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## FROM INFORMATION TO THE WAR OF INFORMATION

The term information is used universally, and its meaning does not raise any doubts. However, despite the common use of the term, the information of attempts to define causes a number of difficulties. In many scientific studies, a solution is sought through the analysis of information content, information features, sources of its creation or areas of practical use.

The article adopted a qualitative research strategy. Therefore, it is purely theoretical. The author presents his reflections on the ontological aspects of the information fight. The presented article is the first one that opens a series of articles devoted to the aforementioned issues. The purpose of the article was to define the number and quality of information and the usefulness and value of information, as well as to clarify the significance of information in an international conflict. The research problem focused on explaining how the quantity and quality of information and the usefulness and value of information are understood in the social sciences. In addition, the author wondered why information is an important factor in international conflicts.

As a result of scientific digressions, the author came to the conclusion that information is defined in relation to mental objects that reflect various forms of news, knowledge about current events. Based on the conclusions obtained from the analysis of the literature on the subject, it can be stated that in the aspect of organization and management theory, the information is a factor determining the effectiveness of action, therefore in the military aspect determines the efficiency of the decision-making process.

The above conditions constituted the main inspiration of the author, whose aim was to present information as an important factor of success on the modern battlefield.

**Keywords:** information, the value of the information, war of information, information hierarchy.

### 1. INTRODUCTION

The essence of the ongoing information revolution, covering all spheres of social life is primarily the progress in the field of information technology. However, we are inclined to take the year 1948 as the turning point, when the fundamental works of N. Wiener and C.E. Shannon were published, and the transistor was invented (W. Shockley, J. Bardeen,

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W. Brattain), we cannot forget about the earlier achievements of S. Morse`a (telegraph), A. Bella (telephone), G. Marconi (radio), or P. Farnsworth (television), that we will stop at the so-called milestones. However, the distinction of significant innovations from the second half of the 20th century exceeds the scope of the article.

However, it is worth devoting attention to the creation of the scientific basis of knowledge about information. In spite of previous works, such as Hartley, Nykvist, Kolmogorow, Erlang and many others, we usually combine the beginnings of information research with the above-mentioned works of Wiener and Shannon.

Wiener preached: "The mechanical brain does not emit thoughts of how the liver releases bile, according to the older materialists, nor does it seem to it in the form of energy, as the muscle does in its operation. Information is information, not matter or energy"<sup>2</sup>. The creator of cybernetics probably wanted to draw attention to the fact that next to two basic and measurable categories, which are matter and energy, a third category of science appears, also measurable, namely information.

Probably there is no unambiguous (and *only correct*) definition of information, which, however, does not interfere with the creation of theoretical concepts and models, that we do not even mention the development of technology. On the other hand, the existing, though far from various expectations, words are fully sufficient, and the same can be applied to concepts such as matter and energy as well grounded in philosophy and science. Therefore, without expecting any terminological term, both theories (models) and technologies should be developed. And it just happens in modern science and technology.

You can talk about the information revolution by exposing technical and technological innovations and the amount of information *that floods* inhabitants from all over the world. Perhaps, however, more attention should be paid to the quality of data and the value of information, even if it would be easier to separate *the wheat from the chaff*.

## 2. QUANTITY AND QUALITY OF INFORMATION

In the *Dictionary of foreign words and foreign-language phrases* we read that *information is identified with thought objects reflecting all forms of news, news, news, communicative items, knowledge of events*<sup>3</sup>. In turn, J. Seidler states that *the information can be called everything that is used for a more efficient selection of actions leading to a certain goal*<sup>4</sup>. At the same time, he states that when talking about efficiency, it is necessary to mean that having and using the right information can be used to accomplish deliberate actions better without significant increase of material resources or energy consumed<sup>5</sup>. On the basis of the analysis, it was assumed that the designatum of the concept of *information*, in factual meaning, should be identified with the name of the content of the sensual perception of the stimulus, and in the functional (functional) sense – with the information process.

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<sup>2</sup> Behind: M. Mazur, *Jakościowa teoria informacji*, Warszawa, <http://autonom.edu.pl>.

<sup>3</sup> W. Kopaliński, *Słownik wyrazów obcych i zwrotów obcojęzycznych*, Warszawa 1980, s. 429.

<sup>4</sup> J. Seidler, *Nauka o informacji*, Warszawa 1983, s. 69.

<sup>5</sup> G. Nowacki, *Znaczenie informacji w obszarze bezpieczeństwa narodowego* [in:] „Nierówności Społeczne a Wzrost Gospodarczy” 2013, z. 36, post-conference study, Conference: „Zagrożenia w cyberprzestrzeni – Bezpieczeństwo ponad granicami”, WAT 2013.

Bearing in mind the issues raised, it is important to also mention other key statements. And yes:

1. Stanisław Lem (*Summa technologiae*, 1964): “The bodies interact materially, energetically and informally. The result of the action is a change of state. If they throw themselves on the ground, because someone called “fall down”, changing my position caused the arrival of information, if I fall because the encyclopedia collapsed on me, the change resulted in material action. In the first case, I did not have to, in the second case – I had to fall. Material-energy activities are determined, whereas informative ones only cause changes in certain probability distributions”<sup>6</sup>;
2. Claude E. Shannon (*A Mathematical Theory of Communication*, 1948): “The basic task of communication is to recreate in a certain place, in a precise or approximate way, a message that has been chosen for transfer at another place. Often messages have meaning, i.e. refer to a system having a specific physical or mental content, or remain in relation to some arrangement. These semantic aspects do not concern the technical side of the problem. The only thing that matters is that the transmitted message is a message selected from a set of possible messages”<sup>7</sup>;
3. Louis Couffignal (*La cybernetique*, 1963): “To distinguish terminologically physical action and psychic action as information components and to specify the use of the word “information” alone, we will use the following terms:
  - information is a set of media and semantics;
  - information semantics is a psychological effect of information;
  - information carrier is a physical phenomenon associated with semantics to create information”<sup>8</sup>.

It is difficult to obtain a definition of information from these, still valid statements, which was not the intention of their authors. However, two aspects of information and information are clearly emphasized, namely:

- **technical aspect** – related to the optimization of transmission systems, i.e. searching for such methods and technical means, to send *a lot, quickly and without error* using specific information channels;
- **semantic aspect** – draws attention to the content (meaning) of information intended for recording or to be forwarded to a specific recipient.

It can certainly be assumed for practical purposes that “Information is a set of facts, events, features of objects, etc. Contained in a specific message, so captured and given in a form that allows the recipient to respond to the situation and take appropriate mental or physical actions”<sup>9</sup>.

As we know, Shannon, proposing a measure of the amount of information – contained in the message and sent through a specific information channel – used the notion of entropy, previously known in statistical thermodynamics. The amount of information contained in the message is the difference between the initial entropy (i.e. before receiving the message)

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<sup>6</sup> Vide: S. Lem, *Summa technologiae*, Warszawa 1964.

<sup>7</sup> Vide: C. E. Shannon, *A Mathematical Theory of Communication*, “Reprinted with corrections from The Bell System Technical Journal” 1948, Vol. 27, p. 379–423, 623–656, July, October, <http://math.harvard.edu/~ctm/home/text/others/shannon/entropy/entropy.pdf> (access: 9.05.2018).

<sup>8</sup> Vide: L. Couffignal, *La cybernetique*, Presses Universitaires de France 1963.

<sup>9</sup> P. Sienkiewicz, *Inżynieria informacji*, Warszawa 1983.

and the entropy obtained after receiving the message. This approach was used to determine the channel capacity and formulate the coding theorem. In addition to Shannon's proposal, there are a number of significant ideas that should not be forgotten, namely: non-robotic information by R. Ingarden and K. Urbanik, the inclusion of R. Carnap and Y. Bar-Hill's semantic information, pragmatic approach to R. Ackoff, the use of information K. Szaniawski and J. Marschak and R. Radner, as well as the qualitative information theory of M. Mazur, or the value of information in terms of Charkiewicz and Rogiński. Some of the above-mentioned shots have been presented in the author's works<sup>10</sup>.

An interesting attempt to generalize many different approaches is the proposal of J.L. Kulikowski, who understands information as reducing the indeterminacy of choice from a certain set of permissible values or potentially possible states. Information is available in the form of information variables known as ordered three:

$$X = \langle S, B_s, \mu \rangle$$

where: **S** means a set of permissible elementary values of the information variable, called realizations; **B<sub>s</sub>** means the additive algebra of the **S** file subsets; **μ** means the principle of semi-ordering elements of the **B<sub>s</sub>** family that meet the demands of an algebraic grid.

In turn, the quality parameters of information considered from the point of view of user's information needs include the following:

- **topicality** ( $q_a$ ) – we consider the information contained in the data to be current, if its record available at some point describes within acceptable error limits the current state of a given object;
- **relevancy** ( $q_r$ ) – we consider information to be relevant if it does not contain a component that is unnecessary from the point of view of the user's needs;
- **completeness** ( $q_k$ ) – we consider the information complete if it contains all the components that are necessary from the point of view of the user's needs;
- **assimilation** ( $q_p$ ) – we consider information to be available when the user can use it without the need to perform additional operations that transform the form of the given presentation;
- **credibility** ( $q_w$ ) – information is considered reliable if there is a certain degree of certainty that this is true or exact information.

The quality of information contained in a given (information variable) is defined as follows:

$$Q(I) \equiv \langle q_a, q_r, q_k, q_p, q_w \rangle,$$

which should express the degree of meeting the requirements resulting from the user's needs of information.

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<sup>10</sup> P. Sienkiewicz, *Systemy kierowania*, Warszawa 1988.

### 3. UTILITY AND VALUE OF INFORMATION

From the point of view of the user, information is not an intrinsic goal, but a means to achieve the goal or group of goals by making specific decisions or acquiring specific knowledge.

An example of a simple determination of the usefulness of information is the following proposal of A. Charkiewicz: suppose that before receiving the information the probability of reaching the goal is  $P_o$ , and after receiving the information it assumes the value of  $P_1$ . We will say then that the usefulness of the information is:

$$U(I) = \log_2 \frac{P_1}{P_o}$$

Thus, information is useful if its receipt increases the probability of achieving the intended goal. K. Szaniawski combines the usefulness (pragmatic value) of information with the classic decision-making model:

$$\langle A, S, \mu \rangle .$$

“The value of information due to a given decision-making criterion is the highest cost of information, in which a certain decision function is inferior (in the sense of this criterion) from any of the activities belonging to A. In other words, the value of information – it is the highest price that is worth (in the sense of a given criterion) to pay for this information”<sup>11</sup>.

Let us assume that a specific object – an object of information – describes a certain set of features whose values change over time. So you can talk about aging information in the facility. Acquiring information about the object is made with a certain accuracy. Transmission of information about the object takes place in the conditions of interference, and therefore it is possible to distort the information. Information stored is also subject to aging. So we have to do with the accuracy of acquiring (measuring, observing) information, errors created when sending and storing information, as well as the aging of the object itself.

If in the information system  $n$  types of information about different functions of the values  $V_j(t)$ , probability distributions of information delivery time to users ( $t$ ) and different costs of information supply  $K_j$  are sent, then the value of information *generated* by the system is determined by the function:

$$V = \sum_{j=1}^n \left[ \int_0^{\infty} V_j(t) \omega_j(t) dt - K_j \right] .$$

### 4. INFORMATION AS AN IMPORTANT FACTOR IN FIGHTING SUCCESS

The fight for information takes place from the moment the first group interests are formed. It is conducted in every field, especially in the economic, political and military areas. Her goal was, is and will be to get more information than her opponent (the enemy),

<sup>11</sup> Vide: K. Szaniawski, *O nauce, rozumowaniu i wartościach*, Warszawa 1994.

misleading him, get surprised, and thus succeed. From the invention of gunpowder through a machine gun, tank, nuclear weapon plane, it has always been successful, who: first used new, surprising weapons, resulting in success in combat.

Modern times are characterized by a huge increase in the importance of computers and information technology (digital). Computers controlling modern production technologies are a factor that connects almost all areas of human activity. So there was another threshold for the development of civilization of human society. The states that used the opportunities created by the IT (computer) technology more quickly dominated the future competition. Of particular importance has been the progress in the development and application of information technology in the military field. Means of communication and computer data centers based on digital technology allow to shorten the time needed to cut the decision and then the appropriate actions (action time – reaction). This is achieved by using information technology on the sensor path – the decision center. The sensor is all sources of information about the enemy, such as: reconnaissance patrol, agent, intelligence, radar, watch station or reconnaissance satellite, while the decision center is a command post where the decision is made at a given moment.

The use of information technology also allows to shorten the internal path of information, i.e. the road that includes the functionaries at a given command post, and make this information available at any time at any command level.

In the opinion of many theoreticians studying the development of civilization, information has already become a decisive factor stimulating the process of development and progress. Information also plays a decisive role in the way of armed conflict, which is conducted not only on the battlefield but in the area of information. He takes particularly sharp forms during the transition of a given country from a lower to a higher level of development.

Internet computer connections, which characterize the world at the beginning of the 21st century, caused that information is widely available. The ease of access to information generates new threats. One of the basic threats is the possibility of uncontrolled leakage of confidential and secret information. An example of the fact that this phenomenon cannot be underestimated are numerous attempts to break into government computers. The second much more dangerous threat is the emergence of the possibility of influencing individuals and organizations of states on others by sending false information, i.e. disinformation.

In the contemporary conflict, therefore, the decisive role is played not only by the number of armored and mechanized compounds, the maintenance of which is very expensive, but information. At the same time, the states – to maintain competitive ability and ensure development – are forced to look for the possibility of using more and more modern information technologies.

At the same time, in the military field, information systems connecting the sensor with the decision center are increasingly dependent on modern civilian technologies, which are available only to highly developed countries. Thus, the vulnerability of less technologically advanced states to the impact of the former will increase. This vulnerability may be so large that it may even disrupt the functioning of the state's basic organs.

The resulting conflicts can be resolved without the involvement of armed forces, which as a result of the blocking of information necessary for their functioning, will become unable to operate efficiently in a given area or environment. Activities aimed at paralyzing the state's information system is nothing more than a struggle in the area of information. Such a fight covers not only the military area, but the whole society, because it will not only run between political and military opponents, but in every field of competition.

However, the notion of fighting in the area of information should not be understood as the use of only intangible means of influence, but also the physical destruction of the devices of the opponent's information system. This fight is carried out between command and control systems, involving bodies for acquiring, processing, transmitting and using information, as well as those that participate in disinformation, interfering with the reconnaissance and command systems of the enemy. So in contemporary conflicts, not the armed combat systems of the potential enemy, but his *nervous system* should be destroyed first. Actions to achieve this goal can therefore be called a struggle to gain dominion in the area of information.

## 5. TYPES OF FIGHTING IN THE AREA OF INFORMATION

According to Western experts views, fighting in the area of information can be divided into the following types<sup>12</sup>:

- Command and Control Warfare, that is, disrupting the command system;
- Intelligence Warfare, that is, counteracting to disrupt and disorganize the recognition system;
- Psychological Warfare, that is all actions aimed at disrupting the psychological immunity of the enemy's army and society;
- Electronical Warfare, that is, undertakings aimed at interfering with all electronic systems;
- Economic Information Warfare, that is, the fight against and economic information;
- Hackerwarfare, that is, activities involving hacking computer systems;
- Cyberwarfare, that is, getting information from scientists and organizations, for example brainwashing.

Hackerwarfare and cyberwarfare differ in the purpose of aggression; the former is directed against data processing systems, the latter against people.

## 6. CONCLUSIONS

The acquisition, possession and use of information accompanies man in all cognitive processes from the moment of his birth. In psychological studies, the dominant thesis is that knowledge is the cognitive result. The transformation of information into knowledge occurs both in a conscious and subconscious way as a result of combining specific experiences and events that took place on the way of personality development.

The development of technology and electronics has initiated an information revolution. Computers, the Internet, mobile phones have become widespread. Multimedia mass media transmit information streams in various forms. Thus, information is not only about intellectual, but also economic power. New technologies, machinery and equipment determine better production effects and consequently lead to economic growth. In the military sphere, the information resources of military intelligence allow us to effectively plan and implement defence tasks, enable the exchange of information essential for the security of the state or the alliance. The struggle for information advantage and domination is inextricably linked

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<sup>12</sup> Vide: JP 3-13.1 - *Joint Doctrine for Command and Control Warfare (C2W)*, JP 3-54 - *Joint Doctrine for Operations Security*.

to armed struggle, the essence of which amounts to acquiring information about a real or potential opponent (threat).

In contemporary concepts of information activities, the relationship between the *information hierarchy* (Data – Information – Knowledge – Wisdom) and the general model of action (Observe – Orient – Decide – Act) is emphasized. In the considerations regarding *information dominance* and *information superiority* and *the predominance of knowledge* one cannot omit the relation between the quantity and quality of information and the usefulness (value) of information. The hypotheses should therefore be accepted:

- in terms of information society, the value of information becomes the basic category;
- data quality is a condition for the value of information, which is a prerequisite for information system user knowledge.

## REFERENCES

1. Couffignal L., *La cybernetique*, Presses Universitaires de France 1963.
2. JP 3-13.1 – *Joint Doctrine for Command and Control Warfare (C2W)*, JP 3-54 – *Joint Doctrine for Operations Security*.
3. Kopaliński W., *Słownik wyrazów obcych i zwrotów obcojęzycznych*, Wiedza Powszechna, Warszawa 1980.
4. Lem S., *Summa technologiae*, Wydawnictwo Literackie, Warszawa 1964.
5. Mazur M., *Jakościowa teoria informacji*, Wydawnictwo Naukowo-Techniczne Warszawa 1970, <http://autonom.edu.pl>.
6. Nowacki G., *Znaczenie informacji w obszarze bezpieczeństwa narodowego [w:] Nierówności społeczne a wzrost gospodarczy, opracowanie pokonferencyjne, Konferencja: Zagrożenia w cyberprzestrzeni - Bezpieczeństwo ponad granicami*, WAT 2013.
7. Seidler J., *Nauka o informacji*, WNT, Warszawa 1983.
8. Sienkiewicz P., *Analiza systemowa*, Bellona, Warszawa 1995;
9. Sienkiewicz P., *Inżynieria informacji*, MON, Warszawa 1983;
10. Sienkiewicz P., *Systemy kierowania*, WP, Warszawa 1988;
11. Szaniawski K., *O nauce, rozumowaniu i wartościach*, PWN, Warszawa 1994.

## INTERNET SOURCES

1. Shannon C.E., *A Mathematical Theory of Communication* [w:] *Reprinted with corrections from The Bell System Technical Journal*, Vol. 27, p. 379–423, 623–656, July, October, 1948, <http://math.harvard.edu/~ctm/home/text/others/shannon/entropy/entropy.pdf>

## OD INFORMACJI DO WALKI INFORMACYJNEJ

Pojęcie informacja używane jest powszechnie, a jego znaczenie nie budzi żadnych wątpliwości. Jednak pomimo powszechnego używania tego terminu, informacje o próbach zdefiniowania powodują szereg trudności. W wielu badaniach naukowych poszukuje się rozwiązania poprzez analizę treści informacyjnej, informacji, źródeł jej powstania lub obszarów praktycznego wykorzystania.



W artykule przyjęto jakościową strategię badawczą. W związku z czym ma on charakter czysto teoretyczny. Autor prezentuje rozważania na temat ontologicznych aspektów walki informacyjnej. Prezentowany artykuł jest pierwszym, który otwiera cykl artykułów poświęconych wspomnianej problematyce.

Celem artykułu było zdefiniowanie pojęć ilość i jakość informacji oraz użyteczność i wartość informacji, a także wyjaśnienie istotności informacji w konflikcie międzynarodowym. Problem badawczy skupił się na wyjaśnieniu jak rozumiana jest w naukach społecznych ilość i jakość informacji oraz użyteczność i wartość informacji. Ponadto, autor zastanawiał się, dlaczego informacje są ważnym czynnikiem w konfliktach międzynarodowych.

W wyniku dywagacji naukowych autor doszedł do wniosku, że informacje definiuje się w związku z obiektami myślowymi, które odzwierciedlają różne formy wiadomości, wiedzę o bieżących wydarzeniach. Na podstawie wniosków uzyskanych z analizy literatury przedmiotu można stwierdzić, że w aspekcie teorii organizacji i zarządzania informacja jest czynnikiem determinującym efektywność działania, dlatego w aspekcie militarnym określa efektywność proces podejmowania decyzji.

Powyższe warunki stanowiły główną inspirację autora, którego celem było przedstawienie informacji jako ważnego czynnika sukcesu na współczesnym polu bitwy.

**Słowa kluczowe:** Informacja, wartość informacji, walka informacyjna hierarchii informacji.

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