Advancing Digital Language Equality in Europe: A Market Study and Open-Source Solutions for Multilingual Websites

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Abstract

The paper presents findings from a comprehensive market study commissioned by the European Commission, aimed at analysing multilinguality of European websites and automated website translation services across various sectors. The findings show that the majority of websites offer content in one or two languages, while only less than 25% of European websites provide content in 3 or more languages. Additionally, we introduce Web-T, a collection of open-source solutions facilitating automated website translation with a help of free MT service eTranslation provided by the European Commission and possibility to integrate other MT providers. Web-T solutions include local plug-ins for Content Management Systems, universal plug-ins, and an MT API Integrator, thus contributing to the broader goal of digital language equality in Europe.

1 Introduction

Within the European Union, a diverse linguistic landscape is comprised of 24 official languages and more than 60 regional and minority languages. Several research studies (Pastor et al., 2017; Rehm et al., 2020; Rehm and Way, 2023) and official resolutions (European Parliament, 2018; European Commission, 2008) have underscored a stark discrepancy in the technological support available for Europe's multitude of languages.

This is especially pertinent in light of the current lack of multilinguality on many European © 2024 The authors. This article is licensed under a Creative Commons 4.0 licence, no derivative works, attribution, CC-BY-ND.

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websites (a website of a company, based in Europe, regardless of whether they belong to a European subsidiary of a global corporation or are headquartered in Europe), highlighting the need to promote the use of language technologies to make digital content and online services multilingual and more accessible for all European citizens.

The challenge of limited multilingual support on websites extends beyond Europe and has been highlighted by research in other parts of the world (Wright, 2004; Miraz et al., 2013; Singh et al., 2016; Sargent and Lommel, 2019; Kelly-Holmes, 2019). Supporting a website in multiple languages (translating both UI and the content) can be a time-consuming and expensive process. Automated translations have revolutionised website localization, making it more accessible to businesses, including smaller enterprises and individuals. Despite limitations of automated translations that may not always accurately convey the intended message or account for cultural differences, businesses can benefit from cost savings, speed, and scalability, which allow them to expand their global presence.

In many cases, a precise translation is needed (government, legislation, healthcare, industry specifications, brand identity, etc.), and to reach that high quality of translation, so far, the automated translation must be followed by postediting by humans. However, automated translation is enough in cases when the users need to get a general understanding of the content of a webpage and non-perfect translation won't have critical consequences. The automated translation accelerates the translation process and as far as the language models can be trained on specific topics, languages, jargons, and dialects, the quality of the translations can be improved to a

level that requires minimum or no human intervention, making the process even more productive (Stasimioti et al., 2020).

Although there are numerous automated translation solutions provided by market players, their use is not dominant on the European web space. To assess and improve the situation, the European Commission (EC) has commissioned an extensive market study on multilingualism of websites in Europe and the development of solutions to support the use of automated translations on websites. The project is implemented in the scope of the Digital Europe Programme's Strategic Objective 5, "Accelerating best use of technologies," and aims to enhance language technologies' capacity within the European public sector and their broader deployment across public and private sectors, NGOs, and academia (European Commission, 2021).

In this paper we present the project findings in analysing the language diversity on the European web space, the use of solutions ensuring automated website translation, and the machine translation services underpinning these solutions.

We also introduce a collection of open-source solutions developed under the project, collectively known as Web-T. These solutions offer free-of-charge automated website translations utilizing the European Commission's eTranslation machine translation (MT) service¹ and are adaptable for integration with other MT providers.

2 Assessing Multilingualism of European Websites

According to a recent study by IDC,² there are slightly more than 1 million websites managed by public sector enterprises in Europe (EU 27 plus Albania, North Macedonia, Switzerland, Serbia, Montenegro, and Bosnia and Herzegovina) and about 8.4 million websites managed by private sector entities in Europe.

To assess the multilinguality of European websites, two randomised sample lists of European websites were compiled. The lists of websites for analysis were compiled by combining a list of websites per country available on built-

with.com, lists of small and medium enterprises (SMEs) provided by national registries, trade organisations, and lists of government institutions, universities, schools, and healthcare institutions on a national level and a regional/city level for each country. A random subset of the lists was used for analysis. One list contains websites sampled from domains of the largest economies: Germany, France, Italy, Austria, and the Netherlands. The list is balanced to include about 20% public sector and about 55% SMEs. with the rest being large or medium companies. The second list contains links to websites of enterprises in EU 27 member states and is balanced between big companies, SMEs, and the public sector.

The Multilingualism Scoring Tool (Vīksna et al., 2022) was used to measure the multilingualism of a website. It analyses the textual content of the website and identifies the number of languages used, the distribution of content in various languages, and the presence of multilingual features. Multilingual features are website features that point to this webpage being available in other languages and offering user access to this content, such as language switcher tool/button/link, machine-readable links to translated content, or blocks of text in various languages available for display using JavaScript.

From the first list of largest economies, 426 websites were crawled with a depth of 2 links. Most websites contain at least one page in two languages (42%), 30% of crawled websites are monolingual when crawled to a depth of two links, while the rest (28%) have at least one page of content in 3 or more languages.

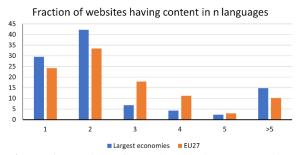


Figure 1 Fraction of websites having content in n languages (depth 2 links).

From the second list of EU 27, 401 websites were crawled and analysed (**Figure 1**). In this case, when crawled 2 links deep, one-third of websites have content in two languages, 24% of websites are monolingual and the rest (~43%) are

¹ <u>https://commission.europa.eu/resources-partners/etranslation_en</u>

² Reference will be provided in the full paper.

multilingual, i.e., having at least one page of content in 3 or more languages.

As usually links to valuable content in other languages are provided on the landing page of the website, we compared these results with those from crawling with the depth of one link. In this case, less than 20% of websites from the countries with the largest economies and less than 25% of EU 27 websites yielded content in 3 or more languages. This shows that for many websites multilingual content is available only for some of the content on deeper levels.

A detailed analysis was performed on 698 public sector websites across 31 European countries (EU 27 countries plus Albania, Serbia, North Macedonia, and Switzerland) for the number of languages in which the websites are published (**Figure 2**). We found that government websites are significantly more multilingual than websites of Education (NACE (The Statistical Classification of Economic Activities in the European Community) code 85) and Healthcare (NACE codes 86, 87, 88) institutions.

3 Solutions for Website Multilinguality

Website multilingualism is enabled by an ecosystem of solutions that includes website builders, content management systems (CMS), machine translation services, systems to manage translation workflows, and plug-ins. Tools such website builders like Elementor WPBakery, along with eCommerce platforms like Wix and Shopify, provide a range of built-in translation tools to enable website owners to create multilingual websites without any coding experience. CMS such as WordPress, Drupal, and Joomla integrate plug-ins and extensions that allow website owners to easily translate their websites. In the backend, automated translation services such as Google Translate, Microsoft DeepL provide Translator and translation to automatically translate website content into multiple languages. The translation management systems (TMS) of language technology vendors like Phrase, Unbabel, Tilde, and many others also enable website translations.

3.1 User Preferences

To analyse user preferences in selecting and using automated website translation solutions, a CATI (Computer Aided Telephone Interview) survey was conducted among 122 European companies of all sizes. The group of respondents

consisted of decision makers and influencers knowledgeable of web translation topics. The countries of residence of respondents include Croatia, Estonia, France, Germany, Greece, Italy, Latvia, Lithuania, Malta, Poland, and Spain.

Our study finds that the most common reasons for businesses to translate their websites are to reach new markets (78%), improve customer service (45%), and comply with regulations (30%). The main challenges of automated website translation are accuracy (54%), cost (36%), and ease of use (32%). The most popular MT

| | Central government | Regional government | Local Government | Education | Healthcare |
|--------------|--------------------|------------------------|---------------------|-----------|------------|
| Monolingual | 23% | 51% | 50% | 48% | 65% |
| Bilingual | 50% | 25% | 26% | 45% | 26% |
| Trilingula | 12% | 12% | 5% | 5% | 5% |
| 4+ languages | 15% | 12% | 19% | 2% | 4% |

Figure 2 Multilinguality of public sector websites.

services used by businesses are Google Translate (68%), Microsoft Translator (42%), and Amazon Translate (31%).

Smaller companies prefer easier, user-friendly, and simplified translation processes. Large companies are looking for advanced functionalities such as access based on roles, workflows that allow consistency of translations, and support for various types of content (documents, videos, blog posts, etc.).

Not surprisingly, data security and compliance are important topics for the majority of the users (71% of the users responded with "Extremely important" or "Very important" to the respective question). Security appears to be more relevant for entities with more than 100 employees than for smaller organizations. The industry sectors that care the most about the security of the websites include the Financial sector and the Distribution and Services sector.

77.9% of the users of MT solutions for translating a website would recommend the use of such solutions to other website owners. 88.4% think that it has helped improve user experience and expand their business, and 66.3% value the cost efficiency for reaching a wider audience. Among those who wouldn't recommend the usage of MT for translating websites, the reliability of translations and the quality of translated content are the major arguments against it.

3.2 Website Translation Plug-ins

Numerous multilingual website translation plugins offer a range of essential features to ensure effective website localization and automated translation. These features include support for translating various elements like text, images, videos, and dynamic content across posts, menus, and widgets. Integration capabilities with diverse management systems content (CMSs), eCommerce platforms, and site builders allow for multilingual content seamless creation. Automated translation workflows, often utilizing third-party machine translation services like Google Translate, Microsoft Translate, and DeepL, streamline the translation process. These plug-ins commonly incorporate automated language recognition, editors, and translation management systems (TMS) for post-editing and collaboration. Multilingual SEO support is a standard feature, enhancing visibility through URL translation, sitemaps, hreflang tags, and more. Performance-related capabilities involve cache memory and Content Delivery Networks (CDNs) to optimize website speed. Security and GDPR compliance measures are typically in place, with data encryption and access controls. Various go-to-market models include free trials, freemium versions, and subscription plans with pricing based on translation volumes and the number of supported sites. Collaboration with CMS and eCommerce platforms is a common market strategy, with plug-ins listed in partner sections on these platforms' websites.

4 Web-T Solutions

To address the need for website translation, we have developed a Web-T website translation solution. In accordance with EC requirements, the website translation solutions that are developed are free of charge, easy to use, secure, implementable on various platforms, flexible, adaptable to different CMSs, integrate free MT service eTranslation provided by the European Commission, as well as open for other machine translation providers. The key findings from the user survey and existing website translation plug-in review were included in the requirements when designing the solutions.

4.1 Overall architecture

The project solutions should suit various types of websites. The majority of websites are based on some Content Management System (CMS). Still, some websites are powered by complicated individually built systems. On the other side of the spectrum are simpler websites that are not based on any standard or custom CMS. It should

also be considered that websites can be hosted as online cloud solutions or as on-premises installations in a local hosting environment.

To cover this variety, the following types of plug-ins are being developed to reach most of the websites:

Local plug-ins developed for popular CMS platforms WordPress, Drupal, and Joomla and directly communicate with the MT service; all translations are post-edited and saved locally in the website database; machine-translation is performed in the backend, HTML page is being rendered from the local CMS database.

Universal plug-in – contains Lightweight JavaScript plug-in for any website translation; translation is performed after the page is rendered on the client's side (by the client's browser). It also includes the Translation Hub for result caching, MT provider configuration, and translation post-editing. Website translation is performed after the browser has rendered the page on the client side.

Hybrid plug-in provides a "lighter" integration in CMS platforms and encapsulates the lightweight JavaScript plug-in, which is connected to the Translation Hub. Website translation is performed after the browser has rendered the page on the client side.

Translation Hub is a distinct module designed to serve as a caching mechanism for storing and editing translations for the universal plug-in. It effectively stores content translated by the MT provider, eliminating the necessity for repetitive requests to the MT provider. Additionally, it offers a user-friendly interface for editing translations.

Each plug-in type supports two MT provider integration approaches that are implemented in the MT API Integrator:

Asynchronous eTranslation Integration – MT requests from local plug-ins and translation hubs are posted to eTranslation. The eTranslation system sends the results back to the endpoint asynchronously;

Synchronous generic MT API – generic MT API is specified. Every local plug-in and translation hub will be able to establish a connection to any MT provider that supports generic MT API implementation. This generic MT API can be created and/or hosted by the website owners, MT providers, or any third-party

translation hub host. Connection to a specific MT provider is enabled by setting the selected integrator URL and an access key.

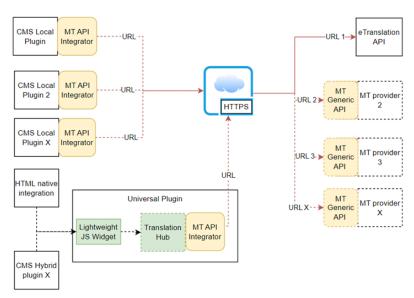


Figure 3 Conceptual architecture of Web-T multilingual plug-ins

While local plug-ins will be directly down-loadable from the respective CMS plug-in repositories, the universal plug-in does not have such an option, thus it will be directly down-loadable from the solution website and EC code repository. Translation hubs will be hosted in a decentralised manner. Website owners can run and host the translation hub by themselves or look for any public/commercial installation available. As the translation hub is open source, any new provider can host it or create an extended solution based on it.

This architecture (**Figure 3**) provides a way to extend the WEB-T ecosystem with solutions for other CMSs without the direct involvement of all MT providers that are part of the ecosystem. The

same applies to extending the ecosystem with new MT providers that will be immediately connected with all CMS integrations.

4.2 Local Plug-ins

CMS local plug-ins are installable in the respective content management system to enable the machine translation of website content. CMS local plug-ins contain an MT API Figure 4 (integrator component. It supports asynchronous API for accessing the eTranslation service and synchronous API for communication with other MT providers. Depending on the

integration, the CMS local plug-in can also contain translation and language management features. For example, the WordPress/

WooCommerce plug-in has all the localisation functionality built into the plug-in, as there is no native multilingual support in the WordPress CMS. In contrast, Drupal and Joomla extensions rely on the built-in features. localisation which translation provide and language management functionality (e.g. translatable retrieval, string translation editor interface, storage, language switcher, etc.), so the main purpose of local plug-ins for Drupal and Joomla is to add translation automated

functionality to the multilingual website setup.

4.3 Universal Plug-in

As the client-owned webpages can be very different in selected technology, content, and architecture, the only generic way to ensure content translation is to perform the translation after the page content and HTML are rendered. Webpages can also be interactive, so the content can also change after the initial page load has been already completed.

The rendering process is typically performed on the client-side Internet browser, thus the only reasonable technology for content translation on the client side is JavaScript code that follows the HTML content changes in end-users' browsers (**Figure 4**).

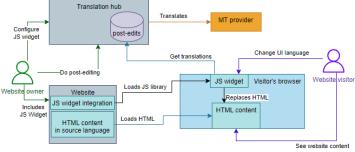


Figure 4 Conceptual architecture of Web-T universal plug-in

As JavaScript functionality is restricted and no back end is possible on the client side, an intermediate server-side tool is needed to act as a proxy between the end-user's browser and MT provider. The necessity for the translation hub as a back-end tool arises from the need to facilitate post-editing, implement cashing of MT results, secure private MT provider keys, and streamline diverse MT API workflows supported by multiple MT providers.

4.4 MT API Integrator

MT API Integrator is a specification to ensure interconnection between various CMS plug-ins and is supported by MT providers. MT API Integrator is implemented in all local plug-ins and the Translation Hub. This component consists of two parts - support for an eTranslation asynchronous approach and generic MT API for synchronous communication for the integration of any MT provider. To allow the website owner to specify which engine the MT API Integrator should use, the user interface must provide an MT engine choice in the WEB-T solution settings – eTranslation or another MT provider. With the eTranslation engine option selected, the website owner will need to provide eTranslation API credentials; when another MT provider is selected - MT provider API URL and MT provider access key.

To facilitate the integration with new CMSs, a distinct MT API integrator PHP library is created, given that PHP is the predominant language used for building CMSs.

4.5 eTranslation Integration

As eTranslation API uses digest authentication, for each call there are 2 requests – to receive authentication information and to send the actual request. Since all eTranslation API methods need authentication (including get-domains), supported language retrieval is only possible after the user has entered the valid eTranslation API credentials.

To optimise translation performance and quality using formatted text with XML or HTML tags, integrations should use document translation to send many translatable items in one request, rather than sending each string in a separate text translation request. For eTranslation integration to work, the WEB-T solution provides a REST API endpoint, which is used to receive async translation responses from eTranslation. If CMS does not support this, a local plug-in cannot be created and the hybrid approach must be used. To align asynchronous eTranslation integration workflow with other MT

provider integrations (synchronous), CMS plugins have to wait for eTranslation responses in a synchronous way (e.g., by regularly checking if the response has been saved in the database by the REST API endpoint handler).

5 Conclusion

Our study underscores the limited diversity of languages in the European web space and the pivotal role of automated translation tools in streamlining website localization. It highlights the need for user-friendly, accurate, and cost-effective solutions. The analysis of user requirements, the Web-T architecture, and open-source solutions offer practical guidance for extending the availability and use of automated website translation solutions. This contributes to the goal of achieving true multilinguality of European web space and advancing digital language equality in Europe.

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Appendix A Questionnaire for the interviews with End users.

Screening:

Q1: Is your company website multilingual?

If yes Q2, if no - cancel

Q2: Are you using automated translation to make your website multilingual?

If no Q3, if yes Q41

Q3: Are you using automated translation solutions for translating documents, texts or to transcribe voice communication?

If yes Q42, If no Q5

Q41: Which solution you are using?

- Register the solution.
- Not sure.

Go to Q51

Q42: Which automated translation solution are you using? (we have 4.1 as we need to distinguish between those that are used for website translations and those used for document translations)

- Register the solution.
- Go to Q51

Q5: Why are you not using automated translation of your organization's website?

Select all that apply:

- We have not tried because we need control over the accuracy of the translation and don't believe that automated translation can provide such.
- we tried, but the quality of the translation was not good enough.
- We tried but had issues such as untranslated elements of the site, layout issues, and others.
- We are not aware of what automated translation solutions may be applied for automated website translations.
- We don't have the technical skills to deal with the integration of a technical solution on our website.
- we investigated options, but the investment seems too high.

- We are faced with incompatibility with the existing IT infrastructure.
- We don't need translation of the content of the website.
- Other.

Thank you, cancel.

Q51. Where did you learn about the etranslation tools for your website?

Select all that apply:

- In social media (FB, Instagram, other).
- In specialized blog posts.
- From our Web developer.
- Found it in the online store (Shopify store).
- We researched on the internet.
- Other, please specify.

Q52. How did you choose the specific automated translation solution you are using?

Select all that apply:

- It was recommended by a colleague or friend.
- It was recommended by our web developer/IT team.
- It had the best reviews and ratings online.
- It was the most affordable option.
- It offers most of the features and functionalities that we need.
- It offers the highest quality.
- It is provided by the tools that we use to build our website (content management systems, site builder, eCommerce system).

Q6: What capabilities of an automated translation solution are important for your company with respect to the quality of translation?

Please rank from 1-5 (where 1 is not important and 5 is very important)

- To support a wide variety of languages.
- To handle industry-specific or companyspecific terminology particularly well.
- To offer supreme quality of translation for specific language pairs and subject areas.

- The capability of my organization to build custom language models.
- Availability of "adaptive machine translation" models that "learn" and adapt to new words and phrases over time.
- Availability of some level of human validation of translations.
- To translate all the elements of the website incl. widgets, product descriptions, and buttons across all web pages, custom posts, blogs.
- Others: Please specify.

Q7: Assuming that the quality of translation of an automated translation solution is good enough, what other capabilities are important when selecting a tool for automated translation of your website?

Please rank from 1-5 (where 1 is not important and 5 is very important)

- Ease of use of the solution.
- Ease of integration of the solution with the technologies used by the website.
- Availability of SEO (Search engine optimization) capabilities to improve website ranking; Examples of capabilities: translation of URLs, translation of metadata, Search Engine Indexing, (to rank higher local language searches), Search Engine Friendly (SEF) URLs i.e., dedicated URL for a multilingual SEO strategy, etc.
- Editing in context i.e., users are able to see exactly how the translated content looks on the website.
- Post-machine translation editing capabilities allowing collaboration of different roles.
- Ability to support specific content for the language-specific versions of the site.
- Automated translation does not harm the performance of the website.
- Quality of the support from the solution provider.
- Others: Please specify.

Q8. Please, indicate to what extent the following features provided by solutions that enable the automated translation of a website are important to you:

- Please rank from 1-5 (where 1 is not important and 5 is very important)
- User interface allows to switch/cancel ad hoc the level of the service.
- Usage statistics/ dashboard.
- Data security and privacy features to prevent disclosure of confidential information.
- Ability to control access to content based on roles.
- Solution complying with GDPR, PCI, HIPAA, or other industry standards.
- Portability of the solution (ability to change the hosting provider, the provider of the CMS, etc., and to keep the vendor of the automated translation solution).
- It is possible to ask for a refund of prepaid subscription fees.

Q9: What vendor offering options were important for selecting a translation vendor:

- Free trial
- Free version of the solution.
- Possibility to switch or cancel ad hoc the level of the service.
- Vendor policy allows to continue using the translated versions of your website if you don't renew your license.
- Hosting services, provided by the translation solution provider.
- Marketing automation capabilities built into the translation solution platform or provided by third parties.
- Affordable pricing
- Other:

Q10: Which features are missing in the current market offering of your vendor of automated translation services?

- Register1:
- Register2:
- Register3:

Optional Question:

Q11: Would you recommend the use of the automated translation services solution to other website owners? Why or why not?

- Yes, because it has helped improve user experience and expand my business.
- Yes, because it is a cost-effective solution for reaching a wider audience.
- No, the quality of automated translations is not good enough.
- No, because it is not a reliable substitute for manual translation.
- Unsure.
- Other, please specify.