The Technological Turn in Interpreting: The Challenges That Lie Ahead

Claudio, Fantinuoli (PhD)

Johannes Gutenberg University Mainz

fantinuoli@uni-mainz.de

1 Introduction

Unlike in other professions, the impact of information and communication technology on interpreting has been moderate so far. However, technological innovations that have newly entered the scene, such as those in the areas of remote interpreting (RI), computer-assisted interpreting (CAI), and, most recently, machine interpreting (MI), could have a potentially disruptive influence on the profession in the years to come. Not only are they slowly changing some daily practices of interpreters, but it is reasonable to assume that they will have an impact on many aspects of the profession, from the cognitive processes of interpreting to the perception of quality, from the way the profession is perceived by the general public to the status and working conditions of interpreters.

In this paper, I will try to put this process of technologization into a broader perspective, presenting a framework that takes into consideration not only interpreting studies, but also other disciplines, such as economics and social philosophy, on one side, and advances in artificial intelligence, on the other. After proposing an interpreting-oriented categorization of emerging technologies, current and potential effects on interpreting will be analysed and presented. I will argue that this technological turn will offer new opportunities for interpreters to revisit and enhance their profession. In the long term, however, chances are it may also lead to a detrimental effect on the profession and, at least in some areas, to a deterioration of working conditions and social status. Several scenarios derived by the presented framework will be discussed.

This paper does not aim at complete scientific (or socio-philosophical) rigour, but rather to advance some hypothesis on the direction interpreting may take in the age of technologization. It is based on the conviction that the discipline needs to address such topics, renegotiating its position in a fast-changing world. In tackling this topic, my intention is to encourage practitioners and scholars alike to think more strategically and widely, and, if at all possible, to be tolerant to the potential changes.

2 The driving wheels of technological change

In discussions about contemporary society, it is now something of a commonplace to say that core social and economic processes are undergoing a dramatic transformation and acceleration. The magnitude of change caused by technological innovation and its ability to penetrate a particular aspect of life is typically described by means of different theories and frameworks. In this context, the concepts of social acceleration and exponential growth, to name but a few, seem to play a central role, as they constitute the background in which new technologies enter society or, in our case, a specific profession.

The concept of social acceleration accounts for the increased speed at which many aspects of our modern life are happening and for that 'sense of speeding up of the world around us' that people commonly feel (Rosa 2005: 13). In economics, for example, acceleration translates to productivity and efficiency paradigms (we produce more goods in a reduced period of time). Advances in technology seem to be connected to this acceleration and there is no doubt that digitalization and, more in general, information technology have impressed a new speed to many, if not all, sectors of society and to many dimensions of life – politics, economics, science, culture, and so forth. Although acceleration may define different things and may be determined by a multitude of factors, we all – at least in western societies – experience it. This feeling also affects the language professions where, just to name a few examples, interpreting services are requested more frequently on short notice and the translation process turnarounds need to be fast.

Strictly connected to social acceleration, the concept of exponential growth refers to the prospective magnitude of change. In particular, it describes growth as an exponential curve, characterized by the doubling of its values at regular intervals. A special feature of this curve is that it does not seem to grow steeply at the beginning. However, at some point, the curve begins to resemble a vertical line, indicating that time approaches zero. This aspect describes an important phenomenon. Growth (and the underlying changes) remains not dramatic for a long time. But at some moment its pace gets very fast and its effect becomes overwhelming. Many current trends seem susceptible to descriptions by way of roughly exponential growth curves with varying rates of doubling (cf. Eriksen 2001). The most typical example in the area of technology is the exponentially accelerating power of computers.

The combination of acceleration and growth of technological sophistication forms the background for the penetration of a certain innovation into a specific aspect of life, for example into a professional community. As soon as this process of penetration starts and finds the right conditions, it may gain momentum and lead, in the case of technology, to its widespread adoption. This may generate a turn or a shift, a moment of dramatic change in some specific aspect of life. I have claimed that interpreting is on the brink of a period of fundamental and irreversible change and that technology will be its main driver. I called this the technological turn in interpreting (Fantinuoli 2018). If social acceleration and exponential growth are some of the fundamental forces at play, there are other drives that need to be taken into consideration to understand why this turn is about to come. I want to claim that at least three driving forces are central

in this process. I will call them the anthropological, the economic and the psychological drives.

2.1 The anthropological drive

Automation and human evolution are processes that run parallel to each other. Automation is not only an engineering impulse to build machines and automata, but a more comprehensive perspective of meaning and definition of life (Accoto 2019). The tendency to automate things is a common attempt by humans to find (mostly technological) means to relieve themselves from the burden of performing a particular activity. Automation can be seen as the utmost consequence of an anthropological or even biological principle, a successful strategy for survival, a common biological imperative of effort reduction (Rosa/Scheuerman 2008). Supported by this driving force, almost any human activity undergoes stages of automatization by means of technological devices. Generally speaking, when it comes down to a specific activity such as translation or interpreting, we can identify four main phases of technology-driven automation, i.e. four different phases of interaction between humans and machines[1].

During the first phase, a particular activity is performed entirely by humans. In the case of aviation, for example, this phase corresponds to the pioneering years of its history. In this very first period, the act of flying the aircraft was performed by the pilot alone relying only on her senses. In a second phase, the same activity is performed by humans with the support of technology. Suffice it to think of all the flight instruments and sophistications that have been added to the cockpit year after year to assist and provide the pilot with information about the flight situation. The third phase introduces the most important shift in the human-machine relationship, as technology can perform the activity autonomously and be supported by humans. In the aviation example, planes fly mostly autonomously with the exemption of very few operations, namely take-off and landing (even if newer machines can also manage these phases, at least theoretically). Finally, the fourth and last phase is the most spectacular one. It is then that technology performs the entire task autonomously without the intervention of humans. The transition from the third to the fourth phase is not only a matter of technological advancement, i.e. of having the technology that can perform such a task autonomously. Many other aspects of ethical and juridical nature come into play. In our aviation example, pilots are there not only to perform particularly difficult operations that are hard for machines to do. They are there to take responsibility for these actions and intervene in case of necessity[2].

Like most of human activities, it is plausible to think that also interpreting as a social activity is subject to this anthropological drive towards automation. Under certain circumstances, this drive may force humans to develop and adopt any technological means that help to overcome language barriers. Similarly, this drive may be responsi-

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[1] For the use of this principle in written translation, see, for example, Schäfer (2002).

[2] In some extreme cases, humans seem to have been prevented from taking control over a failing machine, as the tragic plane accidents of the two Boeing 737 Max aircrafts sadly teach us.

ble for the adoption of technological solutions that will relieve professionals from some burdens connected with their work.

2.2 The economic drive

As any other professional activity, interpreting is caught up in fundamental and pervasive changes of the labor market which are creating new patterns of work organization (Huws 2016; Neufeind et al. 2018). Among others, such transformations are caused by technological developments in the areas of digitalization and automation. This new wave of transformation, which was defined 'second machine age' (Brynjolfsson/McAfee 2014), is typically perceived very differently by scholars and by the general public. Some believe it presents positive opportunities for human-computer interaction (Brynjolfsson/McAfee 2014), others argue that predictions of economic growth and innovation are overstated (Gordon 2014), others again foresee that the introduction of increasing capable systems and new and better ways to share expertise in society will steadily dismantle old professions (Susskind/Susskind 2015).

The paradigms of productivity, optimization and costs reduction are vital forces for professions to adopt available technologies or to develop new ones. In written translation, for example, such forces have led to the widespread adoption of computer-assisted translation tools and, more recently, of machine translation, radically changing the conditions of translation as a professional service (cf. Reinke 2013). Their adoption has transformed not only the way texts are translated, i.e. the process of translation (Pym 2011), but also the economics of the sector. The market research company Common Sense Advisory, for example, reports that translation rates per word have fallen by up to 50% since 2008 because of budgetary constraints and technology (DePalma et al. 2013).

Hence, the adoption of technology is a consequence of economic pressure, but has also dramatic consequences on the sector adopting it, for example on employment, working conditions, etc. There are certain trends in employment and the general economy observed over the past few decades that are becoming commonplace, such as fast turnarounds, cost pressures, and globalization of the market. Among others, however, one phenomenon seems quite relevant for the present debate: the polarization of jobs through automation (Autor 2019; Goos and Manning 2007). This phenomenon describes the tendency to dismantle jobs in the middle of the spectrum of qualified activities. Low-education jobs, i.e. jobs that typically require manual and non-repetitive work with a very high level of human interaction, and high-education jobs, i.e. jobs that require decision making and abstract thinking, seem not to be affected by automation. However, jobs situated in the middle of the spectrum, i.e. jobs missing the characteristics mentioned above, have been described as being in danger of becoming obsolete (Beaudry et al. 2013) or to loose a great number of labor force. This phenomenon is quite relevant because interpreting, as an activity, despite the bag of knowledge and expertise that it requires, may fall into this last category.

The reduction in the demand for cognitive labor, the so called 'demand reversal', may lead to high-skilled workers moving down the occupational ladder and beginning to perform jobs traditionally carried out by lower-skilled workers. This de-skilling process, in turn, results in high-skilled workers pushing low-skilled workers even further down the occupational ladder and, to some degree, out of the labor force altogether

(Beaudry et al. 2013). In this context, all mechanisms that have a de-professionalizing effect on certain market sectors may in the short term be a more concerning issue than technology itself (Vieira 2018). Technology can, however, accelerate this trend.

2.3 The psychological drive

Beside the anthropological forces that lead humans to develop new technologies (2.1) and the economic drives that are central in determining their adoption (2.2), another kind of force should be taken into consideration when dealing with the current technological turn in interpreting. This force is of social-psychological nature and may have an overwhelming effect in increasing the pressure to change consolidated habits, in our case the widespread conception of interpreting as a technology-free activity.

As Besnier (2012) points out, society as a whole is literally obsessed with technology. Since professions are shaped by the society which they are a part of (Bellis 2000), it is reasonable to think that this obsession also applies to their internal dynamics. Many language-related professions, such as written translation, have already adopted specific technologies and have become dependent from them, accomplishing – de facto – a real technological turn.

The basic idea underlying this drive is that the widespread adoption of any sort of technology both in the domains of private life as well as in the professions may have enough persuasive power to impose a paradigm change also in a profession, such as interpreting, that has been historically reluctant to technological change. This longstanding resistance, for example against the adoption of RI (cf. Tripepi Winteringham 2010), has been generally ascribed to the need to safeguard quality and standards. Pym (2011), however, stressed that this resistance reveals an attitude of defense of power rather than of quality concerns. Hence, the fear of being exposed to worsening working conditions is legitimate, but the rationale behind this attitude is the unspoken danger of falling behind, of losing market power and ultimately of becoming obsolete. Pym pointed out that this attitude may change when the profession will "turn the new to suit its own strategic purposes" (2011 p. 4).

As a matter of fact, under the pressure coming from the technologization hype that is influencing any aspect of life, interpreters have recently started developing a more open attitude towards the adoption of interpreting-related technologies[3]. In this context, the adoption of human-centric technologies suddenly appears not as a threat to the profession, but as an opportunity to revitalize and adapt it to a fast-changing environment. Despite the skepticism of the entire category, this pressure may also be emphasized by the advances in machine interpreting and the potential danger posed by this technology. Under the influence of this drive, negative attitudes towards technologies, such as RI, and legitimate concerns about potential consequences on quality and so forth seem to go, at least to some extent, in the background.

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[3] See, for example, the programmatic paper of the European Institutions on new technologies and artificial intelligence in the field of language and conference services, with dedicated sections to interpreting (European Commission, 2019). For an academic articulated interest in new technologies, in particular RI, see Amato et al. (2018).

3 Technologies in the interpreting setting

Throughout history, human activities, especially if related to the professional world, have been made possible or have been influenced by technological advances. Today, doctors rely on highly sophisticated machines to perform their diagnosis, engineers on computer-aided design tools to make plans, police forces on predictive algorithms to identify potential criminal activity, and so forth. There is no doubt that this applies also to the interpreting profession as we know it.

Generally speaking, changes may be caused both by technological advances which are inherent to the profession, such as the introduction of computer-assisted translation tools in the case of written translation, as well as by profession independent advances that may indirectly influence the discipline, such as the invention of the internet, digitization, and so forth. Simultaneous interpreting, for example, has evolved into the standard form of interpreting used at international organisations and multilingual conferences only thanks to the introduction, around 100 years ago, of wired systems for the transmission of sound.

Many may consider this to be the only technological breakthrough in the history of interpreting and regard this activity to be technology-free. However, a closer look at the modern profession reveals a high number of technological advances that have had a profound impact on it. More recently, for example, the wealth of multilingual and specialized information available in digitalized form on the internet has profoundly changed the way interpreters access and acquire knowledge. If one considers that the preparation phase is regarded by right as one of the most relevant parts of the interpreting process (Gile 2009), as it helps the interpreter to anticipate the potential difficulties that may arise during the act of interpreting, both in terms of content and language (Fantinuoli 2017, Stoll 2009), and to fill the knowledge gap that exists between event participants and herself (Will 2009), it is plausible to think that developments in the area of information dissemination and access must have greatly modified some basic assumptions on interpreting. The possibility of retrieving a potentially infinite number of preparatory texts at any time, for example, has slowly shifted the long-standing idea of the interpreter as an 'omniscient' person with a vast stock of encyclopaedic and world-knowledge to draw upon (cf. Riccardi 1998), to a professional that has the skill to 'prepare' for a specific topic or event. The consequences of this technology for knowledge, memory and cognition in interpreting are overwhelming, but exactly how this has affected the way we deal with information has not yet been subjected to systematic scrutiny.

As far as interpreting-related technology advances are concerned, it is possible to identify at least three areas that will be key to the technological turn in the profession. They are remote interpreting, computer-assisted interpreting and, more generally, artificial intelligence. Such areas are in most cases still considered as separate and independent entities. However, there is no doubt that they will soon start to mingle and become subcomponents of a changing interpreting ecosystem. All these areas will impact the profession and determine a shift in the way interpreting is performed, perceived and delivered. The magnitude of change that they will bring by is certainly difficult to predict. Trends and possible future scenarios, however, can be tentatively described and will be object of section 4.

Remote interpreting is a broad concept which is commonly used to refer to forms of interpreter-mediated communication delivered by means of information and communication technology. It is used to designate different settings and modalities, for example when all event participants are gathered at one place while the interpreters are located at a different venue, or when the interpreter and one of the interlocutors are both present at the same place. RI may be used both for dialogic as well as for simultaneous interpreting. From a technological standpoint, RI can be carried out by means of different solutions, historically over telephone lines or satellite connection for audio-video; more recently through teleconferencing systems over the Web. Interpreters may deliver their service from their home office using a specific web-based platform for the transmission of audio-video signals[4], or from a fully-fledged interpreting hub which mimics, at least for simultaneous interpreting, the conditions of an on-site setting, with sound-proof booth, technicians, etc. In the past, concerns have been expressed both regarding the limitations of the technologies available and the complex cognitive and communicative processes underlying interpreting. Tests conducted on remote simultaneous interpreting, for instance, have highlighted, among others, issues in the quality of the audio/video signals, the partial loss of contextual information due to remoteness, and psychological factors, such as fatigue, higher levels of stress and loss of motivation and concentration. In the area of dialogic interpreting, issues like turn taking, alienation and stress have been found to be particularly significant. The results of empirical tests performed over the last decades are, however, vary. Besides stressing a negative perception of RI by the interpreters, there seem to be no clear empirical evidence of negative effects on quality or on the interpreter's well-being brought about by the use of such technologies (cf. Causo 2011; Braun/Taylor 2011; Braun 2015; Seeber 2018).

Computer-assisted interpreting is commonly defined as a form of oral translation in which a human interpreter makes use of computer tools designed to support and facilitate some aspects of the interpreting task – mainly subject preparation and information access – with the goal to increase quality and – to a minor extent – productivity (Fantinuoli 2018a). Among others, CAI tools are designed to assist interpreters in the creation of multilingual glossaries, in looking up terms in an ergonomic way, and in extracting useful information from preparatory documents. First empirical research seem to point out that the use of CAI tools, both in the preparatory phase as well as in the interpreting process, may increase the quality of the rendition (Xu 2018, Prandi 2018).

Artificial intelligence is a sub-field of computer science that focuses on how machines can imitate human intelligence. In particular, machine learning is a current application of AI that allows machines to learn by themselves if provided with relevant data. Machine learning is central to the field of natural language processing and is the science that has brought machine translation to a new level of quality and precision.

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[4] See the report on an extensive round of testing of selected Interpreting Platforms conducted by the European Commission (2019). The preliminary report states that, at least in principle, SI offered through web platforms could be option in certain contexts for the SCIC.

Although the first thought that comes to mind when thinking of artificial intelligence is machine interpreting, there are many other areas in which AI may soon start to enter the profession. AI is supposed to augment the second generation of CAI tools (Fantinuoli 2018a) by automatizing many operations that still need to be performed semi-manually. The third generation of CAI tools will be AI-enhanced. An example is the use of speech recognition to analyze in real time the utterances to be interpreted and provide interpreters with suggestions for so called problem triggers (cf. Gile 2009), such as numbers, terminology, etc.

It is however the ambitious goal of MI which is leading research and development in the area of AI applied to interpreting. The complex nature of human communication, especially in the spoken realm, makes this task quite challenging to achieve. MI is much more than the combination of speech-to-text recognition, machine translation, and speech-synthesis. MI has yet to solve many challenges related to the nature of oral communication and to the peculiarities of interpreter-mediated communication. Many oral texts are particularly difficult to translate because they are imperfect (spontaneity), more ambiguous and rely on a knowledge-based inference by the interpreting agent that must 're-create' the meaning of what is said in order to translate it. Furthermore, MI systems suffer from not being able to anticipate context like human interpreters, as they still lack background and context knowledge (cf. Müller 2016). The ability for a machine to cope with this kind of issues is still quite far to come.

Another issue of the use of MI in real contexts is related to the fact that interpreting is a real-time activity, i.e. it is performed while the source text is unfolding (simultaneous mode) or immediately after a segment has been uttered (consecutive and dialogic mode). On the contrary, in written translation, MT is typically performed after the whole text has been written. This allows users to test the quality of the output of MT and decide if a specific text is suitable for MT or not. If not, the result can be thrown away, another MT engine can be applied or a human translator can be called in before the translation reaches its recipient. MI is instead performed while or just before the rendition will reach the recipient. For the service provider it is virtually impossible to know beforehand if the text will be suitable for MI, as any real-life situation is more or less unpredictable. What is worse, if a MI system – no matter the reason – fails to deliver a usable translation, the communication simply breaks down.

Creating human-like MI is therefore quite a big challenge, bigger of an order of magnitude than creating a quality MT system. Even though the pace of progress is fast and scientists are addressing many of these challenges, there is reason to believe that the development of an MI system that could systematically compete with human interpreters will require a lot of effort, and probably a lot of time.

On a smaller scale in terms of impact, other technologies, such as interpretation management systems (IMS) and computer-assisted interpreter training (CAIT), will also have some influence on the profession in the years to come. IMS are systems designed to manage interpreting bookings, consolidate feedback on interpreting quality and, in more general terms, to optimize and speed up all the processes around planning interpreters' assignments. They may be used by both private language service providers as well as by public and private organizations that need to deal with a large number of interpreting events. Machine learning can be applied in this area to automatize and improve the whole process, for example to minimize delays and interpreter travel

costs by sourcing the best-placed linguist with the appropriate skills. Computer-assisted interpreter training is a broad concept that refers to any tool that can be used to support the teaching and learning of interpreting. Since interpreter training places strong emphasis on students' autonomous practice, CAIT tools support individual practice and group work with access to suitable study support and training materials.

4 Interpreting in the information age

Society and professions are changing at a very fast pace, and the key driver for this change is technology. There is no reason to doubt that interpreting, driven by the forces described in the previous sections, will undergo a period of profound and radical change. As a matter of fact, the profession has recently started to move from being a relatively technology-free activity to an activity supported by interpreting-related technologies. This digital transformation is supposed to accelerate in the years to come. However, the landscape of technology adoption will be quite diverse and this transformation will not equally affect all forms and settings of interpreting. The reason for this is that interpreting is not a monolithic profession. Depending on setting, mode, needs, and so forth, certain forms of interpreting will probably continue to be performed without technological support. Confidential political meetings interpreted in consecutive mode are a good example of this.

As postulated in section 2.1, there is reason to believe that interpreting as a whole will undergo several phases of technologization. The present phase is characterized by the adoption of technologies that have the potential to improve some aspects of the workflow of human interpreters (CAI) and to make it more productive (RI). CAI tools are entering the documentation process, for example during the stage of preparation, as documented by the adoption of such solutions by international organizations and freelance interpreters. If CAI tools become a truly intelligent support for the ancillary tasks interpreters traditionally perform manually, relieving the burden of some time-consuming tasks, they may start to be regarded as indispensable by the profession, like a CAT tool for specialized translators or CAD tool for engineers. This may happen as soon as AI will start automatizing some operations, such as the collection of preparatory documents or the identification of multilingual terminology. For example, given a topic, such tools will collect related texts, pre-process them, extract the relevant information (both of linguistic and factual nature) and present it in an interpreter-oriented way. In doing this, they will take into consideration the interpreter background, previous knowledge and so forth. In other words, they will create a knowledge base perfectly tailored to the specific event and to the needs of the interpreter.

A further step towards a wider penetration of CAI tools could be their envisaged use during the interpreting process. CAI tools may soon become a digital helper giving suggestions for typical problem triggers, such as numbers, terminology and named entities. If the possibility of querying databases in an interpreter friendly way was already proposed in the first generation of CAI tools (cf. Stoll 2009, Will 2009, Fan-

tinuoli 2016), the integration of ASR[5] (Fantinuoli 2017a) and the use of prediction algorithms as a means to reduce its invasiveness (Vogler et al. 2019) may accelerate the adoption of such tools. From a technical perspective, the quality of ASR output has dramatically improved, reaching, at least for some languages, a level that seems suitable to be used in the interpreting setting (Fantinuoli 2017a, Brüsewitz 2019). Furthermore, the questions about data confidentiality raised in the past will probably be solved in the near future with ASR engine becoming ubiquitous and available offline or on private infrastructures.

First empirical research seems to suggest that AI-supported CAI tools may help interpreters perform better, for example in the case of number rendition in simultaneous interpreting (Defranq et al. 2018). Although the use of CAI tools has been traditionally limited to the simultaneous mode, efforts have been recently undertaken to assess if their use may also be fruitful in other settings. Wang and Wang (2019), for example, experimentally demonstrated that the use of a CAI tool integrating ASR and machine translation has the potential to improve general rendition in the consecutive mode. However, more empirical studies are still needed to understand if CAI tools will be able to meet interpreters' real-life requirements: features which can represent a real help or a disturbance need to be validated; the way they should be integrated in the interpreting process requires careful verification; technical features, such as max. latency of the system, need to be identified. Because of the widespread interest for this technology, a number of empirical studies are expected to be published in the near future (cf. Prandi 2018).

CAI tools have an influence only on micro-processes of the interpreting workflow and for this reason their overall impact on the macro-aspects of the profession should be limited. A greater impact should come from remote interpreting. Although there is reason to believe that RI will not completely replace in-situ interpreting, just as simultaneous interpreting did not replace consecutive or dialogic interpreting, there is no doubt that it will become 'mainstream' if it will help to increase service availability, to simplify its provision and to cut costs, for example by reducing expenses for travel, accommodation and so forth (cf. Ziegler/Gigliobianco 2018). In this case, economic forces will prevail over the general feeling of mistrust among practitioners or over legitimate interpreters' concerns, such as fatigue, stress, alienation, and so forth.

As far as its impact on the interpreting market is concerned, it can be assumed that RI will offer increased opportunities for work in new segments, leading to a so-called productivity effect, i.e. an increase in the demand for labor that arises due to technological progress. However, chances are that it may also lead to a deterioration of working conditions. In particular, there is reason to believe that RI may increase the depersonification effect of the service provider. In some segments, especially in the private sector, which is less knowledgeable about quality issues, interpreting starts to be ordered with applications developed to locate interpreters and offer a job to the first bidder or to the one that made the lowest bid. Interpreting is delivered without real human interaction ever taking place. Provided minimum quality standards are met, a

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[5] An online demo of a CAI-tool with integrated ASR is available at www.interretbank.com/ASR

higher interchangeability of the provider will be one of the consequences. When services become more impersonal and uniform from the buyers' point of view, consumers tend to buy the cheapest, initiating a downward spiral of economic decline and, ultimately, deprofessionalization of the industry (Susskind/Susskind 2015) and de-skilling of the workforce (section 2.2).

Although the large-scale adoption of RI could drive a process of commoditization of interpreting, intensifying the effects of modern paradigms of labor organization, such as outsourcing (which is already typical in the language sector and many other professions of the tertiary sector), competition and price dumping[6], this should not be considered the only possible scenario emerging by the described 'absence' of the interpreter. As a matter of fact, a similar process in interpreting has already happened in the past, even though on a minor scale, with the introduction of the simultaneous modality. This breakthrough had an impact not only on the interpreting process, but it also influenced the whole profession, for example the social status and the self-perception of interpreters. At the beginning, interpreters feared a loss of quality in their performance and perceived the relegation into interpreting booths as well as the need to abandon the stage they used to share with diplomats as a worsening of the profession's prestige and, consequently, of their social status. In reality, the broad adoption of simultaneous interpreting together with the increasing demand for interpreting services due to geopolitical changes in the second half of the 20th century led to a professionalization of the whole sector and, in turn, to a general improvement of the occupational status of interpreters. Similarly, RI might well end up generating a new wave of professionalization.

I claimed that interpreting is about to go through a period of profound and radical change, de facto entering the second stage of human-machine interaction. But will the profession ever enter the third stage, the phase where machines perform the job and humans support them? Probably not. The reason is simple. Interpreting is an activity performed in real-time, with no possibility of influencing the communicative situation, for example making the source text more easily translatable by the machine, or of intervening in the rendition by post-editing it. Furthermore, the process of interpreting can not be easily broken down into its components, a prerequisite, together with the routinization, to automate a profession. Since there is de facto no possibility of post-editing the MI output, to enter the third phase MI should have a human-like level of quality. But even with a MI like this, there are only a few hypothetical scenarios in which humans may assist the machine. It is possible to hypothesize, for example, that human interpreters could take over the task of monitoring the interpretation generated by the machine[7]. This would be the case, for example, in highly sensitive events where the interpreter's role would be to intervene only in case of problems, misunderstandings, etc. However, since such a setting does not have any significant advantage in terms of economic savings, it is plausible to think that this or similar scenarios, even if theoretically possible, would remain an exception.

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[6] For example, RI could support price per minute schemes, converging in this way to the translation sector with its price per word scheme.

[7] This is already the case in high diplomatic circles with interpreters monitoring each others.

The stage of full automation of interpreting represents the final (forth) step of technological development in the human-machine interaction. It is generally accepted that increasingly capable and pervasive machines will eventually make many professions obsolete (Autor 2019). In a pessimistic view of prospective future, this would mean the termination of any human activity in the interpreting field. In order for this to become reality, however, MI should reach a level of quality similar to human interpretation. Many interpreting scholars are confident in claiming that technology will not replace interpreters in the future (Ortiz/Cavalli 2018) because of inherent linguistic issues, such as nuances, variation, non-verbal communication, accents, subtleties, emotion, and so forth. However, there is no rationale in asserting that the goal of a human-like interpreting machine will never be reached. Although there is no doubt that human communication is very complex, the real question is if AI will ever be able to tackle such issues at some point in the future. For now, we can simply observe bow modern machine learning approaches, such as artificial neural networks, have improved quality in almost any computational field, such as image recognition, natural language processing, and so on. How long they will continue to produce improvements is still not completely clear, since their full potential has yet to be completely unfolded. But, even when the latest strain of developments will reach its peak and will fail to produce any further advances, other approaches, or more probably a combination of several, will bring about further improvements (see exponential growth). For now, it would be however exaggerated to claim that this will happen any time soon.

Since there is no doubt that the level of MI will progressively increase in the years to come, it is possible to hypothesize that we will slowly enter a time of mixed interpreting service providers, i.e. a time when both humans and machines will deliver interpreting service, depending on the goals, the settings, the expected quality and many other aspects. This may first happen in what can be called 'recreational settings', such as in informal touristic situations, i.e. typically situations that in the past were not served by professional interpreting services. However, as the technology improves and the confidence in its usefulness increases, MI will start to enter what I call, for lack of a better term, the low-end of the market, i.e. areas which are less prestigious, critical and sensitive and which are characterized by higher quality tolerance and more routine situations. The adoption of MI in these areas may also be accompanied by a change in the expectations about interpreter-mediated communication, a sort of price to be paid for the economic savings and the large availability of the service allowed by MI. To overcome the limitations of a non human-like MI, users may indeed be forced, for example, to accept the need to repeat things, reformulate, infer meaning from the translation, and so forth. This would mean a considerable shift in the social and cultural role of interpreting[8]. On the contrary, high-end market segments should continue to be operated by humans, at least until the advent of real human-like MI. The line dividing these markets is not a monolithic but a dynamic one and is therefore difficult to draw. Its position will depend on many factors, not least the public perception of MI and, of course, its quality level.

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[8] See, for example, Pym (2006) and Pöchhacker (2006) for a general introduction on the social and cultural role of interpreting in society.

Besides entering the recreational sector in the short term and some low-end market segments in the middle term, however, one of the biggest impacts of MI will be the changing perception of the profession by the general public. When machines are able – at least till a certain extent – to do the work of a human, interpreters will start to find themselves in a position that will require to explain, and in some case, justify their intellectual work. In some cases, something similar is already happening with the increasing role of English as lingua franca and the need to justify the use of interpreters, for example in international institutions (cf. Reithofer 2014). Although it will probably cause a worsening of the public's perception, chances are that this scenario will lead, at least in the top-market segment, to a renewed appreciation of the quality offered by professional interpreters. Consequently it may boost a new professionalization phase. Unlike what happened in the past, however, this professionalization will be confined to the top-level market and thus it will target a smaller and highly specialized group of people.

5 Conclusion

Many aspects of personal and professional life are changing at a very fast pace due to technological innovations. Being subject to the forces introduced in section 2, interpreting is not immune to these developments. Since, once acquired, only few societies or social groups are able to refuse the use of a technology (cf. Fromm 1968), there is no doubt that interpreting-related technologies, such as RI, CAI and MI, are here to stay.

The interpreter community, both at a professional and at an academic level, has had a very conservative approach to technological innovations in the past. Lately, however, this attitude has changed. The topic of technology has become relevant very quickly in the academia and other important stakeholders have started to recognize its importance. The idea that a balanced and responsible adoption of interpreting technologies could be fruitful to mitigate potential negative trends of innovation (see section 2) and, almost paradoxically, help the profession to defend and consolidate its intellectual uniqueness in an increasingly machine-dominated world, seems to be gaining terrain. Hence, the most promising approach should be directed at using technological advances for the benefit of interpreters, reaping the advantages and opportunities offered by technology while trying to prevent, as far as possible, the risk of being dominated by it and by the consequences arising from its use.

Science and technology of considerable scale and social impact are leaving the design and testing laboratories and are increasingly spreading on a global scale. However, this transfer from science to engineering is happening with only little specific attention and systemic awareness on the part of the interpreting community. Since there is no doubt that interpreting is about to go through a transformation phase driven by socio-technical change, the profession urgently needs to play an active role in this transformation. This requires the development of an open-minded attitude towards technology and the ability to rethink the profession as we know it today, on the basis of empirical evidence, future-oriented ideas and a certain level of awareness about the direction that markets, society and technological developments are heading to. Furthermore, there is urgent need for a research effort directed to anticipating future

trends, enabling the future generations of interpreters to prepare for the disruptive changes caused by digital technologies.

There are many open questions that need to be addressed in the described stages of the human-machine relation. They regard, for example, how professional interpreters interact with, and adapt to, emerging technological ecosystems and how this is changing professional practice. Consequently, the role of training, expertise, etc. needs to be discussed in light of these changes. The topics to address by the discipline are not only limited to human interpreting, but regard also moral and sociocultural questions arising from the fact that machines will influence decisions that were once the sole domain of humans, for example in the case of MI. What if interpreting will be decisive to pass a life sentence (simultaneous interpreting at the Hague tribunal)? Or to decide the results of a top-level political meeting? Is interpreting a task that should not be handled by a machine? The answer will probably depend on the purpose of the specific interpreting task in question. There is a lot of potential for the discipline to discuss and influence the future role of interpreting and human interpreters. The interpreting community would be advised to start this discussion now.

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