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Anna Makuch[1]

The importance of technological innovations for the security of state entities in the time of global threats to sanitary safety – selected aspects

Znaczenie innowacji technologicznych dla bezpieczeństwa podmiotów państwowych w czasie globalnego zagrożenia bezpieczeństwa sanitarnego – wybrane aspekty

Abstract: *Research goal of the article has been set to verify the hypothesis according to which technological innovations contribute to systemic safety during the COVID-19 pandemic. The analyzed area contains key statements of available data regarding innovation impulses in the first pandemic period (2020 – spring/autumn). In the light of this data new trend has been confirmed to be using advanced technologies based on digital records in promoted solutions. Innovation in pandemic days meets conditions, not by classic definitions of the term "innovation" but rather "ultra-fast-innovation" which creatively uses digitalized tools. Technological innovations fulfill their role of aiding the safety process under the conditions which assume that network-based storage and data transfer systems are reliable and resistant against systemic crisis, which is a potential systemic threat.*

Keywords: *security, state system, security systems, innovation, pandemic, health security, new technologies*

Abstrakt: *Badawczym celem artykułu było zweryfikowanie hipotezy, zgodnie z którą innowacje technologiczne przyczyniają się do systemowego bezpieczeństwa w okresie pandemii COVID-19. Obszar analizy objął kluczowe zestawienia dotyczące dostępnych danych na temat impulsów innowacyjności w pierwszym okresie pandemii (2020 – okres wiosenno-jesienny). W świetle danych potwierdzono wiodący trend wykorzystania zaawansowanych technologii bazujących na cyfrowym zapisie w promowanych rozwiązaniach. Innowacyjność doby pandemii spełnia warunki nie tyle klasycznych definicji pojęcia innowacji, co ujęć typu ultra-fast-innovation, stanowiących twórcze wykorzystanie*

[1] Dr. Anna Makuch, Assistant Professor, Faculty of Political Science, University of Economics and Human Sciences in Warsaw, e-mail: a.makuch@vizja.pl, ORCID: 0000-0002-5222-4407

narzędzi zdigitalizowanych. Innowacje technologiczne spełniają swoją funkcję wpierania procesu bezpieczeństwa w warunkach, w których zakłada się, że sieciowe systemy przechowywania i wymiany danych działają niezawodnie i są odporne na systemowe kryzysy, co stanowi potencjalne systemowe zagrożenie.

Słowa kluczowe: *bezpieczeństwo, system państwowy, systemy bezpieczeństwa, innowacyjność, pandemia, bezpieczeństwo zdrowotne, nowe technologie*

Introduction

The research objective of the article is to analyze, in the light of the principles of system analysis, the claim that technological innovation implements the function of society's security in times of crisis. The phenomenon under analysis that meets the conditions of crisis is the COVID-19 pandemic in Poland as a potential threat to the implementation of the state security function. Based on the main objective of the article, it is possible to put a research hypothesis of the following wording, further subjected to the verification process: "Technological innovations have a positive significance for social and state security during a health crisis". This hypothesis will be verified in the light of the system method, corresponding to the object of study, i.e. the state system, the global security system.

1. Conceptualization of key concepts, justification of the research method

To structure the argument, the conceptualization framework will include the categories and concepts used in the article, i.e. "innovation", "security", "crisis", "state system". Operationalisation will allow to minimise semantic inaccuracies and exclude the risk of terminological ambiguity. The principles of the system method and the catalogue corresponding to the problem method will also be presented.

The introduction of the concept of "innovation" is attributed to Joseph Schumpeter, although the very principle of inventiveness was formulated by the French sociologist Gabriel Tarde, whose writings J. Schumpeter might have been familiar with (Musiał, Chrzanowski 2018; see also Sikora,

Uziębło 2013). In the Schumpeterian view, the conditions for innovation include:

- new product,
- better production methods,
- opening the market to the product,
- new sources of semi-finished or raw materials,
- the transformation of a given branch of the economy under the influence of a new product (Musiał, Chrzanowski 2018: 42–45).

The principle of innovation defined this way became an impulse for civilisational changes in Europe from the 19th century onwards, the catalyst for which is considered to be the invention of the steam engine in 1869 by James Watt (Trevelyan 1980: 409; Trevelyan 1982: 446–460) (the process of improving production methods started much earlier and 1869 is considered to be a conventional caesura). The consequences of the processual transformations in the area of the methods and means of production affected every aspect of human existence (communication, trade, transport and others), hence this period is referred to as the Industrial Revolution; to the greatest extent, it influenced the qualitative and quantitative remodelling of the principles of production and the development of private means of ownership and free competition.

In economic sciences, innovation is considered as "a combination of production factors carried out in a new way" (Musiał, Chrzanowski 2018: 44), "creative demolition", so – according to J. Schumpeter – it affects the continuous transformation of the structure of production and use. The direction of transformations fulfils the function of "liberalization", i.e. facilitating and simplifying human functioning in the world. It has been implemented with particular success since the first and second waves of the industrial revolution, and further on it is the cause and consequence of the digital revolution. Noteworthy is the approach of Kenneth Galbraith, who links the concept of innovation with increasing the sense of security on a social scale (Musiał, Chrzanowski 2018: 49). Eccentric or bizarre ideas deserve to be called inventions, but they will not cross the border of commercialization due to their negligible potential for mass use (cost, narrow range of utility, etc.).

The notion of security poses many problems of definition; it is considered to be polysemantic, with high dynamics of meaning, it also belongs to the catalogue of central problems of many disciplines as a fundamental category. The lexical meaning refers to a state devoid of threats, associated

with a sense of certainty (Stańczyk 1996: 15). Thus, the category is characterised by a negative approach, but it is assumed that the positive dimension encompassing not only the level of survival in relation to human social needs belongs in the same way to the scope of meaning. A philosophical insight into the concept of security reveals the debatability of achieving a state of certainty of survival in the face of a multitude of factors defined as really or potentially dangerous. The analysis of the concept confirms the processuality of the notion of security, excluding solutions defining it as a state. Security is a combination of the factor of elimination of threats, stabilization of survival conditions with the state providing the possibility of development understood as the introduction of facilities, facilitation and simplifications of everyday life. Therefore, the immanent feature of the analyzed category is also the development factor allowing not only for physical survival but also for relative freedom to improve the quality of life.

The literature on the subject pays attention to the dynamics of the meaning of the category. The concept of security, for centuries strongly identified with the military potential, nowadays has expanded the scope of the subject in the face of a significant increase in the factors affecting the material scope. While the categories of subjective security still include four groups (unitary – personal, individual; group – family, clan; domestic – state, national; global – regional, international), the catalogue of subjective security is a growing resource – energy, demography, cyberspace, information, historical policy, having permanently introduced the concepts of *soft* and *smart* alongside *hard power* in international relations. The architecture of security is characterized by a common feature of networking and more difficult to indicate boundaries, which illustrates well the dilemma of defining the security of the state, country and nation. For where is the border of the media state system in the face of the reality of global data exchange?

The political system is a subsystem of the social system within which specified features – the interdependence of parts and boundaries – determine the distinction from the environment, i.e. from other systems. The classical Eastonian approach orientates the system to the notion of sovereignty (Beyme 2005: 181; Bertalanffy 1984), while in Karl Deutsch the features of the system are coherence and covariation, supplemented by the factor of transformation (not touching identity) oriented to the maximisation of survival. The structure of the political system is characterised by multidimensionality and networking, at the same time it is possible to indicate

the system of the so-called inputs and outputs. The strength of the political system is confirmed by the realisation of the key objective, i.e. survival and development, which requires the predominance of a consensual attitude over a conflictual one in the process of aggregating interests and maintaining balance. Consensus in the system is a process based on a continuous reconciliation of interacting preferences in the direction of achieving efficiency; the level of competition and consensus in the case of active societies do not so much correspond to each other, as show the predominance of the will to consensus.

In light of the political system concept, stability and the system's ability to regenerate and innovate in response to external and internal factors are considered crucial. The more complex the system, the more difficult it is to maintain a high level of both parameters. The main challenges of the systems are assumed to be the preservation of the dynamics of development with the implementation of planned changes and modifications resulting from independent circumstances or the interference of an active civic factor/participants.

The ontology of the political system corresponds to the principles and rules of all systems, from the system of corporate management to the system of global security, placing at the centre the category of stability and adaptability of the system structure to external circumstances and internal conditions (aggregation of interests). Hence, system analysis shows wide research possibilities in relation to many planes (political systems, economic systems, etc.).

The dictionary meaning of crisis is as follows: "a situation in which some conflict becomes so serious that it threatens to erupt into war, change of government, or some other radical solution" (SJP: "crisis"); a crisis is: "a period of breakdown, downturn, and potential breakthrough in the functioning of a given social or political system" (SJP: "crisis"), while the specification depends on the sector affected by the dysfunction, e.g. parliamentary, governmental, economic crisis.

Causes of crisis in systemic terms can mean: 1) the failure to take into account the threat of destabilizing factors that could have been anticipated (forecasting function within e.g. the science of international relations) (Sennet 2010); 2) the presence of an unforeseen factor with a low degree of probability of occurrence. The crisis factor can be subjective or objective in nature; the objective one influences the destabilization of a larger number of related systems, the subjective one shows weaknesses in

the structure of single subsystems in which, regardless of the influence of external factors, the realization of the stabilization-development function has been disrupted. The crisis of global scope, being a consequence of the SARS-CoV-2 virus emission, according to the classification includes subsystems of the global system (state systems, regional cooperation systems) and the global system.

National and transnational health security systems have shown variable effectiveness in fighting and counteracting, but certain trends and tendencies can be identified on both levels. For the most part, countries have adopted the tactic of promoting sanitary protection measures and reducing direct human contact to the minimum necessary, both in the professional and private spheres. This has intensified the transfer of activities – work, leisure, contacts – to cyberspace, affecting the level of stabilisation of virus emissions, relieving the burden on health services and reducing the need for sanitary products. While maintaining the continuity of certain sectors with greater use of cyberspace than before, it has not avoided the serious collapse of others, especially gastronomy, tourism, culture.

Thus, it can be considered that there is extensive use of technological capabilities within national systems and the global system to minimize loss and damage within the interrelated structure of national systems (*How Poles Use the Internet and Phone in Pandemic* 2020).

2. Specifics of contemporary innovation – new technologies

The term "innovation" is commonly used to refer to tools that improve the functioning of individuals and societies in the realities of pandemic restrictions. Let us assume, therefore, that the creations thus defined in the information exchange system, i.e. reports, analyses and competition results concerning the pandemic period subjected to the summaries, i.e. the spring-summer 2020 and autumn-winter 2020 periods, will be analysed. The review will take into account the most important national and global summaries of innovation or innovation as applied to the fight against the consequences of COVID-19.

Social distancing and separation of selected social groups were invariable elements of state strategies for combating the pandemic in the autumn-winter period (AOTMiT 2020) and continue to be key elements in

reducing the virus transmission. The directions adopted at the state level determined the search for solutions ensuring, above all, the safety of work, economic exchange, entertainment and everyday necessary activities (shopping, medical care).

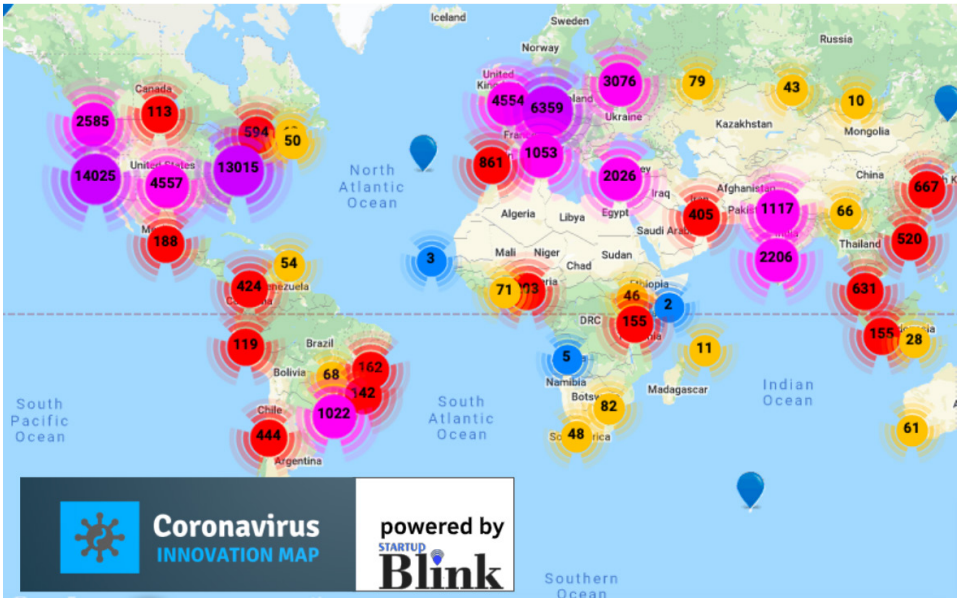
In the report of the Polish Industrial Development Agency (*Monitoring of innovation trends – Report 8* 2020), the analysis concerns the first half of 2020. The work of the analysed state entities concerns the sectors of digitisation, health sciences, support for start-ups and small enterprises. The global leaders in innovation include Germany (dethroning South Korea), while the leader in digitization is still Finland. Innovation is primarily linked to the use of technological tools on the basis of which improvements in these areas are designed.

In September 2020, the European Institute of Innovation and Technology awarded 207 innovative projects and companies from 32 countries. These relate to solutions "in biotechnology and diagnostics, the use of 3D prototypes to reconfigure congested parts of the city and shared workspaces, removing disruptions in food supply chains, and solutions to reduce air pollution" (EIT 2020). The report details the areas of innovation and the nature of projects, all of which are based on technological developments and digital tools (EIT Community Innovation 2020). The conditions for innovation in the sense of classic definitions are met by medical projects, which aim to discover medical instruments that bring about significant changes in the area of health safety or diagnostics or treatment.

As part of a cyclical PARP competition in 2020, innovations in the area of medical technology were awarded a distinction (awarded: intelligent stethoscope, ear prosthesis with bactericidal effect, photovoltaics, product stimulating plant immunity) (They create the future 2020). Work on the submitted proposals – as one can conclude – was not determined by pandemic circumstances, but constitute the implementation of a trend according to which technology supports or constitutes an area for the implementation of new ideas.

The Global Innovation Index has been prepared annually since 2007, taking data from 131 countries and summarizing leading trends and directions. The *Global Innovation Index* report highlights the ever-present potential for innovation related to new technologies ("virtual reality is the key to it") (Dutta, Lanvin, Wunsch-Vincent: 2020), and includes the areas of pharmaceutical and medical research, improvements in transport, mobility and "clean energy". Switzerland is recognized as an innovation leader in

the GII2020 report. The report takes into account pandemic circumstances, affecting the refocusing of actors' attention on the cyberspace network and a significant decline in economic exchanges. In 2018–2019, the most intensive investments included ICT and high-tech. According to the analysis of the authors of the reports, the pandemic influenced the concentration around innovations affecting the areas of education, remote working and trade.



Graphic 1. Innovation map in national order (2021)

StartUpBlink, in collaboration with local stakeholders, has launched a platform that collates data on pandemic innovation. Updated on a regular basis, it is a good guide for professionals and anyone interested. The data is organised into country and city lists. The leader among countries is the United States, followed by Israel and Canada (Belgium, Switzerland, Canada, United Kingdom, Singapore, Spain, South Korea, Luxembourg; see Figure 1). In the list of top cities are: San Francisco, New York, Moscow (Boston, Toronto, Tel Aviv, Los Angeles, Seoul, Taipei, San Diego). As of April 2, 2021, there are 1,078 innovations registered in the lists. They cover categories predominantly using advanced technologies such as prevention, diagnostics, trade, education.

The direction of the use of technological tools is confirmed by a World Economic Forum report ("Digital tools and strategies have become crucial in this effort") (World Economic Forum 2020a). The report takes into account over 150 million English-language publication sources. It presents data from 41 countries and describes the nature of 232 implemented innovations. The data is organized under seven categories including information environment (promoting knowledge, data sharing tools), virus detection and spread, healthcare, improving treatment processes, economic resilience, social cohesion and cyber security. As noted in the paper, solutions may correspond to more than one category (World Economic Forum 2020a: 4).

To conclude, the pandemic time innovations, according to the lists, cover mainly such areas as trade, financial services, sanitary safety, and activities related to the sphere of social communication, entertainment and culture. The dominant trend is the use of digital technologies as an anti-crisis tool.

So far, digitalization has enabled the smooth continuation of intra-state system activity, expanding remote work zones through network contact, stimulating economic exchange and medical research. However, it is difficult to say that the nature of the improvements corresponds to classical definitions of innovation. A more adequate definition is the so-called *ultra-fast innovation*, which is the effect of the creative use of technological capabilities. In more recent approaches, innovation means "the economically successful exploitation of new ideas" (Matusiak 2011: 111), which allows for broader use of the concept. In this area, there are still a lot of opportunities, as indicated by the analysis and conclusions of industry reports. The area of e-medicine, e-commerce, e-government, diagnostic tests is still developing in the direction given by the pandemic restrictions, touching the sphere of direct contacts, eliminated in the light of recommendations of state strategies. As part of significant economic trends, we can observe the intensification of network sales models, network marketing and contact with the recipient of the hitherto direct content (theatre, concerts), expansion of social contact tools through platforms (education, video conferencing, sports), reorientation of industries (automotive, fuel) to the medical market (respirators, disinfectants).

3. Technological innovation – opportunities and threats. Conclusion

At the present time of clear competition between state and non-state entities, the principles of competition for the realization of their own values and interests require an outlook that combines current needs with a long--term perspective. Technological innovation corresponds to the conditions of sanitary regimes, allowing to maintain the continuity of state and business entities. In the area of sanitary safety, new solutions created on the basis of technology allow providing the system with efficiency, effectiveness, while realizing the principle of stability and dynamism.

Thus, it can be assumed that there are empirical grounds for the adoption of the research hypothesis, i.e. that technological innovation in the period of sanitary crisis positively influence the maintenance of systemic safety functions. However, the conducted analysis indicates potential risk areas related to the adopted security model. In many areas, it is likely that the solutions developed during the pandemic will be maintained. It is highly probable that this will apply to areas of professional activity and of the functioning of many sectors of the state. Consequently, it should be noted that focusing efforts on digitization within the critical infrastructure of the state, the economy, communication and culture, points to the potential danger in a situation of a threat to the functioning of the digital environment of the state system, based on the Internet network for data exchange and storage. In strategic areas, it is therefore important to couple the level of digitization with the ability to continue operations in the event of a crisis or threat to digital cyberspace systems.

References

AOTMiT (2020), *Przegląd strategii COVID-19 w okresie jesienno-zimowym* (COVID-19 strategy review in the fall and winter), analytical paper, https://www.aotm.gov.pl/media/2020/08/1_1_aotmit_strategi_walki_z_covid-19_v.1.0.pdf (30.03.2021).

Bertalanffy, L. von (1984), *Ogólna teoria systemów: podstawy, rozwój, zastosowania (General systems theory: fundamentals, systems, applications)*, (Warszawa: Państwowe Wydawnictwo Naukowe).

Beyme, K. von (2005), *Współczesne teorie polityczne (Contemporary Political Theories)* (Warszawa: Wydawnictwo Naukowe Scholar).

Ciesielski, M. (2020), *Innovation in crisis*, https://www.obserwatorfinansowy.pl/tematyka/makroekonomia/trendy-gospodarcze/innowacje-w-kryzysie/ (8.02.2021).

Dutta, S., B. Lanvin, S. Wunsch-Vincent (eds.) (2020), *Global Innovation Index. Who Will Finance Innovations?*, (Ithaca: Cornell University), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf (6.02.2021).

EIT Community Innovation Tackling the COVID-19 Crisis, https://eit.europa.eu/sites/default/files/eit_community_eit_cri_innovations.pdf (30.03.2021).

EIT (2020), *207 przełomowych innowacji i przedsięwzięć nagrodzonych łączną kwotą 60milionów euro w ramach inicjatywy reagowania kryzysowego EIT (EIT Crisis Response Initiative) (207 breakthrough innovations and ventures awarded a total of €60m under the EIT Crisis Response Initiative)*, 8 September, https://eit.europa.eu/sites/default/files/pl-pr_eit_cri_sept_2020.pdf (30.03.2021).

Coronavirus Innovation Map, https://coronavirus.startupblink.com/ (2.04.2021).

Crisis, [in:] *PWN Encyclopedia*, https://encyklopedia.pwn.pl/haslo/kryzys;4011371.html (6.02.2021).

Crisis, [in:] *Dictionary of the Polish Language PWN*, https://sjp.pwn.pl/slowniki/kryzys.html (6.02.2021).

Jak Polacy korzystają z Internetu i telefonu w czasie pandemii. Raport Krajowego Rejestru Długów (*How Poles use the Internet and phone during the pandemic. Raport Krajowy Rejestr Długów*), https://krd.pl/getattachment/3d366a9c-020e-4610-a401-87fce57283bd (30.03.2021).

Innowacje (Innovation) (2011), [in:] K.B. Matusiak (ed.), *Innowacje i transfer technologii. Słownik pojęć*, (Warszawa): 111, https://www.parp.gov.pl/files/74/81/469/12812.pdf (29.03.2021).

National Order Innovation Map, https://www.startupblink.com/blog/coronavirus-innovation-map/ (2.04.2021).

Nieć, M. J. Łapiński, J. Orłowska, R. Zakrzewski, P. Chaber (2020), *Monitoring trendów innowacyjności – Raport 8 (Monitoring trends in innovation - Report 8)*, https://www.parp.gov.pl/component/publications/publication/monitoring-trendow-w-innowacyjnosci-raport-8 (30.03.2021).

Musiał G., I.Ch. Chrzanowski (2018), *Schumpeter – Lange – Galbraith. Innowacje w teorii i praktyce (Schumpeter - Lange - Galbraith. Innovation in theory and practice)*, "Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach", 362: 40–58.

Sennet, R. (2010), *Etyka dobrej roboty (Ethics of good work)* (Warszawa: Warszawskie Wydawnictwo Muza).

Stańczyk, J. (1996), *Współczesne pojmowanie bezpieczeństwa* (*Contemporary understanding of security*), (Warszawa: Instytut Studiów Politycznych PAN).

Sikora, J., A. Uziębło (2013), *Innowacja w przedsiębiorstwie – próba zdefiniowania (Innovation in the enterprise - an attempt to define)*, "Management and Finance", 2(2): 351–376.

To oni tworzą przyszłość. Polskie innowacje nagrodzone w konkursie PARP i NCBR (*It is they who create the future. Polish innovations awarded in the PARP and NCBR competition*) (2020), https://www.parp.gov.pl/component/content/article/58682:to-oni-tworza-przyszlosc-polskie-innowacje-nagrodzone-w-konkursie -parp-i-ncbr (30.03.2021).

Trevelyan, G.M (1980), *English Social History* (London: Penguin Books).

Trevelyan, G.M (1982), *A Shortened History of England* (London: Penguin).

World Economic Forum (2020a), *Critical Frontier. Leveraging Technology to Combat COVID-19* "White Paper", July, https://www.weforum.org/whitepapers/critical-frontier-leveraging-technology-to-combat-covid-19 (2.04.2021).

World Economic Forum (2020b), *ICT COVID-19 Response: Partnering with Technology Companies to Combat COVID-19,* http://www3.weforum.org/docs/WEF_Tech_4_COVID_Early_Compendium_2020.pdf (5.04.2021).