Translators and machines: working together

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Abstract

The increasing use of language technologies has prompted an interest in their impact on cognitive processes and translation products. Potential issues related to human-machine interactions include working conditions, time and resource management, and emotional factors. Drawing on a large corpus of translation processes collected from professionals and students, we discuss the nature of translation as a cognitive and organizational activity. We argue that professional translators need to take increased ownership of language technology tools at every stage: in their development, their application, and their integration into organizational processes. This has implications for industry standards, models of translation expertise, and translation didactics.

1. Language technology in the translation process

Professional translation has become a multi-activity task within a complex system of client expectations, technological aids, information sources, and organizational constraints. Reading and researching in the source language, evaluating retrieved information, and writing and revising in the target language impose heavy demands on bilingual cognitive resources. Translators also have to juggle the competing concerns of loyalty to the source text, a high-quality target text, and audience needs. All of this contributes to mental load, a construct proposed to explain how various factors, such as time pressure or text complexity, can affect translation performance (Muñoz 2012). The increasing technologization of the professional translation workplace, in the form of computer-aided translation tools (CAT) and machine translation (MT), relieves translators of some routine tasks and provides easily-retrievable solutions to recurring problems. It has contributed to increasing speed, improving consistency, and reducing costs. However, there has been little investigation of whether or how much these tools actually reduce the mental load of their users during the translation process.

Competence in the use of language technology tools has become an integral part of the job description of professional translation in the industrialized world. This

is reflected in standards for translation services (e.g. EN15038 2006) as well as in European recommendations for translator training (e.g. EMT 2009). Recent models of translation competence (e.g. Göpferich 2009) identify the importance of technology skills as well as cognitive/behavioral components and psychomotor mechanisms clearly related to human-computer interactions. This seems to align with industry expectations: Gouadec (2007/2010: 156) reports that all of the 650 job vacancy advertisements for professional translators he examined require skills in using TM or CAT systems.

The increased emphasis on language technologies in professional translation has changed the translation process in some dramatic ways. At a cognitive level, language technology tools have effectively extended translators' memory by externalizing it, thus decreasing the load on working and long-term memory (cf. Pym 2011). However, the complexity of many of the newer CAT interfaces may increase the cognitive demands on their users (cf. Hansen-Schirra 2012). Furthermore, the use of translation memory (TM) tools may change the nature of the translation task, encouraging translators to focus on the level of segments and sentences instead of the text as a whole (cf. Hansen-Schirra 2012; Jiménez-Crespo 2009).

The potential impact of such tools on cognitive processes goes beyond the linguistic characteristics of the translation unit. In an investigation of sources of disturbances in translation processes, Hansen (2006) identifies working conditions, time management, use of translation aids, and emotions as important parameters in the translation process. Language technology tools can influence emotional state (cf. Beale/Peter 2008): Szameitat et al. (2009) report that delays in computer responsiveness can affect task performance and cause negative emotions, which potentially contribute to stress. Muñoz (2009; 2012) suggests that typing mistakes might be an indication of stress and cognitive effort rather than simply an artifact of a physical activity. These, in turn, can affect concentration and the flow of the translation process when the translator backtracks to correct them.

2. Investigating workplace processes

The field of cognitive translation research uses a variety of methods to gain information about the internal processes and decision-making involved in translation work. Techniques such as monitoring actions that take place on translators' computer screens, reconstructing the translation process to understand individual steps and decisions, and asking translators to reflect on what they do and why have contributed to a greater appreciation of the competences involved in transferring texts from one language to another. However, translation performance is affected not only by what happens in the translator's mind or on the computer screen, but also by how translators interact with their technological, physical, and organizational environment.

Translation studies has shown a growing interest in translation as a system that involves not only multiple agents but also human-computer interactions (e.g., Risku 2010; O'Brien 2012). Humans and machines can reasonably be considered to impact on, and adjust to, each other in order to respond to disturbances and meet new demands. Much modern technology is designed to optimize human performance, but systems can sometimes react inappropriately and actually be an impediment. Alternatively, what might be considered a disturbance in some contexts may actually be conducive to good performance in others. For instance, Cades et al. (2010) point out that interruptions caused by certain physical conditions in the workplace may not necessarily be detrimental to task performance because people can adapt to them, whereas others may require adjustments to the situation or to the machines and tools being used.

An ergonomic perspective provides an appropriate framework to investigate the impact of various factors on the situated activity of translation. According to the International Ergonomics Association (IEA)[1], ergonomics comprises three domains: the cognitive, the physical, and the organizational. Cognitive ergonomics focuses on "mental processes [...] as they affect interactions among humans and other elements of a system", physical ergonomics on "human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity", and organizational ergonomics on "the optimization of sociotechnical systems, including their organizational structures, policies, and processes". These descriptions can easily be applied to professional translation, as discussed in the next section.

3. The ergonomics of language technology

In a longitudinal study conducted by our research team[2], translation processes were collected from beginners, advanced students, and professionals either at their workplaces or in the controlled setting of our institute's usability lab. The students' workplace processes were course assignments that they recorded with screen recording software and submitted to the research team. The professionals' workplace processes were screen recordings of their normal translation tasks completed at their desks. The participants were shown the screen recordings of their processes after completing some of the translations and commented on what they saw themselves doing. They then participated in a semi-structured interview about various aspects of translation and the tools they normally use, as well as in an anonymous online survey about their workplace and heath. By examining different sources of data (e.g. screen recordings, retrospective commentaries, interviews, target texts), we have identified several ergonomic aspects of tool use

[1] http://www.iea.cc/whats/index.html.

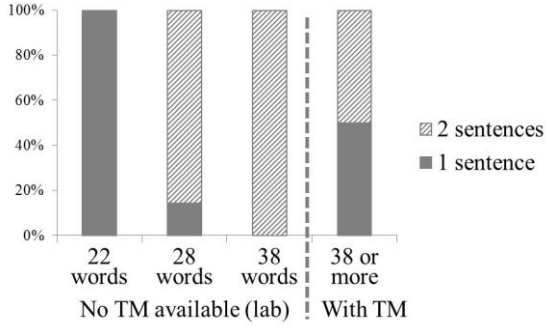
[2] Information on the *Capturing Translation Processes* project and related publications is available at www.linguistik.zhaw.ch/ctp.

which could have adverse effects on translators' performance and well-being (see Ehrensberger-Dow/Massey 2014).

In many processes in our corpus, we have seen features of the text editing software needlessly interrupting the flow of translation. A recurrent example is when the autocorrect feature incorrectly changes a word, forcing the translator to backtrack and undo the change. This is especially relevant for technical translation, which involves terminology and abbreviations that may not be stored in a text editor's dictionaries. Although many software settings can be customized to a translator's needs, language settings are often carried over with the source text. If a translator overwrites it (a common practice observed among our professionals working outside a TM environment), adjustments may be needed that slow down the process. In some applications, the automatic spellchecker does not seem to recognize the target language, requiring repeated changes to the language settings to avoid the distraction of passages underlined in red.

Translators also mentioned becoming annoyed if their tools do not react as quickly as they are used to. In some cases, they also reported that the tools might be influencing their choices and decisions when, for example, they accept the top entry in a concordance list. An interesting case study of the constraining influence of tools is provided by a simple comparison of target texts produced with and without TM. In the lab, with no TM available, professionals translated into German an English source text that had three long sentences. As can be seen in Figure 1, the shortest sentence was always translated as a single sentence but the longest one as two sentences. By contrast, when the same professionals translated source-text sentences of comparable length using TM in the workplace, these were rendered as single sentences 50% of the time. The sentence segmentation typical of most TM system settings (cf. LeBlanc 2013) may unintentionally constrain creativity and the freedom to move away from source-text syntactic patterns.

Figure 1. Source text sentences rendered as 1 or 2 sentences in the target text



Indeed, many comments made by professional translators suggest that language technology tools are unnecessarily constraining their creative autonomy. Even low-level decisions concerning punctuation have to be checked against parallel texts, concordances, and clients' style guides. Some translation tools and aids

might be pushing translation into the direction of a search and match or patchwriting task and away from interlingual transfer of meaning within a multilingual's mind. In this case, retrieval of information and ability to perform will be highly influenced by changes in technology.

There is considerable evidence in our corpus that translators are juggling with many sources of information as they work. A typical professional's screen during a workplace process might display a TM program, a concordance window, a parallel text, and numerous other open tabs. Since it is logistically impossible to determine the number of windows and tabs open in each translation process in our corpus, we compared snapshots of the beginners' and professionals' computer screens 5 minutes into their workplace processes. While the students tended to only have one window open (usually the target text) and about 5 tabs visible in the command bar at the bottom of the screen (see Table 1), the professionals often had at least two or three windows open and far more tabs visible than the students, irrespective of the language pair. During the translation process, the translators repeatedly switched between the windows and tabs, suggesting heavy loads on their working memory to retain information between switches or to remember which tab to open, which can affect performance.

Table 1. Number of windows and tabs open 5 minutes into workplace processes

Version	Group	Number	Windows (range)	Tabs (range)
E-G	Beginners	12	1.0 (1)	4.0 (2-7)
	Professionals	8	**1.9 (1-3)**	**9.0 (3-20)**
G-E	Beginners	10	1.0 (1)	3.5 (2-6)
	Professionals	6	**2.5 (1-3)**	**6.8 (4-12)**

Many issues are related to displays. The settings for some language technology tools require translators to work in one half of the computer screen (e.g. either at the bottom or on the right) and constantly shift between the halves to check information. In certain processes in our corpus, recordings indicate that the translators had trouble finding where they had been working on their text after breaking off to research information or revise previous parts of their work. In addition, computer screens seemed too small to have the internet browser open next to a TM program, which would explain why professional translators constantly switch between windows. A simple expedient like a browser button on a TM interface could ease translators' cognitive load, while greater familiarity with shortcut key combinations would help to automatize routine procedures and release cognitive resources for more demanding work.

4. The technologized translation workplace

Translators spend most of their day working with language and information technologies. Professionals seem to rely much less on external resources than students do, and their pausing behavior suggests that they are spending more time consulting their internal resources (i.e. thinking) than the students are. As a

result, professionals spend significantly more of their time using their keyboard than their peripheral input devices compared with beginners and advanced students, and are correspondingly faster at producing target text (see Table 2 for data from the German-English and English-German lab processes). Translation with language technology tools requires intensive interaction with hardware: an analysis of a 20-minute lab process revealed that, in addition to typing approximately 700 characters and spaces, the translator used the mouse wheel 78 times and made 106 mouse clicks.

Table 2. Use of computer peripherals and TT words in first 15 minutes of lab processes

Group (processes)	Keystrokes/ minute	Switches to mouse/minute	Mouse clicks/minute	TT words after 15 minutes
Beginner (26)	49.2	3.3	7.6	52.5
Advanced (19)	56.9	2.9	6.6	67.4
Professional (15)	**70.7**	**2.5**	**5.6**	**92.4**

Using a keyboard and other input devices such as a mouse and touchpad involves more than just the hands or lower arms; the constant repetition of movement can cause an overload of muscles of the upper extremities and back. Pineau (2011) points out that the arrangement of letters on keyboards force hand distortion, overly frequent finger extension, and imbalances between right-hand and left-hand use. Since both source and target texts are usually in electronic form, eyestrain due to long hours peering at a computer monitor can also become an issue. In the interviews after commenting on their translation processes, the professionals were asked specifically about satisfaction with their computer workstations and user interfaces. Despite being basically satisfied, all of them mentioned issues related to ergonomics, such as having no possibility to work standing and computer-screen size. Complaints about user interfaces generally focused on the limited space available for inputting text because of all the menus and options. Surprisingly for such a screen-intensive task as translation, none of the professionals in our study used two monitors, which would have solved a number of the problems noted.

In addition, many professional translators work in offices that were not designed for intensive text work. Contextual factors, such as ambient noise, inadequate lighting, lack of ventilation, and people moving within translators' fields of vision, can influence translation performance and contribute to health problems. In the anonymous survey done after we recorded processes at the workplace, all of the translators reported a perceived impact of their work on their health, such as burning eyes, concentration problems, headaches, nervousness, general weakness and fatigue, neck pain, and back pain. All of them also mentioned that there were problems with office air quality and ventilation. The most frequently identified disturbances were noise from outside and inside the office (78% and 85% respectively), people moving around the office (78%), and email, chats, or phone calls (71%). Not all disturbances to the translation process were viewed negatively, however. Many of the translators said that they found interruptions such as phone calls, questions from colleagues, and coffee breaks helped sharpen

their concentration afterwards. Prudent distribution of breaks would seem the natural good practice suggested by such observations.

Infrastructural and physical factors may be compounded by issues of organizational ergonomics. A number of translation scholars (e.g. Grass 2011; Olahan 2011) argue that, by largely failing to address human and organizational aspects in the design and workflow deployment of language technology tools, software developers and corporate LSPs have been increasingly disempowering and alienating translators. The segmentation of the translation process into management, terminology, pre-translation, revision, and other tasks can be perceived as positive when it frees up human resources for work that people can do better than machines, but compartmentalization can impact negatively on translators' self-concept and professionalization if it prevents them from making informed decisions and taking adequate responsibility for what they do (cf. Ehrensberger-Dow/Massey 2013).

5. Implications for industry standards, expertise, and didactics

Many of the comments made by the translators in our study reflect the apparent priorities of EN15038 (2006: 11), in which translation is delineated as an activity concerned with terminology, grammar, lexis, proprietary or client style, local conventions and regional standards, and formatting; interestingly, the target group and the purpose of the translation figures last on this list. The question arises as to whether such quality standards may be over-standardizing the profession and placing excessive contraints on the translator. If translators are being constrained by the tools they are using and the system that they are working in, it might prove very difficult for them to gain expertise. Constrained systems run the risk of producing professionals who are very good at routine work when all of the tools are operational, but who may not develop and maintain the expertise needed to handle novel problems.

Understanding how translators use language technology should contribute to optimizing translation workplaces, tools, and decision-making procedures as well as motivating the need for individual adaptations to be built into technologies and systems when indicated. Heightened appreciation of the importance of ergonomic resources, tools, settings, equipment, and organizational systems should also help translators and companies design more efficient and user-oriented workplaces, tools, and workflows. The importance of ergonomic factors extends beyond the various agents in the situated activity of translation. Ergonomic issues are highly relevant for members of any professional group that operates at the human-computer interface. Since the time spent at computer workplaces is increasing, it is clearly in most institutions' and companies' best interest to understand which ergonomic factors represent disturbances that seriously affect the performance of their staff.

Finally, findings from research into how translators work with machines can feed into an empirical, evidence-based approach to language service consultancy and

the professional development of translators, and be directly applied to courses in undergraduate and graduate translation studies programs. We believe that our continuing investigations will enable us to identify good, better, and best practices to diminish the detrimental effects of workplace constraints. This, in turn, will improve our ability to prepare students and professionals for the future challenges posed by human-machine interaction.

References

Beale, R. / Peter, C. (2008). The role of affect and emotion in HCI, in: *Lecture Notes in Computer Science* 4868, p. 1-11.

Cades, D. M. / Werner, N. E. / Boehm-Davis, D. A. / Arshad, Z. (2010). What makes real-world interruptions disruptive? Evidence from an office setting, in: *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 54.4, p. 448-452.

Ehrensberger-Dow, M. / Massey, G. (2014/forthcoming). Cognitive ergonomic issues in professional translation, in: Schwieter, J. W. / Ferreira, A. (eds.). *The Development of Translation Competence: Theories and Methodologies from Psycholinguistics and Cognitive Science.* Newcastle: Cambridge Scholars Publishing, p. 58-86.

Ehrensberger-Dow, M. / Massey, G. (2013). Indicators of translation competence: Translators' self-concepts and the translation of titles, in: *Journal of Writing Research* 5.1, p. 103-131.

EMT expert group. (2009). *Competences for Professional Translators, Experts in Multilingual and Multimedia Communication*. Brussels: European Commission.

EN 15038. (2006). *Translation services – service requirements*. Brussels: European Committee for Standardization.

Göpferich, S. (2009). Towards a model of translation competence and its acquisition: The longitudinal study TransComp, in: Göpferich, S. / Jakobsen, A. L. / Mees, I. M. (eds.). *Behind the Mind. Methods, Models and Results in Translation Process Research*. Copenhagen: Samfundslitteratur, p. 17-43.

Gouadec, D. (2007/2010). *Translation as a Profession*. Amsterdam: John Benjamins.

Grass, T. (2011). "Plus" est-il synonyme de "mieux"? Logiciels commerciaux contre logiciels libres du point de vue de l'ergonomie, in: *ILCEA Traduction et Ergonomie* 14. http://licea.revues.org/index 1052.html.

Hansen, G. (2006). *Erfolgreich übersetzen. Entdecken und Beheben von Störquellen*. Tübingen: Narr Francke Attempto.

Hansen-Schirra, S. (2012). Nutzbarkeit von Sprachtechnologien für die Translation, in: *trans-kom* 5.2, p. 211-226.

Jiménez-Crespo, M. A. (2009). The effect of translation memory tools in translated web texts: Evidence from a comparative product-based study, in: *Linguistica Antverpiensia* 8, p. 213-232.

LeBlanc, M. (2013). Translators on translation memory (TM). Results of an ethnographic study in three translation services and agencies, in: *The International Journal for Translation & Interpreting Research* 5.2, p. 1-13.
Muñoz Martín, R. (2009). Typos and co, in: Göpferich, S. / Jakobsen, A. L. / Mees, I. M. (eds.). *Behind the Mind. Methods, Models and Results in Translation Process Research*. Copenhagen: Samfundslitteratur Press, p. 167-189.
Muñoz Martín, R. (2012). Just a matter of scope. Mental load in translation process research, in: *Translation Spaces* 1, p. 169-188.
O'Brien, S. (2012). Translation as human-computer interaction, in: *Translation Spaces* 1, p. 101-122.
Olohan, M. (2011). Translators and translation technology: The dance of agency, in: *Translation Studies* 4.3, p. 342–357.
Pineau, M. (2011). La main et le clavier: histoire d'un malentendu, in: *ILCEA Traduction et Ergonomie* 14. http://ilcea.revues.org/index1067.html.
Pym, A. (2011). What technology does to translating, in: *The International Journal for Translation & Interpreting* 3.1, p. 1-9.
Risku, H. (2010). A cognitive scientific view on technical communication and translation. Do embodiment and situatedness really make a difference?, in: Target 22.1, p. 94-111.
Szameitat, A. J. / Rummel, J. / Szameitat, D. P. / Sterr, A. (2009). Behavioral and emotional consequences of brief delays in human-computer interaction, in: *International Journal of Human-Computer Studies* 67, p. 561-570.