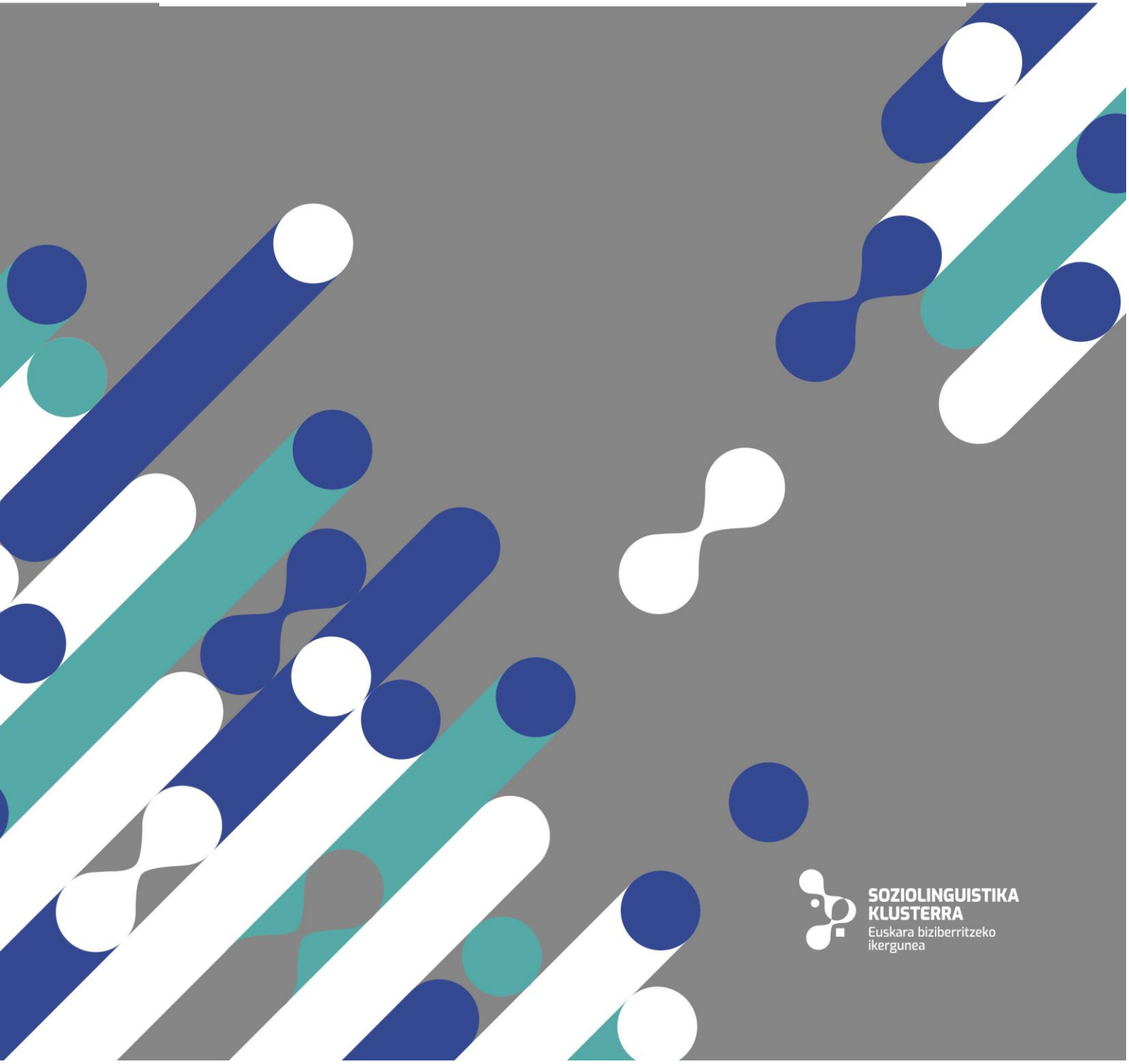
ITZULINGURU

Impact of neural machine translation on the use of Basque language in regulated environments

Distortions, conflicts, adaptations and innovations

Executive Summary (English version)

January 2025



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Euskara biziberritzeko ikergunea

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Gipuzkoa Provincial Council

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Publication of the original report: September 2024
Publication of the executive summary in English: January 2025

PRESENTATION:

The *Itzulinguru* project examined how the use of neural machine translation and other language technologies influences the use of the Basque language

The project studied the current use of neural machine translation by conducting experimental interventions in 25 settings. The conclusions drawn from the study can be used to facilitate the revitalisation of the Basque language and to enable institutions to function more effectively.

The project analysed the distortions, conflicts, adaptations, and innovations that emerge in regulated language activities across businesses, public administration, the media, healthcare, Basque language schools, secondary education, and universities.

The project was carried out between 2023 and 2024, with a deliberate focus on neural machine translation, given its widespread use in diverse everyday social contexts and its advanced level of technological development in Basque. However, the project was also conceived as a starting point for broader research, as it enables the anticipation of other linguistic effects of artificial intelligence and facilitates the monitoring of the use and impact of emerging language technologies as they continue to develop and become more embedded in society.

The *Itzulinguru* project had three main objectives: (1) to identify the transformations, uses, new capabilities, and innovations introduced by neural machine translation in the environments where it is applied; (2) to explore alternative uses of neural translation systems through experimental interventions and assess their outcomes; and (3) to propose the necessary capabilities and criteria to be developed in order to support the revitalisation of the Basque language.

The project was led by Soziolinguistika Klusterra and the Innoklab research group from the University of the Basque Country (UPV/EHU), under the direction of Eduardo Apodaka (UPV/EHU) and coordination of Asier Basurto (Soziolinguistika Klusterra). A *Development Team*, composed of various institutions, guided the project: Osakidetza, the Education Department of the Basque Government, AEK, Elhuyar, Hekimen, the Innoklab research group (UPV/EHU), and Soziolinguistika Klusterra. The project received funding from several public institutions, including the Language Policy Department of the Basque Government, the Basque Language Directorate of the Biscay Provincial Council, and the Language Equality Directorate of the Gipuzkoa Provincial Council.

The results of the *Itzulinguru* project were first presented on September 11 as part of the University of the Basque Country's summer course programme. The course provided an opportunity to further explore the impact of language technologies across various fields and to collectively reflect on future changes related to artificial intelligence.

The full results report of the *Itzulinguru* project is available at **soziolinguistika.eus/itzulinguru**. In the coming weeks, the findings from the report will be published through both academic and public outreach channels.

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1 CHARACTERISTICS OF THE RESEARCH

1.1 OBJECTIVES

The objectives of the research can be summarised as follows:

- to determine the changes, uses, new capabilities, and disruptive innovations brought about by neural machine translation in various regulated activity systems.
- to identify the capabilities and norms that need to be developed for the practical use of neural machine translation systems in order to contribute to the revitalisation of Basque.

These objectives were to be achieved through three main actions: 1) establishing a network of experiences of the actors involved in the project, 2) each actor designing and testing an experimental intervention, 3) collectively analysing the process and results were to be analysed collectively while reflecting on the use of neural machine translation.

1.2 FOCUS AREA: NEURAL MACHINE TRANSLATION IN REGULATED ACTIVITY SYSTEMS

Large Language Models (LLM) and artificial intelligence applications based on neural networks can be applied in many different contexts and they are growing rapidly. Perhaps the most well-known examples are chat-like text generators, as well as generative AI applications for creating drawings, photos, videos, music, and voices. Artificial intelligence will have a direct and profound impact on linguistic practices and the existence of languages. In terms of revitalising minority languages, it is essential not only to keep the global context in mind, but also to assess the available technological tools. The focus of the present research project is on neural machine translation, a tool based on neural networks and Large Language Models.

The level of development of **Basque neural machine translation systems** is rather advanced, and they are **used widely in various everyday social contexts**. The first Basque neural machine translation system was developed in 2015 as part of the TADEEP project, and since then, five translation systems have been launched: Itzuli (the Basque Government's automatic translator), Elia (Elhuyar's multilingual automatic translator), Aditu (Elhuyar's speech recogniser), and Batua (Vicomtech). Although major technological operators, especially Microsoft Translator and Google Translate, offer Basque translation options, the use of translation systems created specifically for the Basque language are still very widespread within the Basque-speaking community (Elhuyar, 2021). In 2021, the Elia translator had 600,000 users, the website was visited more than 2 million times, and the service was used to translate over 610 million words. Most of the translations (58%) were from Spanish to Basque (Elhuyar 2022).

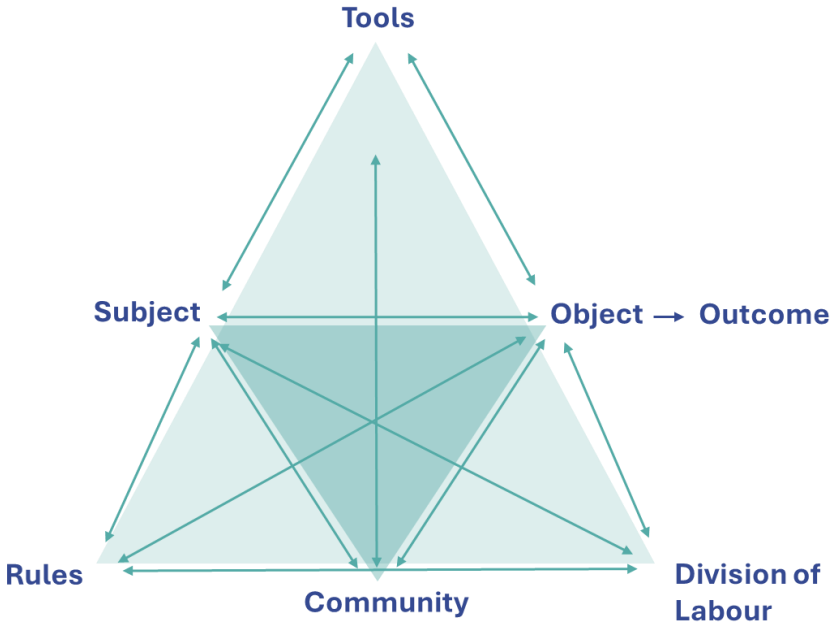
Analysing the social use of neural machine translation systems **developed within the Basque community** is a good first step when assessing technological developments in terms of the revitalisation of the Basque language.

While neural machine translation is used in many different contexts, some of which are informal and everyday situations, this research focused specifically on neural translation systems that are used in **regulated activity systems** or that could be used in such contexts. In other words, the research specifically looked at activities in which the aim was to use, promote, enhance, or teach Basque in one way or another. Although the fields included in the research were varied, including administration, healthcare services, businesses, the media, Basque language teaching, secondary education, and universities, in all cases, in addition to each organisation's specific functional goals, all of them shared the common aim of promoting the use of Basque language by means of regulated activities. Whether the aim was to offer services, work, teach, or offer education in Basque, all of them regulate the use of Basque language, although with varying levels of formality or specificity.

In the above contexts, the objectives and resources linked to the use of Basque have been largely pre-established, at least to a great extent. Even though such activities are regulated and planned, they take place within an overall system, regardless of the organisations' specific intentions. This means that, in order to focus the activities, systemic elements that are separate from the intentions of each actor must be taken into consideration.

To better explain this perspective, we have used Engeström's Activity Systems Theory as our **theoretical framework** (Engeström, Miettinen & Punamäki, 1999). From this perspective, activities are seen as the result of the interaction of various components. The idea is that if one component changes, the entire activity can be modified more easily. However, because systems are regulated and have predefined objectives, such changes are not always possible; instead, activities must be continuously redirected towards the set goals. According to this model, the activity system consists of six components, and it is governed by the relation and interactions between those components. Essentially, an activity is an action that takes place between the positions of subject and object. However, activities are also influenced by many other elements, such as *tools or artefacts*, as well as the *rules, community, and division of labour* affecting them.

In an activity system, when a new component is added or an existing component is transformed, conflicts, tensions, disruptions, and fractures may occur until a harmonious adaptation is achieved among the system's components. Innovations and creations, therefore, emerge from system's evolving internal and external relationships. In this sense, when an intermediary tool such as neural machine translation is used to obtain a specific objective, it may give rise to conflicts, resistance, and constructive changes.



Activity Systems (Engeström, Miettinen & Punamäki, 1999).

So, what happens in this system and in terms of each of the system's agents/elements/nodes when the 'artefact' mediating the connections between the different elements is neural machine translation? Could it challenge the norms? Will it create changes in the community? Will it produce changes in the division of labour and the organisation of work? What about the subjects and subjective predisposition and capacities? Or the objects, in other words, the products, services, etc.? What will happen? And what can we do to ensure that the goal of revitalising the Basque language remains unchanged while deploying the relevant activities?

Conflicts or tensions between the different components of the system may also provide new opportunities. When a new resource, such as neural machine translation, is introduced, intentionally or not, into an already organised and structured activity system, it can end up distorting the system, causing changes in the socio-technical system. Such changes can either support or hinder the revitalisation of the Basque language. The present study aims to understand what kinds of adjustments can be made within regulated activity systems to ensure that technologies such as neural machine translation is beneficial to the Basque language.

1.3 METHODOLOGY: NETWORK OF SOCIAL EXPERIENCES

The distortions, conflicts, and innovations that arise from the use of neural machine translation can be difficult to track in terms of how they influence the different parts of the activity system, as such changes occur in an integrated and complex manner and some elements may thus not be clearly visible. In order to observe such potentially less visible changes, we used the **Social Experience Network** as the methodology to implement collaboratively developed interventions.

The social experience network is based on understanding **activities or tasks as systems**. The method was used to observe how the tensions created by innovations and changes were managed, how they transformed the system, and what new practices emerged.

Experimentation was used as the primary means of revealing and investigating these tensions. Controlled innovations in the activity system were transformed into experiences. Whenever possible, the interventions were designed together with the participants. The interventions produced innovative and tension-inducing elements, resulting in the creation of new knowledge.

The interventions were coordinated and shared within a network. Thus, the **researchers, the research topic, and the investigation** were connected, and the researchers were able to examine the actions, skills, and representations brought about by the interventions they designed, while also studying the tools themselves as well as the entire system.

The research methodology was based on a process of **diagnosis, design, intervention, and reflection**, carried out in collaboration with various agents working in the field of regulated language activities. The assessed activities and implemented interventions were highly diverse, covering seven different *areas*: administration, healthcare services, businesses, media, Basque language teaching, secondary education, and universities. The interventions were conducted in three or four different *environments* within each area, in other words in a total of 25 environments. The interventions in each environment involved dozens of users, whose behaviour was influenced by the changes. Based on the different types of interventions and actors, the participants in the research can be divided into three categories:

- ***Development Team*:** The development team was responsible for directing the research and overseeing its progress. The team included a member from **each area**, who were able to monitor the planning, development, and reflection process related to the interventions.

- ***Monitors*:** Assigned project members were responsible for developing the interventions for the **different environments**, gathering information, and validating their findings with those in charge in each field. There were also workshops organised by the monitors that were aimed at unifying the direction and pace of the different interventions.

- ***Users*:** Users refer to those using the environments in which the interventions were carried out. The aim was to analyse the impact of the designed interventions on the users' activities. The users included a wide range of people participating in the regulated activities, who, depending on the characteristics of the environment and the activities carried out within it could include students, partners from public administrations or companies, service or other types of users, etc.

It is clear that the level of implication varies between the three categories described above. In the following section, we will examine how collaboration between the different participants was developed through the main steps of the research.

1.4 THE PROCESS: KEY STEPS

Given the diverse nature of the interventions and the number of participants, it was essential to align the direction and pace of the research, in terms of the three participant categories, through a step-by-step approach. The steps taken in terms of the development of the project during 2023 and 2024 are briefly outlined below:

Project Design: After ensuring the feasibility of the project, the Development Team was formed. The first step was to define the project's characteristics and come up with a project plan. First, the project leaders submitted a draft of the project's objectives, after which the Development Team helped define the research topic, design the project, list areas of interest, and identify appropriate environments where the different interventions could be carried out.

***Development Team* Meetings:** The Development Team has been part of the project throughout the entire process. The team was responsible for the overall vision of the project and ensuring that it was being developed in the right direction. In addition to ongoing communication through digital channels, the team met in person to review the progress of the distributed tasks and to discuss what needed to be done in the coming weeks. Responsibilities were distributed, often amongst sub-teams. A total of 11 in-person meetings were held between June 2023 and July 2024.

Development of the Theoretical Template: From the offset of the project, along with the first steps, the theoretical template has been constantly developed in line with the different choices and decisions taken throughout the project. The theoretical template also helped focus the drawing of conclusions from the interventions.

Identification of settings: The members of the *Development Team* approached a number of potential environments for the interventions. Each team member was responsible for contacting an intervention environment of one social sector. The project's objectives, process, and related tasks were communicated to the users of the environments, and, if they were interested in participating in the project, they were asked to select a **'monitor'.** Most of the proposals were met with positive feedback, and as a result, a diverse and broad network of interventions was successfully established within the planned timeframe.

Usage Diagnosis: A questionnaire was used as the starting point for the diagnosis. Via the questionnaire, the monitors of each environment were asked about their relationship with neural machine translation at that time. Specifically, they were asked how neural translation systems were being used in their environment, what obstacles they had encountered, what distortions they had observed, what skills had been developed, what advantages had been created, and whether they had any concerns. The diagnosis was helpful for understanding the situation and concerns in

each environment and sector. It was also used as a basis for setting the objectives for and designing the interventions.

Information Workshop: On October 3, 2023, from 9:30 AM to 1:30 PM, a workshop entitled 'Neural Machine Translation: Features, Uses, and Opportunities', was held at Elhuyar's head office (Usurbil, Gipuzkoa). The workshop was attended by the Development Team and the monitors responsible for the interventions. During the workshop, the monitors were given an overview of the development of language technologies and the role of minority languages in this field, thus providing them with information about the research subject. The following areas were covered at the workshop:

- Familiarisation with neural machine translation-based tools: how they work, what opportunities they offer, etc.
- The participants shared their experiences and doubts based on their individual needs and backgrounds.
- Exercises were carried out in order to put the potential and possibilities created by neural machine translation systems to the test.

Design Workshop: To kick off the planning process, a Design Workshop was held on October 17, 2023, from 9:30 AM to 1:30 PM, at the UEU head office (Markeskoa Jauregia, Eibar, Gipuzkoa), under the title 'Designing interventions for specific contexts in which neural machine translation is used' (Appendix 9.2). At the workshop, the participants envisioned how neural machine translation could be used beyond its current common uses. The workshop involved reflecting on the habits and needs present in different contexts. Participants were asked to consider the effects of possible changes in the way translation systems are used. They reflected on how neural machine translation could be used to make certain tasks easier, more comfortable, and more efficient, etc. Some foundations were laid down and the participants were asked to design an experimental intervention to be implemented in their usual environment and activities over the following months.

After that, each monitor, in collaboration with the person responsible for their sector in the Development Team, designed an intervention to be carried out in their organisation between November and February. The interventions are documented in the 'design document' (Appendix 9.1).

Intervention Design: Once the status of neural machine translation in each setting was understood, interventions were designed to test alternative practices aimed at addressing the identified concerns, obstacles, and challenges.

Interventions: A different intervention was implemented in each environment. The duration, depth, and other characteristics of the interventions were tailored to each specific context. All the interventions were implemented between November 2023 and February 2024. The interventions resulted in changes in the way neural machine translation was used in each environment during the specified period. The interventions were monitored through previously agreed-upon and designed methods, adapted to the characteristics of each environment, including surveys,

automated detection of application usage, collection of texts, incident tracking sheets, etc.

Training sessions: Training sessions for the users of the different environments had been envisioned already during the design phase and joint online training sessions were organised during the implementation phase. During the sessions, which lasted an hour and a half, members of Elhuyar, who were responsible for preparing and leading the sessions, presented several tips and guidelines for making the best use of neural translation systems and information on how to edit texts. A total of 66 people participated in the sessions.

Analysis of Results: The results were analysed based on the information collected during the interventions, as well as reflections and testimonies from the people involved in the process. The effects of each intervention were examined, as well as any conclusions that could be drawn from them. By examining different interventions within the same sector, the idea was to identify trends or particularities specific to each sector. Additionally, the project was also analysed from an overall perspective to assess the implemented measures more generally. The main tasks of the Development Team included gathering and analysing information, including the data collected throughout the process and the reflections from the monitoring workshops.

Reflection Workshop: A Reflection Workshop was held on May 24, 2024, from 9:30 AM to 2:30 PM at the UEU head office (Markeskoa Palace, Eibar) in order to share the lessons learned from the interventions and facilitate their analysis. 'Reflection Workshop for Discussing the Results of the *Itzulinguru* Project' (Appendix 9.2).

Report on the Results: The report includes information about the project's approach, process, and lessons learned. It serves as the most comprehensive document for the project's dissemination, and as a basis for creating other materials.

Dissemination. The project's results were published on September 11, 2024, in Donostia within a course entitled the Impacts of Neural Machine Translation, organised as part of the University of the Basque Country's summer course programme. After that, the report on the results was published, and the project was disseminated through public channels and in the academic world (articles, conferences, etc.).

1.5 INTERVENTIONS INCLUDED IN THE RESEARCH

The project included a total of 25 interventions. These were implemented in different environments across 7 sectors. All the interventions were unique and tailored based on the how neural machine translation had been used previously in each environment, the interests and concerns raised in relation to neural machine translation, the options and resources available for the intervention, etc. Please see the sectors and environments where the interventions were carried out below[1]:

ADMINISTRATION	Gipuzkoa Provincial Council – Social Policy and Care Department
	Orio Council
	Vitoria-Gasteiz Council – Sports Department
SECONDARY EDUCATION	Uribe Kosta Secondary School
	Unamuno Secondary School
	Lizardi Secondary School (Economy)
	Lizardi Secondary School (Technology)
COMPANIES	Cikautxo
	Euskalit
	Laboral Kutxa
BASQUE LANGUAGE SCHOOLS	Mungia Council
	Santurtzi AEK
	Ermua AEK
	Lezo AEK
MEDIA	Argia
	Enpresabidea
	Irutxuloko Hitza
HEALTH SECTOR	Senior Management
	Donostialdeko ESI
	Psychiatry Services of Araba
	Barrualde-Galdakao ESI
UNIVERSITY	University of the Basque Country – Journalism
	University of the Basque Country – Sociology (Social Psychology)
	University of the Basque Country – Sociology (Sociological Theory)
	Mondragon University - Global Digital Humanities

[1]Participants' verbal and written contributions were recorded using a coding system, including a reference to the relevant sector (Admin, BH, Enp, Eus, Hedab, Osas, and Unib), and the interventions were assigned a number instead of identifying them directly.

2 RESULTS

The use of neural machine translation has an impact on the linguistic practices and operations of organisations. This project **aimed to systematically examine** the type of impact that is created.

2.1 OPPORTUNITIES CREATED BY NEURAL MACHINE TRANSLATION

This project examined the impact of neural machine translation on regulated language activities specifically in relation to the revitalisation of the Basque language. It appears that the use of neural machine translation has both positive and negative impacts on the use of Basque. In addition, we also identified some less developed uses of neural machine translation, which could make a significant contribution to the revitalisation of the Basque language. If these opportunities were to be appropriately leveraged, the following could be achieved:

a) **Generation of more texts in Basque.**

b) **Enhancing users' Basque language skills.**

c) **Improving the quality of generated texts.**

d) **Increasing the efficiency of organisations.**

e) **Increasing and enabling workers' autonomy.**

f) **Using neural machine translation as a training tool.**

2.2 LESSONS LEARNED FROM THE IMPLEMENTATION OF THE INTERVENTIONS

Apart from the research itself, much knowledge was gained from the implementation of the interventions:

- Due to the diverse characteristics of the interventions, **the project can be considered highly significant and valuable in terms of variation.** The included environments function under diverse conditions in terms of activity type, size, sociolinguistic context, and geography, etc. The interventions also varied in terms of duration, depth, and objectives, among other elements. This meant that a large variety of information on the use of the neural machine translation in regulated language activities was achieved. Through the experiments and results obtained in the different environments, conclusions could be drawn on both similarities and differences.

- When trying out new ways of using neural machine translation and other language practices, **very few negative attitudes and explicit resistance were observed in the different environments** where the interventions

took place. The experimental and controlled nature of the interventions facilitated an open attitude towards them.

- In terms of predisposition, the interventions were carried out in **environments with highly favourable conditions for using Basque and neural machine translation**. This element should be considered when applying the results to other types of situations.
- In some of the environments where the interventions were implemented, the **leadership of certain individuals was a decisive factor** in achieving the desired experience and outcomes. When setting up the teams, the personal characteristics and relationships of those in charge with the other people in the environment influenced the outcomes.
- In some interventions, the proposed conditions, criteria, and guidelines **could not be successfully implemented** in a sustained and consistent manner. The main reasons behind this included internal communication issues, a lack of willingness among participants, and a failure to communicate the objectives of the intervention adequately.

It should be clarified that in this project, **the opinions and experiences of professional translators were not studied separately.** Instead, the project focused on the activities and attitudes of a variety of people participating in *regulated language activities*, including some professional translators, or professionals responsible for translation tasks, despite having been trained in other fields. The Development Team expressed particular interest in exploring the experiences, opinions, and attitudes of professional translators toward neural machine translation in more detail.

2.3 MAIN CONCLUSIONS

Beyond the specific impacts of each intervention on a more localised level, the interventions highlighted the socio-technical dimension of neural machine translation; neural translation technologies become integrated into companies' social customs through the people using them, their actions and practices. Therefore, neural machine translation is not just a simple tool, but a technology that is capable of shaping activity systems. Main conclusions of the *Itzulinguru* project below:

1. Neural machine translation systems, or any other new technologies that are implemented in an organisation, **expose different shortcomings and needs**. The implementation of new tools helps to identify problems in the functioning, norms, and capacities of the members of an organisation, etc. The interventions were helpful in identifying problems, such as a lack of protocols and a critical approach when integrating new technologies into work processes. The interventions also highlighted certain unnoticed deficiencies in both Basque and Spanish language skills. On the other hand, they also demonstrated the risks involved in accepting translations created by neural machine translation systems without reviewal. Thus, it is beneficial to establish revision, editing, proofreading, oversight, and verification procedures both before (pre-editing) and after (post-

editing) the translation process, including details, such as who should be responsible for these tasks and how they should be carried out, etc.

2. In order for new technologies to be used properly and effectively in an organisation, it is advisable to **organise and regulate their use**. Establishing corporate criteria for the use of neural machine translation will improve the organisation's operations, enhance language quality, and help increase the use of Basque. Organisations must design, come to an agreement on, establish, and transmit usage criteria for translation systems that are based on the organisation's particular characteristics, norms, and culture. When such criteria are developed through collective reflection, the chances of users following them increase significantly. In the absence of protocols, and when tools are available to everyone, the risk of them being used ineffectively is also much higher.

3. **It is essential to pre- and post-edit all formal texts** that are to be published in order to ensure language quality and make sure that it is in line with the aim of the text. For this purpose, there must be criteria and resources in place by which the output created by neural machine translation systems can be evaluated critically, as this will pave the way for more conscientious text creation. The quality of the texts entering a neural machine translation system will condition the output (result), and certain errors and inertia can be avoided by preparing texts properly in advance and reviewing them after translation. The importance of pre-editing and post-editing may vary depending on the context and level of sophistication of the translation tool in the relevant language.

4. **Training is crucial and it has great potential** in terms of making the most of the opportunities created by neural machine translation, ensuring that it is used effectively, and identifying any necessary adjustments. Therefore, it is advisable to offer training to those who will be using the tool when integrating it into the work flow. Additionally, in terms of improving text creation capability, training can be used to ensure adequate assessment of text quality. Becoming aware of one's own errors and those typically made by neural machine translation systems is a good starting point for creating texts that the neural translation system can translate better and that readers will find easier to understand. It is also useful to develop the ability to edit texts of different language combinations. Training should involve pedagogical translation and it should be 'hands-on', meaning that translation should be learned through practice, by means of analysing translations, correcting mistakes, and thus learning to distinguish between correct and incorrect ways and to assess texts critically.

5. **It is beneficial to visibilise a texts' trajectories.** Not knowing the trajectory of a translated text can make it difficult to interpret or transform it. In the education field, not knowing where a text has originated may make it harder to evaluate the students' skills. Thus, it is essential to know whether a text is a translation, summary, compilation, or interpretation. In the context of an organisation, it is also beneficial to be aware of the trajectory of a text in order to anticipate the type of revision it may require and to know how to interpret it. Text traceability and recognition can be ensured through *socio-technical means*. The possibility of recording text trajectories through metadata or digital

footprints could also be explored. Methods of traceability and recognition could be established at the organisational level or in broader contexts (academia, education) socially, through rules and protocols. This could mean, for example, using a certain symbol to indicate that a text is a translation or indicating translated sources explicitly, as is the case with bibliographic citations.

6. The use of neural machine translation is **transforming the methods of learning and teaching languages and language-related subjects.** Firstly, students' habits and interest related to technology can be leveraged when addressing language-related content and skills. Secondly, teachers will need to adapt to the new situation by finding new ways of handling and assessing content, as it is becoming increasingly difficult to distinguish between texts generated by tools and those created by humans. Thirdly, the use of neural machine translation systems to translate language teaching materials and resources facilitates making such materials available in Basque. Fourthly, conscious and critical text creation could become one of the main teaching methods at different stages and processes of learning.

7. **The sociolinguistic impacts of neural translation technologies depend on the choices that are made in relation to their technological development and implementation.** On the one hand, the ways in which different technologies will develop in the coming years and how can be applied will determine their use and the impact they will have. Thus, those working on such developments will need to consider the social and sociolinguistic consequences of their 'technical' choices. The ways in which neural machine translation is technically integrated into an organisation's operations has an effect on the resulting language use. Structural adjustments linked to the deployment of new technologies can either feed into old inertia or create new habits. For example, in an organisation this could mean increasing the ability to work faster and more easily in the dominant language, or, alternatively, deploying new tools in a way that helps transform linguistic habits. The project revealed different possibilities and impacts related to certain technical adjustments:

   7.1. Neural machine translation could be **integrated into common applications and software** platforms, including office applications (word processors, email, etc.), as well as specialised applications used in administration and industry. Accessibility, the level of automation, and user convenience are crucial to ensure the acceptance and use of integrated technical adjustments.

   7.2. The possibility of translating from Basque to other languages (and vice versa) can be increased, for example, by using additional languages as intermediary languages. It is important to understand that the Basque-speaking community needs to create and develop language and communication technologies by and for itself if it hopes to thrive as a creative community. We cannot depend only on external technologies, even if those technologies include Basque. Without technological creativity, there is a high risk of Basque becoming a sterile language, lacking any sense of self-referentiality.

   7.3. Neural machine translation can be connected with AI-based technological implementations, which could lead to the impacts of neural machine

translation expanding and increasing significantly. This includes speech recognition, generative text, synthetic speech, multimodality, image recognition, etc.

7.4. Organisations could develop, deliver, and facilitate tools that cultivate their specific writing style. Technical implementations that allow organisations to express their personality, terminology, and linguistic choices, could be particularly beneficial in corporate text creation. Specific glossaries and translation memories, etc., can contribute to such processes.

8. Neural machine translation **transforms dominant language ideologies, representations, discourses, and attitudes**:

8.1. **The definition of the concept of source language becomes vaguer.** The concept is understood differently depending on the organisation's practices, essentially because neural machine translation alters the parameters used to define the creator and created product. When translating from one language to another, sometimes opportunities to improve the original text may arise and be applied. With complex texts, particularly long texts that are based on combinations of multilingual elements, or texts involving many authors, there may be much back-and-forth movement between different texts and languages. Determining the source language of such texts can become nearly impossible, and possibly also less important.

8.2. **The way linguistic practices are understood changes.** There are more opportunities for multilingual written interactions. In the realm of linguistic practices, more importance will be placed on translation and editing skills. In certain contexts, such as the evaluation of educational processes, spoken languages are become increasingly important. In addition to neural machine translation, we need to focus on the impact that other (language) technologies are having on how languages and language skills are being understood, developed, and utilised.

8.3. **Language speakers become users.** While, in the past, language could be understood as a code used by speakers in specific situations, with the increased use of neural machine translation, languages will become an interface in the communication between users. On the one hand, this raises the question of how much technical and critical knowledge of neural machine translation systems do their users actually have. On the other hand, one should consider the impact that the neural translation interface has on the use of different languages, as the way in which a translation tool is perceived and used influences how languages themselves are used. For example, currently it seems that neural machine translation integrates very well into email technologies.

8.4. **New forms of language authority and legitimacy are emerging.** As the use of neural machine translation increases, it is also starting to have an effect on institutions that have been responsible for maintaining language correctness and legitimacy (academies, dictionaries, literature, or the press). Normativist tendencies could become reinforced, as it is easier to apply rigid

rules to texts by means of digital tools. However, the opposite trend could also emerge, if users decide to move away from the neural translator's style.

2.4 FUTURE PREDICTIONS

As the project progressed, some future speculations were made based on the research and discussions carried out within the research team.

Many of them were related to innovations in Artificial Intelligence (AI). We may predict that the impact of generative AI (GenAI) will be 'disruptive', affecting almost all or most areas of social life. Disruptions refer to changes where it is hard to anticipate the outcome of certain situations. The situation we find ourselves in has been created by AI, along with other technological, political, and economic changes. We can no longer use past models to predict the future, instead, we must enter into the realm of pure speculation.

It is crucial for communities speaking minority languages to make strategic decisions in response to the changes brought about by digitalisation. The Basque community should reflect on what kind of future it envisions for itself and how to approach it. In general, language communities like ours will also need to have technological communities. This is not an entirely new idea, but on this occasion, the changes will be considerable. Just as language communities in modern times have needed technologies for writing and spreading written texts, now they will need common, shared, and universal digital technologies in order to survive in a world where large global corporations and state-empires are constantly competing for technological monopolies.

Artificial intelligence and the digital realm will become a universal means, a structural medium and an all-encompassing environment in all relationships and activities. The Basque-speaking community will need to decide what structures and environments it will use, which applications its speakers will deploy, and where and how Basque-language data will be stored, in other words, which internal and external infrastructures it will rely on.

Faced with this broad context, in this research we have been able to come up with some short-term speculations and predictions:

a) We may expect **simple writing and easy-to-read texts to gain prominence**. Simplifying texts facilitates translation from one language to another and the processing of those texts through digital tools. Additionally, it seems that the function and social use of formal written texts will change significantly. In general, along with simplification, there will be a tendency to complement texts with icons, images, sounds, or other elements.

b) **Translingual language creation and the use of paralinguistic resources will become widespread** with the aim of increasing expressiveness. It is likely that neural machine translation will play a decisive role in speeding up these processes. Neural machine translation is already being integrated into systems of

text provision and generation, and thus, the translation and blending of different registers (oral, written, visual, etc.) can be combined with the translation and blending of different languages on different devices (for example, instead of reading an English text, we might ask machines to explain the text in Basque through a short video, or request that an oral conversation be transcribed and developed into a text...).

c) **Translation systems (and other technological infrastructures) will become 'invisible'**: even though translation systems will act as a cornerstone of many linguistic activities, their users will not have a clear awareness of the role of those systems in the process.

d) One of the main **challenges that can be anticipated relates to the motivation for learning new languages**. As translation (and simultaneous interpretation, subtitling, transcription, etc.) becomes implemented technologically, the interaction between speakers of different languages will become easier. Conversations and texts between different languages will become more common in everyday life. There will be less of a need to communicate in the same language. Therefore, the need to learn other languages will become less pressing or more exceptional. The motivation for learning a language for practical reasons will therefore be closely linked to the vitality of a language community and its language production. Minority language communities should take this into account and make sure that they act strategically in order to ensure a vibrant and highly creative language life. The key to keep learning, using, and living in a language could therefore be to combine a supportive and rich psychosocial environment with distinctive and expressive language production. In terms of discursive practices, in addition to promoting the above-mentioned values, it is important to emphasise the immaterial value of linguistic diversity also from a moral and ethical standpoint.