

Editor-in-Chief: Gian Stefano Spoto  
Scientific Editors: Alessandro Boccanelli and Laura Elena Pacifici Noja  
Registration no.: 103/2021, Ordinary Court of Rome  
2 issues per year  
ISSN print: 2785-3713  
ISBN print: 978-88-9295-639-1  
ISSN open access: 2785-4329  
ISBN open access: 978-88-9295-640-7  
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No. 3 | issue 1 | 2022  
First edition December 2022

tab edizioni

© 2022 Gruppo editoriale Tab s.r.l.  
viale Manzoni 24/c  
00185 Roma  
[www.tabedizioni.it](http://www.tabedizioni.it)

Stampato da The Factory s.r.l.  
via Tiburtina 912  
00156 Roma  
per conto del Gruppo editoriale Tab s.r.l.

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# UniCamillus Global Health Journal

## UGHJ

edited by *Alessandro Boccanelli*  
and *Laura Elena Pacifici Noja*

no. 3 | issue 1 | December 2022

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# Monoglot World

by Gian Stefano Spoto\*

Every era has had its own international language, which is neither the most beautiful nor the most harmonious, it is not the most musical nor the most romantic, it is simply that of the countries that dominate the economy. It is also not strange to understand the panic of those who fear that I must start studying Chinese now.

Luckily for the Anglo-Saxons, English still holds on.

Too bad that, especially in Italy, its knowledge is often scarce, superficial, and awkwardly flaunted.

Beyond these considerations, the future of a globalized world cannot be linked to a single language, especially now that the planet is truly polycentric.

On the other hand, the communication of the future

will require ever greater precision, and the use of a language other than our own will no longer be sufficient. It will not be sufficient even in cases in which it has been learned and practiced during many years of permanence abroad.

This is because languages are in our DNA, and it is excessive to claim to know others exactly like one's own, since our language is our thoughts and our feelings, with nuances that we will never find elsewhere, and it is precisely the nuances that shape the mind.

When it comes to health, medicine, science in general, precision is never enough. This occurs especially when two very distant cultures meet and the risks of inaccuracies in the dialogue multiply when a third language comes into play.

An article by Marco Trom-

betti explains very well the path that led us to the platform that makes our publications universal: we do not believe that we have found the definitive solution. We believe, however, that we have come closer to it than we could ever imagine in the very recent past.

It also doesn't matter who will be in control of the future in one, five, ten, twenty or thirty years. Whoever it will be, it will not have any scientific monopoly. It will be powerful, true, but the ever more extensive and rapid communication will allow discoveries and, above all, millions of contributions to scientists, researchers, professionals, scholars who are in even in the most remote parts of the world. Most importantly, they will be able to communicate in real time, with a real language.

\* Editor-in-chief UGHJ.

UGHJ is young, indeed very young. We who conceive it have no pretence to make history or to claim any primogeniture should the topic of

our third number become one of the dominant themes.

We just like to send a signal that others, we hope, will gather to solve this problem,

which will soon become a must (forgive the now ancient Anglicism, I call on the platform to make up for it!).

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# The Value of Multilingual Understanding\*

by Luca De Biase\*\*

The great goals of post-pandemic humanity, from health to climate, from peace to social inclusion, transcend the interests of each, and are pursued only together with the interests of others: in fact, they are united by the need to arrive at a form of global understanding.

It can probably be argued that this is not particularly new. But the contemporary condition makes understanding, not to say cooperation, fundamentally necessary. For structural reasons. Research and education are integral parts of this contemporary dynamic.

What is it all about? In the age of knowledge, value is focused on the intangible:

research, design, image, organization, the meaning of products. Digital infrastructure is essential for knowledge management, which precisely summarizes economic value. In turn, value is defined when the demander recognizes it in the offeror's proposal: thus it occurs in the dimension of communication. Unlike price, value is not only monetary, it is also cultural.

Hence, the dimension of essential exchange is transformed: it is not so much about the quantitative setting of prices and exchanged quantities of material goods, which takes place in the marketplace, but rather about the dialogue between humans who express and recognize the value of the

knowledge embedded in products and services. In short, the knowledge economy works if those who offer and those who demand communicate and understand the value of the knowledge embedded in products and services. In a global context, these communications are international and cross-cultural and therefore must cross linguistic and cultural boundaries-which means that the services of the translation and localization industry are strategic. If this is true, the topic of mutual understanding between people and populations should move up the list of priorities for companies and buyers.

So what are the risks and opportunities that can be

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\* This journal can be published in several languages thanks to the technology and translator network of Translated, a company that states: "We are on a mission to open up language to everyone, using a powerful combination of expert human translators and machine intelligence". And Imminent, Translated's research center, has contributed this editorial, to share its views about the strategic importance of multilingual understanding.

\*\*University of Modena and Reggio Emilia.

recognized in a scenario like this?

Busy in the daily business of developing their companies, entrepreneurs, managers of public and private enterprises, servants of the state and leaders of educational institutions may be tempted to postpone engagement in international communication activities. But innovation in the world of translation and localization may convince them to focus on the topic. If the transmission of a text from one language to another is becoming easier for major languages thanks to machine translation, the added value of taking into account different cultural contexts is all to be explored and becomes the task of important business activities. Not only marketing, at the downstream end of production, but also planning and design, at the upstream end: because products and services

in themselves communicate. All platform activities, for example, are actually the product and communication of the firm combined. And the structure of platforms often adds to the form of institutions that provide a valuable service to society. Right from the design stage, the service must think about being accessible to generate mutual understanding among those collaborating in the development of social value forms.

There was a time when industrial economics might have been thought to be concerned first with the processes by which goods were produced and then with doing the advertising necessary to make them known in order to sell them. Today, communication—that is, the sharing of knowledge necessary to express and recognize value—is an integral part of the design

of the product and the entire company that produces it. And the same goes for educational institutions, research centers, civic associations and so on.

Some might argue that international understanding is only effectively achieved through the development of a lingua franca, or a global tool of expression. But whatever language is chosen to bridge cultures, it actually imposes on communication the cultural structures of the country in which that language originated. Multilingualism enhances the depth of cultures that have developed their own languages over time: by adapting to another culture's modes of expression, people cannot draw on their own culture but must limit themselves to their knowledge of another's culture.

Cultural diversity is a form of wealth. As long as it does not become divisive.

# How Close Are We to Removing Language Barriers in Healthcare

by Marco Trombetti\*

## Abstract

Language barriers create obstacles in providing high-quality healthcare and maintaining patient safety. Existing solutions, like interpreter services, cultural mediators, and smartphone apps, aren't able to overcome barriers adequately due to high costs, privacy implications, or poor quality. Machine translation offers a real solution once it becomes able to provide human-quality translations at reasonable prices. New research from Translated, a pioneer in AI-powered translation services, shows that this will soon be possible, thanks to the perfect symbiosis between professional translators and machine translation. Machine translation can radically impact the healthcare industry in three main areas: the translation of information for the general public, the translation of specialist publications such as scientific papers, patents, and disease reports, and seamless doctor-patient communication and the gathering of patient feedback.

## Keywords

language barriers, machine translation, artificial intelligence, open source, innovation.

## 1. Introduction: The Availability of Universal Communication Tools and Their Impact on Healthcare

Allowing everyone to understand and be understood in their own language is one of the most significant challenges for humankind. Achieving this will facilitate

unprecedented collaboration between human beings. Imagine, for example, if scientific research were available in every researcher's language as soon as it was published. We are not far from that, as proven by the research we conduct at Translated, a global language services provider and pioneer of AI-powered translation services. This groundbreaking research was presented at the last

annual conference of the Association for Machine Translation in the Americas (AMTA) in Orlando.

By analyzing the edits made by 136,000 of the best professional translators in the world to 2 billion sentences processed by automatic translation software (machine translation), for the first time in history, we were able to quantify the speed at which we are approaching

\* Computer scientist, entrepreneur, and investor.



the singularity in translation. The singularity is reached when the best-performing professional translators spend the same time correcting a translation produced by machine translation (MT) as they do correcting one completed by their peers.

In the medical field, breaking language barriers is even more impactful than in other areas. These barriers prevent patients from clearly understanding their clinical conditions, thus making it difficult for them to adhere to necessary therapy correctly. In addition, these barriers make it hard, if not impossible, for doctors to acquire the required consent to care and limit data and information needed for diagnoses and research. Today, many larger healthcare institutions offer interpreter services, but these come at significant costs. Thus, most organizations in the medical sector still rely on cultural mediators or DIY solutions, such as smartphone apps. The Covid-19 pandemic has made the need to address this problem more important than ever. According to the European Commission<sup>1</sup>, the pandemic increased the demand for translation by 49% in the healthcare industry. Fortu-

nately, technological advances are pushing the healthcare community to look at machine translation as a means of overcoming language barriers, and universal communication tools are close enough to provide adequate support.

We expect that machine translation will have a radical positive impact on the healthcare industry. Potential applications are in three main areas:

- The translation of information for the general public.
- The translation of specialist publications such as scientific papers, patents, and disease reports. This will provide access to global research studies and real-world data (e.g. clinical trials and drug discovery).
- Seamless doctor-patient communication and the gathering of patient feedback collection, even from discussions happening on social media among users. Here, we can combine MT with automatic speech recognition (ASR) and text-to-speech (TTS) technologies to support spoken language.

However, machine translation will perform well in healthcare only when it pro-

vides translations as good as those done by translation professionals. At Translated, we have been monitoring MT quality since 2011, and recently, we decided to use the massive amount of data we have collected to measure how far we are from providing human-quality machine translation. When we reach the singularity in translation, we can integrate real-time automatic translation in almost every device at a very accessible cost.

## 2. A Brief History of Machine Translation

The concept of automatic translation was mentioned for the first time in the 9<sup>th</sup> century when an Arabic cryptographer introduced techniques for systematic language translation that are, incredibly, still relevant<sup>2</sup>. However, the first public demonstration of machine translation was done in 1954 in the United States<sup>3</sup>. It was a small experiment, but it encouraged researchers to push forward. Early systems relied on bilingual dictionaries and rules stating how to translate words or phrases from a source language into a target language. Next, a statistical approach was developed: by analyzing large volumes of human translations,

machines started predicting the equivalence of a phrase in the target language. The phrase-focused pattern-learning and pattern-forecasting approach drove the first version of Google Translate in the early 2000s.

Today, Google Translate and the most advanced machine translation engines rely on deep learning-based neural network models to learn and predict final outputs. This is a deeper, more reliable form of pattern detection and forecasting. In this kind of system, the translation is produced by a single sequence model trained to predict one word at a time, considering the entire source sentence and the translation that has already been provided.

In 2017, a consortium comprised of Translated, the Fondazione Bruno Kessler, the University of Edinburgh, and TAUS introduced the first adaptive machine translation, ModernMT<sup>4</sup>. It was initially a research project backed by the European Union<sup>5</sup> that later became open-source software and a commercial service powered by Translated. In this new model, MT learns in real-time from the translator's corrective feedback without retraining the translation model.

The idea for adaptive machine translation dates back to a previous research project conducted by Translated, the Fondazione Bruno Kessler, the University of Edinburgh, and Le Mans University, sponsored again by the European Union<sup>6</sup>. The initial idea was to create a tool to edit machine translation results and manage localization workflows. The research objective was an MT system that could learn from translators' corrections and automatically improve over time. The MT component of the solution was later separated to focus on the editing tool, which was finally released as open-source software in 2014. The European Commission included the project amongst those with the highest potential for innovation funded by the Seventh Framework Program. Translated further refined the research prototype and created a commercial version, Matecat<sup>7</sup>, a free-to-use computer-assisted translation tool and MT editing software that the company adopted as its exclusive production tool. With Matecat and ModernMT, Translated is pushing hard for a perfect symbiosis between human creativity and machine intelligence: by removing

redundant tasks, AI allows professionals to focus on the nuances of language, improving the quality of the translation. This synergy gives linguists better suggestions while MT keeps learning. Together, they become more efficient, adaptable, and cost-effective every day.

### 3. About the Process and the Data Collected

In 2011, Translated standardized and settled on a highly reliable metric to evaluate MT quality accurately. We call it Time to Edit (TTE): this is the average time per word required by the best-performing professional translators to check and correct MT-suggested translations. This makes it possible to switch from automated estimates still in use in the industry to measurements of human cognitive effort, reassigning the quality evaluation to persons traditionally responsible for the task: professional translators. We have been tracking Time to Edit for almost a decade, collecting over 2 billion edits on sentences effectively translated by 136,000 professional translators worldwide working across multiple subject domains, ranging from literature to tech-

nical translation and including fields in which MT is still struggling, such as speech transcription. The linguists were selected for the specific jobs they completed using proprietary AI called T-Rank<sup>8</sup>, which gathers work performance and qualification data on over 300,000 freelancers who have worked with the company over the last two decades. The AI considers over 30 factors, including résumé match, quality performance, on-time delivery record, availability, and expertise in domain-specific subject areas.

Working in Matecat, translators check and correct translation suggestions provided by the MT engine of their choice. The data was initially collected using Google's statistical MT (2015-2016), then Google's neural MT, and most recently by Modern MT's adaptive neural MT, introduced in 2018, which quickly became the preferred choice amongst almost all our translators. Translated has been collecting the average time to edit a word continuously for over seven years.

To refine the sample, we only considered the following:

- Completed jobs delivered at a high level of quality.

- Sentences with MT suggestions that had no match from databases of previously translated segments of text.
- Jobs in which the target language has a vast amount of data available along with proven MT efficiency (English, French, German, Spanish, Italian, and Portuguese).

From the resulting pool of sentences, we removed:

- Sentences that didn't receive any edits since they did not provide information about TTE, and sentences that took more than 10 seconds per word to be edited, as they suggest interruptions and/or unusually high complexity. This refinement was required to make TTE comparison possible across multiple years.
- Work on adaptation to locale, i.e. translations between variants of a single language (e.g. British English to American English), since these are not representative of the problem at hand.
- Large customer jobs, since they employ highly customized language models and

translation memories in which TTE performance is far better than average.

Time to Edit is impacted by two main variables other than MT quality: the evolution of the editing tool and the quality delivered by the translator. The influence of these two factors can be considered negligible when considering the long-run trend of improvement we observed.

#### 4. A Surprising Linear Trend Approaching the Singularity in Translation

When plotted graphically, the TTE data shows a surprisingly linear trend. Our initial hypothesis to explain this is that every unit of progress towards closing the quality gap requires exponentially more resources than the previous unit, and we accordingly deploy those resources: computing power (doubling every two years), data availability (the number of words translated increases at a compound annual growth rate of 6.2% according to Nimdzi Insights), and the efficiency of machine learning algorithms (computation needed for training, 44x improvement from 2012-2019, according to OpenAI<sup>9</sup>).

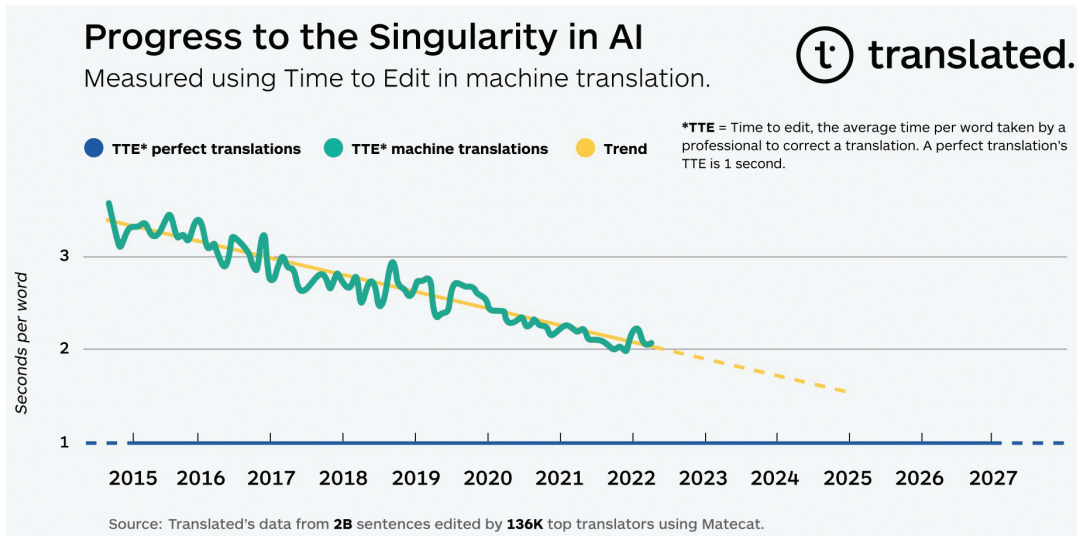


Fig. 1.

## 5. Conclusion: How Close We Are to Breaking Language Barriers

If progress in machine translation quality continues with the current trend, in about six years the best-performing professional translators will spend the same time correcting a translation produced by machine translation as they do correcting one completed by their peers. The exact date when we will reach the singularity in

translation could vary somewhat, but the trend is clear. We are therefore close to being able to provide real-time, universal, accessible translation tools that will break the language barriers, allowing us to improve clients' health outcomes, lowering the risk of death.

From a research point of view, the evidence Translated has provided about the progress in MT quality is quite possibly the most compelling evidence of success at scale seen

in both the MT and AI communities in general. Indeed, many AI researchers think that solving the language translation problem is equivalent to producing artificial general intelligence (AGI). Translated's discovery has thus quantified, for the first time in history, the speed at which we are approaching the singularity in artificial intelligence – the hypothetical future point in time at which artificial intelligence transcends human intelligence.

## Notes

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