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Communication using artificial intelligence in turbulent market conditions

Abstract
The paper presents the scope of application of artificial intelligence in the communication process. Particular attention was paid to the technology of bots used in new media. The functionality of these solutions in turbulent market conditions has been described, indicating both their positive and negative effects in turbulent communication conditions. The Author pointed out the advantages and disadvantages of practical applications of artificial intelligence in new media and the prospects for improving such communication possibilities.

Keywords: communication, artificial intelligence, AI, turbulent market, crisis situation

"Sometimes the need to create fictional worlds stems
only from a desire to defend against chaos; perhaps even madness"
Stephen King

Introduction

Turbulent market conditions are characterized by an ever-present unpredictability, which is a permanent component of business reality. Change brought about by constant and permanent turbulence, instability and uncertainty is an increasingly common space to which organizations must become accustomed and then be able to anticipate, assess and respond to these circumstances in order to ultimately exploit the opportunities arising from constantly recurring turbulence and states of uncertainty. Changes in turbulent environments often have the characteristics of chaotic systems. This means that both the nature of change and its effects can be difficult to predict for organizations, customers and other market participants.

The aim of this article is to show the practical implications of realizing the communication process in new media using artificial intelligence. In particular, the increasing functionality of bots in the increasingly dynamic and turbulent changes of the market environment was taken into account. The issues are presented from the perspective

of competing market players and the ultimate users of these communication solutions, i.e. customers.

The thesis adopted in the study is that, in turbulent conditions, the importance and intensification of communication processes using artificial intelligence in new media is increasing, with positive and negative consequences on the side of effectiveness and efficiency in achieving marketing objectives.

Considering the objective of this study, a rich literature on the management, communication and functionality of new media in a turbulent market was used and, in addition, a secondary research was carried out by statistically compiling the source results of data from the period 2014-2021, published by specialized national and foreign organizations analyzing the new media market.

Turbulent business environment

There are few processes that can be described and explained in a simple way. Indeed, there are many situations of a complex, dynamic and irregular nature, and a sudden transition from regular to chaotic dynamics occurs in many types of phenomena. Chaos theory, which is a universal approach to phenomena in society and nature, indicates that there are systems in which simple causes lead to significant irregularities in behavior, which in turn give the impression of randomness. Chaotic systems are extremely complex and are characterized by a high sensitivity to initial conditions and an avalanche-like amplification of the first deviations, which is referred to as the so-called butterfly effect. According to Michal Tempczyk[1] is a new, interesting and creative perspective on the dynamics of matter and social phenomena at different levels of organization. The problem is explored from different scientific perspectives and shows that in any environment, the resulting turbulence destroys the initial regularity and linear simplicity of the phenomenon, revealing the true, 'uncontrollable' nature of the turbulence of the changes taking place.

Until recently, considerations of the conditions for doing business on the market could be reduced mainly to the idyllic concept of perfecting established procedures in repetitive, planned and linear situations. The collapse of *Lehman Brothers,* one of the largest US banks, at the beginning of the 21st century – 15.09.2008 – officially triggered the first global economic crisis of the new century. Other events of the 21st century, relevant to this study, certainly also include the epidemiological threat defined as SARS CoV-2, as well as Russia's armed invasion of Ukraine. In all of the cases cited, extra-coordinated ongoing measures are required to be applied, and both long-term and short-term plans, based on standard principles of predicting the future, are not applicable in practice. This is due to the numerous, sudden and hard-to-define changes, requiring extraordinary flexibility in terms of multiple decision-making.

[1] M. Tempczyk, *Mechanisms of chaos*, 'Studia Philosophiae Christianae' 2002, no. 38/1, pp. 29-40.

A wealth of management literature indicates that situations in the business environment are increasingly characterized by a rapidity of change that is impossible to forecast, causing an increase in risk and uncertainty in the activities of almost every organization[2]. The various conditions that determine the conduct of business activities take on the character of chaotic change, and the environment itself is described as turbulent (sometimes also turbulent), in which – as Kazimierz Perechuda notes[3] – decision-makers are required to be able to anticipate and react on the basis of a rapid cycle of knowledge creation or even the creation of entirely new knowledge.

The phenomenon of the turbulence of a company's environment was described in the 1980s by Harry I. Ansoff[4], who indicated at the time that turbulence was steadily increasing and was determined by four components:

- the novelty of change, increasingly out of step with the experience of employees;
- intensity of the environment, requiring an intensification of resource commitment and attention;
- the speed of change in the environment and constant adaptation to new conditions;
- increasing complexity and increasingly unpredictable conditions.

As Donald Sull notes[5], as a result of unpredictable change, the ability of organizations to be creative and maintain their value increases. One need only refers here to the cited situation of the COVID-19 pandemic to realize how quickly the communication systems available at the time were implemented in organizations and other tools for mass communication were developed. It is also worth noting that the crisis triggered by the pandemic became a natural source of inspiration for new, ground-breaking technologies for producing and testing new generations of vaccines.

The environment should be considered a critical aspect of organizational performance, as Huber states[6], an increasing number of organizations will be executing processes in a turbulent and extremely fast, even ultra-fast, environment with rapid and discontinuous changes in four areas – demand, competition, technology and regulation.

The dynamics of the environment will be further increased by continuous technological and technical progress, especially related to the implementation of communication processes, largely determining the speed of decisions taken on the market. As a result, current information will become inaccurate, inadequate, unavailable or even untrue and outdated with the passage of time. It can therefore be concluded that time

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[2] P. Kotler, J.A. Caslione, *Chaos. Management and marketing in an era of turbulence*, transl. D. Bakalarz, MT Biznes, Warsaw 2009.

[3] *Scenarios, Dialogues and Processes of Knowledge Management*, ed. K. Perechuda, Difin, Warsaw 2008.

[4] H.I. Ansoff, *Strategic management*, transl. K. Obłój, J.N. Sajkiewicz, Państwowe Wydawnictwo Ekonomiczne, Warsaw 1985.

[5] D. Sull, '*How to thrive in turbulent markets*', Harvard Business Review, No. 87 (2), pp. 78-88.

[6] G.P. Huber, *The Necessary Nature of Future Firms: Attributes of Survivors in a Changing World*, Sage, London 2003.

is becoming a significant source of competitive advantage[7]. In a turbulent environment, modern, flexible companies should therefore attempt to:

- anticipating the scope for change,
- increasing the speed of response to these changes,
- looking for solutions to respond more efficiently and effectively.

Taking into account turbulence as an immanent feature of the contemporary organizational environment, it should be stated that efficient companies are forced to abandon traditional solutions, adequate to the stable, slowly changing environment, in favor of ways of operating, adapted to highly dynamic opportunities.

In terms of the dynamism of changes in the environment and elements of chaos theory, it is worth noting the concept of the so-called enterprise in motion. According to Ewa Masłyk-Musiał[8], there are basically two types of organizations: organizations adapting to changes in the environment once it has been ascertained that the previous methods no longer work, and organizations adopting as a principle the need for constant change caused by the very fact of market changes. This second type of organization is called an organization in motion. The movement of an organization can be seen as a kind of waiting state, since it is easier to make a move when one is not at rest. Such an organization can therefore more easily establish relationships with partners and search for new constellations of alliances than an organization at rest. An enterprise in motion, according to Rafał Krupski[9], oscillates in the amplitudes of the environment, and a kind of interference strengthens the potential of the company. It is also possible for a company to influence its surroundings in such a way that the surroundings vibrate in the amplitudes of the company.

In summary, in an environment of volatility and chaos, a holistic approach to managing organizations in the marketplace is necessary. Management concepts should accept volatility, creativity and holism. It becomes a serious problem to simultaneously take into account the objectives of communication and management of organizational ties and to analyze and generate responses to market signals coming from a turbulent environment. Under these conditions, the critical parameter is the time required to sustain positive relationships and the same time required to respond to ultra-fast changes. It appears that the implementation of technological communication solutions, based on artificial intelligence, can significantly and multidimensionally improve the functioning of organizations in the market.

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[7] Organisational managers should be expected to be able to operate under time pressure and to deal effectively with not fully identified, dynamic changes taking place in the near and distant environment, which consequently requires incurring ever higher risks.

[8] E. Masłyk, *Organisation in motion*, Oficyna Ekonomiczna, Kraków 2003.

[9] R. Krupski, *Wykorzystanie chaosu w zarządzaniu – organizacja w ruchu* [in:] *Zarządzanie przedsiębiorstwem w turbulentnym otoczeniu*, ed. R. Krupski, Polskie Wydawnictwo Ekonomiczne, Warszawa 2005.

New media and artificial intelligence in the communication process

A peculiarity of today's market is that organizations operate under conditions of extremely dynamic technical and technological development. Consequently, it becomes necessary to adapt communication solutions to the intensely changing conditions. Particularly important seems to be the right choice of tools and solutions, enabling effective, and sometimes also effective, outreach to customers. Attracting and retaining the attention of customers requires increasing creativity in the preparation of content that is more imaginative and, especially importantly, entertaining and more emotionally engaging. It is becoming necessary to create innovative message content and forms of communication, capable of not only making the message more interesting, but also encouraging users to stay focused on the communication process for longer.

In order to stand out from the competition in a plethora of different messages, it is becoming necessary to make coherent use of marketing communication tools, combining promotional and entertainment objectives, providing a more relevant and more engaging way to reach customers. The response to changing customer tastes and predispositions in marketing communication is the so-called new media.

The term 'new media' has been around since the 1960s, however, despite the passage of years, there is still no clear definition and many authors approach the issue differently. On the one hand, there is the conviction that the defining characteristic of the emergence of new media is television, and that new media are merely techniques of data acquisition, processing and transmission introduced at a later time than traditional television. On the other hand, it is believed that when attempting to categorize, one should use, as a criterion for defining new media, the medium and interactivity, indicating that new media represent a more complete and non-traditional use of electronic devices[10]. According to Lev Manovich[11] new media are analogue media converted to digital form. Olgierd Witczak[12], on the other hand, draws attention to the digital process of creating, disseminating and processing content using mainly the Internet and mobile telephony for this purpose. Accordingly, such media in practice include the internet with the inclusion of all instruments of influence and mobile technologies[13]. Thus, it is becoming increasingly common to refer to the new social media as interactive digital multimedia.

[10] Cf. J. Skrzypczak, *Popularna encyklopedia mediów*, Kupisz Publishing House, Poznań 2006.
[11] L. Manovich, *Język nowych mediów*, transl. P. Cypryański, Wydawnictwa Akademickie i Profesjonalne, Warsaw 2006.
[12] O. Witczak, *New media in branding and corporate image building*, 'Studia Ekonomiczne' 2013, no. 140, pp. 80-97.
[13] J. Wyrwisz, *New media in creating the image of an organisation*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego Problemy Zarządzania, Finansów i Marketing" 2015, no. 41 (875), Vol. 1, pp. 211-220.

For statistical purposes, the Central Statistical Office adopts the following definition of new media[14]:

> [...] a generic term for the many different forms of electronic communication made possible by the use of computer technology, using, among other things, electronic publications on CD-ROM, DVD, digital television and, above all, the Internet. This means the use – for communication purposes – of desktop and laptop computers as well as other wireless mobile devices. New media include, inter alia, websites, email, online communities, online advertising, electronic kiosks, digital cameras and camcorders, integration of digital data from the telephone, virtual reality environments (including video games). The term is a reference to 'old' [traditional] media forms, such as print newspapers and magazines, which are static representations of text and graphics.

New media are seen as a practical system of cognitive communication between organizations and the environment[15]. They represent a particular configuration for the interactive transmission of opinions and experiences. They also allow seamless interaction with other users. They capture their attention and engage them by providing information and entertainment. They can provide a utility of time, place or possession, and allow the identity of the audience to be shaped[16]. They focus attention on the changes occurring in contemporary communication and exploit its key strengths[17].

Thanks to new media, the communication process, typical of mass communication, has developed. A society living in a *DIY (do it yourself)* culture is noticing more and more clearly that the internet, thanks to social networks, blogs, discussion forums or mobile applications, offers extraordinary opportunities to create and share content in real time[18]. These solutions play an extremely important role as marketing tools with significant functionalities from the point of view of the company and its customers. This is because it becomes possible to respond directly and immediately to a message, which promotes the use of this form to form a bond with the organization's audience.

The literature identifies key properties of new media, which usually boil down to five basic elements[19]:

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[14] Regulation of the President of the Council of Ministers of 1 April 2011 on the determination of the templates of reporting forms, explanations on the manner of their completion and templates of statistical questionnaires and surveys used in the statistical surveys established in the programme of public statistical research for 2011. Journal of Laws. U. No. 83, Item 453.

[15] See M. Bartosik-Purgat, *Nowe media w komunikacji marketingowej przedsiębiorstw na rynku międzynarodowym*, Wydawnictwo Naukowe PWN, Warsaw 2018.

[16] See T. Gackowski, *New media. Challenges and limitations*, Institute of Journalism, University of Warsaw, Warsaw 2013.

[17] M. Jeziński, *Nowe media a media tradycyjne prasa, reklama, internet,* Wydawnictwo Adam Marszałek, Toruń 2009.

[18] Cf. J. Bobryk, *Świadomość człowieka w epoce mediów elektronicznych*, Polskie Towarzystwo Semiotyczne, Warsaw 2004.

[19] M. Szpunar, *What are new media – an attempt at conceptualisation*, "Studia Medioznawcze" 2008, no. 4 (35), pp. 31-40.

- numerical representation: a new media object can be described in formal (mathematical) language and subjected to algorithmic processing, for example, by applying an appropriate algorithm, we remove noise from a photograph;
- modularity: a new media object is made up of independent parts, down to the level of indivisible 'atoms' – pixels, 3D points, text characters – and the modular structure makes it easy to remove elements or change them;
- automation: new media make it possible to automate many of the activities involved in their creation, processing and sharing;
- variance: the object of new media is not something predetermined once and for all, but rather it is something that exists in many versions that are different from each other, the number of which can be theoretically infinite; we can compare new media to maps of the terrain made at different scales, differing from each other in the detail of the mapping;
- transcoding: allows media to be converted to computer data and converted from one format to another.

Furthermore, according to Denis McQuail[20] new media can be ascribed distinctive characteristics to distinguish them from traditional media. The most relevant characteristics are usually reduced to:

- interactivity: the response rate to the sender's offer from the user;
- social presence (sociality): a sense of personal contact with others;
- the richness of the content: the degree of reduction of ambiguity, the number of clues, the engagement of the senses and the greater personalization;
- autonomy: the degree of independence from the source and its control;
- lucidity: a source of entertainment rather than utility;
- privacy;
- personalization: the degree of uniqueness and personalization of the message.

It is therefore difficult not to agree that the commonly used epithet 'new' has an ideological connotation, as it is usually associated with something better. It therefore has a multitude of rational and emotional meanings, such as innovative, avant-garde, ground-breaking, rationalizing, for consumers, producers, the public and the media, who have no fears for the future and count themselves among the innovators or early adopters. The use of this innovative communication solution in an organization's activities directly influences associations and evaluations of companies and its products. Novelties represent certain hopes and promises of greater market opportunities[21].

The turbulent development of technology contributes to the fact that, for many people, the re-evaluation reached through the development of technology is downright

[20] D. McQuail, *Theory of mass communication*, transl. M. Bucholc, A. Szulżycka, Wydawnictwo Naukowe PWN, Warsaw 2022.
[21] M. Lister, J. Dovey, S. Giddings, I. Grant, K. Kelly, *New media. Introduction*, Jagiellonian University Publishing House, Kraków 2010.

astonishing[22]. Communication that is implemented via digital technology is becoming ubiquitous, providing full accessibility over time on a 365/24/7 basis, high transmission quality and, in addition, the *content* offered is much more functional than previously offered analogue.

In dynamic market conditions, information is time-sensitive and increasingly imprecise, and is even treated as unattainable in relation to ultra-fast changes in the environment. As a result, market situations are subject to constant, complex and unpredictable changes, turning into market shocks in extreme situations. In such critical (crisis) circumstances, manifestations of human perceptual and decision-making 'ineptitude' are clearly discernible, requiring compensation or even its substitution by advanced IT solutions, referred to as '*artificial intelligence*' (AI). As Alfred Skorupka notes[23], it is not easy to define artificial intelligence. The term consists of the adjective 'artificial', meaning not naturally occurring, and the noun 'intelligence', expressing the ability to acquire and apply knowledge and skills. Thus, artificial intelligence can be described as a field of knowledge dealing with the search for communication techniques for solving problems, through the development of reproducible algorithms for action, which humans individually cannot clearly define and apply in practice[24]. As a result, the AI solutions used, whether of a supportive or substitutive nature, should produce the "most" effect – faster, simpler, cheaper, most perfect in the sphere of decision-making.

In the literature[25], it is generally accepted that AIs are computer programs capable of the kind of behavior that would be described as intelligent if manifested by humans. McCarthy described the process as early as the 1950s, as follows: "[a process that] makes a machine behave in a way that we would call intelligent if a human behaved in that way"[26]. Based on the definitions of AI proposed in the literature, key categories of its functionality can be identified (Table 1).

[22] T. Drabowicz, *E-inclusion in the information society* [in.], *Społeczeństwo informacyjne. Functional and dysfunctional aspects*, eds. L. Haber, M. Niezgoda, Jagiellonian University Publishing House, Cracow 2006.
[23] A. Skorupka, *General artificial intelligence from a philosophical point of view*, 'Transformations' 2022, no. 1 (112), pp. 130-142.
[24] P. Artemyev, *Selected paradigms of artificial intelligence*, Polsko-Japońska Wyższa Szkoła Technik Komputerowych Publishing House, Warsaw 2013.
[25] See more extensively K. Różanowski, *Artificial intelligence: development, opportunities and threats*, 'Zeszyty Naukowe Warszawskiej Wyższej Szkoły Informatyki' 2007, no. 2, pp. 109-135.
[26] See J. Kaplan, *Artificial intelligence. What everyone should know*, transl. S. Szymański, Wydawnictwo Naukowe PWN, Warsaw 2019.

Table 1. Human decision-making problem areas vs. postulated solutions in AI definitions

Authors and their definitions	Main areas of human decision-making problems	Key functionalities of artificial intelligence
R.E. Bellman (1978) automation of abilities attributed to human thinking, abilities such as decision-making, problem-solving, learning **J. Haugeland** (1989) research being conducted towards creating computers that think, machines that have a mind	How does the thought process occur in humans?	think like a human
P.H. Winston (1984) studies of computational models that enable perception, inference and action **E. Charniak, D. McDermott** (1985) a study of mental capacity by means of computational models	How to think rationally?	think rationally
E. Rich (1984) research to create computers with skills that humans are now better at **R. Kurzweil** (1990) the art of creating machines capable of performing actions that require human involvement and intelligence	How do humans act?	act like humans
G.F. Luger, W.A. Stubblefield (1993) branch of computer science concerned with the automation of intelligent behaviour **W. Duch** (2018) solving effectively non-algorithmic problems, based on knowledge modelling	How to act rationally?	act rationally

Source: own study.

Human thinking and behavior manifests the weakness that it is not always rational. Hence, 'human thinking' and 'rational thinking' and 'human behavior' and 'rational behavior' stand in opposition to each other.

It can therefore be seen that the issues of AI functionality mainly include problem-solving methods. Given the dynamism of the market changes taking place, adopting more and more crisis scenarios and turbulent situations, it is not difficult to justify the need to create such algorithms that mimic the ways of human inference in the turbulent decision-making process[27].

The challenge for developers of AI applications is to develop self-learning systems that, based on past situations and their solutions, can improve themselves through simulated analogies. In this way, the prediction and forecasting of the course of phenomena in a hyper-dynamic environment and the variance of the consequences of decisions are important areas in which the application of artificial intelligence is expected to be significant.

[27] An important area of research and practical implementations of AI is the processing of natural human language in terms of automatically translating sentences between different languages, giving verbal commands to machines, as well as extracting key data from spoken sentences and building an information base from them for decision-makers. Such extracted knowledge in critical situations can be extremely valuable due to the speed of obtaining and communicating key data, but also its rationality, which could be lacking in an emotionally-driven and surprised human being.

Specialists and scientists are also trying to explore the processes of perception, that is, vision, touch and hearing, and thus build electronic equivalents of these organs and apply them to robotics[28]. It is robotics that represents one of the most astonishing human applications of AI. Robotics involves building machines that are capable of performing physical tasks and do not need to take human form at all. An example of the use of such functionality in a communication process – chatting with a bot on a website and in a mobile phone application – is shown in Figure1.

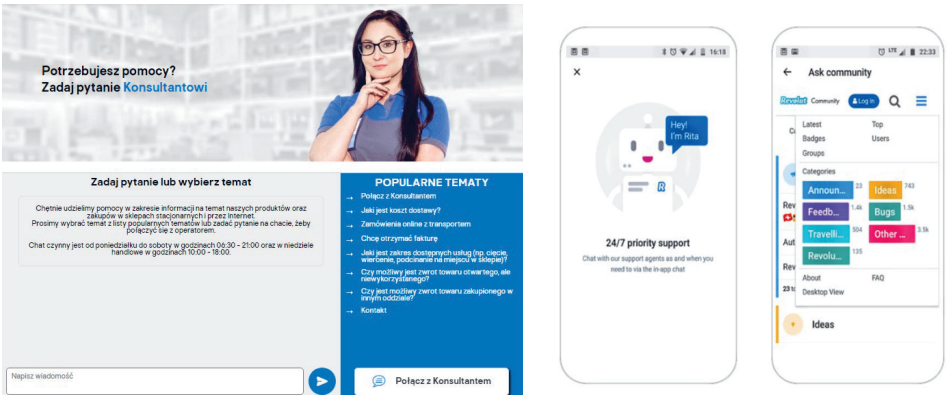


Figure 1. Examples of bot communication dialogues using an artificial intelligence system
Source: https://www.castorama.pl/informacje/pomoc and https://finanteq.com/revolut-the-economics-of-helping/.

Undoubtedly, AI is the area of technology that people have high hopes for, as it is already significantly improving their lives. Artificial intelligence in the broader sense is more than a computer programme that declassifies a human being due to the speed of its calculations[29]. Artificial intelligence allows better simulation of brain activity. It uses algorithms that allow learning, pattern recognition, but also – inference, classification, generalization, dependency detection, adaptation and prediction. All these capabilities of artificial intelligence, combined with the attributes and functionalities of new media, are gaining a growing number of followers. This is due to people carrying out time-pressured activities, in which their creativity is often lost.

It is also worth pointing out other applications of AI and new media in human activity. Increasingly, websites and mobile applications are being made available that allow for the more perfect preparation of graphics, video and even text for publications[30]. Examples of sites offering such functionality are shown in Figure 2.

[28] L. Rutkowski, *Metody i techniki sztucznej inteligencji. Inteligencja obliczeniowa*, Wydawnictwo Naukowe PWN, Warszawa 2005.
[29] A. Betlej, *Network society- potentials of change and ambivalent effects*, Publishing House of the Catholic University of Lublin, Lublin 2019.
[30] Interesting sites using the technical possibilities of artificial intelligence are for example: https://openai.com/dall-e-2; www.copy.ai; https://beta.tome.app/; https://waymark.com/; https://

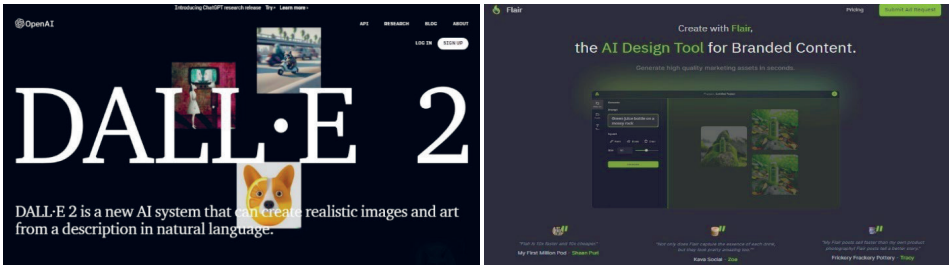


Figure 2: Websites using an artificial intelligence system to develop graphic elements
Source: https://openai.com/dall-e-2 / and https://withflair.ai/.

In order for AI to behave like a human, effective human-machine-human communication is required, as natural language processing, followed by proper knowledge representation, automatic reasoning and machine learning of the sender's intentions, becomes crucial. In addition to the functionality of human behavior, artificial intelligence solutions are also expected to be rational, which, in the context of the dynamism of the changing environment, turning into chaos and turbulence, does not necessarily equate to complete infallibility. For it is still ultimately the human being, assisted by AI, who remains responsible for making many decisions.

Examples and implications of applying artificial intelligence to communication activities

The data-driven economy is a challenge for development in the 21st century, both socially and economically. It is possible to identify many areas in which applied artificial intelligence, as a new trend in the development of the technology known by the acronym DARQ[31], is producing spectacular results. The turbulent changes in the environment and the accompanying extremely dynamic technological progress, including mainly the increase in the computing power of computers, as well as the possibilities of collecting, storing and using data (*big data*), are the key factors behind the growing interest in implementing AI solutions[32].

The rationale for the implementation of artificial intelligence and its use in marketing decision-making processes stems from the increasingly perceived inadequacies of the thought processes of those involved in decision-making. The cause of erroneous

withflair.ai/; https://www.synthesia.io/; https://www.personal.ai/; https://smodin.io/; https://www.jasper.ai/ (accessed 21.05.2023).

[31] The acronym translates as: *Distributed Ledger, Artificial Intelligence, Extended Reality, Quantum Computing* – see more extensively J. Kisielnicki, J. Zadrożny, *DARQ Technology as a Digital Transformation Strategy in Terms of Global Crises*, 'Problemy Zarządzania' 2021, no. 19 (93), pp. 150-167.

[32] See J. Kisielnicki, J. Zadrożny, S. Fabisiak, *Artificial Intelligence as a Tool Supporting Organisational Entrepreneurship – Theoretical Problems and Case Analysis*, 'Problemy Zarządzania' 2022, no. 20 (1), pp. 125-149.

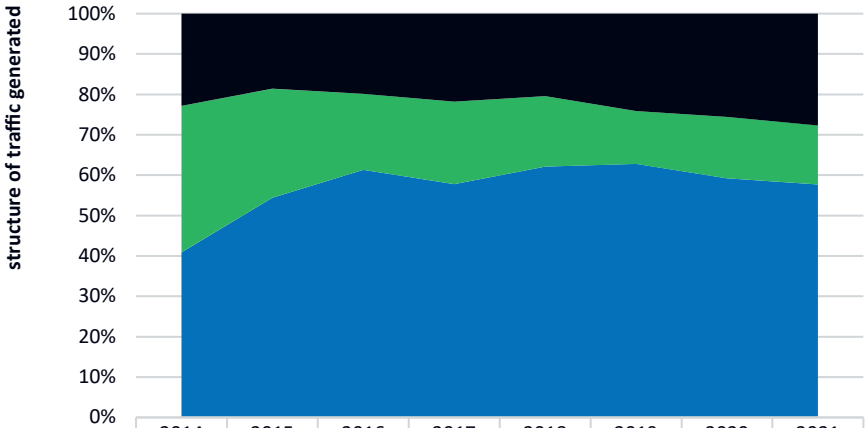
decisions may be, among other things, various kinds of heuristic cognitive errors[33] distorting thinking.

The development of artificial intelligence is very closely linked to the dynamics of the environment, especially the growing popularity of new media, and thus the introduction of innovative communication solutions in the field of robotics – computer vision, as well as computer speech recognition (chat GPT-3). There are many applications of such technological solutions in the sphere of marketing practice, especially in the analysis of large sets of data, concerning, for example, current consumption behavior, the activities of competitors, the effectiveness of loyalty programs, as well as the construction of effective and efficient communication systems of an organization with its market environment. The application of AI in the implementation of personalized marketing communication without human involvement in decision-making processes may prove crucial. In such circumstances, bots, using artificial intelligence, are finding increasing application in customer service[34].

Taking into account the objective of this study, related to confirming the essence and the extent of the consequences of the use of artificial intelligence in the communication process in new media, a *desk* research study was carried out by compiling the source results of the research conducted by specialized organizations involved in the analysis of the new media market[35]. The collected and processed national and international data were taken from the period 2014-2021 and analyzed using statistical methods.

Analyzing the communication traffic generated on the Internet between 2014 and 2021, it can be clearly seen that there is an increase in the use of so-called bad bots, which replace both traditional human activity and the use of good bots, which support humans in the implemented communication activities using this medium. Detailed data showing the structure of internet user activity is presented in Figure 3.

[33] See more extensively M. Makowski, '*Perception of the content of television advertising messages*', Media Business Culture 2022, no. 2 (13), pp. 57-76.
[34] M. Sobocińska, '*Artificial Intelligence and Human Talent in Decision Making in the Sphere of Marketing in an Enterprise*', Problemy Zarządzania 2021, no. 19 (1), pp. 66-76.
[35] For more on the method of measuring domestic and foreign secondary sources (so-called *desk research*), see S. Kaczmarczyk, *Marketing research. Podstawy metodyczne*, PWE, Warsaw 2011, as well as M. Makowski, *Gromadzenie i analiza danych rynkowych,* CEDEWU, Warsaw 2022.



	2014	2015	2016	2017	2018	2019	2020	2021
Bad bots	22,8%	18,6%	19,9%	21,8%	20,4%	24,1%	25,6%	27,7%
Good bots	36,3%	27,0%	18,8%	20,4%	17,5%	13,1%	15,2%	14,6%
People	40,9%	54,4%	61,3%	57,8%	62,1%	62,8%	59,2%	57,7%

Figure 3: The structure of the communication traffic carried out online between 2014 and 2021
Source: https://www.statista.com/statistics/1264226/human-and-bot-web-traffic-share.

It is worth pointing out at this point how good and bad bots are defined. According to the classification adopted in Imperov's reports[36], bad bots are automated applications created and used on the internet with malicious or often criminal intentions to gain a competitive advantage. Not all bots turn out to be bad in practice and there are many examples of good bots that provide a beneficial service related to accurately finding and sharing online content with internet users. Through applied indexing, they help people match queries to the most relevant sets of web pages. Recognizing the difference between good bots and bad bots is becoming increasingly difficult as bad bot behavior becomes more sophisticated and therefore protecting average users from their illegal online activities becomes more difficult in practice.

Analyzing the content of websites in terms of the communication traffic generated, related to searching for and sharing content, it can be seen, as illustrated in Figure 4, that there are subject areas that are largely the domain of human activity – gambling, healthcare, insurance (more than 75% of the communication traffic generated). There are also websites that are used to a significant extent (more than 50% of generated traffic) by so-called good bots, looking for such content in the published content that could be effectively used for business purposes – this is mainly about published reports and data, as well as dedicated services for business. However, special attention should certainly be paid to websites dominated in recent years by bad bots, whose activity can have serious negative consequences. In this respect, financial (especially banking), educational, service and IT support, as well as commercial and governmental sites

[36] See Imperva.com, *Bad Bot Report. Evasive Bots Drive Online Fraud*, 2022.

require vigilance. In these cases, there can be both the theft of funds and detailed data used for other criminal activities.

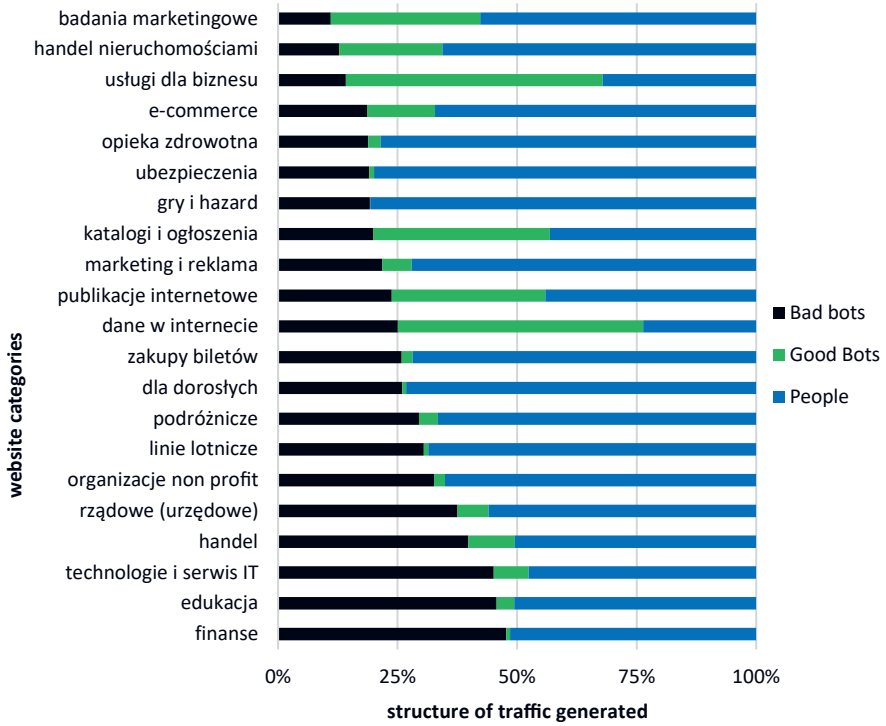
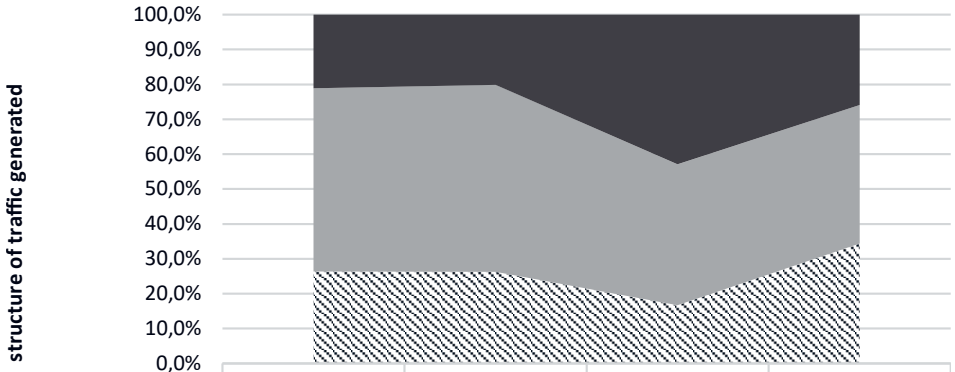


Figure 4. structure of traffic in terms of websites 2014-2019
Source: Imperva.com, *Bad Bot Report* 2020.

The artificial intelligence of evil bots operating on the Internet always leads to negative consequences for unwitting users. While it is proof of the progress and technical and technological development of AI, the criminal dimension of the objectives pursued should by no means be a justification or excuse for this type of creativity. Practical solutions applied in the realm of evil bots use sophisticated techniques to simulate human behavior in decision-making processes. This makes it difficult, if not impossible, for protective algorithms, combating competitive dishonesty or phishing for unsecured data, to block them. The negative consequences of such procedures for users are often irreversible, shattering previously linear activity in many spheres of activity. Details of the structure of the communication traffic generated by bad bots are shown in Figure 5.



	2018	2019	2020	2021
Sophisticated bots	21,1%	20,1%	42,9%	25,9%
Moderate bots	52,5%	53,6%	40,4%	39,7%
Simple bots	26,4%	26,3%	16,7%	34,4%

Figure 5: Structure of communication traffic generated online by bad bots between 2018 and 2021
Source: own compilation based on Imperva.com, *Bad Bot Reports*, 2019-2022.

It is noteworthy that in 2020, i.e. during the socio-economic crisis caused by the COVID-19 pandemic, the activity of the most sophisticated evil bots was at its highest. It was during this period that new media, due to their functionality, took on a dominant role in the communication process, and this could even have provided the ideal crisis conditions for numerous abuses and illegal procedures. The year 2020 also marks the presidential election taking place in the United States. As can be seen from the data presented in Figure 6, a significant increase in traffic directed to government websites worldwide by advanced bad bots was recorded during the most turbulent period, just before the November elections. The situation on government websites continued until the swearing-in of the new US president, Joe Biden, in December.

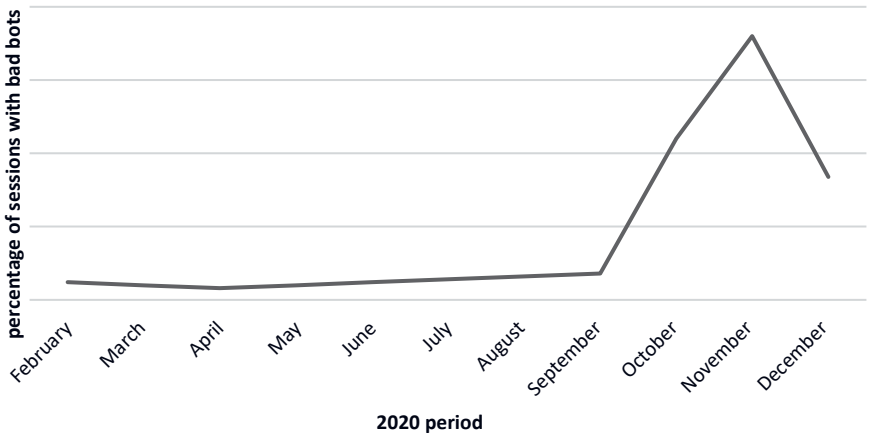


Figure 6: Traffic of bad bots on government websites in 2020
Source: Imperva.com, *Bad Bot Report*, 2021.

Further incontrovertible evidence of the use of communication bots in a dynamic environment, for the purposes of unfair competition in the market, may be the generation of fictitious orders (shopping baskets), the complete blocking of access to the websites of bidders, the slowing down of the operation (refreshing of the content) of the websites, and in extreme cases the stealing of user login data or impersonation of real customers, or even sophisticated attempts to use fictitiously generated credit card numbers. As can be seen from the data shown in Figure 7, the percentage of bad bot attacks during the most dynamic, even critical in terms of emerging chaos, sales period of the so-called *black week* increased significantly in 2020. This was also due to the launch of the new generation of gaming consoles[37].

[37] In 2020, many gamers were frustrated as buying a next-generation GPU or CPU gaming console became impossible due to bad bots hoarding them all. The timing of the pre-sale was no coincidence.
On one online trading portal alone, the profit was estimated to be around $82 million:see:https://dev.to/driscoll42/an-analysis-of-the-80-million-ebay-scalping-market-for-xbox-ps5-amd-and-nvidia-f35, information dated 2.12.2020 (accessed 21.05.2023).

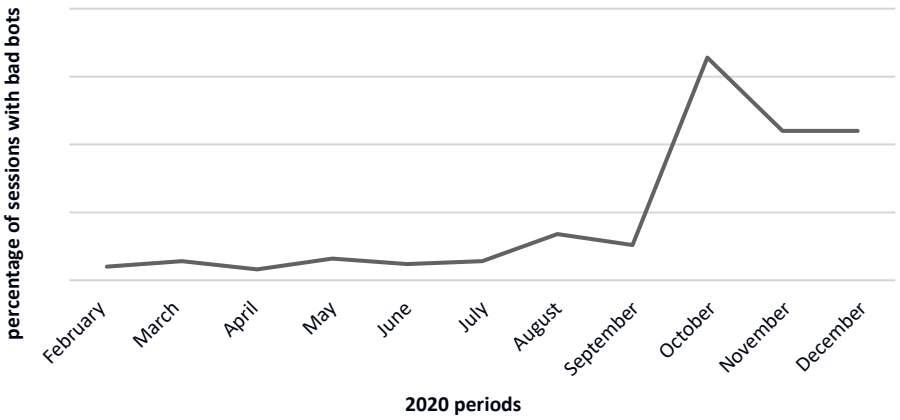


Figure 7. Traffic of bad bots on sites related to commercial activities in 2020
Source: Imperva.com, *Bad Bot Report*, 2021.

Turbulent conditions resulting from the COVID-19 pandemic also led to the use of bad bots on websites promoting vaccination and even enabling registration for the then first administration of the vaccine[38]. Details illustrating this situation are shown in Figure 8.

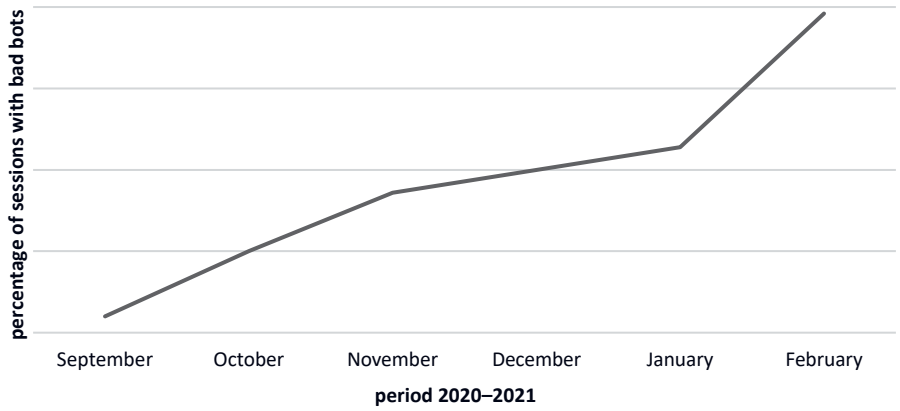


Figure 8. traffic of bad bots on health-related sites for 2020-2021
Source: Imperva.com, *Bad Bot Report*, 2021.

It can therefore be concluded that the turbulent market situation is, on the one hand, a perfect, even ideal opportunity for the harmful and criminal use of the artificial

[38] There was a 372% increase in traffic from bad bots on healthcare-related websites worldwide between September 2020 and February 2021. As vaccines were introduced for more age groups, there were signs of bot activity on sites offering vaccination options. Massive activity was found at a rate of as many as 12,000 queries per hour.

intelligence of bad bots, or the result of their operation in the initial stable conditions, creating multidimensional communication chaos for decision-makers. It is also worth pointing out at this point that the action of bad bots was recorded in the first days of the armed attack on Ukraine[39]. The characteristics of the impact of bad bots in business activities in the market are summarised in Table 2.

Table 2. Artificial intelligence activities of bad bots in business activity

Scope of action	What do 'otherwise intelligent, bad bots in business?	Areas of most frequent activity
Price scraping	They lead to a loss of customers who search online for offers of the same products according to the lowest price criterion.	Commerce, Travel agencies, Airlines
Content Scraping	Creatively produced content is copied and used without permission to describe similar offers on the internet.	Classifieds, job ads, finance, trading platforms
Credential stuffing	Use of dictionary terms to verify a user's name and password and duplication on other sites.	Any activity that requires the use of a login and password
Account creation	Create new accounts to gain benefits – points, discounts, free demo products.	Communication platforms, social media, gambling, discounts
Card cracking	Testing of missing, individually secure credit card data (expiry date, CVV).	Any site with payment processing trade, donations, gambling, booking
Denial of Service	Reduced speed, prolonged refreshing of content, and complete blocking of access to the offer.	Every industry
Gift Card Balance Checking	Theft of money from loyalty cards and gift cards of customers making payments.	Any business that processes gift card payments
Denial of Inventory	Holding purchases in the shopping basket without payment, causing a fictitious exhaustion of the offer to customers.	Offering rare, limited edition, seasonal products
Scalping, Grinchbots	Used to gain priority for limited availability of preferred products.	Limited, rare offers, often electronics, IT, health services

Source: own compilation based on Imperva.com, *Bad Bot Reports*, 2019-2022.

However, it is certainly not appropriate to generalize the applications of AI and bots as technological solutions that cause social and economic harm. This is because in such cases AI is not yet able to autonomously recognize the negative consequences resulting from the use of a criminal algorithm developed by a human.

Instead, it should be forcefully emphasized that, in practice, AI solutions in ultra-rapid, turbulent market conditions bring many benefits. People are increasingly getting used to, accepting and even cannot imagine the absence of text or voice chat bot communication

[39] A 145% increase in automated attacks targeting Ukrainian web applications was observed between 24.02-1.03.2022 to disrupt services. Denial of service (DDoS), fraud and malicious code insertion attacks were carried out by advanced bots. The attacks were aimed at denying critical services in finance, telecommunications and energy. Two massive *account takeover* (ATO) attacks were also recorded and stopped.

solutions. As can be seen from the data[40] presented in Figure 9, more than a third of the people surveyed expect immediate answers in situations of decision-making problems and therefore 24/7 communication functionality, as difficult to organize and increasingly less effective and efficient to provide with direct human intervention. Only a quarter of survey participants prefer traditional communication with an actual human being.

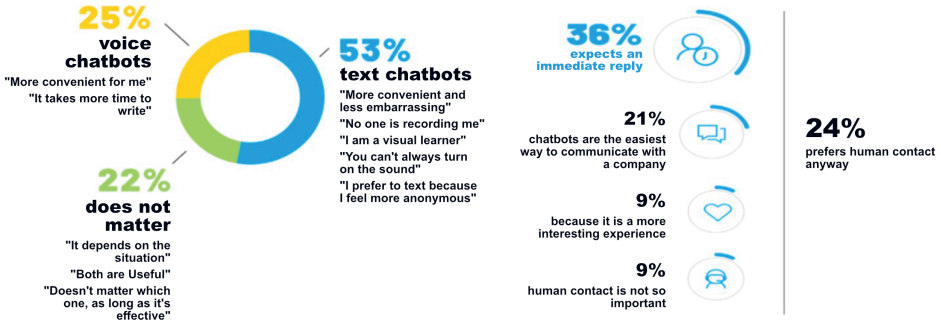


Figure 9: Experiences, expectations and opinions of users served by bots
Source: UX UPGRADE, SYMETRIA, *Chatbots in Poland 2020*.

Artificial intelligence solutions applied to communication bots in many cases facilitate overcoming the difficulties of everyday life and support decision-making. It can even be argued that the individually perceived state of decision-making confusion and even emotional agitation are areas where substantive and quick feedback in the communication process determines the functionality of the use of bots. Figure 10 shows respondents' indications of the general areas of usefulness of communication bots. It is worth noting the confidence attributed in detail to the industries served by bot artificial intelligence[41].

[40] The source data comes from the UX UPGRADE – SYMETRIA survey, conducted in October 2020 using the CAWI method on a sample of 259 respondents. Its aim was to find out about the experiences of people using bots, as well as their expectations of this type of interface.

[41] Telecommunications and fashion enjoy the highest level of trust, so AI-enabled communication processes seem indispensable, regardless of the degree of turbulence and chaos. In the case of medicine (individual health) and finance (individual wealth and asset risk), on the other hand, social acceptance of AI solutions does not yet seem high, all the more so in turbulent market conditions it could prove excessively risky.

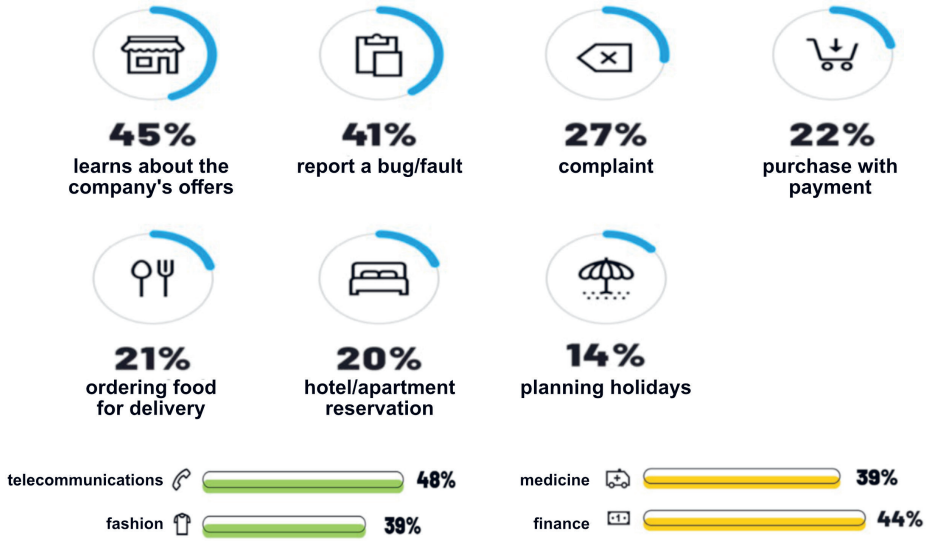


Figure 10: Usefulness of bots in the communication process vs. level of customer trust
Source: UX UPGRADE, SYMETRIA, *Chatbots in Poland 2020*.

The functionality of the use of artificial intelligence positive bots can be assessed on the basis of the advantages and disadvantages declared by users of such a technological communication solution. Such a comparison is presented in Figure 11.

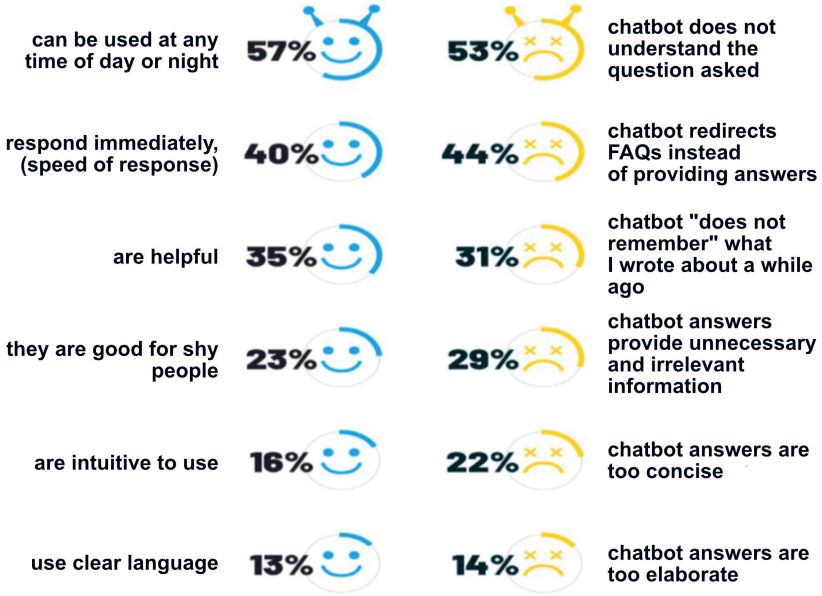


Figure 11: Advantages and disadvantages of bot-operated communication processes
Source: UX UPGRADE, SYMETRIA, *Chatbots in Poland 2020*.

As can be seen, communication technology using bots still needs a lot of improvement, mainly in terms of understanding the questions asked and their context, and generating more accurate, sought-after answers. In turbulent situations in the marketplace, compounding communication and decision-making chaos may be an important direction for further technological improvements.

Conclusions and outlook

In a turbulent market environment, decision-makers are required to be flexible in their actions and shorten their reaction time to changes, which in practice means taking numerous communication actions on the basis of a rapid knowledge creation cycle.

The turbulence of the market environment, which is ubiquitous in the modern economy, is a result of the intensity of competition, the globalization of markets, as well as new technical possibilities for communication. Thanks to new media, the use of innovative communication tools should lead to effectively and efficiently supporting, rather than replacing, decision-makers in their market activities. In addition, AI technologies should be constantly monitored with regard to both their practical usefulness and the legitimacy of the operational results obtained.

In 2020, the global chat bot market was estimated to be worth $430.9 million. According to *Grand View Research,* it will reach almost $2.5 billion by 2028 with an annual growth rate of 25%. Projections indicate that by 2024, the number of voice assistants could reach up to 8.4 billion, more than the world's population.

By 2025, it is estimated that the value of the AI market will grow to more than USD 190 billion, with a growth rate of 36.6%. At the same time, AI-based solutions are expected to be implemented by as many as 97% of the largest international companies. On this basis, as well as on the basis of the practical examples cited, the statement that in the growing turbulent conditions the importance and intensification of communication processes using artificial intelligence in new media is increasing, and the role of AI researchers should be to improve the usability and legitimacy of the effects of this technology.

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