Research Article

The Economic Cybernetics Analysis and the Effects of the Occurrence of COVID-19 in Romania

Ionuț NICA and Nora CHIRIȚĂ

Bucharest University of Economic Studies, Bucharest, Romania

Correspondence should be addressed to: Ionuț NICA; ionut.nica@csie.ase.ro

Abstract

From the perspectives of early warning and identification of risk, risk quantification and analysis, also as risk management, we propose recommendation, which includes analysis of citizen behavior in panic, cooperation of the institutions in Romania. The whole analysis will be performed from a perspective of the field of economic cybernetics. The 2019-nCoV coronavirus epidemic started in China's Wuhan city, which has spread throughout the country and subsequently, in a very short period of time, in several states, being viewed as a global contagion effect that causes great concern. As the virus gets closer to Romania, it becomes worrying and citizens are already panicking. Therefore, in this article we will analyze, according to public data, what is the current situation and how well Romania is prepared to manage the risks arising from the confirmation of COVID-19 in the country and how the behavior of citizens in a state of panic is influenced. In addition, we analysed the medical system from Romania from the point of view of the analysis of the management of the viable system, in the situation of pandemic crisis the medical system being one of the sensitive points of any system.

Keywords: COVID-19, Risk Management, Viable System Model;

Introduction

Mankind is nowadays situated at one of its thousands of key points which have left their footprint within history (either pandemics or wars, among other events resulting in mass deaths). This time, every grain of power on a global scale is focused on the occurrence of the novel coronavirus in Wuhan. Time and time again, there have been performed tests on the hypotheses assuming an influenza-related virus (even the 1918 Spanish flu), SARS coronavirus (Severe Acute Respiratory Syndrome) or

_____

_____

MERS (Middle East Respiratory Syndrome) and the avian flu. Within one month from the occurrence of the first infection, the structure of the new strain has been discovered and named Wuhan or Coronavirus 2019-nCoV, after the city where it first made its mark. According to experts, respiratory disease in Wuhan is caused by a new type of coronavirus remotely related to SARS coronavirus (SARS-CoV). Aggressive human-to-human transmission has led to a large number of coronavirus infections leading to the deaths of over 1000 people in several countries. According to official World Health Organization's figures, there were 2,918 deaths out of a total of 81,109 confirmed cases worldwide. The majority were registered in China (2,718 out of 78,191). These figures indicate a mortality rate slightly above 3%.

In this paper we set out to analyze the first economic and social effects of the risk arising from the SARS-CoV- 2 viruses in Romania. We consider that the greatest impact on society in Romania is public panic, lack of medical supplies, insufficient hospital beds and lack of medical staff. Through this research, we believe that we will contribute to the Romanian literature on the topic of risk management in the context of Coronavirus.

The work is structured on 3 important sections. The first section presents the most important problems that may arise in Romania after the pandemic has been confirmed. The second section presents the medical system in Romania and addresses the emergency department within a hospital from a cyber perspective. We propose a new approach to the viable system model [1] within the emergency department to build a clear picture of potential issues regarding the management of patients arriving at the emergency room. The main problem is how to manage waiting time when selecting patients according to the severity of the case. In addition, we also conducted a brief analysis on the situation of beds in hospitals in Romania compared to Italy, a country strongly affected by this pandemic. In the last section we discuss the risks generated by the pandemic in Romania and propose some solutions to reduce their impact throughout the society.

The specialized literature in this field was not very extensive. In view of the situation and urgency of this pandemic, the international academic community is looking for different possibilities to accelerate the development of the disease detection and the identification of an appropriate treatment. More and more academic and research organizations and institutions propose different solutions to help the above objective. For example, the Wellcome Trust collected over 100 signatures to provide access to a database of disease research findings. Thus, journals such as Springer, Taylor and Francis, Elsevier or the British Medical Journal provide important data and research in this area. [2,3]

The work paper deals with the incipient aspects of the appearance of Coronavirus in Romania. Due to the rapid advancement of the pandemic, research in the field will be faster, so that specialized literature will change daily.

Main Problems

The risk management of this potential occurrence of Coronavirus in Romania could pose many problems. The major potential impacts on society in Romania could be: public panic, lack of medical supplies and food, insufficient beds and medical staff. A confirmation of the coronavirus epidemic of the Romanian population could also have an impact on the functioning of economic units, such as banks.

The spread of the virus in as many countries in Europe close to Romania and the confirmation of the occurrence of coronavirus in Italy has already caused panic among the population. Access to the Internet, to social networks such as Facebook and inter-national news, makes it easy to increase panic and the appearance of chaos in the behavior of citizens. With panic, the economic issues will become even larger in the short term. On an emotional basis, consumption may also rise, but only

_____

_____

artificially. This could also lead to a penury in goods, which relies on popular perception of a certain danger. Among the causes, there could be miscommunication, media hype and individual subject knowledge. For example, because of the fear that this form of virus will be confirmed in Romania, people have started to buy as much food as flour, pasta, water, oil, gourd and canned food to prepare with supplies. Thus, a chaos has already been created that does nothing more than amplify the panic even more.

Figure 1: Photography of a supermarket from Romania

Source:https://www.mediafax.ro/social/cozi-in-supermarketurile-din-tara-romanii-si-au-facut-provizii-de-teama-coronavirusului-foto-si-video-18890921

Fear of a coronavirus epidemic in Romania has made it difficult for citizens to storm supermarkets to make food supplies and other necessary things in case isolation becomes necessary. Because of the fear of the coronavirus, and the locals from Borşa, Maramures County, they emptied the shelves of supermarkets. Some of them think about what's worse and make supplies for a few weeks. Others send packages for relatives established in Italy or another affected country. The panic created is self-stimulated by many news stories, some documented and others less documented. Another event that contributes to this behavior of Romanian citizens is also due to the fact that Italy is part of countries infected with coronavirus. A 71-year-old Italian citizen was in Romania on February 18-22, and now, having returned to the Italian town of Cattolica, he has been confirmed to be infected with this virus. This event together with the entry of Italy on the list of infected countries, generated another shock of fear in the population of Romania. [4,5]

The head of the Supervisory Board of the National Bank of Romania said that the situation may become worrying for the Romanian banks if they do not provide a working scenario in case of unforeseen events, such as coronavirus, regarding the continuity of the business. From an economic point of view, in the context of investors fearing that the epidemic with the new coronavirus will slow down the economy, European and Asian stock markets have been on a downward trend. The panic created among the citizens leads to as many purchases regarding non-perishable foods, hygiene and protection materials. People need to be aware that this exaggerated fear can lead to a lack of food

_____

_____

and hygiene materials, and this is a potential danger to life, health and basic survival. The population must be rational at these times regarding the choices and decisions they make.

The medical system in Romania

A difficult question, but relevant as it may be, is whether the medical system in Romania is ready for a possible coronavirus pandemic. Do the medical units in Romania have enough beds for an emergency patient boom? Do they have enough medical staff? Do the hospitals in Romania have an emergency system within a hospital that is ready to make an appropriate and timely triage on a large volume of patients coming

to the emergency for fear of a possible coronavirus infection?

In the following, we will describe from the perspective of a viable system how an emergency room is organized within a hospital in Romania and how the triage is performed. In addition, we will analyze the situation of available beds in Romania compared to Italy. In addition, we will analyze the situation of available beds in Romania compared to Italy. According to some researchers that this virus has the characteristics of a pneumonia, we will analyze how many deaths were in Romania due to this disease compared to Italy before the possible occurrence of this virus.
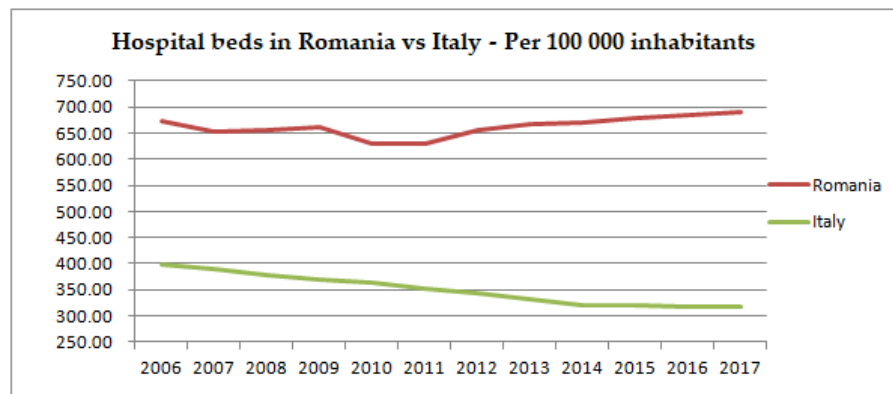
Figure 2: Hospital available beds in Romania compared to Italy
Source: Authors computation based on data available at 26.02.2020
https://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tps00046

According to the Eurostat, hospital beds provide information on health care capacities, i.e. on the maximum number of patients who can be treated by hospitals. Total hospital beds are all hospital beds which are regularly maintained and staffed

and immediately available for the care of admitted patients; both occupied and unoccupied beds are covered. Hospitals are defined according to the classification of health care providers of the System of Health Accounts (SHA).

Table 1: The data of available beds

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	674.13	653.87	656.92	662.01	628.49	631.03	659.60	667.31	671.15	679.12	683.99	689.21
Italy	399.30	390.64	379.10	369.34	364.35	351.73	342.16	331.17	321.09	319.55	317.21	318.07

Source: Author computation based on data available at 26.02.2020
https://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tps00046

_____

_____

Table 2: The data of the death due to pneumonia

Year	2011	2012	2013	2014	2015	2016
Romania	30.75	34.75	31.8	32.56	38.45	36.45
Italy	13.01	13.91	13.24	12.89	15.98	14.35

Source: Authors computation based on data available at 26.02.2020
https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00128&plugin=1

According to the Eurostat, death rate of a population adjusted to a standard age distribution. As most causes of death vary significantly with people's age and sex, the use of standardized death rates improves comparability over time and between countries, as they aim at measuring death rates independently of different age structures of populations. The standardized death rates used here are calculated on the basis of a standard European population (defined by the World Health Organization). **[6,7]**

Although there are more beds in Romania than in Italy, the lack of beds and medical staff in the number of patients is already a known problem in Romania. In addition, as shown in Table 2, in Romania there is a higher death rate from pneumonia than in Italy, so from this point of view we can say that there is a possibility that the human body is not prepared for coronavirus. In addition, many Romanian citizens rush to the hospital after experiencing cold symptoms or fever because of the fear of viral infection. The lack of beds and medical staff could be an important risk factor. According to the data updated so far, there are 380 confirmed cases and 12 people dead in the European Union (plus Great Britain, Iceland, Norway and Liechtenstein, Switzerland). The map presented by European Center of Disease Prevention and Control (ECDC) is updated in real time.

From the ECDC's point of view, things are as follows: At this point, the best way to reduce the spread of the virus is to quickly identify and test suspicious cases and to identify and monitor the people they came in contact with. In the past, systematic implementation of infection prevention and control measures has been effective, both for SARS-CoV (severe acute respiratory syndrome) and MERS-CoV ("Middle East respiratory syndrome", published in 2013 in Saudi Arabia).

An approach to the Viable System Model in the Emergency Medical System

Associating mathematical and cybernetic systems, modelling the behaviour on subsystems can lead to the apparition of discrepancies between decision results adopted according to the delivered solutions and the existing expectations between the members of human society. Even though differences are present, the obtained results can be used in order to improve regulatory processes in order for the medical system to use an optimal allocation combination of resources and guarantee the satisfaction of all agents of human society. **[1,8]**

National protocol for the triage of patients in emergency hospitals structures from 25.03.2019 is based on ESI (Emergency Severity Index) triage scale, from 1 to 5, in order to facilitate the priority based on state of emergency. The second goal of this type of triage, by asking who should be seen first, beside taking into consideration what resources are required for the patients, but also sending them to the right place at the right time. Triage is done in a specially arranged area, having specific lay outs depending on the available space. Two parameters are taken into account, the moment when the patient entered in the facility and is seen by triage assistant and the moment when the patient is receiving the first medial consultation in the treatment areas. **[15]**

_____

_____

The character of the limited resources regarding the emergency medical personnel requires the diagnosis of the emergency system for an optimal allocation of these resources. Thus, an approach to the Viable System Model (VSM) may highlight certain factors that would influence the viability of the entire emergency system.

Starting from the cybernetic conception of Norbert Winer, McCulloch and Ross Ashsby, Stafford Beer created the viable system model as a systemic tool for observing collective behavior at large systems. VSM allows a qualitative evaluation of the strategies used to operate with the complexity inherent in cybernetic systems, so that useful tools can be made in the organizational diagnosis but also in establishing optimal decisions. VSM is a means of observing the structural context in which different people engaged in an organization, enterprise or economic system, evolve, showing how they interact and how to solve certain problems. Viable systems are capable of having a separate, autonomous existence, compared to other components of the enterprise. Stafford Beer, the parent of managerial cybernetics, laid the fundamental foundations of the viable system model starting from the way the human system works, considering it structured into different relatively autonomous systems, but capable of coordinating and working together to ensure the well-being of the whole organism. Thus, he defined 5 systems that form the basic structure of VSM. Starting from these theories, I will describe the viable system of the emergency admissions department within the Hospital of Bucharest.

Moreover, I will consider the 5 triage rooms to be the 5 basic systems of a viable system at this medical institution. The 5 codes associated with the triage are described in section 4 and represented in the diagram below.

System 1: includes everything intended to ensure the functioning of the entire system. In the case of my study, system 1 associates it with level 1 of the triage, the red code, in which the medical intervention on the patient is immediate and does not allow waiting queues. A very large number of patients at this level, in a very short period of time, lead to a large allocation of existing staff.

System 2: In some situations, patients may arrive in the emergency room with a major risk of intervention. Thus, from the number of resources allocated to system 1, they can also be allocated here for medical interventions in case of need. Therefore, a conflict of resources is created. Resolving these conflicts is the task of system 2, providing stability to the model. At the level of this system, there must be already assigned personnel to do the correct sorting and to place them in yellow code corresponding to level 2 of the sorting, and only if it is the major emergency in which the resuscitation is required to be allocated to system 1.

In case of following the investigations at system level 2 or if the patient associated with code 1 does not die and it is found that multiple personnel will be needed and that vital functions are affected, the emergency room associated with level 3 is allocated, green code. Thus, system 3 has the role of supervisor for system 1, optimizing the interactions, seeking to make an efficient allocation of personnel. This increase of efficiency in the functioning of a system is called synergy. This is a process by which the result of the functioning of the elements of system 1 (medical resources) together leads to greater results.

The patient who has stable vital functions and needs a single medical resource is included in the triage code 4, the blue code. Thus, in system 4 we will place the patients in this level of triage, after they have become stable, but still have to be monitored. System 4 will evaluate threats, opportunities and elaborate different reports on changes in vital signs. So, this system produces plans to ensure long-term viability.

The system 5 associated with level 5 triage, white code, has the role to ensure that all patients included here improve their health quickly, without going to other

_____

_____

interventions and worsening the health condition. System 5 must maintain its

balance and function in a certain context without losing its cohesion.
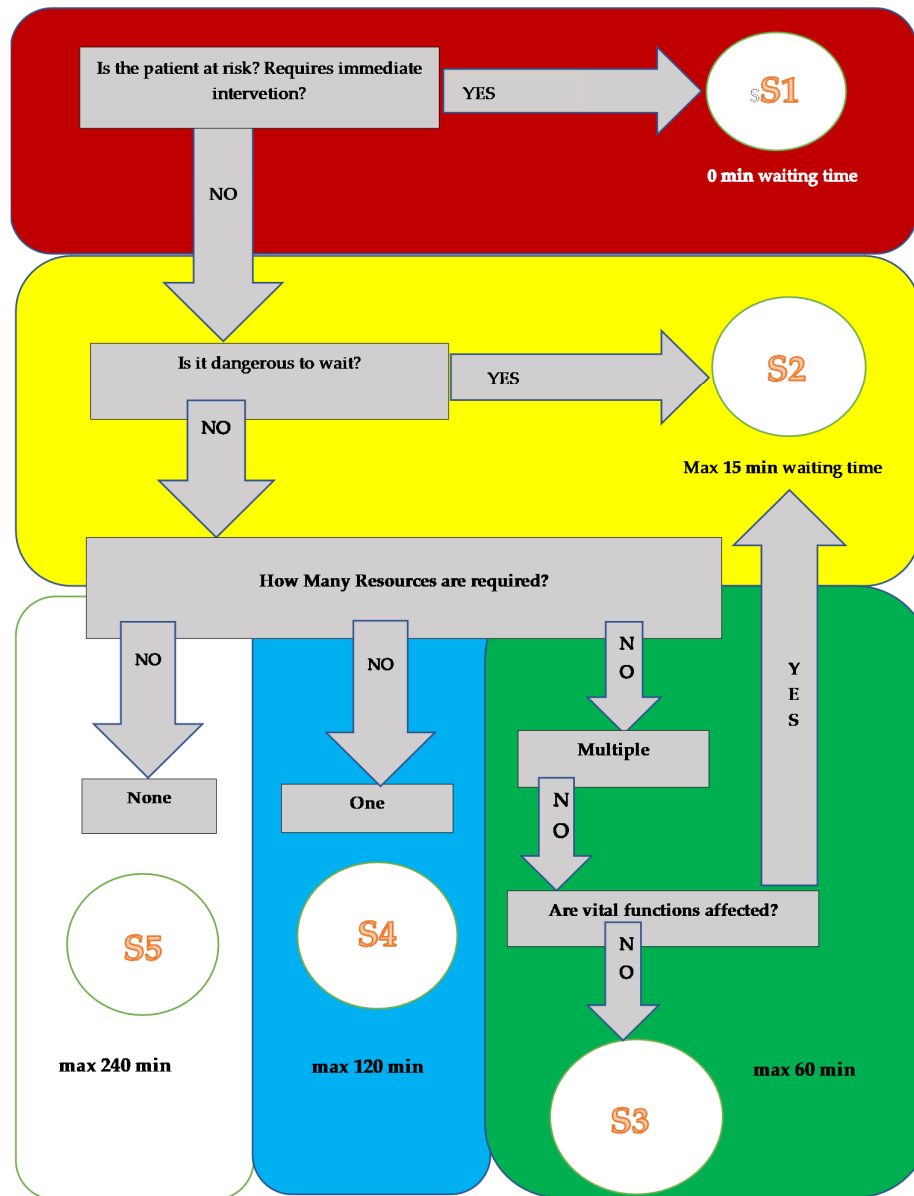
Figure 3: Viable System Model of the Emergency System Room. The diagram describes the VSM of an ideal emergency system

Source: Authors computation

Risk Management, Discussion and Recommendations

Most EU Member States have developed risk assessment methodologies, adopted in national law and already operational. These

developments are taking place in the context where, starting with 2010, in order to improve the capacity of the Member States to respond through measures of prevention, preparation and intervention to the identified risks, the European Commission has initiated a process of

_____

creating a unique methodological framework for risk assessment to enable the development of common European strategies and policies, based on comparable results at EU level. A common European framework aims at better management and distribution of resources, with the aim of preventing and managing effectively and efficiently the negative effects of disasters and other risks at European Union level. Several epidemics and pandemics that have emerged in recent centuries have their origin in China. In 1781-1782, a flu virus killed many people in China and other countries. The Asian crisis that broke out in 1957 killed over 1 million people. Then followed SARS, in 2002, and bird flu, in 2013. [9,10,11]

An important measurement for the prevention and control of the epidemic could be the analysis of the possible risks and their monitoring. Risk monitoring combined with knowledge based on the analysis of larger amounts of data and certain information, combined with artificial intelligence and data science could be a factor that would contribute to improving the reason and behavior of citizens. Due to the high rate of spread of an epidemic, a small amount of data is used and little research is needed to make quick decisions so that the spread of the contagion is prevented. From the point of view of risk management, several parties must be involved, as follows: medical resource, political departments, emergency departments, patient, coronavirus suspected patient, research institutions, citizen, media and inter-national community. They must create a complex network of interactions so that the best decisions are made. When it comes to a contagious disease, many people face panic. We recommend the use of medical personnel specialized in psychology and not only to intervene to promote an optimistic psychology.

Another important player that could help increase citizens' optimism is the government itself, or even the president. For example, it is to be appreciated that the president of Romania discusses with the citizens through press conferences and

transmits that the level of mobilization remains high but calls for calm and correct information. All citizens must understand that it is the responsibility of each individual, not just the institutions, to cooperate, to fully respect the directions and advice of the authorities, in order to have a successful strategy in preventing and combating coronavirus infections.

Another recommendation is to continue to publish in a transparent and correct way the reports on citizens who were suspected of the virus but the test came out negative. The media should focus on such news, not on hyperbolizing fake and unrealistic news. To avoid limiting existing resources, authorities should impose in the case of a coronavirus infection, but perhaps before that, a department that will determine for each household the optimal consumption and their needs to accurately provide information regarding medicines, protective masks and food. Another recommendation is to equip several hospitals with the necessary equipment for testing people regarding the transmission and occurrence of this virus because at present there are only a few units throughout the country and every minute is precious in these conditions.[12,13]

In Romania, there was a great debate about how the authorities prepared to take security measures at airports in the case of passengers, Romanians and foreigners, who came from Italy, the European country most affected by coronavirus and where many Romanians live. The question is what specific measures should the Romanian authorities take at airports in order to avoid contact between suspected / infected persons coming from Italy (for example) and other persons? It is up to the Member States to decide what measures to take and ECDC has no power over their decisions. Member States have different approaches to quarantine and the measures to be taken to prevent the spread of the virus, including for returnees or returning from an epicenter of infection. The control measures to be taken to minimize the subsequent transmission of the virus are based on the available information regarding the

_____

_____

magnitude of this outbreak and the rate at which it spreads.

Unfortunately, just at the moment of designing this article, the first case of a citizen infected with COVID-19 was confirmed on the Romanian territory **[5]**. The Secretary of State and the Minister of Health officially declared the first case of a patient infected with coronavirus. The Secretary of State stated that the patient was in good condition, had no fever, cough, had no symptoms. Because he is positive, he will be transferred to the hospital and hospitalized. A crew from ISU Dolj, with a special insulated truck, are already departing from Craiova to take the person from their home and transport them to "Matei Balş" Hospital, from Bucharest. Under these conditions, the first and most critical step is restoring people's confidence because many people are and will be psychologically affected. So far, Romania has proven that it still has the situation under control, the state institutions act quickly and preventively every potential and existing case.

Conclusions

In the next research, we will analyze how the behavior of citizens will change considering that the existence of this virus in a patient has been confirmed right now. We will see how the press and state institutions will react to this topic. In addition, we will analyze what will be the impact on industry, companies, banks and, implicitly, on the country's economy.

In this paper we analyzed how the installation of the Coronavirus pandemic would affect Romania from an economic, social and risk management point of view. It is clear that the deficiencies of the medical system together with the panic created by the media create a negative effect on the way people react to the situation. The key point of such an event is calm and rational thinking. From an economic point of view, we expect the impact to be a negative one, because the pandemic is set up globally. Stock markets will be affected, industries will cease activity and lay off employees.

The economic behavior will be influenced by the behavior of all citizens, organizations and businesses and the decisions taken by each actor involved in the economic system. **[14]**

All of these will create an ideal framework, unfortunately, for the installation of a possible economic crisis. It all depends on how the pandemic will worsen or improve. Installing it in a country and its longer life span will have devastating effects both on the economic level and on human lives.

Taking preventive measures before confirming coronavirus to a citizen of Romania, we can say that the institutions were prepared for this occurrence. We will see how things will evolve in the next paper. The state will evolve in a positive sense only by making rational decisions, increasing the optimism of the citizens and respecting the strict rules regarding the treatment of this pandemic.

References

1. Chiriță, N., Nica, I. (2019). Cibernetica Firmei. Aplicaţii şi Studii de Caz. *Economic Publishing House*;
2. Yue, X.G., Shao, X.F., Li, L.I.M, Crabbe, J., Mi, L., Hu, S., Baker, J.S., and Liang, G., (2020). Risk Management Analysis for Novel Coronavirus in Wuhan, China. *Journal of Risk and Financial Management* 13(2), 22. Available online: https://www.mdpi.com/1911-8074/13/2/22 (accessed on 26.02.2020);
3. La, V-P., Pham, T-H., Ho, M-T., Nguyen, M-H., Nguyen, K-L., Vuong, T-T., Nguyen, H-K., Tran, T., Khuc, Q., Ho, M-T., Vuong, Q-H., (2020) Policy Response, Social Media and Science Journalism for the Sustainability of the Public Health System Amid the COVID-19 Outbreak: The Vietnam Lessons, *Sustainability 2020*, 12(7), 2931. Available online: https://www.mdpi.com/2071-1050/12/7/2931 (accessed on 10.04.2020);
4. Online source: https://www.digi24.ro/stiri/actualitate/magazine-golite-de-frica-coronavirusului-in-maramures-localnicii-trimit-pachete-si-

_____

rudelor-din-italia-1266009 (accessed on 26.02.2020);

5. Online source: https://www.digi24.ro/stiri/actualitate/primul-caz-de-coronavirus-in-romania-1266806 (accessed on 26.02.2020);

6. European Centre for Disease Prevention and Control. Situation update worldwide in COVID-19 cases. Available online: https://qap.ecdc.europa.eu/public/extensions/COVID-19/COVID-19.html (accessed on 26.02.2020);

7. World Health Organizations. Available online: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200226-sitrep-37-covid-19.pdf?sfvrsn=6126c0a4_2 (accessed on 26.02.2020);

8. Nica, I., Chiriță, N., Ciobanu, F.A. (2018). Analysis of Financial Contagion in Banking Networks. *32nd IBIMA Conference, Vision 2020: SUSTAINABLE ECONOMIC DEVELOPMENT AND APPLICATION OF INNOVATION MANAGEMENT, pages 8391-8409;*

9. Liu, S-L., and Saif, L., (2020). Emerging Viruses without Borders: The Wuhan Coronavirus. *Viruses 12: 130.* Available online: https://www.mdpi.com/1999-4915/12/2/130/htm (accessed on 26.02.2020);

10. New Virus Discovered by Chinese Scientists Investigating Pneumonia Outbreak. Available online:https://www.wsj.com/articles/new-virus-discovered-by-chinese-scientists-investigating-pneumonia-outbreak-11578485668 (accessed on 26.02.2020);

11. Wellcome Trust. (2020) Sharing Research Data and Findings Relevant to the Novel Coronavirus (COVID-19) outbreak; *Wellcome Trust: London, UK*;

12. Nature. Calling all Coronavirus Researchers: Keep Sharing, Stay Open. Available online: https://www.nature.com/articles/d41586-020-00307-x (accessed on 10.04. 2020);

13. Kickbusch, I.; Leung, G. (2020) Response to the emerging novel coronavirus outbreak. *BMJ 2020, 368, m406;*

14. Vuong, Q.-H.; Ho, T.-M.; Nguyen, H.-K.; Vuong, T.-T. (2018) Healthcare consumers' sensitivity to costs: A reflection on behavioural economics from an emerging market. Palgrave Commun. 2018, 4, 70;

15. Nica, I. (2020). Operational Research in the Emergency Medical System of Romania*. Database Systems Journal, vol. XI/2020, pages 3-13.* Available online: http://www.dbjournal.ro/archive/31/31.pdf (accessed on 10.04.2020).