Exploring professional translators' attitudes towards control and autonomy in the human-centred AI era: quantitative results from a survey study

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Abstract

This paper presents a survey study on attitudes of US professional translators towards self-perceived "control" and "autonomy" regarding translation technologies. In the human-centred AI (HCAI) and "intelligence augmentation" paradigms, humans retain the highest possible levels of control and autonomy alongside high levels of automation. The rationale for this study is that the cycle of translation technology adoption normally implies human adaptation to technologies that have been previously developed without their input. This often leads to resistance to adoption and negative or divergent attitudes. Now that AI app integration is still at the early stages of development and adoption, it is of utmost importance to identify users' needs and attitudes to develop tools that professionals can easily adopt and feel in control of. Methodologically, the study involved a self-administered online Qualtrics survey that was completed by 41 US-based translators in May 2024. The self-reported levels of control and autonomy are generally high, while subjects reported medium levels of forced technology use by external agents. The use of generative AI remains low, with 0% of respondents indicating being forced to use AI or LLMs, in line with other recent studies. Future expectations of control in the AI era declined dramatically, but this perceived loss of control in the AI era was attributed to human agents in the process rather than AI apps or algorithms (big tech, developers, LSPs, project managers, clients, etc.). These low levels of sense of agency in the future correspond with recent studies that find that exploitation through "digital Taylorism" by other human agents might be perceived as more of a threat than AI or translation technologies themselves.

Keywords: human-centred AI, LLMs, control, autonomy, translation technologies, translators' attitudes.

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Resumen

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Este artículo presenta un estudio basado en encuestas sobre las reacciones de los traductores profesionales de EE. UU. hacia la percepción de "control" y "autonomía" en relación con las tecnologías de traducción. En los paradigmas de Inteligencia Artificial Centrada en Humanos (HCAI) y de "aumento de la inteligencia", los humanos conservan los niveles más altos posibles de control y autonomía junto con altos niveles de automatización. El fundamento de este estudio radica en que el ciclo de adopción de tecnologías de traducción normalmente implica la adaptación humana a herramientas previamente desarrolladas sin su participación, lo que frecuentemente conduce a una cierta resistencia a la adopción y reacciones negativas o divergentes. Ahora que la integración de aplicaciones de IA aún se encuentra en las primeras etapas de desarrollo y adopción, es crucial identificar las necesidades y reacciones de los usuarios para desarrollar herramientas que los profesionales puedan adoptar fácilmente y sobre las cuales sientan un alto grado de control. Metodológicamente, el estudio se llevó a cabo mediante una encuesta en línea autoadministrada con la plataforma Qualtrics, respondida por 41 traductores radicados en EE. UU. en mayo de 2024. Los niveles autodeclarados de control y autonomía son, en general, altos, mientras que los encuestados reportaron niveles medios de imposición de uso de tecnologías por agentes externos. El uso de IA generativa sigue siendo bajo, con un 0 % de los encuestados indicando que se ven obligados a usar IA o LLMs, en línea con otros estudios recientes. Sin embargo, las expectativas futuras de control en la era de la IA disminuyeron de manera drástica, aunque esta pérdida percibida de control se atribuyó a agentes humanos en el proceso (grandes empresas tecnológicas, desarrolladores, LSP, gestores de proyectos, clientes, etc.) más que a las aplicaciones o algoritmos de IA. Estos bajos niveles de sensación de agencia de cara al futuro coinciden con estudios recientes que sugieren que la explotación mediante el "taylorismo digital" por parte de agentes humanos podría percibirse como una amenaza mayor que la IA o las tecnologías de traducción en sí mismas.

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Palabras clave: IA centrada en humanos, LLM, control, autonomía, tecnologías de traducción, LLM, predisposición de los traductores.

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Resum

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Aquest article presenta un estudi basat en enquestes sobre les reaccions dels traductors professionals dels EUA cap a la percepció de "control" i "autonomia" en relació amb les tecnologies de traducció. En els paradigmes d'Intel·ligència Artificial Centrada en Humans (HCAI) i d'"augment de la intel·ligència", els humans conserven els nivells més alts possibles de control i autonomia juntament amb alts nivells d'automatització. El fonament d'aquest estudi rau en el fet que el cicle d'adopció de tecnologies de traducció normalment implica l'adaptació humana a eines prèviament desenvolupades sense la seva participació, la qual cosa freqüentment condueix a una certa resistència a l'adopció i reaccions negatives o divergents. Ara que la integració d'aplicacions d'IA encara es troba en les primeres etapes de desenvolupament i adopció, és crucial identificar les necessitats i reaccions dels usuaris per desenvolupar eines que els professionals puguin adoptar fàcilment i sobre les quals sentin un grau elevat de control. Metodològicament, l'estudi s'ha portat a terme per mitjà d'una enquesta en línia autoadministrada amb la plataforma Qualtrics, que han contestat 41 traductors establerts als EUA el maig de 2024. Els nivells autodeclarats de control i autonomia són, en general, alts, mentre que els enquestats han reportat nivells intermitjos d'imposició de l'ús de tecnologies per agents externs. L'ús d'IA generativa continua sent baix, amb un 0 % dels enquestats indicant que es veuen obligats a utilitzar IA o LLM, en línia amb altres estudis recents. Així i tot, les expectatives futures de control en l'era de la IA han disminuït de manera dràstica, tot i que aquesta pèrdua percebuda de control s'ha atribuït a agents humans en el procés (grans empreses tecnològiques, desenvolupadors, LSP, gestors de projectes, clients, etc.) més que a les aplicacions o algoritmes d'IA. Aquests baixos nivells de sensació d'agència de cara al futur coincideixen amb estudis recents que suggereixen que l'explotació per mitjà del "taylorisme digital" per part d'agents humans podria percebre's com una amenaça major que la IA o les tecnologies de traducció en si mateixes.

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Paraules clau: IA centrada en humans, LLM, control, autonomia, tecnologies de traducció, LLM, predisposició dels traductors.

1. Introduction

Since OpenAI released ChatGPT in November 2022, we have experienced the meteoric rise of different generative large language models (LLMs) and AI apps. In professional translation, these LLMs have started to be integrated into translation environments and management workflows (e.g. Sanchez-Gijón and Palenzuela, 2023; GALA, 2024; Briva Iglesias et al., 2024). The disruption brought by these new technologies has the potential to revolutionise how professionals interact with translation technologies, how these professionals produce translations and search for relevant information, or how they communicate and negotiate with other agents in the production chain (clients, language service providers (LSPs), tech support, etc.). It also has the potential to positively or negatively impact professionals' attitudes towards translation technologies, a key issue in translators' motivation and satisfaction (Sakamoto et al., 2024). This is especially true if professionals perceive that technologies are forced upon them, they do not align with their processing styles or expectations, or they lead to higher cognitive load or cognitive friction (Ehrensberger-Dow and O'Brien, 2015; Sun, 2021).

The potential applications of LLMs and AI in the translation ecosystem are many, such as management, terminology extraction, language improvement, neural machine translation (NMT) functionalities, and quality estimation, to mention a few (Sanchez-Gijón and Palenzuela, 2023; Pym and Hao, 2024; Jiménez-Crespo, 2024). In the industry, other areas of interest for AI implementations are the supply chain, value proposition, customer service, administrative tasks, and human resources (GALA, 2024). Nevertheless, to date, the adoption and integration of generative LLMs and other AI applications is still far from the hype after they were introduced to the wider public. In the industry, a recent GALA (2024) report on localisation and automation shows that 63% of LSPs are currently using AI (including NMT), but only 40% implement it in their localisation programs. When asked specifically about LLMs, only 35% of LSPs used them. According to this industry report, AI technologies are primarily being used for speed and efficiency gains, cost savings, the reduction of human error, or even for FOMO (fear of missing out) reasons. As far as translators themselves are concerned, a recent survey study with 600 respondents, conducted by the European Language Council (CEL/ELC) Special Report Interest Group (SIG) (Rivas Ginel et al., 2024), showed that 37.17% of translators have integrated AI into their translation or interpreting workflow (NMT and generative AI). Among the main drawbacks of AI-powered tools, participants reported output quality and mental effort, with 48.84% of them reporting that AI tools increase their cognitive effort. Other key barriers to the implementation of generative AI (GenAI) were that this technology is not relevant or that translators are not required to use it, as well as ethical and confidentiality issues.

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Amid this revolution, these novel technologies have raised concerns about the possible replacement of professional translators in a wide range of tasks, translation scenarios or content types through automation and AI integrations. In the survey by Rivas Ginel et al. (2024), 61.67% of respondents identified GenAI as a threat to the profession, while 46% of LSPs showed a negative attitude in the latest ELIS 2024 report (ELIS, 2024). Generally, concerns about replacement or degradation of job conditions often result in negative attitudes and resistance to adoption of translation technologies (e.g. Ruokonen and Koskinen, 2017). This cycle of adoption and resistance to adoption is documented in published literature. For example, survey and focus group studies have reported that professionals resist adoption of new technological developments at the early stages of implementation, such as the introduction of computer-assisted translation (CAT) tools, NMT post-editing (MTPE), workflow automation or the "platformisation" of a segment of the translation market (e.g. Presas, Cid-Leal and Torres-Hostench, 2016; Nunez Vieira, 2020; Firat, 2021; Salmi, 2021; Nunez Vieira, Ragni and Alonso, 2021; Ragni and Nunez Vieira, 2022; Gough et al., 2023; Herbert et al., 2023). This resistance is often attributed to the lack of involvement of professionals in the actual development and implementation of new technologies, workflows, or integrations. For example, it has been reported that most research involving human stakeholders in NMT is directed towards the overall improvement of machine translation (MT) systems, rather than improving the usefulness of NMT for professional translators (Ragni and Nunez Viera, 2021). Resistance is also attributed to professionals' lack of involvement in economic decisions related to how translation technologies change compensation or job relation environments (Firat, Gough and Moorkens, 2023). As Briva Iglesias (2024) indicates, the regular process of technology adoption in the language service industry is normally carried out through human adaptation, meaning that translation technologies are developed first, and then it is humans who need to be trained to adapt to an existing technology or workflow. The author also claims that research in the opposite direction is needed to foster the adoption of technologies: developing technologies that meet users' needs and expectations to avoid the rejection of these technologies and help leverage the advances that they might provide. This is, in fact, the main objective of the present study.

2. Control, autonomy, and human-centred AI approaches in translation

One of the main drawbacks that professionals attribute to the encroaching of technologies into their daily jobs is the potential loss of control and autonomy (Ruokonen and Koskinen, 2017; Sakamoto et al., 2024). This is a common phenomenon across the vast number of AI-driven fields. A survey study across different domains identified that the prime concerns of AI experts are the loss of human agency and loss of control over their lives or professional endeavours (Anderson and Raine, 2018). This also applies to translation as a profession: previous studies have also identified that professional translators are concerned about this loss of human agency or control (Caldwell et al., 2018; Moorkens, 2020). New GenAI applications in the translation domain will potentially lead to the same issue. In this context, the objective of this study is to research precisely

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how professional translators perceive or conceptualise the notions of "control" and "autonomy", two essential features of emerging human-centred AI (HCAI) approaches (Shneiderman, 2020, 2022). According to Schneiderman (2022), one of the main goals of HCAI is to place "humans at the center by increasing human control, even though there are high levels of computer automation and AI algorithms". High levels of human control and high levels of automation are possible, moving towards a paradigm in which the inevitable rise of AI does not necessarily lead to human-in-the-loop AI paradigms (Schneiderman, 2022). These "human-in-the-loop" paradigms often respond to development or architectural approaches where developers of AI systems, technologies and implementations tend to favour the central role of AI systems, assuming a subservient role of the human in the process. In this sense, if AI tools and implementations in translation are going to be "human-centred" anytime soon, these tools should be developed with an eye on users' control and autonomy to increase users' satisfaction (Ozmen Garibay et al., 2023), positive or convergent attitudes (Ruokonen and Koskinen, 2017), rates of adoption, etc. The study of perceptions of and attitudes towards control and autonomy in human-machine interaction should thus be a priority for technology-oriented translation studies.

2.1. Human-centred AI in translation

This study is inspired by the recent introduction in translation studies of the notions of "human-centred AI" and "augmented intelligence/cognition" in translation (O'Brien, 2023; Jiménez-Crespo, 2023, 2024a, 2024b). The main difference between general AI and HCAI is that the former intends to emulate human cognitive processing and replace humans in certain tasks, while HCAI involves augmenting human function (Shneiderman, 2020, 2022; Rogers, 2022; Capel and Bereton, 2023; Ozmen Garibay et al., 2023). Thus, HCAI and one of its sub-areas, "intelligence augmentation" (Sadiku and Musa, 2021), are focused on the integration of AI with human cognitive processes to enhance and improve the efficiency, efficacy or problem-solving abilities of human actors. As previously mentioned, the main objective of HCAI approaches is to put "the human at the centre", while maintaining high levels of automation. In HCAI, AI is seen as "complementary to human intelligence and [it] will not take over human function" (Sadiku and Musa, 2021: 192). Rather than modelling cognitive processes of humans for their substitution, HCAI research aims to "enhance human capacities and improve human experiences rather than replacing them through automation" (ibid: 1). As such, AI implementations mainly intend to amplify, augment, and enhance human performance, at the same time as they support "human self-efficacy, encourage creativity, clarify responsibility, and facilitate social participation" (Shneiderman, 2022: 120). Humans and AI apps and algorithms are seen as complementary agents whose strengths are united to achieve a common goal, but always keeping humans firmly in control (Abbass, 2019; Jiménez-Crespo, 2023).

It is undeniable that HCAI applications are presented as having unnumberable advantages in a broad range of fields, offering capabilities such as automating tasks that are redundant, enhancing predictions, offering decision support or helping provide

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better personalisation. Nevertheless, as Väänänen et al. (2021) indicate in their introduction to their special issue on human autonomy through HCAI, these technologies also "pose a threat to human autonomy by over-optimizing the workflow, hyper-personalization, or by not giving users sufficient choice, control, or decision-making opportunities" (ibid: np). The notions of "autonomy" and "control" are closely related. "Autonomy" here is understood as either the agent or the human having control and being able to make fully independent decisions. Shneiderman (2022) proposed a bi-dimensional framework that includes different levels of human control paired with computer automation, aiming simultaneously for the highest possible levels of both human control and computer automation. The notion "human control" comes from psychological approaches, and it is closely related to the sense of agency (e.g. Moore, 2016). This sense of agency, also known as "perceived control", refers to a person's subjective experience of feeling that they were the initiator of a behaviour and are actively in control. Therefore, human control over technology "stems from perceived control over one's actions to make decisions and influence events" (Alfredo et al., 2024: 2). It is closely related to those technologies and interfaces that support an internal locus of control, that is, the perception of users that they control the outcome. This locus of control can be both internal and external (Rotter, 1966), depending on whether the person believes the outcome might be due to their behaviour or not. Thus, in human-computer interaction, the literature shows that it is key to design interfaces and workflows that support this internal "locus of control". In fact, one of the main golden rules of interface design in HCAI is that developers need to "[k]eep users in control" (Shneiderman et al., 2016). This need means that new AI technologies should be developed in a way that does not "[jeopardize] human control, agency, and autonomy" (Väänanen et al., 2021: np).

In terms of human-computer interaction, studies have found that users who feel out of control can potentially feel more stress, anxiety and low esteem, and experience more anger and hostility (Hinds, 1998). Therefore, designers of human-computer interfaces need to consider the users' sense of control as an important determinant of the overall usability of any system (Hinds, 1998). In this context, and if the language industry or technological giants intend to "augment" human translators' cognitive abilities (professionals and non-professionals[1] alike), notions such as control and autonomy in relation to AI and automation deserve a closer look, especially at a time when tech companies are rushing to include AI applications in translation workflows, such as the memoQ AGT generative AI plugin for translation environments (Moorkens et al., 2024). Autonomy and control often appear as desired qualities that should be embedded in emergent technologies in surveys of professional translators' attitudes towards language technologies (Nunez Vieira, Ragni and Alonso, 2021). Here, it is undeniable that translators should feel and perceive that they are at the centre of the cognitive system and retain autonomy and the locus of control while translating. But what does self-perceived control

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[1] Jiménez-Crespo (2023) presents an overview of industry discourses related to "augmentation" through technologies in non-professional collaborative or crowdsourcing platforms.

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and autonomy mean for professionals? Do professionals today feel that they are in control of translation technologies and how they are integrated into their workflows? What are their views or expectations regarding the coming AI era?

The qualitative results of the survey study reported in the present paper are a first step towards the study of "human control" in professional translation in the AI era. They are intended to be a first step in identifying possible avenues for following the previously mentioned golden rule of HCAI design (Schneiderman et al., 2016).

3. The survey study

This section of the paper describes the survey study on the attitudes of professionals in the United States towards "control" and "autonomy" in technological environments. The wider overall objectives of the survey were to identify (1) professional translators' attitudes towards control and autonomy over existing translation technologies that they use, (2) their expectations regarding control and autonomy over the upcoming implementation of LLMs and other AI apps in the translation workflow, (3) any potential correlations between translation experience and attitudes towards control and autonomy, and (4) what ideas about autonomy and control these professional users would like to see implemented by developers in upcoming AI-enhanced translation technologies. This paper includes only the quantitative data related to objectives 1, 2 and 3 mentioned above. Objective 4 will be included in future studies, given the need for extended processing of the qualitative results obtained in the survey and the limitations in terms of length of the current paper.

3.1. Research questions

This paper investigates the following research questions:

RQ1: What kind of translation tools are used by respondents and how do they rate their command of translation technologies?
RQ2: What levels of "perceived control" do professional translators have over existing translation technologies that they use?
RQ3: What levels of "autonomy" do professional translators have when working with translation technologies today?
RQ4: Are there any correlations between the different data points [age, years working with translation technology, freelance vs. in-house translator, command of translation technologies, etc.] and attitudes towards AI, and perceived "control" and "autonomy"?
RQ5: What levels of control do respondents expect to have over translation technologies in the coming AI era? Where will the locus of control lie, with humans or machines?

For question (RQ4), this paper presents results on possible correlations between years of experience and reported levels of command, use and control (present and future). This is motivated by a number of previous studies that report differences in technology use or attitudes towards technologies depending on the number of years of experience subjects have. It is hypothesised here that years of experience might impact participants' attitudes towards control or towards the future impact of AI in their profession. For

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example, previous studies have shown that years of experience can correlate negatively with attitudes towards technologies (Sakamoto, 2020; Sakamoto et al., 2024), even if other recent studies in legal settings have not shown any correlation (Prieto Ramos, 2024). Salmi (2021) discusses how Finnish translators with over 20 years of experience have a lower perception of the efficiency of translation technologies than those with under 10 years of experience and aged below 35 years old. Similarly, in Ehrensberger-Dow et al. (2014), younger translators (18-45) were most likely to use CAT tools, and in Presas, Cid-Leal and Torres-Hostench (2016), older participants were more resistant to adopting MT.

3.2. Statistical analyses

To evaluate results, linear regression analyses were carried out using RStudio for Statistical Computing (R Team, 2022). The data was analysed following a descriptive analysis performed using the "tidyverse" (Wickham et al., 2019) and "dlyr" packages (Wickham et al., 2023).

3.3. Methodology

The survey was designed using the online survey tool Qualtrics, and it was checked for face and content validity to ensure usability and comprehensibility through expert reviews and a pilot study. Ethical approval was obtained from the Institutional Review Board at Rutgers University. The survey was available from May 10th to May 25th, 2024. Participants were recruited online by means of emails distributed via professional associations in the USA and social networks (e.g. LinkedIn). The only requirement for participation was to be a full-time translator in the USA with more than two years of experience. To encourage participation, a snowball sampling method was used (Goodman, 1961; Biernacki and Waldorf, 1981).

1. The online self-administered survey contained four distinct sections. In addition to a section with demographic questions (12 questions), the survey included questions designed to obtain qualitative data (six questions) and quantitative data (10 open-ended questions). The survey began with a brief introduction of the study and information on duration, data use and storage, privacy, freedom of participation, and compensation for participation. Participants then had to consent to the study.
2. Part 1. The initial part of the survey elicited demographic information (years of experience, education, language combinations, specialisations, current working arrangement (in-house, freelance), etc.). This part included questions Q1 to Q12.
3. Part 2. The second part of the survey sought information related to respondents' current use of translation technologies (types of technologies, frequency of use). This part included questions Q13 and Q14.
4. Part 3. The main part of the survey comprised questions related to attitudes towards "perceived control" over the translation technologies currently used, such as perception of control over technologies, whether respondents were required to use technologies by clients/management/LSPs, scope for personalisation, types of technologies, features, integrations, user interfaces, whether respondents would like to have more control over existing technologies, etc. This part included questions Q14 to Q22.

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5. Part 4. Attitudes towards control and autonomy in AI-enhanced translation environments in the near future (expected levels of control and autonomy, tasks or subcomponents of the translation process expected to be more impacted by AI implementation, etc.). The last part of the survey mainly included qualitative questions (Q24 to Q28), while one quantitative question (Q23) asked about future levels of control over integrations of AI and AI-driven tools into the translation process. The results of these questions will be reported on in a different paper, given the length limitations of the current paper.

All quantitative data was obtained using a linear scale ranging from 0 to 100% for more precise measurements. In total, 52 responses were recorded in the previously mentioned two-week period, but only 41 participants completed all sections of the survey. The remaining participants only completed the first or second part of the survey (demographic data or technology use), but not the parts related to control and autonomy, and their responses were deleted.

3.4. Demographic data

Data was collected from 41 survey participants (28 females and 12 males). The ages of the participants ranged from 76 to 24 (M = 43.83, SD = 14.06), while their professional translation experience ranged from two to 50 years (M = 13.8, SD = 14.08). As for their current job situation, 58.53% of the participants stated they were full-time freelance translators, 24.39% were part-time freelance translators, and 17.07% worked in-house. Respondents reported primarily working in the legal field (52.8%), followed by medical (47.92%), education (28.17%), government-institutions (27.08%), community translation (25%) and financial-economic (18.75%). The survey included an open-ended option for "other" specialisations (29.17%), and participants reported fields such as social sciences, international development, literary, constructions, and patents. Figure 1 shows a breakdown of specialisations.
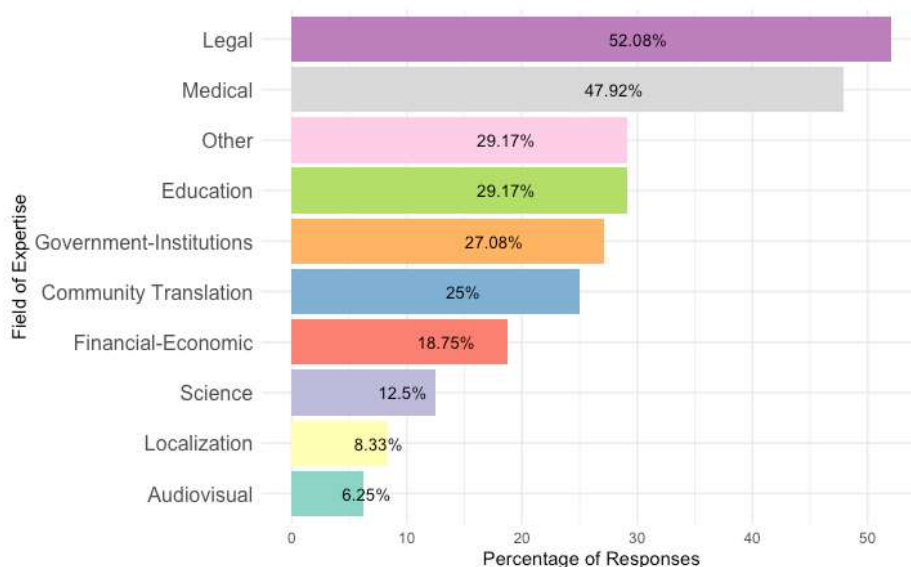

Figure 1. Reported fields of specialisation by percentage of participants.

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Different language combinations and working languages were reported, including English, Spanish, French, Portuguese, Portuguese/Cape Verdean, German, Ukrainian, Urdu, Finnish, Haitian Creole, Dutch, Hebrew, Belarussian, Polish and Arabic.

4. Results

This section reports on the results of the quantitative portion of the survey. It starts with participants' use of translation technologies, followed by their perceived level of command over these same technologies. The next subsection includes all data related to perceived control and autonomy. The Results section ends with data related to attitudes towards future control and a look at answers to an open-ended question related to where the locus of control might lie in the AI-driven future.

4.1. Part 2. Command and use of technologies

Part 2 of the survey inquired about translation technology use and was related to the first research question (RQ1). It included two survey questions (Q13, Q14) related to use and command of technologies. The first question in this section (Q13) was "What translation technologies do you use at work and how often?" The question included seven possible responses: translation memory, NMT, adaptive or interactive NMT, terminology databases, ChatGPT or other LLMs, quality assurance technologies, and an open field for "others". Each had a sliding scale ranging from 0 to 100% to rate how often each technology was used (0% being never, 50% sometimes, and 100% always). Figure 2 shows the breakdown of translation technology use by mean percentage of use reported by participants. Terminology databases (M = 61.44, SD = 36.12) and translation memory (M = 61.30, SD = 36.53) were the most used technologies, followed by quality assurance technologies (M = 56.74, SD = 30.69) and NMT (M = 53.10, SD = 32.78). The mean percentage of use of adaptive or interactive NMT was 32.46% (SD = 29.74). Participants also reported use of "other" technologies, with a mean of 47.36%. Some such technologies were collaborative reporting tools, or proofreading software such as PerfectIt. Participants also reported other QA tools, such as Verifika QA Technology, or proprietary translation memory software.

Each translation technology item had an optional open field where respondents could state which specific translation technologies they used. In terms of NMT, DeepL was the most used system (n = 9), followed by Google Translate (n = 3) and Microsoft Bing (n = 2), after which came ModernMT, Phrase MT, Language Weaver and memoQ with one mention each (n = 1). Very few participants indicated the type of generative LLM that they used. The responses that were given mainly mentioned ChatGPT 3.5 or 4 (n = 9), while there was one response each for Claude, memoQ AI assistant and in-house solutions.

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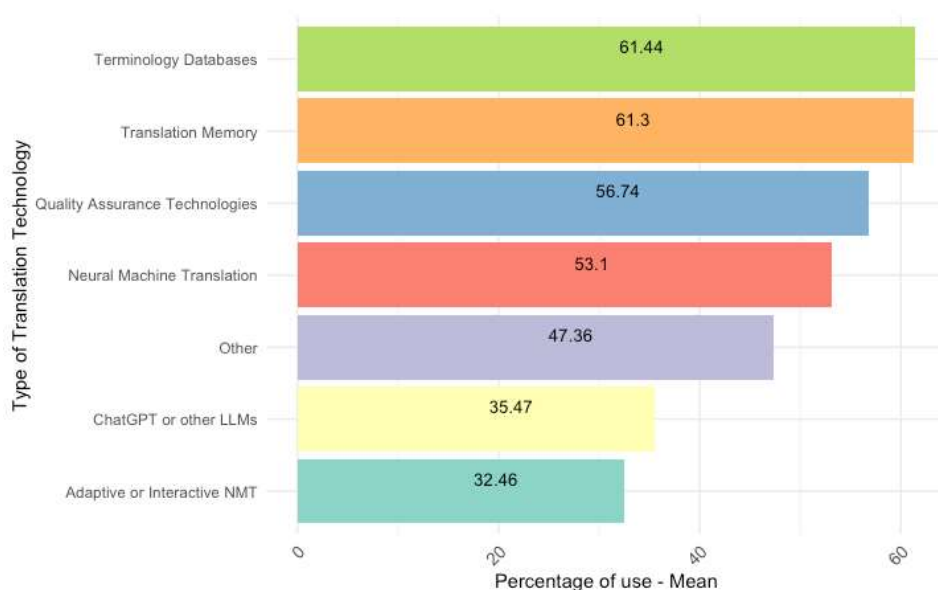
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Figure 2. Use of translation technologies in mean percentages.

The next question in this section (Q14) was related to command of translation technologies. It was formulated as follows: "On a scale from 0 to 100, how do you rate your command of translation technologies in general?" It included a sliding linear scale ranging from 0 to 100% for participants to rate their perceived command of translation technologies in general (0% being extremely poor, 50% average, and 100% excellent). The mean value of the responses was 66.42 (SD = 24.86, min = 5, max = 100); i.e. participants reported their command of technology to be above average, but not "excellent".

As previously described, earlier survey studies had reported that years of experience can correlate with lower levels of use or resistance to adoption of translation technologies. A linear regression analysis was conducted to examine how each of the variables age (Age) and years of experience (Years_Work) is related with the response variable perceived command of technologies (Command_total). The result of the correlation analysis in Figure 3 shows very weak positive linear relationships between Age and Command_total (Pearson correlation coefficient r = 0.05747), and between Years_Work and Command_total (Pearson correlation coefficient r = 0.1166). These results suggest that years of translation experience might have a positive impact on perceived command of translation technologies.
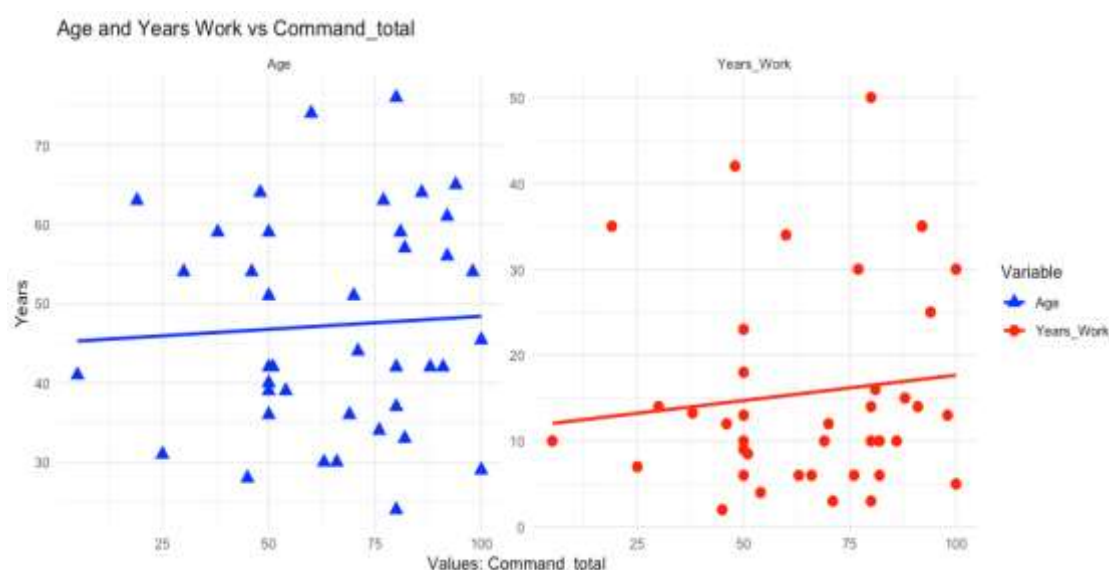
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Figure 3. Linear regression analysis of age (Age) and years of work (Years_Work) vs. perceived command of technologies (Command_total).

4.2. Perceived levels of control over translation technologies

The main quantitative sections of the survey, Part 3 and Part 4, included six questions related to perceived control over translation technologies. The six survey questions, which included a linear scale ranging from 0 to 100% to measure attitudes towards perceived control of translation technologies, were the following:

- Q15. "How do you rate your overall level of control over the technologies that you use during your translation work? (meaning during the process of translation). Use the slider to rate from 0 (No control over the technologies I use), 50% (Some control), to 100 (Total control over the type of technologies I use, and when I use them)."
- Q16. "Do you feel that you have autonomy as a professional in terms of how technology is used and integrated in your day-to-day work?"
- Q17. "Do you feel that you can control what technologies you can use or turn on-off depending on the type of content, translation task, passage, time of the day, etc.?"
- Q18. "Do you work with some translation technologies because clients, managers, organisations or LSPs require or demand it?"
- Q19. "Which translation technologies do you use because clients, managers, organisations or LSPs require, or demand it?"
- Q20. "Would you like to have more control over the type of translation technology integrations that you work with?"
- Q23. "Human-centred AI involves a high degree of automation with humans firmly in control of the overall process. Imagine that in the near future you will work in a translation platform or translation management system powered by AI integrations. On a scale of 0 (Not being in control), 50% (Being somewhat in control), to 100% (Being totally in control), do you think you will have control over the integrations of AI in the translation process?"

The survey also included an open-ended qualitative question relevant to the present study, regarding where the locus of control will lie in the AI-driven future of the translation industry:

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- Q24. "If it is not you (the translator), which humans or other agents (human or non-human/machines) are, or will be, in control of the process?"

A summary of quantitative results is shown in Table 1 and in Figure 4. The six quantitative variables in this section of the study, which each correspond to a question, were Control_tech_total (Q15), Autonomy_tech (Q16), Control_tech_on/off (Q17), Forced_tech (Q18), Control_more (Q20), and Control_future_AI (Q23). Table 1 includes a summary of the statistics for the responses in this section, including mean, maximum and minimum values, standard deviation, and variance.

Variable	Mean	Maximum	Minimum	Standard Deviation	Variance
Control_tech_total	76.08	100	30	20.56	422.85
Autonomy_tech	73.17	100	9	27.32	746.44
Control_tech_on/off	81.35	100	40	19.92	372.23
Control_more	67.32	100	0	29.92	895.62
Forced_tech	48.09	100	0	31.1	967.57
Control_future_AI	47.17	100	0	25.98	675.24

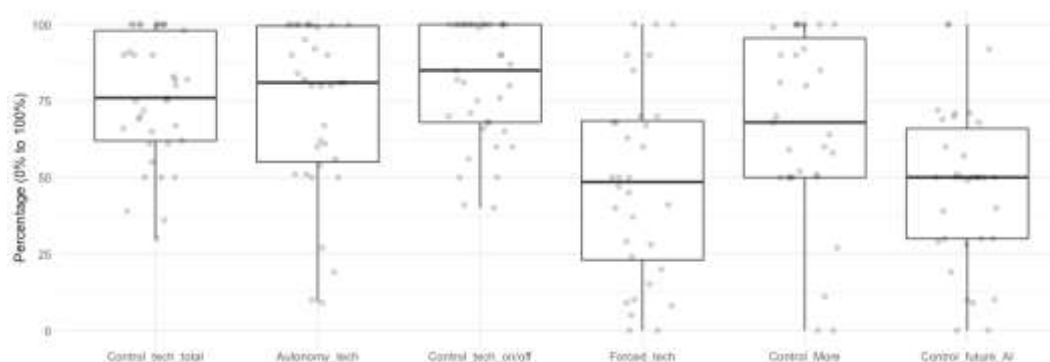Table 1. Summary of statistics for the responses given using a linear scale ranging from 0 to 100%.

Figure 4. Boxplot summary of responses for the six variables in the study related to control and autonomy (Control_tech_total, Autonomy_tech, Control_tech_on/off, Forced_tech, Control_more, Control_future_AI).

4.2.1. Control over technologies

The first question in Part 3, Q15, inquired about the participants' overall level of control over the technologies they used. It did not elaborate on whether the control was internal or external, or which types of external agents could impact their attitudes towards control. Overall, the mean value for perceived control over translation technologies in general (Control_tech_total) was 76.08 (min = 30, max = 100, SD = 20.56). The mean reported value for autonomy over translation technology (Autonomy_tech) was slightly lower at 73.17 (min = 9, max = 100, SD = 27.32).

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4.2.2. Autonomy

Q16 was related to translators' autonomy over technology use and how technologies are integrated into their day-to-day work. The results were very similar to the previous question (Q15), with a mean of 73.17 (min = 9, max = 100, SD = 27.32). This question was presented towards the end of the survey and not immediately after the previous one, and the results show similar ranges.

4.2.3. Control and turning translation technologies on and off

The next question, Q17, was also related to control over the technologies themselves. The formulation of the question referred to whether participants had control over what translation technologies they used depending on a number of variables, such as content type, task, intratextual variation, time of the day, cognitive load, etc. In this case, the construct "control" was modelled in relation to "internal control" (Rotter, 1966). One potential way to operationalise this type of "internal control" is to relate the notion of "control" to translators' choices about when to use or not use different translation technologies depending on several factors. The mean value of the responses for this type of internal control increased to 81.35 (min = 40, max = 100, SD = 19.92). This increase indicates that modelling specific types of control over technologies might impact attitudes towards control in general, more so today when AI implementations are still not widely used or available.

4.2.4. Forced used of technologies and perceived control

To tease out what different types of "external control" (other human or non-human agents) might be at play in the translation process, Q18 directly asked if participants used technologies because other human agents in the overall translation workflow insisted on them doing so. This question was posed to investigate whether any perceived lack of control was due to the technologies themselves (including user interfaces, AI apps, limitations on customisation, etc.), or whether this attitude was related to impositions from other human agents in the cycle (clients, companies, developers, etc.). In this case, the mean value for this type of control over technologies dropped to 48.09 (min = 0, max = 100, SD = 31.1). This result indicates that any perceived lack of control over technologies might not be fully attributable to technology use being imposed upon in-house or freelance translators. As an example, in this section one respondent (S.39) answered as follows: "I answered 0% because I already have total control." The participant also said that she does not work on a cloud server and has full autonomy and control over the technology she uses. In Q19, there was 0% reported use of generative LLMs or other AI apps. These results shed light on the different forces at play regarding issues of control over technologies. Furthermore, the results show higher values than those reported in the study conducted by Rivas Ginel et al. (2024), where 17.38% of users of NMT reported that they were required to use it, while 4.43% of users of GenAI reported being required to use it.

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To further investigate this issue of forced control, a linear regression analysis was conducted to examine the relationship between the variable years of experience (Years_Work) and the response variable Forced_tech. The result of the Pearson correlation analysis (r = -0.33339) shows a moderate negative correlation, suggesting that as the number of years of experience increases, the perceived intensity of forced technological use tends to decrease to a moderate extent. This might imply that more experienced translators are less likely to be forced to use specific translation technologies, although the relationship is not very strong.
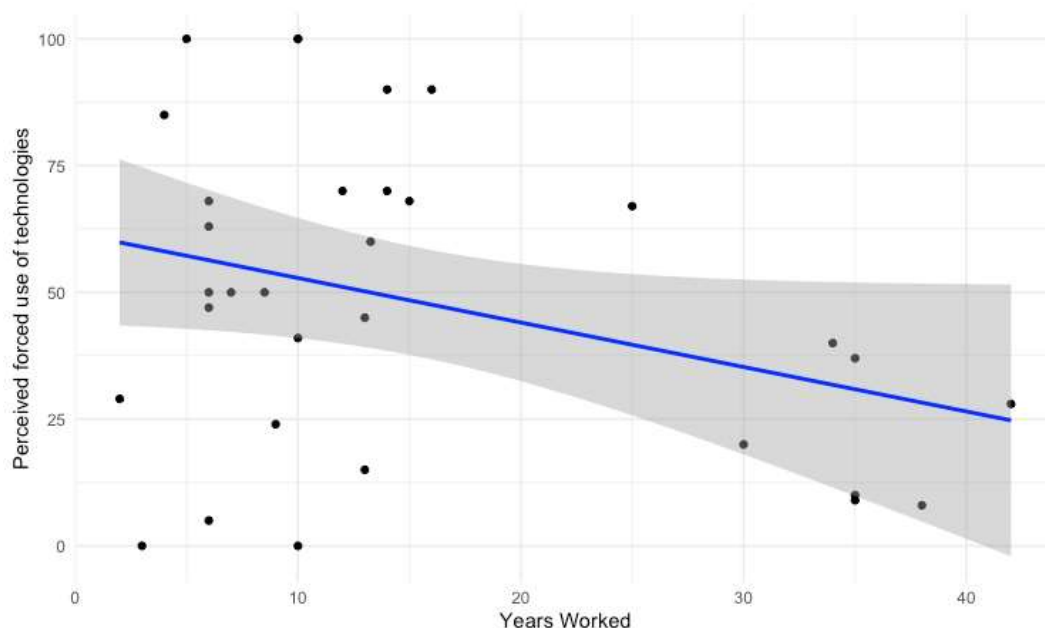

Figure 5. Linear regression analysis of forced use of translation technologies (Forced_tech) (0 to 100%) vs. years of experience (Years_Work).

4.2.5. Expectations of control

The next question (Q20) asked if participants would like to have more control over their use of translation technologies. The mean value of their responses was 67.32 (min = 0, max = 100, SD = 29.92). This indicates that even when the mean value is close to that of the variable Control_tech_total, there is an almost similar desire for more control over the technologies used.

4.3. HCAI and future control

The final question with a sliding scale (Q23) projected the construct of control towards the future. The question directly addressed the fact that control is retained by humans in a HCAI paradigm, but it acknowledges that the continuous development of AI technologies might imply increased automatisation and decreased control over the translation process and technology integrations. The mean value of the responses for attitudes towards or expectations regarding future control fell to 47.17 (min = 0, max = 100, SD = 25.98). Here, fears about automation in and the encroachment of AI on the

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translation process can be perceived (Nunez Viera, 2020; Sakamoto, 2020; Sakamoto et al., 2024). This can be partly explained by previous studies showing that users might tend to perceive lower levels of control over newer technologies, such as new AI applications and technologies (e.g. Sieger and Detjen, 2021).

A linear regression analysis was again conducted to examine the relationship between the variable years of experience (Years_Work) and the response variable Control_future_AI. The result of the Pearson correlation analysis (r = 0.429) suggests a moderate positive correlation, which, in turn, suggests that as the number of years of experience increases, levels of control over technology in the AI era tend to increase to a moderate extent. This might imply that more experienced translators have more positive attitudes towards their level of control over technologies in the future, although the relationship is not very strong.
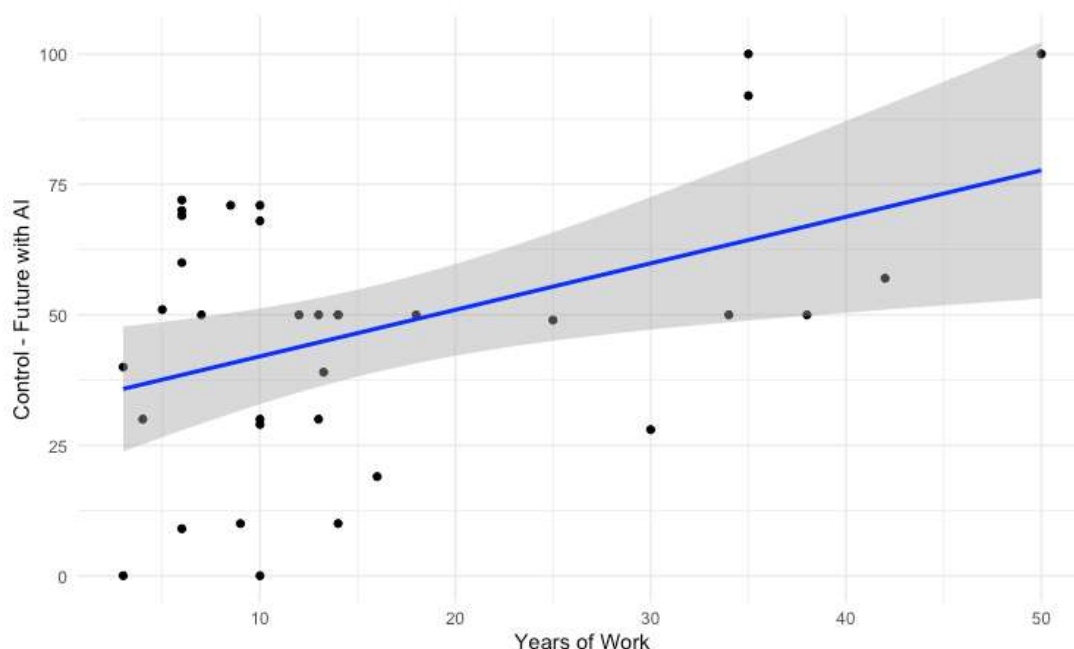

Figure 6. Linear regression analysis of expected levels of control in the future (Control_future_AI) vs. years of experience (Years_Work).

4.3.1. Locus of control in the future

As reflected in the previous results, participants believe that future technological advances might entail translators having less control over translation technologies or how they integrate them in the future. Question Q24 asked participants where they believed the locus of control would lie, if they felt they did not have it. Responses were entered in an open-ended field and subsequently analysed and categorised through a bottom-up approach. In total, 14 responses included a combination of more than one potential "locus of control", such as "clients or LSPs". Figure 7 shows the breakdown of responses to this question. Results show that participants believe that in the near future, the locus of control will lie mainly with other humans in the technological ecosystem, such as "developers or big tech" (26.5%), "LSPs" (14.29%), "clients" (14.29%) or "project

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managers" (10.2%). "Translators" or "humans" were present in 12.24% of responses. Contrary to recent fears of automatisation (Sakamoto, 2020; Ragni and Viera, 2022), "algorithms" or "machines" represented only 6.12% of responses. Some responses included "do not know" or "unsure" (6.12%), while one respondent answered, "Not the machine!"
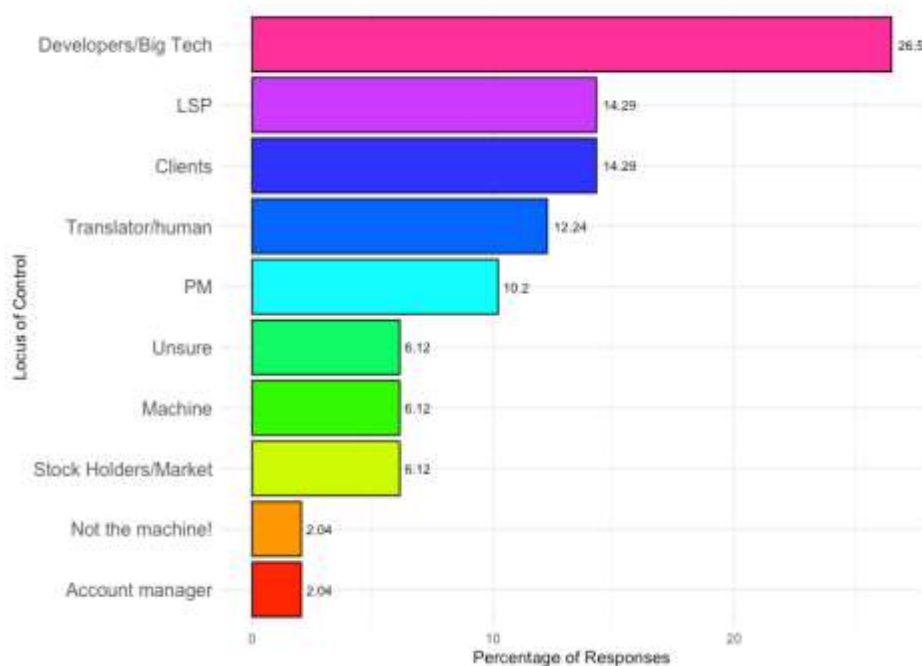

Figure 7. Attribution of locus of control over translation technologies in the AI-driven future by participants.

These results indicate that in this study, fears of automation might not be directed towards AI or algorithms, but primarily towards other human agents in the translation technology workflow. In total, 73.44% of responses attributed the locus of control to other human agents in the translation workflow, mainly those in charge of tasks other than translating per se. These collectives are chiefly those who develop the tools (including big tech), or those directly involved in commissioning translations, such as LSPs, clients, PMs, account managers or stockholders. This suggests that the threat posed by automation or AI as an abstract entity might not, to date, have affected attitudes towards control over technology. Rather, participants primarily perceived other human agents as the reason why they might lose autonomy or control in the near future. These results are in line with Jiménez-Crespo's (2023) suggestion that in crowdsourcing platforms the locus of control lies primarily with developers or project managers. It is possible that the reported expectations of lower levels of control are not yet directly related to algorithms, but rather to the agents who funnel translation work towards automated systems or those who work to develop "human-in-the-loop" systems. These systems, as part of what Moorkens (2020) and Baumgarten and Bourgadel (2024) term "digital Taylorism", could be influencing such attitudes.

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5. Conclusions

This study was initiated to shed light on how professional translators conceptualise the notions of "control" and "autonomy" in the use of translation technologies. This was done in part to collect vital information to help develop AI-enhanced technologies that can be more easily adopted and that face less resistance to adoption. The literature has shown that resistance to adoption and dissatisfaction with translation technology can be mitigated if technologies can be fully individualised and/or controlled by actual users, rather than workflows, customisation or control options being imposed by developers, LSPs or clients (e.g. Briva Iglesias, 2024). Respondents reported high levels of overall perceived control (M = 76.08) and autonomy (M = 73.13), with higher levels of perceived control when asked if they have agency to turn on/off any technology or use it more or less depending on the type of task, content, moment of the day, perceived cognitive load, etc. (M = 81.35). They also reported medium levels of forced or imposed use of translation technologies (M = 48.09), in line with the study by Sakamoto et al. (2024: 72), where translators reported that translation technologies do not dominate their work (average score of 2.83 out of 5). In terms of their perception of how their control might be impacted by future AI developments, participants consistently reported that they expect to have lower levels of control in the future (M = 47.17), probably in line with the existing tendency to perceive lower levels of control over newer technologies (e.g. Sieger and Detjen, 2021). Nevertheless, when asked where the future locus of control might lie in the AI era, most respondents attributed their expected lower levels of future control or lower sense of agency to other human agents in the process, such as developers, big tech, LSPs or clients. In fact, 73.44% of the responses attributed future control to other human agents in the translation workflow. This indicates that in this study, fears of future loss of agency can be attributed to other economic players in the translation ecosystem, rather than to AI or translation technologies themselves. This also reflects the fact that most participants reported moderate levels of imposition of overall translation technologies, such as NMT or GenAI, in line with the tendency observed in Rivas Ginel et al. (2024).

In terms of correlations, it is of interest that the number of years of experience consistently correlates with higher reported levels of command of translation technologies, perceived control, lower levels of imposition of translation technologies, and higher levels of future control. In this sense, this paper matches the findings of other studies that report that years of experience do not necessarily correlate with lower levels of command of technologies or negative attitudes towards them (e.g. Prieto Ramos, 2024). Multiple regression analyses should be conducted to further tease out any potential interaction between the different variables, such as years of experience, command of technologies, actual use of technologies, and current and future levels of control.

A limitation of this study is the survey's relatively small sample size, which may have limited the statistical analyses and the generalisation of results. "Survey fatigue" on issues related to AI might have been a contributing factor in this regard. Nevertheless, some of this study's results regarding the percentage of use of GenAI and NMT closely

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match those of larger studies. In the present study, participants reported a value of 37.7% for use of LLMs (SD = 30.69), matching the value of 37.17% reported by a much larger survey of professionals conducted by Rivas et al. (2024) (600 participants), or that of 40% in the current report on LLM and AI use in the industry based on the latest GALA (2024) survey on automation (154 respondents). It is nevertheless slightly higher than the values of 17% reported by professionals and 21% reported by LSPs in the latest ELIS (2024) report. Similarly, the value for use of NMT in the present study is 53.1%, compared to 51% in Rivas Ginel et al. (2024). The latter study, with 600 professionals, also inquired about the frequency of use of NMT, offering participants different options to select from: very frequently (2.59%), frequently (19.62%), occasionally (21.48%), rarely (9.52%), very rarely (16.48%) and never (28.88%). All in all, the midpoint in the present study also corresponds to the "rarely" statement, indicating an approximately similar range of use of NMT in both studies. As such, despite the smaller sample due to the interest in exclusively surveying US-based translators and the timeframe, the results obtained in this study could be considered to be representative of the selected population sample.

To finish with, in the future of "human-centred AI" in the language industry, ethical and sustainable approaches that put translators at the centre can lead to higher satisfaction and less potential stress, anxiety and low esteem, or even anger and hostility towards new technologies. Further research will undertake a qualitative analysis of the rest of the open-ended responses provided by participants, to investigate specific ideas that might help develop more translator-friendly technologies.

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Appendix 1.

Part 1. Demographic Data

Q1. What is your name?
Q2. What is your email?
Q3. What is your gender?
Q4 What is your age?
Q5. How many years have you worked as a professional translator full-time?
Q6. Place of birth (country)
Q7. Which language pairs to you translate? I translate into:

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Q8. Which language pairs to you translate? I translate from:

Q9. What best describes your current work situation?

- Freelance Translator (Full time)

- In-House translator

- Freelance Translator (Part Time)

Q10. What are your fields of expertise?

Q11. Education and Training: What is the highest level of education you have achieved?

Q12. What is the highest level of education you have achieved in Translation and Interpreting?

Part 2. Use and command of technology.

Q13. What translation technologies do you use at work and how often?

- Translation Memory. Which one?

- Neural Machine Translation. Which one?

- Adaptive or Interactive MT. Which one?

- Terminology Databases. Which one?

- Generative LLMs (ChatGPT, Gemini, Bard, etc.). Which one?

- Quality Assurance Tools. Which one?

- Other Tools. Which one?

Q14. Translation Technology Use In a scale from 0 to 100, how do you rate your command of translation technologies in general? Use the slider to rate from 0 (Extremely poor), 50% (Average) to 100 (Excellent).

Part 3 Control over technologies.

Q15. How do you rate your overall level of control over the technologies that you use during your translation work? (meaning during the process of translation) Use the slider to rate from 0 (No control over the technologies I use), 50% (Some control), to 100 (Total control over the type of technologies I use, and when I use them).

Q16. Do you feel that you have autonomy as a professional in terms of how technology is used and integrated in your day-to-day work? Use the slider to rate from 0 (No), to 50% (Maybe) to 100 (Yes).

Q16a Please explain

Q17. Do you feel that you can control what technologies you can use or turn on-off depending on the type of content, translation task, passage, time of the day, etc.? Use the slider to rate from 0 (No control over the technologies I use), 50% (Some control), to 100 (Total control over the type of technologies I use and when I use them).

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Q18. Control over technologies Do you work with some translation technologies because clients, managers, organizations or LSPs require or demand it? Use the slider to rate from 0 (I am never required to use specific translation technologies), 50% (I am sometimes required to use them) to 100 (I am always required to use specific translation technologies).

Q19. Which translation technologies do you use because clients, managers, organizations or LSPs require, or demand it?
   -Translation Memory
   -Neural Machine Translation
   -Adaptive or Interactive MT
   -Terminology Databases
   -Generative LLMs (ChatGPT, Gemini, Bard, etc.)
   -Translation Management Tools
   -Quality Assurance Tools
   -Other Tools

Q20. Would you like to have more control over the type of translation technology integrations that you work with? Use the slider to rate from 0 (No), to 50% (Maybe) to 100 (Yes).

Q20b Please Explain

Q21. What technologies, features, integrations, user Interfaces etc. would you like to have more control over (layout, interactions, notifications, turning assisting technologies on – off when necessary, etc.)?

Q22. Imagine that developers of translation technologies, or those who set up translation workflows, were asking the opinion of translators about what "control" over translation technologies means, or how they should implement it. What would be your response?

Part 4. HCAI, control and the future

Q23 - Human-Centered AI and the future Human-Centered AI involves a high degree of automation with humans firmly in control of the overall process. Imagine that in the near future you will work in a translation platform or translation management system powered by AI integrations. On a scale of 0 (Not being in control), 50% (Being somewhat in control), to 100% (Being totally in control), do you think you will have control over the integrations of AI in the translation process?

Please explain

Q24. If it is not you (the translator), which humans or other agents (human or non-human/machines) are, or will be, in control of the process?

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Q25. Which part or subcomponents of the translation process do you think you might lose control over when AI gets more integrated in the workflow?

Q26. If you had to provide input to design an AI technology tool to augment your capacities to translate better, more efficiently, or faster, how would you describe it?

Q27. Human-Centered AI involves a high degree of autonomy of the human agent(s). If you would develop AI applications for translation, what would "autonomy" mean for you?

Q28. In your opinion, what are the main challenges translators might face in the age of automation and AI?