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Language technologies impact on modern communication: analysis of new formats, challenges, and education

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Abstract Updating modern communication requires the improvement of innovative language technologies to facilitate communication in remote conditions. The process of modern communication requires integration into the world and European space currently. Modern society faces more and more new communication challenges that need to be solved. Therefore, our research aimed to identify innovative language technologies that are often used by modern society and to determine their advantages and disadvantages. Moreover, the article deals with studying the peculiarities of modern communication. To achieve the purposes of the research, such methods were used: theoretical: analysis of scientific literature; empirical: questionnaires, interviews; graphics. The results of the study made it possible to define the most popular language technologies in Ukraine, and their pros and cons. Searching the problem provided the opportunities to determine the main formats and challenges that influence modern communication and the ways to improve innovative language technologies facilities for comfortable communication.

Keywords: modern communication process, language technologies, communication challenges, advantages and disadvantages of language technologies.

1. Introduction

European integration supporting common values is important for the promotion of a cohesive European society driving sustainable growth. We should improve modern communication between Ukrainian and world society to give future generations a chance to come to the world and EU community. Such changes are possible with highly developed language technology usage by contemporary society and communication policy.

It is important to communicate comfortably with the new generation, who should be able to act productively and purposefully in modern conditions according to modern demands of society, requirements of intercultural communication, and challenges of linguistic globalization phenomena.

The process of communication with the world community is especially important in the conditions of the integration of Ukraine into the European educational space. Regardless of the difficult contemporary circumstances in the conditions of a real threat to the sovereignty of our state (armed aggression of Russia) and the value of the life of every Ukrainian, we should find a way of communication with European and world society.

Currently, representatives of modern society should streamline communication and create a dynamic and modern environment. The communication space requires the creation of conditions for positive personal development, psychological comfort, and creative realization. Therefore, the question of how and means of developing productive communication proficiency is one of the most urgent problems.

The following overview of scientific resources given in the next material of the article proves the need to find a solution to the research issues and mentioned problems using reaching the tasks in the study. Therefore, there is a need to understand the peculiarities of modern communication and the means of language technology usage.

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Despite the attention of scientists to the problem of language technology's impact on modern communication, both Ukrainian and foreign researchers still do not exhaust all aspects of the researched issue. This is important because of the constant updating of modern language technologies to improve communication between people.

The purpose of the article is to study and substantiate modern language technologies as important means of communication in modern society. To achieve this aim, we should implement some tasks, the solution of which will ensure the step-by-step realization of the result. The tasks are 1) to identify the main peculiarities of modern communication; 2) to study the key modern language technologies; and 3) to research and describe the core advantages and disadvantages of language technologies.

2. Literature review

A great number of scientific works are devoted to the problem of developing communication in modern circumstances. In particular, Nandanwar and Choudhary (2021) study a web page categorization method that categorizes web pages based on semantic features and contextual knowledge; Li et al. (2022) study the problem of function point analysis as a means of automated data function extraction from textual requirements by leveraging a language model; Pandey, Roy (2023) analyzed the survey about natural language generation using sequential models; and Iglesias, Sicilia, García-Barriocanal (2023) propose deep learning methods usage for spam software tools in pictures taking into account the specific situation when the pictures and the damaged content are sent using spatial and frequency domains; Chen, Yang, Liu, Sun (2020) focus on the issue of machine translation, namely, reinforced zero-shot cross-lingual neural headline generation.

A growing body of literature has examined both theoretical and practical frameworks of the issue of modern communication. We studied and analyzed some of them. In particular, a group of scientists from the USA (Nadiri et al., 2018) investigates the contribution of modern communication infrastructure to the productivity, production structure and factor demands of industries characterized by high-speed broadband access networks for the aggregate economy. Litschko, Glavaš, Ponzetto, and Vulić (2018) performed a comparative analysis of unsupervised cross-lingual information retrieval using monolingual data. Jain and Rastogi (2019) comprehensively studied the concepts and mechanisms of speaking recognition systems. MacLaren (2019) pays attention to intersecting linguistics and heritage and the process of language preservation and revitalization in cultural institutions. Chakraborty et al. (2020) describe the study of dependency on several long short-term memory cell units for character-based text generation models. They proved that the vocabulary of the corpus produces better results if the size is reduced. Ling, Steichen, and Figueira (2020) held a multilingual investigation of consumption, querying, and search result selection behaviors. Steichen and Lowe (2021) focus on the issue of multilingual users' search. The investigation of query and result list language choices is made. Christie (2022) focuses on the process of preserving language through policy, education, and culture. Jin, Jin, Hu, Vechtomova, and Mihalcea (2022) analyzed the results of a survey about deep learning for text style transfer. Lu et al. (2023) highlight major features of the concept and advantage of semantics that characterize a new kind of semantics-aware communication framework, including both the semantic encoding and the semantic communication problem.

Scientific sources contain a certain amount of research on language technologies. Roy and Viswanatham (2016) pay attention to the positive influence of artificial intelligence techniques on classifying spam emails. Jagfeld, Jenne, and Vu (2018) focus on word- vs. character-based sequence models for data-to-text natural language generation and processing. Gatt and Krahmer (2018) conducted a contemporary state survey of key objectives, apps and evaluation of natural language generation. Sarwar, Bonab, and Allan (2019) study the translation process for cross-lingual information retrieval tasks and describe the peculiarities of a multitask approach for search query translation. They proved that the model generates balanced and precise translations with the regularization effect it achieves from the multitask learning paradigm. Wei and Zhang (2019) researched the automatic generation of natural language answers with structured question answering with attention over instances. Zbib et al. (2019) propose a neural network model to estimate lexical word translation probabilities for cross-lingual information retrieval from text and speech. Schmitt et al. (2020) investigate the unsupervised joint system for text generation from knowledge graphs and semantic parsing. Xiang et al. (2020) analyzed novel linguistic steganography based on character-level text generation. Wang, Hsiao, and Chang (2020) draw their attention to communicative language technology that assists in writing an automatic paper based on an RNN and the TextRank algorithm. Cao (2020) studies the process of generating natural language descriptions from different kinds of tables. Zhu et al. (2020) outline modeling graph structure in a transformer for better abstract meaning representation to text generation. Altalhi and Gutub (2021) pay attention to predictions of cyber-attacks utilizing real-time Twitter tracing recognition in their survey. Another group of scientists (Haifeng et al., 2022) research new technologies, their impact and progress in machine translation. A team of scientists (Mahalakshmi et al., 2022) researched effective multilingual retrieval with query optimization using deep learning techniques. Sun et al. (2022) propose a framework with bidirectional difference locating and semantic consistency reasoning for change captioning descriptions. Yadav et al. (2022) identify the advantages of extractive text summarization using a deep learning approach.

3. Methods

To achieve the aim of the research, the following methods of data collection were used: theoretical: analysis of scientific sources; empirical: studying the communication process, questionnaires, interviews, conversation and focused group discussion; graphic.

Primary data were collected from leading research databases, articles and other scientific sources. To complete a detailed understanding of the issue, we analyzed the scientific literature on modern language technologies to improve productive communication. Secondary data were collected with the help of a questionnaire and expert surveys. Therefore, the search resulted in the identification of peculiarities of modern communication today. Furthermore, we implemented a survey to define the key modern language technologies that are mostly used in contemporary communication.

The methodology of expert assessment was implemented to rate the core advantages and disadvantages of language technologies. To ensure the reliability of the obtained data, independent competent experts of high qualifications (everybody has a PhD) were involved.

4. Results and discussion

In the process of researching language usage, the importance of the speaker and hearer is undeniable. Moreover, the role of the content, the quality of using language and the nature of the relationship between the speaker and the hearer are important.

Analysis of the text, its semantics and structure can identify not only what determines the formation of the meaning of the text but also how the aim of communication is achieved. The means of achieving the particular result for the partners in the process of speech activity determines the practical direction of the text.

The communication process is directly related to the type of communication situations and the effective relationship between the text sender and receiver.

Practically oriented communication aimed at the result of the communication process is built by both the situation itself and the speakers' previous knowledge, intentions, expectations, and beliefs. It also targets how the receivers, both at the micro and macro contextual level, can finally understand the text. Modern communication has evolved significantly due to technological advancements and changing societal norms. The results of the research made it possible to determine the key peculiarities of modern communication (Table 1).

In summary, modern communication is characterized by digitalization, instantaneity, global reach, visual and multimodal elements, social media, customization, privacy concerns, and a range of technological tools and platforms that have reshaped how individuals and organizations interact and share information.

Based on the analysis of scientific literature, we determined that the main modern language technologies encompass a wide range of tools, techniques, and applications that leverage advancements in natural language processing (NLP), machine learning, and artificial intelligence (AI) to interact with and process human languages. Next, we will dwell on each of the key areas and examples of modern language technologies in more detail.

Language Translation Services. Cloud-based language services provide APIs and tools for integrating translation, speech recognition, and other language capabilities into software applications. One of the most commonly used types of translation is machine translation. Modern machine translation systems, such as Google Translate and DeepL, use neural networks and large datasets to provide increasingly accurate translations between languages.

Chatbots and Virtual Assistants Chatbots and virtual assistants such as Siri, Alexa, and chatbots on websites use NLP to understand and respond to user queries and commands. One of the varieties is Legal and Compliance. Such tools help organizations analyze and review large volumes of legal documents, contracts, and compliance-related content more efficiently. Language Understanding in Autonomous Vehicles helps autonomous vehicles understand and respond to voice commands and natural language instructions. Language understanding technology is quite similar. NLP models can understand the intent and entities within user queries, enabling more natural and context-aware interactions in applications such as virtual assistants and chatbots.

Sentiment Analysis. This technology helps analyze the sentiment or emotional tone in text data, making it valuable for understanding customer feedback, social media trends, and market sentiment.

Speech Recognition. Technologies such as automatic speech recognition (ASR) convert spoken language into text. They are used in applications such as voice assistants and transcription services.

Text summarization. Text summarization algorithms can automatically generate concise summaries of long articles or documents, making information more accessible.

Language Generation. Language models such as GPT-3 can generate human-like text, enabling applications in content generation, chatbots, and creative writing. Content recommendation systems are quite similar. They use NLP to analyze user behavior and recommend content, such as articles, videos, or products, based on individual preferences. In healthcare, NLP is used for medical record analysis, clinical documentation improvement, and extracting insights from patient data.

Named entity recognition (NER). The technology identifies and classifies named entities such as names of people, places, organizations, and dates within text.

Text Classification. Text classification models can categorize text data into predefined categories, making them useful for applications such as spam filtering, sentiment analysis, and topic labeling.

Multilingual Search. Search engines use NLP to enable users to search for information in multiple languages and return relevant results.

Language Teaching and Learning. Language learning platforms and apps incorporate NLP and speech recognition to provide personalized language instruction and feedback.

Content Moderation. Social media platforms and online communities employ NLP to detect and filter out inappropriate or harmful content.

Conversational AI. AI-powered chatbots and virtual assistants use NLP to hold natural conversations, answer questions, and assist users in various domains.

Table 1 The peculiarities of modern communication.

№	Peculiarities	Description
1.	Digitalization	Modern communication is predominantly digital. People rely on smartphones, computers, and other electronic devices to send messages, make calls, and access information. Digital communication includes emails, text messages, instant messaging apps, and social media platforms.
2.	Instantaneity	Communication is nearly instantaneous. Messages can be sent and received in real time, regardless of the geographical distance between individuals. This immediacy has led to a greater sense of connectedness and has transformed the pace of business and personal interactions.
3.	Multimodality	Modern communication often combines various modes of communication in a single platform or device. For example, smartphones support text, voice calls, video calls, and multimedia messaging, giving users a range of options for expressing themselves.
4.	Global Reach	Modern communication has a global reach. People can connect with others from different parts of the world with ease, enabling cross-cultural exchanges and collaborations on a scale never seen before.
5.	Visual Communication	The importance of visual elements, such as images, videos, and emojis, has grown significantly in modern communication. Visual content is often used to convey emotions, provide context, and enhance engagement.
6.	Social Media	Social media platforms have become central to modern communication. These platforms offer a space for individuals and businesses to share updates, opinions, and content with a broad audience. They also facilitate networking and community building.
7.	Decentralization	Communication is less centralized than in the past. Traditional gatekeepers, such as newspapers and television networks, have been supplemented by a multitude of online voices and influencers. Anyone with internet access can potentially reach a global audience.
8.	Asynchronous Communication	While real-time communication is common, asynchronous communication is also prevalent. People send emails, leave voice messages, and use other methods that do not require an immediate response, allowing for flexibility in communication.
9.	Customization and Personalization	Communication tools and platforms often allow users to customize their experience. They can choose who to connect with, which content to see, and how notifications are delivered, giving individuals more control over their communication environment.
10.	Privacy Concerns	As communication has become more digital, concerns about privacy and data security have grown. Individuals and organizations must be mindful of data protection, encryption, and cybersecurity to safeguard their communications.
11.	Overload of Information	With the vast amount of information available online, individuals may experience information overload. Filtering and curating content have become important skills to manage the sheer volume of information.
12.	Ephemeral Communication	Some platforms and apps support ephemeral or disappearing messages, which are automatically deleted after a set period. This feature is popular for privacy-conscious individuals and for sharing content that does not need to be permanent.
13.	Remote Work and Collaboration	Modern communication tools have enabled remote work and collaboration, allowing teams to work together regardless of their physical locations. Video conferencing, project management tools, and collaborative software have become essential for businesses.
14.	Accessibility	Modern communication tools often incorporate features to enhance accessibility for individuals with disabilities, making communication more inclusive.
15.	Social Impact	Modern communication has had profound social and political impacts, facilitating movements, protests, and social change through the rapid dissemination of information and mobilization of individuals.

Source: compiled by the authors.

Language Preservation. NLP is used to digitize and preserve endangered languages and historical texts. Cultural and language diversity of language technologies are increasingly adapted to address the linguistic and cultural diversity of users around the world.

Modern language technologies continue to advance rapidly, and their applications span various industries, from business and education to healthcare and entertainment. These technologies are transforming how we interact with and process languages, making communication and information access more efficient and accessible.

The next step of the research was conducting the methodology of expert assessment to determine the rating of the most used language technologies in Ukraine (Table 2, Figure 1).

Table 2 The most used language technologies in Ukraine.

Rating	Language technologies	Percentage
1	Language Translation Services	29,52 %
2	Speech Recognition	19,34 %
3	Language Generation	17,48 %
4	Language Teaching and Learning	15,27 %
5	Chatbots and Virtual Assistants	9,13 %
6	Others	9,26 %

Source: compiled by the authors.

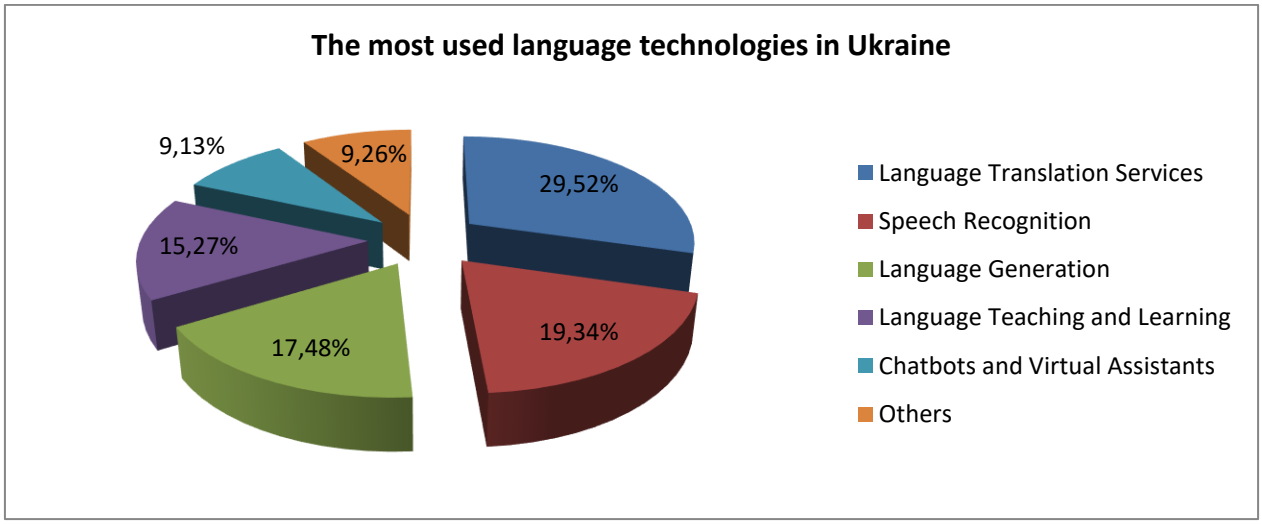

Figure 1 The most used language technologies in Ukraine.
Source: author's elaboration.

In the course of the study, the main advantages and disadvantages of modern language technologies were determined using questionnaires and surveys. Language technologies, like any other technological advancement, come with both advantages and disadvantages (Table 3).

While language technologies offer numerous benefits in terms of efficiency, accessibility, and communication, they also come with challenges related to bias, privacy, security, and ethical considerations (see Table 4).

In summary, we should mention that balancing the advantages and disadvantages of language technologies requires careful consideration of their ethical and societal implications. Therefore, we should carefully select technologies for productive communication in modern society.

Integrating language technologies into educational and communicative practices can enhance learning experiences and improve communication. The research made it possible to propose some specific recommendations for educators and practitioners.

The teachers should be kept abreast of the latest developments in language technologies, including natural language processing (NLP), machine learning, and artificial intelligence (AI) and to follow reputable sources, attend conferences, and join online communities to stay informed about emerging tools and trends.

Moreover educators must clarly understand pedagogical aims and how language technologies can support these goals. To be more effective they can identify areas where technology can enhance communication skills, language acquisition, and overall learning outcomes.

Table 3 Key advantages of modern language technologies.

Advantages	Description
Efficiency	Language technologies automate tasks related to language processing, such as translation, transcription, and summarization, making these processes faster and more efficient.
Improved Communication	Language technologies enable instant communication across languages and cultures, fostering global communication and collaboration.
Access to Information	Search engines and content recommendation systems powered by language technologies help users find relevant information quickly and easily.
Enhanced Accessibility	Speech recognition and text-to-speech technologies improve accessibility for individuals with disabilities, making digital content more inclusive.
Personalization	Language technologies enable personalized content recommendations, voice assistants, and chatbots that can provide tailored information and services to users.
Multilingualism	Machine translation and language learning apps help individuals learn and communicate in multiple languages, breaking down language barriers.
Data Analysis	Sentiment analysis and text analytics tools allow businesses and organizations to gain insights from large volumes of text data, aiding decision-making and customer engagement.
Automation	Language technologies can automate customer support, content generation, and data entry tasks, saving time and resources.
Language Preservation	NLP can be used to digitize and preserve endangered languages and historical texts for future generations.

Source: compiled by the authors.

Table 4 Key disadvantages of modern language technologies.

Disadvantages	**Description**
Bias and Fairness	Language models and algorithms can inherit and perpetuate biases present in training data, leading to biased or unfair outcomes, particularly in issues related to gender, race, or culture.
Privacy Concerns	Language technologies may raise privacy concerns, especially in applications like voice assistants that collect and process user data.
Security Risks	Text-based attacks, such as phishing emails and malicious chatbots, can exploit vulnerabilities in language technologies.
Job Displacement	Automation of language-related tasks could lead to job displacement in fields such as translation, content creation, and customer support.
Quality Issues	Machine translation and automated content generation may not always produce high-quality results, leading to misunderstandings and errors.
Loss of Human Touch	The increasing reliance on automated communication, like chatbots, can lead to a loss of the human touch and personal connection in customer service and other interactions.
Dependency	Overreliance on language technologies can lead to reduced language proficiency and communication skills in individuals.
Ethical Concerns	Ethical dilemmas arise when language technologies are used for potentially harmful purposes, such as deep fake generation and disinformation campaigns.
Complexity	Developing and maintaining language technologies can be complex and resource-intensive, limiting access for smaller organizations and communities.
Resistance to Change	Some individuals and organizations may resist adopting language technologies due to unfamiliarity, mistrust, or concerns about job security.
Digital Divide	Access to language technologies is not equitable, and the digital divide can exacerbate disparities in access to information and communication tools.

Source: compiled by the authors.

After that practitioner-teacher should choose appropriate toolls, select language technologies that align with educational objectives. This may include tools for language learning, automated writing analysis, speech recognition, or translation and to ensure that chosen tools are user-friendly and accessible to a diverse group of learners.

Then teachers will provide training sessions for educators and practitioners on how to use language technologies effectively. It is important to address any concerns or reservations, and emphasize the benefits of incorporating these tools into educational practices.

It is useful to promote collaboration, encourage collaboration between language technology experts, educators, and practitioners, foster interdisciplinary partnerships to develop and implement innovative solutions (Akimova et al., 2022).

Moreover educators should customize learning experiences: use language technologies to personalize learning experiences based on individual needs and preferences, implement adaptive learning platforms that can adjust content and difficulty levels to meet the unique requirements of each learner.

It is important to integrate language technologies into curriculum to make them an integral part of the learning process, design lessons that seamlessly incorporate these tools to reinforce language skills.

It is effective to leverage language technologies for providing timely and constructive feedback on students' language proficiency, writing skills, and communication abilities, use automated tools to streamline the assessment process and identify areas for improvement.

Moreover it is useful to discuss the ethical use of language technologies, including issues related to bias and privacy, promote critical thinking and awareness about the implications of using these tools in educational settings.

To our mind it will be great result if teachers encourage creativity: inspire educators and practitioners to explore creative ways of using language technologies to enhance communication and learning, support the development of innovative projects and activities that integrate these tools in unique and engaging ways.

After that it is importnant to evaluate and iterate, regularly assess the effectiveness of integrating language technologies into educational practices, gather feedback from educators, practitioners, and students to make informed adjustments and improvements.

By following these recommendations, educators and practitioners can harness the power of language technologies to create dynamic, effective, and engaging learning experiences.

5. Conclusions

In conclusion, in this paper, we have presented a study of the peculiarities of modern language technology usage with the aim of productive communication not only in Ukraine but also all over the world. According to the aim of the study, we implemented some tasks:

1. We have identified the main peculiarities of modern communication;
2. We have studied the key modern language technologies and made the rating of the most used language technologies in Ukraine;
3. We have researched and described the key advantages and disadvantages of modern language technologies.

Our work has led us to conclude about the importance of modern language means usage for effective communication processes.

Ethical considerations

Not applicable.

Conflict of Interest

The authors declare no conflicts of interest.

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