Title: Specifics of Algorithmization in Data Culture

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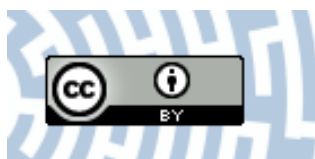
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Specifics of Algorithmization in Data Culture

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Abstract

Information societies effectively transform existing cultures. New cultures are variously defined, but because of the fact that they are dominated by information, the term "data cultures" seems to be the most relevant name for them. Although, it is possible to create a single global data culture in the future and such predictions prevail in academic and non-academic reflections on this subject, so far in addition to global trends there occur local data cultures, what also dynamizes and enriches both individual and collective identities. As Kazimierz Krzysztofek aptly notes, in this situation: "The greatest contradiction of the civilization of the 21st century is drawn. On the one hand, a continuous imperative: be creative and innovative, on the other hand, an increasing pressure on prediction of people's behaviour, because unpredictability causes chaos, which cannot be managed". In other words, one of the most important social issues today is to create some order in data culture / cultures (often pictured by columnists and researchers as a "magnetic storm"), to reduce its / their infinite complexity, i.e. simply the algorithmization process. With regard to culture, it is not possible to use unequivocally a mathematical algorithm that is the most precise, or a genetic or hormonal algorithm that functions in nature, because accustoming cultural chaos is always strongly ideologized. The algorithm should be treated as a metaphor used to explain cultural phenomena, especially their developmental tendencies. For the researcher of contemporary societies, it is very important to answer the question: what proportions of structure and network are the most beneficial for the survival of data culture / cultures? This answer also directs reflection on the quality of life of individuals and societies, limiting or promoting individualism and collective intelligence in the era of hyper-digitization. These considerations are limited to the initial characterization and evaluation of the information algorithmization of man. The author of the study refers to the concepts of researchers from different countries, highlighting the specificity of today's algorithmization, among others the model of ambient perception, which facilitates participation in the networked information environment, scope and reach of the big data phenomenon, forms of data visualization, personalization of content, Isotype visual language, network custody, data journalism and others. In conclusion, it is pointed out that the information algorithmization of man is constantly growing, which proves that data management strategies weaken the phenomenon of information overload through the logic of numerical civilization, which limits diversity, seeking to count, record and globalize everything.

Keywords: information society, data culture, algorithmization, distraction, strategy, mobile application, authority

Introduction

The development of every society is an extremely complex process, and therefore its description must be limited to presenting only its dominant features. Modern society is most often referred to as the information society, because information is one of its essential products of important utility and culture-forming value for it, largely determining its progression. Hence, information is the axis of our attention and the following considerations. More precisely, we will focus on high technology, which for half a century, transforming mostly into objects of everyday use (so-called soft technology), makes further breakthroughs in interpersonal communication and all spheres of life, i.e. when compared to the past it extremely speeds up production, storage, processing, sending and exchanging various types of information. In the 21st century, almost every member of society, regardless of the diversity of these societies in terms of economic and cultural development, has a sense of increasing information redundancy and experiences difficulties in solving many problems related to it.

Information societies transform, quite radically, all - small, large, highly developed, and underdeveloped - local identity cultures, making them strongly dependent on a very dynamic and expansive global culture, a non-identity culture in the traditional sense of personal identification. Many boundaries and principles that have conditioned previous social orders are blurred. First of all - as the media sociologist aptly emphasizes –

In the modern world, hierarchical structures have become completely outdated. The "up-bottom" hierarchy of information flow gradually rots - it can be metaphorically said that it has not stood the test of time. A knowledge and information based society even forces us to function in more flexible, egalitarian structures, with a rapid circulation of information and other resources, which is ensured only by the network structure. [...] Networks, however, are not amorphous, you can determine their number of connections, orientation, reciprocity, transitivity, density, strength and other elements thanks to which we can analyze what position individual units have in the network and how the network affects interpersonal interactions. However, life in a network society is not free from disadvantages – taking into account the high complexity of the structure, there may occur problems with coordination of activities [...] (Szpunar, 2005, pp. 82-83).

The problems mentioned above, regarding not only actions, but also the coordination of thinking, have become very complicated and multiplied over the last several years for many reasons, not only those related to the expansion of technology. Referring to the classical typology of social time, by Georges Gurvitch, it can be stated that at the end of the second decade of the 21st century, information societies live in *le temps de l'incertitude* (uncertain times), in which events develop in a very variable rhythm, and the present shows a pronounced advantage over the past and which - in the common sense - are increasingly taking the form of *le temps explosive de la création* (extremely explosive time of creation), based primarily on discontinuity, instability and randomness. According to the French researcher, the uncertain time still accelerates its course, while the explosive time increases the risk and forces strenuous effort beyond one's capabilities (Gurvitch, 1961, pp. 37-39). Some tired and frightened by the pace of life members of information societies even believe that the order of time sequence embraced in the Latin sentence: *Animus meminit praetoritorum, praesentia cernit, future providet* (Mind remembers the past, sees the present, predicts the future) has already been unduly violated, while others even say about the "magnetic storm" (rapid and intense changes in the physical and symbolic parameters of the information stream) that is already underway in the communication space. Even if such a radical position is rejected, there is no doubt that one of the most important social issues is to create some order in this space.

This space, i.e. the culture produced by the information society, is today referred to as the data culture, because in the public and private sectors, both employees and decision-makers most often shape their knowledge and make decisions based on the principles of the so-called datafication, i.e. the use, mostly in the form of analysis, of an increasing number of numerical data. Datafication, already dominating in business, industry, economy and more and more often in politics, also enters colloquial communication, art and fun, it is everywhere and involves managing an enormous amount of information that on the one hand increases the sense of redundancy, but – on the other - is also a the source of the wealth of cultures that can expand the possibilities of human cognition and develop the creativity of individuals and social groups.

Researchers generally use the terms "information" and "data" interchangeably, although colloquially, "data" is treated as raw facts, and "information" as contextualized data having a specific meaning. However, in communication practices,

millions of books stored on library shelves contribute to overload in the same way as terabytes of databases on server magnetic tapes. As long as the Web user does not interact with them in a real communication situation, there is basically no difference whether we are talking about data or whether we use the concept of information (Piekarski, 2017, p. 17).

In other words, in the pragmatic approach that we are interested in this text, the idea of the data culture is the concretization of a new and higher form of culture based on the network structures of functioning of the information society. The data reinforce the hitherto endless complexity of life in contemporary individuals and societies, and cast a stronger, partly new light on the issues of the adopted principles of social orders, i.e. procedures of conduct in specific circumstances. These processes receive a powerful impulse for data production via the "Internet of Things" and the so-called smart homes, what researchers pointed out a few years ago. For example, one of them wrote:

It is estimated that there are about 40 billion devices integrated into the network, which means that there are already 5 times more devices connected to the network than people. By 2017, the ratio of devices to people will increase as 1 to

130. Their number in the long term [i.e. today - T. M.] will exceed a billion. All these objects emit an avalanche of data (Krzysztofek, 2015, p. 59).

The same researcher several years earlier pointed out

the greatest contradiction of the 21st century civilization. On the one hand, a constant imperative: be creative and innovative, on the other, an increasing emphasis on predictable human behavior, because unpredictability causes chaos that cannot be managed. This was relatively less important when the technology of the era of mechanics imposed certain procedures on human muscles and senses. However, today's technologies replace some of the brain's functions by imposing their algorithms on it (Krzysztofek, 2004-2005, p. 61).

Therefore, the purpose of this research reflection is to identify the most important algorithms that are developed by the modern information societies as well as the specific features of this algorithmization. We assume that information algorithmization of a human being is exemplary (model) for many other ways of solving current social dilemmas, which, among other things, explains why it is also worth to consider its specificity.

When one talks about different types of recipes used in a world where more and more electronic calculations need to be made, obviously a mathematical algorithm seems to be the most accurate recipe. The very term "algorithm" comes from the Latinized name of the scholar Muhammad ibn Musa al-Khuwarizmi (Latin Algorismus), who in the 9th century in his treatise entiled *Al-kitab al-muchtasar fi hisab al-Jabr wa-al-mukabala* (*A short book on calculating by complementing and balancing*) wrote "rules for performing basic decimal arithmetic operations" (after Knuth, 1968, p. 3).

And at the beginning of our century, the famous mathematician, the creator of "A New Kind of Science", unambiguously announced that "at the beginning of everything there was an algorithm" (Wolfram, 2002), thus expressing the conviction that all scientific and man-made algorithms imitate algorithms of nature. However, the algorithms associated with the latest inventions based on high technology are not created on the basis of simple similarities, neither to mathematical programming nor to natural "recipes", e.g. genetic or hormonal algorithms, although sometimes, as in the case of ant colony optimization algorithm programs or neural networks, they imitate them a little.

In addition:

Computerization of intelligence, its algorithmization, is something that we know very little about. The very term "artificial intelligence" or [...] algorithmic intelligence seems to be contradictory. We understand intelligence as our, essentially unprogrammed, and therefore non-algorithmic, abilities. For many people, the very idea of an intelligent machine does not sound sensible (Harel, 2002, p. 163).

Regardless of how strongly and widely doubts in these matters are dispelling and deepening, one belief gains absolute certainty in every person today, namely that culture (and everything else also), despite its increasing complexity and openness at the same time, is growing more ordered, i.e. algorithmized. Therefore, it is best to treat the algorithm as the most important - at least for now - metaphor of modern culture, with the help of which one can describe, analyze and explain numerous changes that occur in our lives.

Methodology

The short history of the data culture and research on it unambiguously confirms the need to use multi-methodology in analyses of human algorithmization. It has been proofed by the works by Geoffrey C. Bowker and Susan Leigh Star devoted to the classification and standardization of various aspects of life, both those that are self-steering and those that are subject to external control (1999) and Bowker's article on layering biodiversity processes in "local data cultures" (2000). Furthermore, information algorithms are elements of the organization of systems of all kinds and almost all spheres of human activity, as demonstrated by, among others Microsoft's 2014 incorporation of data culture into everyday life through - primarily company-oriented - services such as Office 365, Azure or SQL Server (in the scope of device and database management as well as network security, in the field of cloud calculating services and others).

The constant increase in the number of algorithms and their increasing range of functioning are factors that somehow automatically impose on researchers a broad, increasingly wider multidisciplinary perspective. The analysis of this cultural phenomenon, always strongly ideologized and politicized, which in these considerations is not the subject of

attention, therefore requires parallel and comparative approaches, based on knowledge from various fields and disciplines of science, mainly sociology, anthropology, history, information systems and design.

This is indeed the logic of numerical civilization created and developed by - as Arthur Kroker and Michael A. Weinstein called its authors in the previous century - "virtual class" (1994). According to it, everything should be *ponderabilium*, *calculabilium* and *metrabilium*, which means counted, weighed, measured, recorded, and today it often means simply - globalized, i.e. mainly algorithmized. The dream of mathematization and computation, which can be derived from the seventeenth-century philosophy of Gottfried Wilhelm Leibniz (the idea of Calculemus) still remains just a dream, because the scale of data production and processing is constantly increasing. New spirals of complexity are constantly emerging, expanding the information spaces arranged by an increasing number of algorithms. Currently, these spirals are wound up by self-recording and self-displaying technologies as well as the machines that communicate with each other by their algorithms (Arthur, 2009).

The geometric increase in new algorithms makes the area of research we analyze extremely dynamic and forces us to engage in some kind of research games, i.e. contamination of various ideas and methods that consolidate the fairly common belief in the fluidity of the studied information reality itself and all descriptive and evaluative approaches to it. Today, basically, one can only point to certain solid elements in this reality, knowing that they will evolve quickly, becoming more perfect, or be replaced by completely new ones.

Algorithms, or strategies to prevent information overload

The phenomenon of information overload has been known since antiquity and was dealt with by representatives of various sciences in each of the past eras (see e.g. Blair, 2010). That is why it is known that the most important commodity causing commonly felt communication disruptions is not information at all, but it is the human attention needed to capture its sense, and more precisely the distraction increasing along with the development of our civilization (North, 2012).

Digital technologies make – as Chad Wellmon convincingly states - the network become more accessible because it seems much smaller and easier to use than we usually have imagined. [...] the discussion about the infinity of information is rather pointless, because we do not experience information as pure data regardless of whether it is a byte or yottabyte, but as data filtered and shaped by the keyboards, screens and touchpads of our digital technologies. Regardless of how impressive the astronomical amounts of information seem to us, our bewilderment and concern about the enormity of data obscure only the image of how we actually interact with them and the world that data and we are part of (2012, p. 67).

Following this trail of thought, it can be stated that also in the networked information economy, in which multitasking currently enjoys great interest (simultaneous use of many communication devices), the most noticeable is the distraction of attention that multimedia users, that is almost all members of the modern society, are constantly trying to defeat.

Information treatment, that is, such a focus of attention, thanks to which data gains meaning, is most often referred to as filtration. The more information we have, the more we need to filter it, and therefore it is very important to have knowledge about filters and on how to use them. Algorithmization involving the use of specific information selection strategies is one of the most effective filters available to the information society. Its effectiveness largely depends on the members of society with several basic media competences, especially the basics of programming. Depending on the level of mastery of these skills, algorithms of this kind are more or less "friendly" (and useful) to humans, which somewhat jokingly, but with conviction illustrates Douglas Rushkoff's postulate: "program or be programmed" (2010).

In communication practice, we already use many strategies to prevent information overload. In this text, I will mention only those that the previously cited researcher Karol Piekarski considers fundamental and presents them in the chapter of his book devoted to Data Culture, entitled: *Algorithms to the rescue: strategies for selecting content on the Web* (2017, pp. 141-256). The author treats strategies as hybrid phenomena (combinations of technological and design solutions, as well as social content management mechanisms), arising in response to information overload, arising both in a bottom-up way and independently of the intentions of the information society's members as a necessary condition for their adaptation to real needs.

In his opinion:

The development of the World Wide Web has been a logical consequence of phenomena that have been taking place in the knowledge system since at least the beginning of the 20th century - defragmentation and globalization have forced the creation of a universal management system that would allow to reorganize dispersed knowledge using the intellectual capital of various social groups. The overriding principle of the new system was the standardization of protocols, enabling the smooth joining of various pieces of information. Due to this type of interoperability and interconnectivity, it became possible to find and create patterns and principles in a (permanently) disordered information environment (Piekarski, 2017, p. 143).

In other words, the realization in 1989 of the vision of "the potential possibility of connecting anything with anything" (Berners-Lee, 2000, p. 162), i.e. the emergence of a hypertext web, consisted in the wide availability of tools enabling quick combining of content from various sources and developing new communication and cultural standards to maintain the open nature of the Web and to deal with the data overload.

Except for these standards of combining and receiving information, the basis of today's algorithms is also the need to accept the chaotic nature of knowledge and the use of new, much more than before, democratic information processing strategies. New knowledge systems are created thanks to a new type of taxonomy, known as folksonomy, i.e. the categorization of content by spontaneously cooperating people within unhierarchized communities by using arbitrarily selected keywords and bottom-up metadata creation, enabling information selection (Maj, 2009 & 2014, pp. 24-45). These folksonomic strategies are not intended to create a holistic and finite picture of reality, but they can effectively manage information chaos by using partial solutions. The essence of this form of social filtering is the combination of algorithmization and collective intelligence: "With the right algorithm, we are able to contextualize a disordered set of meta-information, just like search engines or tag and link management systems do" (Piekarski, 2017, p. 172).

In practice, there already exist many forms of algorithmization. The Big Data model, which is a fundamentally new approach to constantly growing information resources, is very popular and still expansive. It consists in replacing existing ways of understanding the reality, primarily in formulating hypotheses, determining - on the basis of an avalanche of information taking into account the preferences of the Web users - the degree of dependence between completely different phenomena, the degree of probability of occurrence of events, risk assessment, etc. (Mayer-Schonberger, Cukier, 2013). Algorithmization based on data visualization also becomes more and more popular, which goes far beyond the existing specialized diagrams development thanks to the use of the universal visual language Isytope. The creator of this language, based on transformation mechanisms that transform almost all figures into images, is Otto Neurath. Transformation mechanisms are creatively adapted to new technology environments, take into account the huge potential of interactivity and virtuality, personalize messages and generate completely new symbols (Neurath, 2010). The language of visualization plays an increasingly important role in the so-called data journalism, practiced by interdisciplinary teams of journalists, programmers and designers searching and using infinite databases.

Among other popular algorithms, there are two alternative ways to filter content: automatic personalization and curated web. The first is based on the automatic adjustment of messages to the preferences of multimedia users, while the second - on the strict selection of information made by network curators. The first generates overproduction of profiles, the second - intermediaries in access to information who replace former gatekeepers. Both methods of algorithmization currently strongly "compete with each other", but most researchers believe that although they have a high potential for creating order, none of them strengthens the credibility of information sources. Karol Piekarski believes that associated with them in attempts to overcome information overload limitations and threats can be reduced with the help of a new model of perception, called ambient perception (2017, pp. 257-284). As it happens in the world of everyware, it covers with algorithmization not only traditional media products, but also everyday objects (Greenfield, 2010). Simply said, various extensions of the human perception apparatus make information easily available at the place and time required by media users, making it easier for them to make specific decisions. The ambient perception model, which is a kind of synthesis of all previously described forms of algorithmization, is a model open to new information phenomena, open to the future.

Algorithms, or utility software programmed for portable devices

All the forms and methods of algorithmization mentioned so far are widely known to the participants of network communication and used by them, even if they are not very educated people and do not deal with programming. Some are primarily used for practicing various professions, arts and sciences, sports and games of all kinds and highly

specialized works, but the vast majority, in addition to those profession-related associations and conditions, which rightly let us treat algorithms as tools of power (this is, however, a broad topic for a separate studies), is more or less consciously, useful and effectively used by all members of the information society. The algorithms achieved by means of mobile applications are much closer to them, especially since mobile phones have been replaced by smartphones (since 1992) and the popularity of tablets and phablets (hybrids of both devices) is increasing. We will make a brief review of their huge potential for algorithmizing modern man by following the though path of the researcher, who defines them as "the tissue of everyday life", defining and cataloging all spheres of human life, which is "updated according to the marketing principles of survival on the market" (Orzeł, 2017, p. 13) .

Mobile applications are primarily utility software that kaleidoscopically meet the emerging needs of individuals and social groups, more and more often referred to by programmers as *Multi-Screen Consumer* (combinations of three screens: laptop, tablet and smartphone are the main matrix for obtaining information), and by sociologists as *homo mobilis.* The increase in mobility is associated with the increase in the decision-making of the multimedia user and, therefore, each subsequent update of operating systems entails enrichment and harmonization of their experience. However:

What would a smartphone be without permanent internet access? Undoubtedly, permanent connectivity is the existential foundation of the "smart" prefix and the mobile applications that are a part of it. This system of connected vessels becomes an indicator of a new cultural order. Why not use this fact for effective (and impressive) product promotion? (Orzeł, 2017, p. 79).

Research on these forms of algorithmization conducted around the world clearly shows that the main goal of the expansion of the new mobile order is to develop new consumer behavior. Through the application, producers of various goods try to get into the consciousness of customers, and consumers try to manifest their unique "I" to force them to meet their own needs. That is why current trends on the mobile application market are extremely mobile: the words of Steve Jobs, Apple president, many years ago stating that "people do not know what they want until they are shown" often are true. However, opposite beliefs, a strong firmness expressed by consumers, seem true similarly often too. In addition, the dynamically understood principle of "one size does not suit all people" is spreading in new marketing. Of course, marketers are more effective than customers, but customers have more and more opportunities and chances to articulate their needs for which they want to pay providing they are met.

Mobile marketing still has huge development perspectives ahead, because it uses increasingly complex strategies for transforming multimedia users into potential consumers. For example, the SoLoMo trend has recently become popular (an acronym for Social, Local and Mobile), based on a combination of social media, geolocation and a rich mobile staffage, offering recipients information that steer their expectations, firmly embedded in their locality and encapsulated in additional up-to-date content (Kelly, 2014). Other trends in this area are illustrated by, among others application versions of branch online and brick-and-mortar stores, a *Brandomesticator* loyalty application, or finally application hybrids promoting famous places and institutions important for some reason.

A separate, very popular and multi-genre group of applications is associated with computer games ubiquitous in the contemporary culture, which are also used on other devices, such as portable consoles, tablets and smartphones. Telephones for new media players have been created since 2003, the pocket games segment is rapidly growing. Furthermore, the tactile trend is intensively developing due to the use of "Augmented Reality". Mobile gaming is constantly diversified and enters complex relationships with new technological inventions, social phenomena and consumption trends.

On the one hand, mobile applications satisfy and even enhance the culture of individuality, on the other, they express the strenuous pursuit of information society members to rationalize and organize their lives. Since 2013, when first selfie and later self-tracking made the smartphone a manifest of human personality, there was an invasion of mobile start-ups, widely known since 2011, which propose ways of dealing with risk through innovation. This type of algorithmization accurately reflects the nature of one of the basic directions of development of modern societies, most often referred to as "controlled destruction", about which an outstanding British sociologist wrote twenty years earlier: "The possibility of destroying the established order of things and opening new roads, and thus colonizing a new fragment of the future, is a feature of the disturbing nature of modernity" (Giddens, 1991, p. 184).

Summing up this fragment of considerations, it can be stated that many everyday devices organize our lives, because they have become ICT hybrids, screens with components of a computer connected to the internet and logged in to the appropriate "cloud". Televisions, telephones, watches, and even ovens, washing machines, refrigerators and coffee machines become "intelligent" and "cross-linked" thanks to mobile applications and effectively facilitate everyday management. Effectively, because members of the information society not only change most of their current communication behaviors, but also acquire completely new competences in the field of information production and processing. These are, among others digital reading, multitasking or recording high quality videos with the use of drones. Some of these behaviors, however, are quite controversial, e.g. according to the American Psychiatric Association, the constant desire to take pictures and post them on social networking sites can be a form of obsessive-compulsive disorder (*Selfitis* is on the list of personality disorders), and non-reflective checking of everything in mobile applications can lower the level of individual meanings and decision making.

Conclusion

Not only researchers of the information society, but also its ordinary members are at the same time satisfied with information algorithmization, but also do not hide anxiety about the role of computer algorithms in their lives. They more often control their daily thoughts and actions and determine their future.

Algorithms, invisible pieces of code forming the construction and mechanics of the modern era of machines - writes the English mathematician, Hannah Fry - gave everything to the world - from subscribing to information channels in social media, through search engines and satellite navigation, to the systems of recommendation of musical works - and are part of our modern infrastructure on a par with bridges, buildings and factories. We installed them in hospitals, courtrooms and cars. They are used by the police, supermarkets and film studios. They got to know our likes and dislikes; they tell us what to watch, what to read and who to date. At the same time, they have hidden possibilities, **due to which they slowly change criteria of humanity**" [emphasis T.M.] (2019, pp. 12-13).

Though this diagnosis made to the modern world may resound strongly and menacingly, but it is repeatedly backed up by multidisciplinary research conducted on all continents and in the everyday life of several billion users of multimedia and other electronic devices.

H. Fry thoroughly characterizes and analyzes the mechanisms and ways of functioning of algorithms in various areas of life. First, in the chapter with an eloquent title: *Power,* she refers to a chess game played in 1997 by Grandmaster Garry Kasparov with a chess computer, Deep Blue. Man's loss became an opportunity to document the thesis that "the power of the algorithm is not a simple function of what was written in the lines of his code" (Fry, 2019, p. 17), it is "our human tendency to look zero-one - recognizing the algorithms as either all-powerful or useless – that is a serious problem in the age of advanced technologies" (2019, p. 38). The author looks at the algorithms that the police use to create silhouettes of potential criminals, judges to formulate judgments, doctors to challenge previous diagnoses (including problems of overdiagnosis and unnecessary treatment), passengers of autonomous cars to clarify their moral principles, and contemporary artists to predict popularity. Her findings accurately summarize the current state of affairs in the areas of reality we analyze, and contain clear and specific postulates for the further development of algorithmization of the information society and scientific research on it. According to H. Fry, the most important is the attempt to achieve a balance between the strengths of man and machine: "the best algorithms are those that take into account man at every stage of their operation" (2019, p. 258).

So we should never allow machines to have authority over us, to force us to adapt to them thoughtlessly. However, achieving this goal is not easy, because the algorithms enjoy numerous successes in replacing many human skills and difficult tasks. Although we know that not every aspect related to the human being can be quantified, today at the peak of the extremely explosive time of creation (this old Gurvitch's metaphor gained more and more relevance at the end of the second decade of the 20th century), when almost everyone experiences the ubiquity of high technology, most popular ideologies are based on the dogma of growth, which means that quantity is treated as a measure of the better quality of various processes and human life (Miczka, 2015, pp. 13-17). Quantity has become an obsession for individuals and social groups, and of course this also applies to algorithmization. But do biological nature and structure, today mainly network, and communication mechanisms cope with the solution of this *coincidentia oppositorium* shaping the development of the information society?

The answer to this question is (for now?) negative. Most experts on this subject, like cited earlier Kazimierz Krzysztofek, believe that there is no time perspective that would set boundaries for the growing pressure of information algorithmization of man, on the contrary, technologies producing algorithms are accelerating (2005, pp. 60-73). It is hard not to wonder when one considers the redundancy of information - after all, breaking through such reality requires increasingly better information bypasses, but the point is that adapting technology to man, which today involves the increasingly intensive algorithmization of them and their surroundings, does not dehumanize our species.

Reference

[1] Arthur, B. (2009). *The Nature of Technology: What it is and How it Evolves*. Cambridge-London: The Free Press and Penguin Books.

[2] Berners-Lee, T. (2000). *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web*. San Francisco: HarperBusiness.

[3] Blair, A. (2010). *Too Much to Know: Managing Scholarly Information Before the Modern Age*. New Haven: Yale University Press.

[4] Bowker, G.C.; Star, S.L. (1999). *Sorting things out. Classification and its consequences (Inside Technology)*. Cambridge, MA: The MIT Press.

[5] Bowker, G.C. (2000). Biodiversity Datadiversity. *Social Studies of Science*, Vol. 30, Issue 5, pp. 643-683.

[6] Fry, H. (2019). *Hello world. Jak być człowiekiem w epoce maszyn.* Kraków: Wydawnictwo Literackie.

[7] Giddens, A. (1991). *Modernity and Self-identity. Self and Society in the Late Modern Age*. Cambridge: Polity Press.

[8] Greenfield, A. (2010). *Everyware: The Dawning Age of Ubiquitous Computing*. Berkeley: New Riders.

[9] Gurvitch, G. (1961). *La multiplicité des temps sociaux*. Paris: Centre de documentation universitaire.

[10] Harel, D. (2002). *Komputery – spółka z o. o. Czego komputery naprawdę nie umieją robić*. Warszawa: Wydawnictwo Naukowo-Techniczne.

[11] Kelly, S.M. (2012). *SoLoMo Revolution Picks Where Hyperlocal Search Left Off* : http://mashable.com/2012/01/12/solomo-hyperlocal-search [12.11.2018].

[12] Knuth, D. E. (1968). *The Art of Computer Programming.1:Fundamental Algorithms*. Boston: Addison-Wesley Professional.

[13] Kroker, A.; Weinstein, M. A. (1994). *Data Trash: The Theory of the Virtual Class*. New York: St. Martin Press.

[14] Krzysztofek, K. (2004-2005). @lgorytmiczne społeczeństwo. *Transformacje. Pismo interdyscyplinarne*, 3-4 (41-42) & 1-4 (43-46), pp. 60-73.

[15] Krzysztofek, K. (2015). Zmiana – transformacja – Big Data: wzajemne sprzężenia. *Transformacje. Pismo interdyscyplinarne*, 1-2 (84-85), pp. 33-67.

[16] Maj, A. (2009). *Folksonomia jako nowy model wiedzy. Komunikacyjne i kulturowe aspekty Web 2.0*, [online:] http://annamaj.wordpress.com/2009/11/04/folksonomia-jako-nowy-model-wiedzy-komunikacyjne-i-kulturowe-aspekty-web-2-0 [10.07.2019]

[17] Maj, A. (2014). The Role of Retention and Data Analysis in the Ubicomp Paradigm. *Transformations – An Interdisciplinary Journal*, 3-4 (82-83), pp. 24-45.

[18] Mayer-Schonberger, V.; Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Boston: Houghton Mifflin Harcourt.

[19] Miczka, T.(2015). Imperative: "The More the Better" as a Danger for Proper Development of Information Society. *Academic Journal of Interdisciplinary Studies*, Special Issue, Vol.1, No 3, S.1:13-17.

[20] Neurath, O. (2010). *From Hieroglyphics to Isotype: A Visual Autobiography*. London:Hyphen Press.

[21] North, P. (2012). *The Problem of Distraction*. Stanford: Stanford University Press [epub].

[22] Orzeł, B. (2017). *Aplikacja mobilna jako zjawisko kulturowe*. Katowice:Wydawnictwo Uniwersytetu Śląskiego.

[23] Piekarski, K. (2017). *Kultura danych. Algorytmy wzmacniające uwagę*. Gdańsk: Wydawnictwo Naukowe Katedra.

[24] Rushkoff, D. (2010). *Program Or Be Programmed: Ten Commands for a Digital Age*. New York: OR Books.

[25] Szpunar, M. (2005). Od struktury hierarchii do struktury sieci jako dominującej formy porządku społecznego. In: M. Sokołowski (ed.). *Oblicza Internetu – Internet a globalne społeczeństwo informacyjne*. Elbląg: Wydawnictwo Państwowej Wyższej Szkoły Zawodowej: 75-84.

[26] Wellmon, Ch. (2012). Why Google I snt Making Us Stupid…or Smart. *The Hedgehog Review*, Vol.14 No 1:62-78.

[27] Wolfram, S. (2002). *A New Kind of Science*: Wolfram Media.