pollame marcio?**" chiese. "Non credo." "**E la testa nera?**" "Vuoi dire **la tenebra**?" "No. Intendo il **comedone**, la malattia."	"I polli hanno mai avuto **marciume di pollame?"** "Non credo proprio." "**Che dire blackhead?**" "Vuoi dire **Oscurità**?" "No, intendo **blackhead**, la malattia."

emphatic form such as *Noi il pollo lo mangiamo* would imply "Don't worry. If *we* do, it's ok."

The wordplay on the misunderstanding about chicken diseases and the hen's name, Darkness, generated nonsensical dialogues, as shown in Table 6.6.

Although all the translatants for "poultry rot" suggest a disease, they do not work, first because *pollame* only refers to birds raised to be eaten, and second because the noun phrases so generated cannot be the object of the predicator "have." The second disease mentioned, "blackhead," yields three different solutions, of which TT_2 (back-translated: "What about black head?") plausibly prompts the subsequent request for clarification, which fails, however, because the chicken's name is then translated as a noun. In TT_1 and TT_2, the answers shift "blackhead" to the common meaning of the word, i.e., a clogged pore, thus producing nonsense. A human translator might render "Darkness" from the very beginning as a meaningful yet acceptable name, e.g., *Nerina* (approximately "Little Black Darling"), so that explicitation could be successfully used in this dialogue, e.g., *Intendo la malattia che gli fa venire la testa nera* (back-translated: "I mean the illness that turns their heads black").

A rough overall assessment of the outputs' usability is shown in Table 6.7.

Table 6.7 Outputs' usability

	TT_1 (170 segments)	*TT_2 (172 segments)*	*TT_3 (168 segments)*
Usable segments	51	68	37
Limited editing required (1–2 items)	56	58	59
Full rewriting required	63	46	72

Two important types of errors have been deliberately ignored: tense consistency (all the TTs showed repeated shifts among different past tenses), which needs to be homogenised at document level, and the overlaps created by the name "Darkness." Having restored accuracy and fluency, the human translator will still need to homogenise the full text and probably move sentence constituents to reproduce intonation patterns, clarify meaning, or reproduce the information flow.

Conclusions

The fast, routinary, chunk-based text processing of machine translation has traditionally been considered ill-suited to the slow, conscious, all-round problem-solving approach that characterises literary translation. Recent developments in neural networks and deep learning, however, are improving outputs to the degree that literary texts are no longer considered impossible, even if some critical aspects remain unsolved. The present piece of research, limited as it may be, brings together a linguistic analysis of TTs and an evaluation of their usability from the point of view of a literary translator. Taking for granted that the MT output of literary texts cannot be used immediately, the decisive question is the degree of post-editing and rewriting required. The examples in the previous section discuss a few chosen points related to cohesion, context-dependent interpretation, and fluency. Most of them show shortcomings that require intervention, mainly in terms of correcting errors and reformulating sentences to adapt them to the situation described; sometimes a subtler analysis is needed, especially with dialogue lines mimicking situated exchanges in real life: seemingly correct, they may end up meaning something incongruous within the context. On a positive note, about one third of the segments are usable, some short ones successfully reproduce orality, and several lexical equivalents match both meaning and register. Comparing the three TTs, DeepL contains the fewest errors and provides interesting solutions, while Bing has the most mistakes at all levels—lexis, meaning, and syntax; Bing is also the only version that contains untranslated and invented words (11 and 5 respectively). The TTs were also submitted to 12 MA students with the request to rank them. Eleven indicated DeepL as the best version, while opinions were mixed regarding the other two, with a slight preference for Google.

From a professional point of view, literary MT is fascinating for its potentially creative suggestions, but I doubt it can increase productivity. In the sample from *Brood*, the post-editing would concern both gender and number, but, more importantly, cohesive reference, substitution, and lexical cohesion, as well as joining, restructuring, or reformulating sentences and readjusting lexical balances. Moreover, the search for what I termed reverberations—one of the traits of literariness—would be

extremely time consuming because the lack of a progressive co-creation of meaning prompts the translator to repeatedly scan the text looking for intratextual links to key words and themes. Similarly, Taivalkoski-Shilov (2018) underlines the inseparability of form and content in literary texts and warns against the compromised quality of parcelised post-editing. While it is always difficult to change single items without compromising the overall balance, reworking the MT output can generate a tension between the translator's "voice" and the software's (Kenny and Winters 2020), resulting in an uneven style. The examples shown in Tables 6.3, 6.4, and 6.5 require what Bayer-Hohenwarter (2011) defines as "translational flexibility," i.e., "the ability to depart from conventional modes of thinking and […] from the linguistic structure of the source text" (2011, 669), but, at present, MT does not seem to be equipped with it.

Systems specifically trained on literary texts are suggested as ways to improve output (Kuzman, Vintar, and Arčan 2019; Toral, Oliver, and Ballestín 2020), but literature feeds on life, and literariness is co-constructed with the reader, who will experience different triggers depending on their sensitivity, knowledge, and experience. Moreover, literary translators love the challenges that each text affords and use them as benchmarks for creativity. Training a system on a certain author would probably yield translations closer to their idiolect, but this, in turn, risks curtailing expressive possibilities, as strings from pre-edited versions are likely to surface in the new TT. An undesirable consequence might be that the language of internationally acclaimed authors could progressively fossilise if translations were carried out by recycling their language through specially trained MT systems. While the process may work fairly well with highly codified genres such as hardboiled fiction, or Harlequin romance, it would also deepen the gap between "high" and "low" literature. Once established, the system could be economically profitable for publishers but culturally and ethically questionable for readers, who would be exposed to increasingly stereotyped language, and for translators, whose work and fees would be further jeopardised (Taivalkoski-Shilov 2018).

A less ambitious but useful application of raw literary output is in translator training and foreign language teaching, where translation is regaining popularity: depending on students' competence, MT texts could be used to enhance post-editing and language skills, or even promote literary appreciation.

Further research is needed to improve the output and gauge its effectiveness in the publishing industry; at the same time, however, and on a much larger scale, it may be worth reflecting on the long-term consequences of delegating something so eminently human as creative texts to systems that, through their constant learning, are now increasingly prompting ethical questions.

Notes

1 www.theguardian.com/commentisfree/2020/sep/08/robot-wrote-this-article-gpt-3
2 *Merriam-Webster's Dictionary and Thesaurus*, www.merriam-webster.com/dictionary/stodgy#synonyms
3 As all the examples in this paragraph refer to Polzin's novel *Brood*, only the page number will be indicated. All italics in the examples are mine.
4 The choice fell on deep-learning-based systems that are free, widely used and resourced; non-specialised training of data was considered a suitable characteristic given the open gamut of themes and language in fiction. Translated versions produced in March 2021.
5 www.sketchengine.eu
6 https://voyant-tools.org

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7 The "Oxen of the Sun" hypertext

A digital hypertext in the study of polyphonic translations of James Joyce's *Ulysses*

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Introduction

One might say that James Joyce's *Ulysses* (1922), a pivotal work of English-language modernism, is a text that was found in translation. On the one hand, if translation is viewed as a form of transformative textual practice (Robinson 2017, 441), of adaptation (Hu 2003, 283), or reported speech (Taivalkoski-Shilov 2010, 2; Mossop 1998, 239), one might view *Ulysses* itself as an extremely free and creative translation not only of Homer's *Odyssey* but of the European literary tradition, from Dante and Thomas Aquinas to Édouard Dujardin, and of the English prose style from the Old English prose of Ælfric to the Victorian Modern English writers who perhaps influenced Joyce the most: John Henry Newman and John Ruskin.

On the other hand, the full meaning and form of *Ulysses* was discovered, and is being discovered, only through the creative, critical, and hermeneutic process of (re)translation. The first readers of the 1922 Shakespeare and Company *Ulysses* read the book as an uncontrolled outpouring of the romantic imagination (Gilbert 1955, ix). Only through the first French translation process of Auguste Morel and Valery Larbaud, assisted by Stuart Gilbert and Joyce himself, was the readership made aware of the very special construction of the book, and this changed the way in which it was read (cf. Mihálycsa and Wawrzycka 2020, 9; Rodriguez 2013, 132–133). In the conversations that Joyce had with Stuart Gilbert during the translation process, on the basis of which Gilbert wrote the first major study of the book, *James Joyce's "Ulysses"*, Joyce made Gilbert and the French translation team aware of the "Homeric correspondences" of the book, which were then reported in the Gilbert (1955, 30) "schema".[1] This schema is now a standard element in new editions of the book and its translations. In fact, it is almost impossible for any subsequent translator or reader not to take those subtextual and paratextual links to Homer, the travels of Odysseus, and, more specifically, Victor Bérard's *Les Phéniciens et l'Odyssée* (Gilbert 1955, vii) into account. In a sense, we are still in the same multilingual hermeneutic process begun by Morel

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and others in 1929, or even by the very first *Ulysses* translation into German by Georg Goyert in 1927.

A third relationship *Ulysses* has with translation is that each new (re)translation of the book is met with questions of whether the book can be translated at all (e.g., Senn 1984, 1). The explicit way in which Joyce rewrites earlier European works, writers, and text styles, the stylistic variety and heterology, and, in some episodes, the erosion of syntax and denotative meaning to the acoustic, musical, intermedial play of signifiers, rhythms, and sounds makes each translation process of the book an explicit hermeneutic interpretation, and a literary event. Yet this supposedly impossible task has been fulfilled many times, as the book has been translated into over thirty languages, many of them having two or more retranslations. In fact, the book has been so extensively translated that, in his survey of all Joyce translations up to 2000, Patrick O'Neill (2005, 10) described it as a *polyglot macrotext*.

In my doctoral thesis (Niskanen 2021) on the Finnish and Swedish (re)translations of *Ulysses*, in particular its intertextual material—the pastiches, parodies, and musicalised passages—I set out to discover how the thoroughgoing intertextual, dialogic nature of Joyce's text has been re-created in the polyphony of the four translations studied. In order to study the translations of the "stylistic pastiches" of the "compilation pastiche" (see Nyqvist 2010, 124–127) episode "Oxen of the Sun", in which Joyce imitates the "embryonic development" (Gilbert 1955, 30) of English prose style, I developed a method to isolate those textual elements that cause the reader of the source text to abandon the regular mode of reading and search for an alternative, intertextual reading of the text (Niskanen 2021, 225). In order to compare whether those elements were reproduced in the target texts, I applied Margaret A. Rose's notion of *signals of parody* (Niskanen 2021, 96). According to Rose (1993, 41), the "reception of the parody by its external reader will depend upon the latter's reading of the 'signals' given in the parody text which relate to or indicate the relationship between the parody and the parodied text". I follow Sanna Nyqvist (2010, 190) in understanding pastiche as a complicated, transformative, and ambivalent imitative practice that exists on the same intertextual spectrum with parody; therefore, in my view, the signals of parody can be applied to the study of pastiches in the "Oxen of the Sun", and those signals fulfil what Gérard Genette (1997, 86) calls a *pastiche contract* between the writer and the audience: "[T]his is a text where x imitates y".

The research method was developed on a digital platform, which works as a companion for the analysis chapter on the translations of the "Oxen of the Sun" episode. In the *Oxen of the Sun hypertext* (OSH),[2] the text of chapter 14 of *Ulysses* is divided into 30 major pastiche passages. In the text, there are tags that operate as links. The links lead to the texts being imitated in the passage. There are larger excerpts that operate as links to the Finnish and Swedish translations of the passages. These open

up to pages with four translations of the respective excerpts, two Swedish and two Finnish, and back-translations into English. On the translations page, there are tags corresponding to the original passage, allowing for a comparison of whether the allusions have been rendered in the new language for the target text audience.

In this chapter, I explore the research questions that can be addressed with the hypertext and the new methodologies made possible by the tool, and, ultimately, I test the hypertext with two analyses conducted with the tool. Based on the analysis, it seems that the method on which the OSH is based is advantageous in explicating the presence of an imitated *hypotext*, which shows through as a *palimpsest* under the surface of an imitative *hypertext* (Genette 1997, 399). In this chapter, I explore two examples from the "Oxen of the Sun" episode and the types of textual relations that can be detected by the digital OSH method, as well as how these creative-text ST relations can be compared to those in the TTs.

Neither a borrower, nor a lender be: The borrowed styles of the "Oxen"

On a macro level, James Joyce's *Ulysses* is a re-writing and re-telling of Homer's *Odyssey*, in which the role of Odysseus is played by the Jewish-Irish ad canvasser Leopold Bloom, the long-suffering wife Penelope is the local opera star Marion Bloom, and Telemachus, son of the wandering hero, is Stephen Dedalus, the portrait of James Joyce as a young man. On a micro level, the book is a veritable encyclopaedia of imitated text types and styles from *Lady's Pictorial* and *A Woman's Temptation* to advertisements and promotional leaflets of the time, from popular literature to Shakespeare and Dante. However, some episodes in the book, which changes its "technic" of narration in each of the 18 episodes, are more explicitly intertextual. Episode 13, "Nausicaa", is divided between the focalised consciousness of Leopold Bloom and the inner monologue of Gerty MacDowell, which appears to be a mosaic of quotations, a composite of romance fiction and fashion magazines. In episode 12, "Cyclops", the main narration of the episode at the tavern is interrupted approximately thirty times by interpolations of different textual styles, such as legal documents, medieval romances, or Theosophist séances, etc. In episode 14, the "Oxen", Joyce narrates the simple story of Mr Bloom arriving at the maternity hospital to enquire after the labour of Mrs Purefoy, partaking in the drunken discussion of the medical students there, meeting young Stephen Dedalus, and leaving with them after the child's birth to Burke's public house, using the technic of historically successive prose styles, or, as Joyce called it, "embryonic development". Joyce commented to Harriet Shaw Weaver that the episode comprised "nine circles of development (enclosed within the headpiece and tailpiece of opposite chaos)" (Joyce 1966, 16).

It has been argued that Joyce manages an "intertextual economy" in the "Oxen" episode (Osteen 2004, 125). At closer scrutiny, Joyce's episode shows explicitly the usually implicit fact that each utterance in a language has been borrowed from previous users, but, at the same time, he is able to capitalise on that borrowed capital. The translators of the episode can also be seen to be working on this economy of borrowing and repaying. Osteen (2004, 127) goes on to discern two readings of "Oxen": One is a reading of Derridean iterability, where the episode "deconstructs the difference between borrowing and originality by making the latter a function of the citationality of the text", and the other reading is that of Riffaterre's "legitimate" intertextuality, whereby Joyce invites his readers to track down his specific intertextual sources. Joyce's "anthology" of pastiches does not explicitly name its models but fulfils the pastiche contract by more covert textual markers: The individual stylistic imitations can and have been linked to the "originals" by slightly scratching the surface of the text. However, the "originality" of the episode seems to lie in the collage of the individual imitations, the compilation pastiche.

Ronan Crowley has discussed what Dirk Van Hulle (2009, 83–114) called "Joyce's virtual library". Joyce lived his adult life first as a voluntary exile and then as an exile by necessity of two world wars, and he was therefore unable to maintain, or leave behind for researchers, a complete physical library. When he left Trieste with his family in 1920, he had to leave behind a library of several hundred volumes. When the Joyces left Paris in the winter of 1939, Joyce's library was packed up and "put in safekeeping" (Crowley 2020, 107). It is left for researchers to restack Joyce's virtual library, those books we know he at least perused from evidence in his own writing, his correspondence, and by the Shakespeare and Company lending library slips: "This is a vast, sprawling conglomeration of print matter brought into speculative apposition by critics on the basis of information in Joyce's correspondence, oeuvre, or prepublication dossiers" (Crowley 2020, 109). What makes the virtual library ambivalent, of course, is whether a book passed across the author's table, whether it was perused, whether a passage was copied in a notebook for future reference or material, or whether it was thoroughly read.

This is also the case with the pastiches, the stylistic imitations that make up the "Oxen" episode. Some imitations, such as the one of Daniel Defoe (U 326.529–326.565) or Jonathan Swift (U 326.565–328.651), are based on a thorough and appreciative reading of the imitated authors and texts. Some, such as the Elizabethan prose chronicles passage (U 320.277–321.333) or the Reynolds, Johnson, South, Hume compilation pastiche (U 333.845–334.904), rely heavily on quotations Joyce wrote down in his notebooks from two anthologies: George Saintsbury's *A History of English Prose Rhythm* (1912) and William Peacock's *English Prose from Mandeville to Ruskin* (1903). Robert Janusko (1983, 47–52) has argued that Joyce worked on nine notebooks, each one representing one month of gestation, in accordance with his technic of embryonic development.

Through genetic analysis of Joyce's sources, Janusko separates different imitations, which he calls parodies, and correlates them in a "working outline" (Janusko 1983, 79–82) to narrative events and the development of the human embryo. The beginning of the episode, the headpiece, takes place before the conception of English prose style, and therefore before specifically identifiable stylistic imitation. The stylistic pastiches-proper begin with the earliest Old English alliterative and monosyllabic prose, and the tailpiece or the "afterbirth" is a miscellany of not written prose but forms of spoken language. Through cues in Janusko (1983), Gifford and Seidman (1988), Johnson (1998), and others, I built a reference network of the OSH to the Peacock and Saintsbury anthologies and other hypotexts of Joyce's virtual library.

Pastiche, dialogue, and translation: Imitating an imitation

By using the OSH, I am able to analyse and discuss how the connections between Joyce's "Oxen" and its hypotexts are re-created in the literary horizons of the Finnish and Swedish (re)translations, how Joyce's imitations are imitated, and how the pastiches are rendered in a new context. There are two traditions of understanding "pastiche". In one, pastiche is understood as an eclectic collage or montage of different influences, reflecting the Italian origin of the word as a culinary term, *pasticcio*, referring to a pastry composed of mixed ingredients. Richard Dyer (2007, 53) has considered the compilation sense of pastiche and suggested naming it *pasticcio pastiche*.

For Dyer, a *pasticcio* is a work put together of elements taken from elsewhere, and this putting together involves the quotation and imitation element of pastiche. This combination involves creativity and invention—in essence, criticism. In artistic *pasticcio*, the "central notion is that the elements that make up a pasticcio are held to be different, by virtue of genre, authorship, period, mode, or whatever and that they do not normally or perhaps even readily go together" (Dyer 2007, 10). The ingredients of the pie are mixed, but not melded, together.

Sanna Nyqvist calls this *pasticcio* tradition of pastiche a "compilation pastiche". The other tradition, which stems from French art criticism at the turn of the seventeenth and eighteenth centuries and was applied to literature, Nyqvist (2010, 124) proposes to call "stylistic pastiche": "the acknowledged imitation of the individual style of another writer". In this tradition, pastiche is understood as a text that another writer could have, but did not, write. The "Oxen" episode of *Ulysses* could be seen as a compilation pastiche composed of chronologically successive stylistic pastiches. Translation of the episode can either highlight the ambivalently evolving sense of a compilation pastiche or focus on the individual stylistic pastiches. In other words, different hermeneutic translatory processes can re-create the ST as an instance of Derridean iterability or "return" the styles to their "rightful owners" as an example of Riffaterre's "legitimate"

intertextuality. The translator may concentrate on the single, melded voice of the narration or pick out the ingredients and isolate the voices from the choir.

My *polyphonic* view of translation mixes the *dialogism* of Mikhail Bakhtin with the *productive translation criticism* of Antoine Berman. Kris Peeters and Guillermo Sanz Gallego have also studied the many voices—the heterology of the "Oxen"—by testing the *retranslation hypothesis* inspired by the thinking of Antoine Berman and put forth by Chesterman (2017, 132) on the Dutch and Spanish retranslations, and re-retranslations, of the "Oxen of the Sun" episode of *Ulysses*. They focus on the (re)translator's creativity and "on the various ways in which the (re)translator's voice may alter the author's voice and, ultimately, the target reader's experience" (Peeters and Sanz Gallego 2020, 222). They have looked at cases of explicitation, simplification, dialectical forms of discourse, and linguistic hybridity. On the basis of Bakhtin's (1984, 226) notion of dialogical or double-voiced narration (when the text shows traces of the other's voice: *Skaz*-narration, parodic stylisation, or pastiche), Peeters and Sanz Gallego (2020, 227) offer a reformulation of the retranslation hypothesis: "Whereas first or early translations are likely to explicitate and conventionalize and are, therefore, monological […], retranslations are likely not to explicitate meaning or conventionalise language".

In other words, first translations are not simply target oriented, bringing the literary work over to the target culture, and retranslations are not monologically source oriented, taking the TT reader over to visit the culture and aesthetics of the ST. Rather, retranslations are, in Peeters and Sanz Gallego's (2020, 226–8) view, a dialogic double, showing both the translator's creative voice and the polyphonic intertextual material of the ST, whereas the first translations in their research material tended to reduce the heterology of the ST by replacing it with more conventionalised literary language customary to the target literary horizon.

Whereas Peeters and Sanz Gallego's reformulation of the retranslation hypothesis adds utility to the hypothesis, which has historically been found to have limited explanatory power (cf. Paloposki and Koskinen 2010, 34), the problem of the reduction of Antoine Berman's method of productive translation criticism to a normative hypothesis remains. As Berman's thinking is interpreted according to the hypothesis, *ethnocentric* first translations ease the passage of the work into the new language and cultural context, and retranslations make it more foreign and faithful again. But in Berman's thinking, the relationship (*l'épreuve*) of especially retranslation to the foreign (*l'étranger)* is far more complex. Berman (2009, 67) sees first translations and retranslations as a continuous, self-correcting process. Translation is a form of critical reading and productive rereading; thus, retranslations are needed to complete the cycle of bringing an author to a new language and culture (Berman 1992, 155). The first translation is inevitably the introduction, and

retranslations have more freedom in (re)evaluating their relation to the ST context and the TT literary horizon, but Berman does not make a normative assessment as to how retranslators use, or should use, that freedom. In the case of the Finnish and Swedish "Oxen" translations, through the signal-based analysis on the OSH, I demonstrate that the first translations tend to recreate a more ambivalent sense of a single, evolving compilation pastiche, whereas the Swedish retranslation renders a more varied, mixed collection of individual stylistic pastiches not often tied to the tagged elements of translations of the original hypotexts. The Finnish retranslation not only cuts the episode into what appear to be individual, recognisable pastiches but superimposes onto them stylistic pastiches from the embryonic development of Finnish prose style.

Signals of pastiche: Elements fulfilling the pastiche contract in the hypertext

Gérard Genette (1997, 398–9) describes intertextuality, or, in his terminology, hypertextuality, through the metaphor of *palimpsest*. Palimpsests are ancient or medieval parchments, from which old writing has been scraped to make room for new text, but the old text still shows through the new text and is partially discernible. In the same way, under the surface text of James Joyce's "Oxen", the history of English prose style is allowed to show through the borrowed lexical and syntactic traits and the stylistic and orthographic elements of the imitated writers, books, and oeuvres. Genette (1997, 5) calls the new text the *hypertext*, and the earlier text, "upon which it is grafted in a manner that is not that of commentary", the *hypotext*. The hypertext invites the reader to engage in a relational reading.

Genette (1997, 86) calls this understanding between the writer and the reader the *pastiche contract*: Pastiche as *acknowledged* imitation explicitly discloses the text or author it is imitating. Genette (1997, 128) acknowledges Philippe Lejeune's autobiography contract as the inspiration for the term. Joyce's episode of pastiches does not explicitly name its models, but it fulfils the pastiche contract by means of its markedly archaic style and orthography in the beginning of the episode, changing rapidly through more or less recognisable styles (Bunyan, Swift, and Dickens being arguably some of the most universally recognisable) and developing into an array of modern styles of spoken English that invite readers to link the individual stylistic imitations to the "originals" by their own earlier reading, or by consulting annotations and reading companions. Also, by discussing the construction of the episode in both the Stuart Gilbert interviews, which resulted in the Gilbert schema, and in his personal correspondence, Joyce retrospectively establishes the pastiche contract paratextually.

In addition to these "macro level" elements, which establish the pastiche contract of the entire compilation pastiche episode, there are the

triggers and markers in the individual stylistic pastiches themselves. For the analysis of Joyce's pastiches in the OSH, I borrow a term from Margaret A. Rose's study on parody, the "signals of parody". According to Rose (1993, 39), there are two models of communication at work in parody, one between the parodist and the author of the parodied text and the other between the parodist and the reader of the parody. Like parody, pastiche is both imitation and transformation of form and content (or style and subject matter). For Rose (1993, 36–45), the relationship between the textual worlds of the hypertext and the hypotext is defined by a comic incongruity that produces a humorous effect. Such effects function as signals of the parodic nature of the text or, in this case, fulfil the pastiche contract. Rose (1993, 45) gives some examples of possible signals: "[T]he comic incongruity between the original and its parody […] together with the changes made by the parodist to the original by the rewriting of the old text, or juxtaposition of it with the new text in which it is embedded, may act as 'signals' of the parodic nature of the parody work for its reader". The reader might pick up on a humorous, hyperbolic tone, a change of genre, or something that feels "out of place". In the following, I demonstrate which kinds of signals can be isolated in the OSH. Also, considering the ways in which the intertextual reading mode is, or is not, re-created in the TTs, I explore the kinds of analysis that can be carried out using the signal-based method and the digital companion.

Imitating the imitation in the Finnish and Swedish (re)translations of the "Oxen of the Sun"

Starting with the notion of signals of parody and the pastiche contract, we can move onto testing which aspects in the hypertext of the "Oxen" episode of *Ulysses* trigger the intertextual mode of reading in Joyce's work and cause readers to look for a hypotext showing through the surface of the text as a palimpsest. By using the OSH and its signal-based method, we can then compare how these aspects are re-created in the Finnish and Swedish TTs.

The Finnish *Ulysses* translations are by Pentti Saarikoski (1964) and Leevi Lehto (2012b), and the Swedish translations are by Thomas Warburton (1946) and Erik Andersson (2012a). My question is, can the signal-based method and the OSH explicate how one translates a pastiche—i.e., how one imitates an imitation? That is, when a work is cut off from the literary tradition and context that it rewrites and is in dialogue with, and when it is rewritten in another language, time, and literary horizon, how are the intertextual connections and the intertextual mode of reading re-created? Does the OSH tool and its signal-based method have explanatory power in this analysis?

The first translator of *Ulysses* in Swedish was Thomas Warburton, a Swedish-speaking English citizen born and raised in Finland, with

his *Odysseus* of 1946. He was a young poet who had only translated two works of prose from Finnish to Swedish when he suggested to the Swedish *Albert Bonniers* publishing house that he translate Joyce's monumental work. His first language was Swedish as spoken in Finland, and he finished the translation work in exile in Stockholm during WWII. His translating position, his relationship to the prevalent conception of what translation was at the time, conforms to the invisible, conventionalising aesthetic. The first Finnish translation, by another young poet, Pentti Saarikoski, had been long awaited by the time it was finally published in 1964. Saarikoski was already a popular poet, but he was also an amazingly prolific translator (Tarkka 1996, 472). He is mostly remembered today, however, as a disputed translator, even lending his name to the Finnish term "Saarikoski-syndrome", which is used to denote an overly simulative and unfaithful translation (Koskinen 2007, 504).

The Swedish retranslator of *Ulysses* is Erik Andersson. When Andersson completed his four-year project of retranslating *Ulysses*, he was already an established writer, translator, and retranslator. Among others, Andersson had translated Oscar Wilde, Nick Hornby, James Ellroy, and Flann O'Brien from English to Swedish. In addition to the retranslation of *Ulysses*, he is the Swedish retranslator of *The Lord of the Rings*. The Finnish retranslation is by poet and translator Leevi Lehto. Whereas Andersson's retranslation was commissioned by the publishing house, with no explicit agenda towards the ST or the earlier translation, Leevi Lehto began his translation project in 2001 specifically to challenge some qualities of the then already controversial Saarikoski translation (Niskanen 2010, 10). The new Finnish translation, published in June 2012, is a very different kind of *Ulysses* from Saarikoski's *Odysseus*. In the "Oxen" episode, Lehto chooses the same strategy as Caetano Waldrigues Galindo (2020, 218), the translator of the third and most recent Brazilian *Ulisses*, and the Spanish re-retranslators of *Ulysses*—namely, replacing the pastiches of the embryonic development of English prose style with imitations from the history of the target language prose. Describing Tortosa and Venegas's Spanish re-retranslation, Peeters and Sanz Gallego (2020, 232) state that they "intended to reproduce in parallel the evolution of the Spanish language and different literary styles".

To test the kind of analysis the OSH hypertext and the signal-based method allow, we can look at what has come to be called the "Latinate style passage", the eighth section in the OSH hypertext. This is a compilation pastiche of Jeremy Taylor's *On Prayer* (as quoted in Peacock 1903, 88–91), Sir Thomas Browne's *Religio Medici* (as quoted in Peacock 1903, 78–9), and John Milton's *Areopagitica*, which Joyce copied in his notebooks from the Saintsbury anthology (1912). In this passage, Joyce becomes a kind of bricoleur, a collector and compiler of the text materials. As Leopold Bloom enters Sir Andrew Horne's lying-in hospital and part-takes in the revelries of the young medical students there, the

style of the episode evolves from Old English monosyllabic alliteration and Middle English moralities to the Latinate prose style of the Stuart period to depict the learned and lewd witticisms of the drunken medical students. The styles of Milton, Taylor, and Browne are not melded together, but rather Browne's baroque eloquence and warnings against spiritual dryness are explicitly different from Taylor's gradually unfolding sentences and solemn passages on virtue, and still noticeably different from Milton's polemical Puritan prose of, specifically, the topical and socially aware *Areopagitica*.

Example 1 (Milton, Taylor, and Browne pastiche):

> Remember, Erin, thy generations and thy days of old, how thou settedst little by me and by my word and broughtedst in a stranger to my gates to commit fornication in my sight and to wax fat and kick like Jeshurum.
>
> (U 322.367–71)

In the OSH, I have created tags from the signals of parody that can be read in each imitation, based on close reading and previous scholarship. There are tags for Joyce's imitation of the syntactic traits of Jeremy Taylor, which act as links from the hypertext to the hypotext of *On Prayer*, from the Peacock anthology, the imitation of lexical and syntactic traits of John Milton linked to an appropriate passage from his *Areopagitica*, and Sir Thomas Browne's characteristic, rhythmical use of both archaic and modern present tense third-person singular forms of verbs linked to a passage from *Religio Medici*, also from the Peacock anthology. As a further hypotext, Gilbert (1955, 300–1) mentions the *Improperia* (Reproaches) of the Catholic liturgy, but the Authorised Version, the King James *Bible* and especially The Fifth Book of Moses, is an obvious hypotext that Janusko, for instance, does not even cite.

There are no translations of Taylor into Swedish or Finnish, but Browne's *Religio medici* was translated into Finnish as *Lääkärin uskonto* in 1921 and into Swedish as *Religio Medici* by E. Abramson in 1948. Milton's *Areopagitica* has not been translated into Swedish or Finnish, but Milton's language exists in both languages, of course, in *Paradise Lost* (*Det Förlorande Paradiset* and *Kadotettu Paratiisi*, respectively). Furthermore, I have tagged the Bible allusions to their translations in both languages.

First translations:

> Ty må du, Erin, aldrig förglömma dina gångna släktled och dina forna dagar, hurusom du ringa aktade mig och förde en främling till mina portar att öva otukt inför mina ögon och att bliva fet och vällustig såsom Jeshurum.
>
> (Sv/Warburton 1946, 377)

> For you, Erin, must never forget your olden generations and your former days, how you despised me and brought a stranger to my gates to practice fornication before my eyes, and to be fat and lustful as Jeshurum.
>
> (OSH back-translation)

> Muista, Erin, menneet sukupolvesi ja ammoiset päiväsi, kun sinä pienenä istuit minun jalkaini ja minun sanaini juuressa ja toit muukalaisen minun porteilleni huorin tekemään minun silmäini nähden, lihavaksi paisumaan ja ilakoimaan kuin Jeshurum.
>
> (Fi/Saarikoski 1964, 386)

> Remember, Erin, your past generations and your days of past when you were little and sat by my feet and by my words and brought a stranger at my gate to fornicate in my sight, to wax fat and frolic like Jeshurum.
>
> (OSH back-translation)

The first thing, therefore, that the OSH hypertext does for the analysis of the translations is to separate the specific stylistic imitation trees of Browne and The Fifth Book of Moses from the compilation pastiche forest of the "choppy Latin-gossipy bit", as Joyce (1957, 139–40) called it. Another aspect it allows us to focus on is whether, and how, these allusions have been re-created in the TT in those cases where the hypotext has been translated prior to the translation of the hypertext. Focusing on the Finnish and Swedish translations of the Browne hypotext, where the rhythmic dexterity of the alteration between archaic and modern verb endings, such as the coexistence of the archaic present tense second-person singular "hast" with "have" and "saith" with "said", was tagged, one can see that this element is not created in the first translation TTs.

As it is, the hypertext can alert the scholar to the existence or, in this case, absence of a link between tags, but human close reading is still needed to recognise that the Finnish first translation re-creates something similar in the archaic plural possessive noun endings "jalkaini" [feet] and "sanaini" [words], as opposed to "jalkojeni" and "sanojeni", which would be expected.

Retranslations:

> Tänk, Erin, på dina förgångna släkten och dina dagar som fordom voro, huru föga du aktade på mig och mina ord och förde in en främling genom mina portar för att bedriva otukt i min åsyn och bliva fet och istadig som Jesurun.
>
> (Sv/Andersson 2012a, 387)

> Think, Erin, of your past ancestors and your days of old, how little you respected me and my words, and brought in a stranger through my gates to fornicate in my sight, and become fat and defiant like Jesurun.
>
> (OSH back-translation)

> Muistaos, Erin, miespolviais mennehiä ja muinaisia päjviä, mitenkä pilttin' istuit vierelläin mun, ja sanain ääress', ja muukalaisen porteilleni saatoit huorin tekemähän katsannossain lihomaan ja potkimaan kuijn Jesurun.
>
> (Fi/Lehto 2012b, 441)

> Remember, Erin, your past generations and the days of old, how as a little lad you sat by my side, and by my words, and brought a stranger to my gate to commit adultery in my sight wax fat and kick like Jesurun.
>
> (OSH back-translation)

The Finnish retranslation follows the chronologic development of Finnish prose style. In this passage, Leevi Lehto imitates the style of Jaakko Juteini, a Finnish national romantic writer whose written Finnish style was considered, even in his own time, as quite radical and eccentric. In the Lehto TT example in the OSH, there is a link to the TL hypotext of Juteini's *Neuvo-kirja* ("Book of Advice") of 1819, with tags for the imitated use of an occlusive stop after nasal occlusive ("syndiä" instead of "syntiä" for [sin]), and, later on in the text, the use of an end predicate ("pauhaden vastas" instead of "vastasi pauhaten" for [bawled back]). The stylistic elements of the "Latinate style" of the ST can still be seen in the "Juteini style" of the Finnish retranslation, and it would be more appropriate to say that the Finnish pastiche elements have not replaced the original, but rather have been added on top of them.

A different kind of intertextuality that this passage demonstrates is one between the translators. The Swedish translators reproduce the phrase "settedst little by me" with varying archaic, Biblical formulations of [how you despised me] or [how little you respected me]: The past ancestors have not respected the speaker but have instead brought a stranger to the gate. The first Finnish translator renders the phrase as [when you were little and sat by my feet], reading "little" as an adjective instead of an adverb and rendering the meaning of the sentence as opposite to the Swedish interpretations and the general understanding of the text: Stephen Dedalus is talking about the transgressions of youth here. In a polyphonic dialogue, Saarikoski's surprising interpretation has been conveyed to Lehto's Finnish retranslation not from the ST but from the earlier translation, as he, too, depicts Erin as a [little lad] who does sit at the Lord's side.[3]

For another example, we should attempt an OSH-based analysis of a stylistic pastiche passage consisting of one recognisable imitated author, style, and hypotext. The long-awaited moment of childbirth in the episode is depicted in the style of philosopher and satirist Thomas Carlyle, "the last clear voice before the chaos with which this chapter ends" (Janusko 1983, 76). Curiously, Joyce places Carlyle as the last of his recognisable pastiches, out of chronological order, after the imitation of Walter Pater, his junior. Presumably, with the style of Carlyle, the evangelist of manual labour and spiritual exertion, it was possible for Joyce to congratulate the father of the new-born baby, Theodore, Purefoy, "the remarkablest progenitor barring none in this chaffering allincluding most farraginous chronicle" (U 345.1411–4). This not altogether hidden metatextual reference to Joyce's own episode of perpetual metamorphoses of style, with its implied questions of biological and literary fecundity, production and re-production, originality and copy, is followed by the afterbirth or tail-piece, which consists of the language of the street and public house—slang and drunken slurs.

Example 2 (Thomas Carlyle pastiche):

> By heaven, Theodore Purefoy, thou hast done a doughty deed and no botch! […] In her lay a Godframed Godgiven preformed possibility which thou hast fructified with thy modicum of man's work.
>
> (U 345.1410–4)

As Janusko shows from his analysis of Joyce's notebooks, the voice of Carlyle is based on passages form the Saintsbury and Peacock anthologies. In the OSH, there are tags on the hypertext for the near quotation of the construction "and no botch" linking it to its hypotext, Carlyle's philosophy of clothes in his comic novel *Sartor Resartus*, itself a parody of German Idealism, likewise the expression parodically and hyperbolically expanded by Joyce to "Godframed Godgiven preformed possibility". What is more, the OSH highlights the thematic trait linking "work" and "fecundity", manifesting itself in lexical variants such as, in the quoted example, "man's work", and later in the full OSH passage as "doughty deed" and "labour".

First translations:

> Vid himlen, Theodore Purefoy, ett vackert arbete har du gjort och det utan vank! […] I henne låg en gudaskapad förutbestämd möjlighet som du bragte till skörd med din obetydliga människokraft.
>
> (Sv/Warburton 1946, 405)

> By heaven, Theodore Purefoy, you have done a beautiful job, and without a hitch! […] In her lay a god-created predetermined opportunity that you brought to harvest with your insignificant man power.
>
> (OSH back-translation)

> Taivaan tähden, Theodore Purefoy, sinä olet tehnyt miehen työn, etkä patustellut! […] Hänessä oli kätkössä Jumalanluoma Jumalanantama preformoitu mahdollisuus, jonka sinä olet hedelmöittänyt vähäisellä miehen työlläsi.
>
> (Fi/Saarikoski 1964, 414)

> For heaven's sake, Theodore Purefoy, you've done a man's work, and no bungle! […] In her there was concealed a God-created God-given preformed opportunity which you have fertilized with your minor man's work.
>
> (OSH back-translation)

Sartor Resartus has not been translated into Finnish. There is a Thomas Carlyle translation that predates the Finnish *Ulysses* translation, *Entistä ja nykyistä*, Werner Andelin's translation of Carlyle's historical and socially critical book *Past and Present*. In Swedish, there is a *Sartor Resartus* translation by E. Ryding from 1922, which has been linked to the Swedish TT examples from the tagged elements on the ST. This allows us to compare the links between the hypertext and the hypotext of the ST and the possible links between the TT and its hypotexts.

In the first Swedish translation, the tag for the "and no botch" construction "och det utan vank" [and without a hitch] differs considerably from the Swedish Carlyle hypotext "en tredje finns ej" [there is no third]. The parodic formulation of "Godframed Godgiven preformed possibility" is rendered as "gudaskapad förutbestämd möjlighet" [godcreated predetermined opportunity], which is to be compared to the Swedish Carlyle formulation "hus dig fans en av Gud skapad form" [in you lay a God created form]. Here, Warburton's translation reduces parodic ambiguity by means of conventionalisation or simplification. As for the Finnish first translation, which has no chance of referring to a direct Finnish hypotext, there is an interesting choice of an archaic, artisan verb "etkä patustellut" [and no bungle] for "and no botch". The overarching thematic trait of "work" and "fecundity" is re-created through vocabulary such as "miehen työn" [man's work], miehen työlläsi [your man's work], and "taakkasi" [your load], although with considerably less variation than in the ST.

Retranslations:

> Ja jösses, Theodore Purefoy, en karsk bragd har du gjort, jajamän! […] Hos henne fanns en gudagiven gudagrönskande förutbestämd förutsättning som du har befruktat med din manliga dagsverksdroppe.
>
> (Sv/Andersson 2012a, 414–415)

> Yes crikey, Theodore Purefoy, a stern feat you have done, yes indeed! […] In her there was a god-created god-given preshaped possibility that you have fertilized with your drop of manly day job.
>
> (OSH back-translation)

> Taivaan tähden, Theodore Purefoy, kelvon teon olette tehnyt ettekä töhertänyt! […] Henessä lepäsi Jumalanluoma Jumalansuoma ennaltamuotoeltu mahdollisuus, jonka Te olette hedelmöittänyt hiukkaisella miehen työtänne.
>
> (Fi/Lehto 2012b, 472)

> By heaven, Theodore Purefoy, you have done the proper deed and no flutter! […] In her was resting a God-created God-given preshaped possibility which You have fertilized with your speck of man's work.
>
> (OSH back-translation)

In the Swedish retranslation, the hypertext tag for "and no botch" is rendered as "jajamän!" [yes indeed!], which does not re-create the tagged link to the Swedish hypotext "en tredje finns ej" [there is no third]. The hyperbolically expanded expression "Godframed Godgiven preformed possibility" is re-created in Swedish as "gudgiven gudagrönskande förutbestämd förutsättning" [god-created god-given preshaped possibility], which, while it does re-create the content, rhythm, alliteration, and parodic effect of Joyce's sentence, does not recreate the link to the Swedish hypotext "Gud skapad form" [God created form]. More than lexical or stylistic, the links of the Swedish "Oxen" retranslation to the Swedish voice of Thomas Carlyle are thematical.

At this point, the Finnish Leevi Lehto retranslation drops the successive and recognisable pastiches of Finnish prose style, presumably assuming that the embryonic development of language ends at birth, and what follows is what Joyce (1966, 16) called the "tailpiece" of the episode, the "afterbirth", a miscellany of not written prose but forms of spoken language. However, the Carlyle pastiche is quite a recognisable stylistic pastiche within the compilation pastiche of the episode, and, corresponding to that view, I have separated it from the "tailpiece" in the OSH. The thematic trait of "work" and "fecundity" is carried over from the original Carlyle hypotext to the Finnish retranslation TT in the lexical variants of "kelvon teon" [the proper deed], "miehen työtänne" [man's work], and "taakkanne alla" [your burden].

Conclusions: The use of the OSH in the analysis of the Finnish and Swedish "Oxen" (re)translations

These examples, and many more in the OSH, show that, with the use of the signal-based method of analysing the pastiches of the "Oxen" utilised in the digital hypertext, it is possible to isolate textual elements operating as signals of pastiche, creating the pastiche contract between the hypertext of the episode and its hypotexts from the history of English prose style. Once isolated and analysed, one can compare these tagged signals in the *Ulysses* source text to the existence or absence of the tags between the Finnish and Swedish *Ulysses* target

texts and their respective hypotexts. The analysis method would seem to have explanatory power for how a reference from the hypertext to a hypotext is created and, from another perspective, how intertextuality is read into a text.

In this chapter, I used two examples, one compilation pastiche and one individual stylistic pastiche, to test which kinds of signals one can isolate using the OSH. While the method can isolate and explicate elements that activate the intertextual reading mode in the source text, it is limited to showing when the chosen tags linking the hypertext to either the ST hypotexts or TT hypotexts (as in the case of the Finnish retranslation) are re-created. When the chosen criteria are not fulfilled, it is left to the human analyst to consider other strategies that the translators may have adopted. In the case of the Finnish and Swedish "Oxen" translations, these overarching strategies include the first translators' tendency to recreate a more ambivalent sense of a single, evolving compilation pastiche, with occasional passages more closely following the translations of the imitated hypotexts, such as Warburton's translation of the "Everyman" pastiche or Saarikoski's translation of the "Dickens" pastiche, as can be seen in the OSH. The Swedish retranslation renders a more varied, mixed collection of individual stylistic pastiches that are not, however, necessarily tied to the tagged elements. The Finnish retranslation re-creates the intertextual reading mode through imitations from the embryonic development of Finnish prose style. What became apparent through the OSH method is that the Finnish retranslation adds elements of Finnish prose style on top of elements imitated by the source text rather than replaces the English pastiches with Finnish ones.

Taken outside the "Oxen" and *Ulysses*, and taking a "macroanalytic approach" on a larger text corpus (cf. Jockers 2013, 12–7), the signal-based method of detecting intertextual elements in a text could lend itself to application in a larger cross-disciplinary project, with aspects of comparative literature, translation studies, and digital humanities, for the development of a machine assisted translation application that would work with the human translator in practice to alert them to intertextual elements in the text. This could develop the OSH from a close reading aid for the analysis of a single text, which it is now, to a distant reading tool for the practice of literary translation.

Notes

1 Joyce had, however, discussed some of these allusions earlier in his letters, most notably in his correspondence with Carlo Linati, the Italian translator of Yeats' *The Countess Cathleen* and Synge's *The Playboy of the Western World*. Joyce had sent Linati a schema of *Ulysses* as early as 1920.

2 Due to copyright restrictions, the *Oxen of the Sun hypertext* is available on a private site that requires registration. The OSH is built on a WordPress platform. In order to access the site, one needs to register a WordPress account

at www.wordpress.com. After registering, the page https://oxenofthesunhypertext.wordpress.com/ gives a prompt to "request an invite". After sending the request, permission to enter the site arrives via email.

3 The full passage and its translations are analysed at greater length in my dissertation (Niskanen 2021, 151–5), which can be read at https://helda.helsinki.fi/handle/10138/329581.

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8 Translating with technology

How digitalisation affects authorship and copyright of literary texts

Maarit Koponen, Sanna Nyqvist, and Kristiina Taivalkoski-Shilov

Introduction

In copyright terms, translation is an anomaly. Copyright laws protect the expressions (not the ideas) of original works, but translators create derivative works that use new expressions to convey the ideas and forms of the originals. The copyright regime has struggled to accommodate the rights of translators to those of the original authors and to maintain the priority of the latter despite the inevitable transformation of expressive originality in translation (see Nyqvist 2018; Venuti 1995). A new complexity has arisen with digital resources such as translation memories (TMs) and machine translation (MT), which automatise the production of translated texts and multiply the collaborative aspect of translation, thus heightening the already problematic status of translation as intellectual property. The use of TMs, which enable the reuse of translations, raises questions of authorship and copyright, which are made even more complex when translated texts are used as training data for developing MT systems. The training corpora contain millions of translated segments originating from different sources, from TMs made available by international organisations to public domain literary works and webcrawled texts. A translation produced by an MT system presents an amalgamation of the corpora rather than a copy of any given translation.

To date, TMs and MT have been used mainly in domains such as localisation and administrative texts, but recently there has also been a growing interest in translation technology for literary translation (e.g. Toral and Way 2015; Moorkens et al. 2018; Kenny and Winters 2020). In this chapter, we examine authorship and copyright issues and the potential effects of digitalisation and translation technology on literary translation. Similar to the approach taken by Hadley (2017, 183), this chapter can be called meta-analytical in its nature: we review scholarship that addresses questions of copyright and authorship involved in translation as a process and translations as data. Rather than focusing on specific case studies, this approach allows us to take a broad view of issues arising

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in the context of translation in general, and more particularly in the intersection of translation technology and literary translation.

In what follows, we discuss copyright issues and the notions of textual ownership vs. authorship, first from a legal and technical perspective, then moving on to ethical considerations. We start with a historical overview and analysis of the legal status of translation in the context of international copyright. We then go on to examine translation technology in more detail, with a particular focus on the reuse of translations in TMs and MT training. Next, we discuss the notion of authorship in literary translation, where we focus on the ownership of the translation product, achieved with the help of translation technology, and ask whose text is a translation rendered fully or partly with the help of translation technology. Finally, we reflect on the implications raised, discussing open questions and possible solutions.

Translation and copyright

Copyright laws developed across Europe from the eighteenth century onwards in response to the need to control the production and distribution of books and the ideas contained in them. Early copyright laws aimed to regulate the book market by distributing rights between authors, printers, and booksellers, to control the flow of information in the interest of censorship, and eventually to protect the rights of individual authors in order to encourage the creation of new works (Borghi 2017; Saunders 1992; Woodmansee 1984). Following the expansion of the international book trade in the nineteenth century, the ideas of copyright and *droit d'auteur* were extended to translations of literary works (Hemmungs Wirtén 2009). One aim of the first multilateral international copyright agreement, the Berne Convention of 1886, was to regulate the division of rights between the original author and the translator in order to determine the status of translations as intellectual property (Ricketson 1986; Ricketson and Ginsburg 2006).

The legal status of translation in the Berne Convention

The Berne Convention and its subsequent revisions harmonised key elements of the national copyright laws of its signatory states (176 states, according to WIPO 2020). Influenced by the continental European legal tradition, which emphasises the *droit d'auteur*, the treaty acknowledges both the moral and economic rights of authors. Moral rights include the right of attribution (the author's right to claim the authorship of his or her own work) and the right of integrity (the author's right to preclude modifications to his or her own work). These rights remain with the author even when the author surrenders the economic rights. Economic rights include the rights to reproduce and distribute works and the right to authorise derivative works, such as adaptations.

In the nineteenth century, it was unclear how translations should be classified, whether to regard them as reproductions or adaptations, where permission from the original author was necessary, or independent creations outside the control of the original author (Hemmungs Wirtén 2009; Ricketson and Ginsburg 2006, 35). A main concern in the discussion on translations was also the benefit of the reading audiences: it was suggested (and indeed implemented in the 1886 Berne Convention) that the original author's right to authorise translations should be limited to a period of ten years from the publication of the original, allowing for free translation rights thereafter (Ricketson and Ginsburg 2006, 66–67).

The sections concerning translation and translation rights were repeatedly revised during the first decades of the Berne Convention, resulting in the still operative categorisation of translations as derivative works (Art. 8), whereby original authors were granted the exclusive right of making or authorising translations during the period of protection (the minimum length currently prescribed by the Berne Convention is the author's lifetime plus 50 years) (Art. 7 § 1). However, the Convention also acknowledges the creative input of translators in Art. 2 § 3, which stipulates that translations and other kinds of adaptations "shall be protected as original works without prejudice to the copyright in the original work."[1]

Copyright in translation is thus based on the division of rights between the author of the translated work and the translator. The translator's copyright in his or her work does not limit the moral and economic rights of the translated author in the original work, and the publication and reproduction of the translation requires permission from the author. Conversely, the translator's copyright limits the original author's rights to the translation: for instance, the author may not reproduce or modify the translation without the translator's consent (Cabanellas 2014, 53).

Challenges of translation in relation to current copyright systems

The legal status of translation as codified in the Berne Convention and applied to the national laws of its signatories provided mechanisms for managing the problems of rampant piracy and the unfair treatment of both authors and translators in international contexts, but it also manifests the difficulty of assimilating translation as a creative activity in the traditional copyright framework. The reiteration of the key term "originality" in Art. 2 § 3 cited above suggests dual standards of originality. By classifying translations as secondary, derivative works, the law ascribes originality in translation to the primary text and its author (Nyqvist 2018; see also European Commission[2] 2014, 99).

The idea of transcendent originality, however, contradicts another fundamental principle of copyright protection—namely, the division between ideas and expression. Copyright law grants protection only to manifestations of ideas, not the ideas themselves. The originality and basis for the protection of literary works lies in their expression. Thus,

as a translation is original not in its content but in its expression, the novelty of its expression could form an argument for refuting the original author's right over the translation. A commentary to the Berne Convention, the 1978 *WIPO Guide to the Berne Convention*, defined translations as works that express an author's thoughts in a different language—an interpretation that recategorises the original work as belonging to the realm of ideas rather than expression (WIPO 1978, 19; see also Venuti 1998). Original and derivative at the same time, translation undermines the concept of original authorship as the foundation of copyright protection. Yet, as Cabanellas (2014, 54) notes, the practical reason for distinguishing between original and derivative originals lies in the economics of translation: the value of the original surpasses that of a translation and hence "[t]he extension of the copyright in the original work to translations permits a market remuneration for translators and the international effectiveness of copyright, which is one of the underlying goals of the contemporary copyright regime."

In the twenty-first century, the rapid advance of MT technology, the reuse of translation data, and the increasing use of TMs as translation tools have further complicated the legal status of translation. Whereas copyright law is based on the notion of an original work attributable to an author, in the context of MT, existing translations and their originals are transformed into bits of data in vast corpora used to automatically produce new translations. Machine-assisted and machine-generated translations thus challenge the human/machine division inherent in copyright laws, which grant protection only to original human achievements, not mechanical output.

As will be illustrated in more detail, MT raises a wide array of copyright concerns. The production and harvesting of translation data, the crediting and remuneration of authors and translators whose texts are utilised in the training of artificial intelligence, the transformation of original works into bits of data, the creative input and authorship of the programmers involved in developing translation software (which may in itself merit copyright protection), the eligibility of translation corpora for compilation protection (a type of copyright protection), and the authorship and ownership of the translations produced by, or with the assistance of, MT are currently objects of speculation, as hardly any case law exists, and academic research is only now emerging. (It is telling that Cabanellas's thorough *The Legal Environment of Translation* from 2014 does not discuss MT.)

The prevailing uncertainty and lack of established codes of conduct cause difficulties for all stakeholders, from original authors and translators to software developers and users of TMs and MT tools. Strong enforcement of the existing, conflicting rights of different parties might result in the so-called anticommons problem (Moorkens and Lewis 2019, 476), where utilising valuable materials becomes impossible, which discourages the development of potentially beneficial technologies.

Bringing MT from more information-oriented translation tasks to creative texts like fiction will undoubtedly electrify the discussion, as stakes are higher in genres that highlight originality of expression and the role of the author. The increasing emphasis on Open Access publication both in public and private sectors and the possibility of a more nuanced distribution of rights through mechanisms such as the Creative Commons licensing system[3] have opened new possibilities for reusing texts in TMs and MT. Nevertheless, transitions between open and protected spheres require special attention to ensure fair treatment for both the producers and users of translations.

Translation technology and its effects

Where the previous section provided an overview of copyright and translation, this section focuses on the effects of expanding digitalisation and technology use in translation workflows. Translation technology, which covers tools such as TMs and MT, appears to have had comparatively little impact so far in the literary translation context. Such tools are, however, commonplace in technical translation and localisation, and increasingly used in many contexts. Translation technology depends on parallel corpora formed by alignments of source texts and their translations. Parallel texts have been collected in an electronic format that enables the reuse of translations since approximately the 1980s (Simard 2019). In this section, we discuss how translations in the form of parallel texts are reused in TMs and MTs, and the implications for copyright and authorship.

Translation memories and machine translation systems

A TM is essentially a database consisting of parallel texts aligned as translation units (sentences or similar segments such as titles and captions). When a translator uses the TM in a computer-assisted translation environment, the software segments the source text and compares the unit being translated against the source language units stored in the TM. If one or more similar segments are found, the software presents them to the translator as a suggestion to reuse the previous translation. The translator may accept a suggested segment, revise it as necessary, or reject the suggestion completely and write a new one. The new or revised translation unit is then saved in the TM for potential reuse. As noted by Lewis et al. (2016, 1601), TMs often contain units from multiple source texts, multiple translators, and even multiple clients because they are commonly reused between different projects by language service providers.[4] On cloud platforms, TMs may be shared with and utilised by multiple translators, particularly in crowdsourcing (Moorkens and Lewis 2019, 7), and translated target texts may, in turn, form source texts for indirect translation (Moorkens and Lewis 2020, 473).

Translation memory ownership and related questions of copyright are unclear. Even in the simplest case, where a TM contains only one source text translated by one translator, it involves elements with different copyright claims: the source text, the target text, and the TM database itself (European Commission 2014, 128–129). The situation is further complicated by the inclusion of legacy data from previous projects. This introduces ownership claims involving each author of the source content and each translator of the target content already in the database, as well as potentially the language service provider or client through database rights covering the alignment of the translation units (Lewis et al. 2016, 1602–1603). During the translation project, new source and target content is added, with potentially new authors and translators. Producing the translation generally involves translation suggestions offered by the TM or an MT system (see discussion on MT below). Revising or post-editing these suggestions may give the translator a claim to copyright of the new translation, although this depends on the level of editing: the claim is weaker if very little editing is done (European Commission 2014, 102–103; Lewis et al. 2016, 1603). Although the translator is, in most cases, considered the author of the translation and an explicit transfer of rights is therefore required if the translation is reused (European Commission 2014, 113–114), it is common practice in localisation, technical, and administrative translation to deliver TMs to the language service provider or client as a "by-product of a translation effort" even if the transfer of rights is not explicitly addressed in contracts (Moorkens and Lewis 2019, 7). In part, this is likely due to the fact that translators see value in benefiting from each other's work by sharing TMs, as Moorkens and Lewis (2019, 8) discuss. However, widespread freelancing and practices in the field may also disempower translators and limit their ability to assert intellectual rights to their work (Moorkens et al. 2016, 1).

While TMs reuse previous translations by suggesting similar segments, MT systems aim to translate new, previously "unseen" content. Since the early 2000s, MT has been dominated by data-driven approaches, first Statistical MT and more recently Neural MT. Both Statistical and Neural MT utilise machine learning, which involves compiling a corpus of data, generally some sort of pre-processing and annotation, then training a learning algorithm based on the corpus (Eckart de Castilho et al. 2019). MT relies on corpora of translated texts, although monolingual data may also be used. While a detailed description of MT technologies is not within the scope of this chapter (see e.g. Forcada 2017; Simard 2019), some notes about the processing of parallel texts are in order. In (phrase-based) Statistical MT, the aligned source and target segments in a corpus are chopped into sequences of consecutive words (termed phrases), and translation probabilities are calculated for pairs of source and target phrases. The translated segment is then generated by piecing together phrases to form the most likely candidate. Neural MT processes parallel texts as even smaller units—words or sub-word

units (individual characters or sequences of characters)—and builds the translation by predicting the most likely next word taking into account the context of the full sentence (or sometimes multiple sentences). MT systems have mostly been trained for specific source and target language pairs, but more recent developments include multilingual systems (e.g. Tiedemann and Thottingal 2020). For these systems, parallel corpora from many different language pairs are used to train a single model to translate between any of the languages involved.

Translation corpora

Vast quantities of text are needed to train MT systems, and the most valuable for this purpose are aligned translations created by translators (Moorkens and Lewis 2020). Obtaining these resources, however, is complicated. When building a corpus of parallel texts, agreements are needed from the author and publisher of the original text, and the translator and publisher of the translation (De Clercq and Montero Perez 2010, 3384; Lewis et al. 2016). The complexity of the situation is observed, for example, by Bywood et al. (2013), who describe a corpus of subtitles collected as part of a research project. The project partners included subtitling companies that contributed data for MT development, but Bywood et al. (2013) discuss the difficulty of obtaining permissions, as copyrights were held by the client, not the subtitling company. Based on their experiences in compiling the multilingual Dutch Parallel Corpus intended for both research and commercial use, De Clercq and Montero Perez (2010, 3386) also state that most copyright holders were reluctant to donate texts and often stipulated that the texts should be unrecognisable and not downloadable in full, for example.

Some translation memories and parallel texts may be made available by public service institutions in the European Union, for example, with provision of reuse for any commercial or non-commercial purpose (Moorkens et al. 2016, 3). One example is the Europarl corpus of translated European parliament speeches (Koehn 2005). TMs may be shared also on specific vendor platforms such as the TAUS Data Cloud, which has a common intellectual property agreement covering the corpora shared (Lewis et al. 2016, 1601). Corpora also include crowdsourced translations, such as the parallel corpus of TED talks and their translations created by volunteers and shared under a Creative Commons license (Cettolo, Girardi, and Federico 2012), or the OpenSubtitles parallel corpus consisting of subtitle translations uploaded by the users of a website (Tiedemann 2012, 2215). Parallel corpora may also be built by "crawling" the internet. This involves automatically collecting texts from multilingual websites, detecting parallel documents (with the help of clues such as URLs, HTML structure, content similarity, and images), identifying their languages, and aligning sentences in the documents (Toral et al. 2017, 1022–1023). Although such data can contain misidentified or misaligned translations,

Toral et al. (2017, 1045–1046) suggest that it offers a solution for building parallel corpora particularly in under-resourced languages. For instance, the ParaCrawl corpus contains webcrawled parallel texts in 23 European languages, with numbers of aligned sentences ranging from 195,000 for Maltese–English to over 30 million for French–English (Esplà-Gomis et al. 2019).

An example illustrating the scale of parallel corpora and the variety of sources and text types is provided by the OPUS site, which hosts freely accessible parallel corpora and tools intended to support the research and development of MT (Tiedemann 2012). OPUS is the largest collection of openly available parallel corpora: in 2020, the site contained 57 parallel corpora covering more than 700 languages and totalling over 9.2 million documents across all corpora and language pairs (Aulamo, Sulubacak, and Virpioja 2020, 3782–3783). Types of texts in OPUS include administrative/legislative texts published by institutions such as the European Commission's Directorate-General of Translation and the United Nations, newspaper texts (for which translations are often compiled and released by research projects and evaluation campaigns such as the annual WMT conferences[5]), religious texts, digitised books, open source localisation files, subtitles, and Wikipedia articles (Tiedemann 2012; Aulamo, Sulubacak, and Virpioja 2020). The number of retrievable sentence pairs in each corpus generally ranges from tens of thousands up to tens of millions, although numbers may be smaller for specific corpora and language pairs (Aulamo, Sulubacak, and Virpioja 2020, 3788).

The use of MT also involves unsolved questions of ownership and intellectual property rights. In general, the legal status and copyright of various corpora used for training MT and other natural language processing systems is unclear (Eckart de Castilho et al. 2019). The report on translation and intellectual property rights commissioned by the European Commission (2014, 115) states that the reuse of translations can constitute an infringement on the rights of the source author or translator. As noted above, the owner of the compiled TM may also have separate rights. Although extracting individual translation suggestions and using these to create a new translation would not be substantial enough to infringe on the rights of the database owner, the situation may be different for repeated and systematic extraction—for system training, for example (European Commission 2014, 124–125). Varying use scenarios—publishing translated content vs. using TMs for new translation projects vs. using aligned translations for MT training—may require different usage rights, which should be covered separately in contracts (Lewis et al. 2016, 1603; European Commission 2014).

Machine translation and literary texts

The textual similarities employed by TMs are generally useful only within narrow domains, and a TM is unlikely to provide for texts of a different

genre, as noted by Moorkens et al. (2016). MT, however, extends the potential reuse of translations to other domains and genres, where strict text-based comparisons of segments might not provide usable matches. Due to the vast amounts of data required, MT system training generally combines parallel texts from different genres—for example, all the corpora available in OPUS for the relevant language pair. This may be followed by fine-tuning with a smaller amount of data in the relevant domain. Although literary texts may not be particularly useful in TMs, training corpora for MT systems used in various domains often contain public domain literary translations.

Recent work has also explored using MT for literary translation. Toral and Way (2015) experimented with a Statistical MT system for translating a novel from Spanish into Catalan. Their MT model was first trained on approximately 630,000 sentences of parallel news texts, then fine-tuned with around 22,000 sentences from two novels by the same author, with a Catalan language model trained on news, novels, and over 16 million sentences of web texts (Toral and Way 2015). In a small-scale manual evaluation of 101 sentences, two readers ranked 60% of the MT sentences of equal quality or even higher than a human translated sentence (Toral and Way 2015, 129). Subsequent work reported by Toral, Wieling, and Way (2018; see also Moorkens et al. 2018) addressed English-to-Catalan MT of a novel. This study compared both a Statistical and a Neural MT system trained on over a million parallel sentences from 133 translated novels, 400,000 sentences of parallel subtitles (statistical system only), and over 5 million sentences from more than 1,000 novels written in Catalan (Toral, Wieling, and Way 2018, 3). Translators participating in the study rated the output of both systems as helpful, mostly fluent, and adequate, with a slight preference for the Neural MT (Moorkens et al. 2018, 254–255). Although translated novels were used as training data, it is difficult to determine domain in the case of literary texts. As Toral, Wieling, and Way (2018) state, their "in-domain" material included novels from various different genres. Style of expression may, however, be very different in, for example, historical works compared to science fiction or contemporary romance novels, and in works by different authors.

The effect of technologisation on authorship

Even though translators' rights are partly protected by laws and conventions, their relation to the texts they create while translating can also be viewed from the perspective of general ethics of translation that investigates translators' rights, in addition to their duties (see e.g. Chesterman 2001, 143). This section broadens the discussion to ethical questions concerning authorship and textual ownership in literary translation, which are actually age-old issues in translation theory. The line between creative writing and translating has never been clear-cut, since

translators can take liberties when translating, original texts can be misleadingly presented as translations (pseudo-translations), and the author and translator can be the same person (self-translation). Additionally, translators' attitudes towards the author and the source text have varied from servility to hubris over the centuries (see e.g. Ballard 1995). This has affected their translation strategies and consequently the make-up and identity of the translated text.

Authorship vs. ownership from an ethical perspective

Today's norms of translation and copyright laws give literary translators less room to manoeuvre than those of previous centuries, but even in copyright terms the status of the translated text is still ambiguous, as discussed above. The same applies to the translator's status, since no clear rules exist concerning what amount of visibility is suitable for translators vis-à-vis the source text author (see Flynn 2013). Even though some prominent translation scholars have encouraged translators to claim more authorship for their translations (see e.g. Venuti 1995), practicing translators tend to opt for less. This does not mean, however, that they do not claim ownership of their translations. Jansen (2019), who studied contemporary Scandinavian literary translators' attitudes towards the author and the source text, makes a useful distinction of two kinds of "mental" ownership that literary translation entails:

> **There might, in fact, be two kinds of belonging at play, namely ownership and authorship**. The translators [who responded to Jansen's questionnaire] do claim ownership, meaning thereby that it is "their" text, because
>
> (a) they have **written or created** the translated text, for which they **take responsibility** […];
> (b) they hold the copyright to the translated text and **they want the final say in the editing process**—in other words, it's their text, not the publishers' (or as one respondent says, "the translator is not the editor's servant"); and
> (c) the authors as a rule do not know the target language and are thus unable to value or control the translation.
>
> However, […] the large majority does not seem to claim ownership in the sense of authorship, that is of taking over the authorial role, replacing the original author, and rewriting the source text according to their own agenda.
>
> (Jansen 2019, 684; emphasis added)

Jansen's clarifications are pertinent not only for distinguishing between contemporary human authors and translators, but also for pondering

whether an MT system used to translate a literary text without human involvement could be considered the owner of the target text similar to a human translator. According to the European Commission (2014, 102–103), running a text through an MT system alone does not make a work creative, and raw MT is not protected by copyright. Neither does the MT system meet the requirements for mental ownership of the translated text, as defined by Jansen (2019). Obviously, the system is unable to take responsibility for the target text or to have any say in the editing process. Nor does it need copyright or textual ownership: as we know, machines have no need to make a living or to gain symbolic capital. Copyright legislation and (inter)national copyright conventions have been created to protect the rights of flesh-and-blood authors and translators and to foster and reward their creativity (Nyqvist 2018, 10).

As to those individuals who create MT programs, the trend in this field appears to emphasise sharing the fruits of invention rather than claiming authorship or textual ownership. As discussed earlier, MT models are built using translation corpora and training algorithms. Toolkits such as the MarianNMT framework[6] (developed and maintained by the Microsoft Translator team together with academic and commercial partners; see Junczys-Dowmunt et al. 2018) are commonly distributed as open source and can be used by any company, organisation, or private user to train and deploy their own MT models. Trained MT models are also available as open-source software (see e.g. Tiedemann and Thottingal 2020). Business models for commercialising MT systems by language service providers or technology companies can take the form of selling clients the use of generic MT systems as a cloud-based service (often charged in terms of number of words translated), or services where a dedicated system is trained and maintained on behalf of the client. These practices would deserve an ethical investigation of their own.

The question of ownership of a literary translation is thornier in the case of machine-assisted human translation or human-assisted machine translation. If resources such as TMs and MT (with their associated questions) were used collectively to create a new translation, determining the owner of the translated text becomes a complex issue with no clear, generally applicable solution. To date, such dilemmas are mainly theoretical owing to the practicalities of literary translation. Unlike other clients in the translation industry, publishing houses do not currently appear to impose the use of TMs in literary translation projects, not to mention reusing TMs between different projects and sharing them between translators. Professional literary translators tend to work alone or in pairs, and if they resort to TMs, then these are most probably in private use. A literary translator who utilises a legally purchased or free TM tool and creates a TM for a translation project does not transgress any ethical guidelines, especially if the database is not reused for translating other authors, which would increase the risk of homogenising the voices of different authors to sound like a single author in the target language

(see Taivalkoski-Shilov 2019, 697). As to post-editing machine-translated literary texts, copyright stipulates creative, human input, which raises potential questions when a translation is produced by recombining prior texts and involves post-editing by the translator (European Commission 2014, 102–103). The situation may be even more complicated if, instead of post-editing a static machine-generated text, the translator is working with a so-called interactive system, which adapts the suggestion shown according to edits made by the translator and may even learn from these changes in real time to generate translations adapted to the specific text or the specific user (see Peris and Casacuberta 2019). Selecting and post-editing MT suggestions "could give rise to copyright protection in case the translator would be able to imprint his [sic] personality and make such work original," as concluded in the report by the European Commission (2014, 103). Consequently, even a translator—or other agent of literary translation, such as a line editor in charge of post editing—who post-edits could claim textual ownership for a literary translation, depending on how much the post-editor's "personality" has left a mark on the translated text.

Machine-assisted literary translation and multiple translatorship

In fact, machine-assisted literary translation presents a particular case of what Jansen and Wegener (2013) have termed *multiple translatorship*. This concept has been inspired by Stillinger's notion of *multiple authorship* that underlines the collaborative nature of artistic writing. Traditionally, literary works officially attributed to a single author or translator have been discussed as if no one other than the source text author or the translator had a share in the (re)creation of the text. Nevertheless, as Stillinger (1991, v-vi and passim) and Jansen and Wegener (2013) have convincingly argued, most (literary) texts, whether original or translations, tend to be the fruit of a conscious joint, composite, or collaborative production of some sort.

The notion of multiple translatorship is helpful in reminding us that the technology-assisted translation process is not exceptional in introducing more voices to the translated text: textual fragments from previous human translations, machine-generated suggestions, and interactively created ad hoc translation solutions. As Alvstad et al. (2017, 4) suggest, "translation is a matter of circulation of and confrontation between voices." From the perspective of textual ownership, what matters is the creative input, textual design as a whole, and moral responsibility for the text. Having said that, to counter translators being gradually pushed to ever more ancillary roles in technology-assisted literary translation processes, it is necessary to highlight their role in translation technology development and create new ways to foster and reward their creativity. Such practices would be in line with the "human-centric approach" to artificial intelligence adopted by the EU and the ethical principles of this

approach, one of which is fairness and "ensuring equal and just distribution of both benefits and costs" (European Commission 2019, 12).

Discussion and concluding remarks

The advent of translation technology in literary translation provides an opportunity to redefine the translator's relationship to the source text author. Separating authors and translators dichotomously has been commonplace even though, as Jansen (2019, 684) argues, the distinction between them "may occasionally be blurred and should perhaps be seen rather as a continuum" (see also Walkowitz 2015). Sometimes, authors and translators even appear as antagonists, for instance when Venuti, criticising current copyright laws as being unfair to translators, writes:

> From the viewpoint of translators and translation, these limitations [on the translator's control of the translated text] carry some troubling consequences, both economic and cultural. By subordinating the translator's rights to the author's, the law permits the author to shrink the translator's share in the profits of the translation.
>
> (Venuti 1998, 47)

And yet, the millennial relationship between authors and translators has covered a wide range of differing attitudes and forms of interaction. Jansen's (2019, 678) recent study indicates that some translators interact with their source text authors simply for the purpose of bonding. Several of Jansen's respondents wrote that they cherish friendships with their authors. Authors' attitudes to their translators have been less studied (for some exceptions, see Chesterman 2004/2017; Greenall 2019, 653–655). According to Washbourne (2017, 25), "[t]he writer may view translation as a threat to the original and to his or her identity, or, on the opposite pole, as a transformative, life-extending experience." Judging by Washbourne's (2017, 16 and passim) article, the experience of *being translated* tends to be upsetting in one way or another. However, Washbourne's study did not include authors whose text has been machine translated or crowdsourced from amateur translators. Authors' attitudes towards these new forms of translation probably vary (see e.g. the case of Richard Powers in Besacier 2014). Still, it is likely that authors prefer professional human translators over these new options that have appeared with the technologisation of translation.

A hypothesis can be formed that, from the original authors' perspective, human translators stand for quality. The termination of the author's (and subsequent rightholders') control with the expiration of the copyright opens up possibilities for myriad translation practices, among them MT. In the context of literature, MT has been applied to texts in the public domain by some businesses to publish print-on-demand versions of world

literature classics into a variety of languages. Such machine-translated texts have undergone little, if any, post-editing, resulting in barely legible "translations" (see Taivalkoski-Shilov 2019, 699n5). Copyright laws present no impediments for such predatory publishing, except in Denmark, Finland, Norway, and Sweden, where copyright protection is extended to works that can be considered classics (Fredriksson 2019, 10–12). If they are transformed or republished publicly in a form that "violates cultural interests," to quote the Copyright Act of Finland (51 § 1), such practices can be prohibited by the authorities. In Finland, the landmark ruling on the protection of classics concerns precisely translations of classic literature that the court deemed to be of inferior quality (Korkein oikeus [The Supreme Court of Finland] 1967 KKO 1967-II-10). As the example regarding the protection of classics demonstrates, copyright laws sometimes provide alternative models for the author-centred and temporally limited basic form of copyright that can be problematic vis-à-vis translations, as we have argued. Yet the protection of classics and its possibilities for more extensive and ethically sensitive modes of copyright protection are limited to the Nordic countries and cannot therefore address the global trend of expanding MT use for publishing literary classics.

Indeed, rethinking the protection and fair treatment of all the stakeholders in translation in the digital age requires more than a minor adjustment of existing national and international copyright laws. The internationalisation of the book trade in the nineteenth century led to substantial copyright reforms and to international regulation that is still in force today (the Berne Convention and the inclusion of most of its statutes in the WTO-governed TRIPS treaty from 1995 onwards). The rapid digitalisation of literature and translation from the late twentieth century onwards represents a similarly urgent challenge for the regulation of intellectual property. However, literature and its translation are marginal areas in the worldwide trade on intellectual properties, and the copyright regimes have proved very resistant to attempts at fundamental revision. Therefore, it seems unlikely that legal copyright alone could provide a framework for the regulation of translation in the digital age.

One measure for addressing the situation is through contracts. Various guidelines for translation contracts emphasise that the translator retains copyright to the translation and that the translation can only be used for the purpose(s) agreed upon in the contract. Moorkens and Lewis (2020, 472–473) discuss this perspective in the recommendations of the Netherlands Association of Interpreters and Translators, for example. The principle also underpins the guidelines of the Finnish Translators' and Interpreters' Association (SKTL n.d.) and the European Council of Literary Translators' Associations (CEATL 2018), among others. Although such guidelines recommend explicit written agreements covering the ownership of translation data and the transfer of rights between the translator

and client, contracts tend to ignore copyright issues, as shown by the review of translation contracts from different countries reported by the European Commission (2014, 133). Furthermore, even when contracts cover the transfer of rights, the translator may not realise the translation could be further shared as part of TMs or other translation data (Drugan and Babych 2010, 8). Contracts should therefore define which rights are transferred and how the "translator's work products" may be exploited, as well as the type and form of authorised exploitation, duration, and compensation (European Commission 2014, 133). The guidelines addressing literary translation also stipulate that contracts "must not call for the summary transfer of all rights." Rather, "each licensed right shall be mentioned in the contract," and the "right to exploit the work through technologies that do not yet exist" would not be transferred (CEATL 2018). Although the literary translation guidelines do not address uses such as MT evaluation and training, other recommendations have been made that these should be specified separately, including in cases where post-edited MT is used (Lewis et al. 2016, 1603).

In addition to the transfer of rights in contracts, compensation can also be considered. In the literary field, it is considered fair practice that the translator is paid royalties, as well as "a share of the profits derived from secondary uses" (CEATL 2018). Although this refers to uses such as e-books and audiobooks, a parallel could be drawn to a secondary use of the translation as data. Drawing on the 1976 UNESCO *Recommendation on Translators' Status and Rights*, Drugan and Babych (2010, 8) suggest that translation contracts should include a provision for supplementary payment if the translation is to be used in a way not originally specified in the contract. It is important to note, however, that these guidelines focus on contracts between the translator and client. They do not address situations where translations are exploited by a third party. In particular, tracking an individual translator's contribution is often impossible because identifying metadata is typically removed when TMs and similar resources are shared (Moorkens et al. 2016, 3). This situation could perhaps be addressed by suggestions regarding digital knowledge commons and the possibility of non-exclusive data ownership right, which would enable translators to record their contribution to a dataset, thereby asserting partial data ownership, and provide for more sustainable control of translation resources and compensation (Moorkens and Lewis 2019, 11; 2020, 476).

The questions concerning copyright, authorship, and textual ownership in the technologised literary translation process are very complex, with no clear answers. On the one hand, it is crucial that the rights and needs of flesh-and-blood authors and professional translators continue to be recognised and protected. On the other hand, it is important to allow the development of new technologies and foster the creativity of the parties that contribute to them. Professional literary translators can also benefit from the advances in technology, and technology can

widen our understanding of the processes of (literary) translation. For a more sustainable future, the rights and needs of different stakeholders in translation—from authors, translators, and developers of technological solutions to the various users of translation products and technologies—should be taken into account. Copyright laws are clearly insufficient as a means of regulation, and, in practice, copyright tends to protect those who have power, while it is the weak that need protection and the financial security that copyrights can offer. The current uncertain circumstances clearly manifest the necessity for a more comprehensive and circumspect approach to translation in the digital age.

Notes

1 The current version of the Berne Convention for the Protection of Literary and Artistic Works (as amended on 27 September 1979) can be accessed at https://wipolex.wipo.int/en/text/283698.
2 The report "Translation and Intellectual Property Rights," to which we refer as European Commission 2014, was commissioned by the European Commission and produced by the law firm Bird & Bird LLP. The team of authors at Bird & Bird was led by Jean-Christophe Troussel and Julien Debussche. Hence some researchers refer to the text as Troussel & Debussche 2014. As it is a report issued by the European Commission, we prefer to attribute the text to the issuing organisation.
3 See https://creativecommons.org.
4 Some clients may, however, specifically forbid the inclusion of their texts in TMs used for other projects (European Commission 2014, 128).
5 http://statmt.org/wmt20/
6 Available at: https://marian-nmt.github.io/

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