HOW CAN SYSTEMS THINKING HELP US IN THE COVID-19 CRISIS?

Abstract:

The COVID-19 pandemic outbreak remains one of the most influential events in the global economy over the recent years. While being primarily public health-related, it has a tremendous impact on many other aspects, including business management. Many businesses were forced to introduce rapid changes to their business models in order to survive. The aim of this paper is to show the complexity and inter-relations of changes triggered by COVID-19 outbreak. Understanding of this complexity is crucial for developing business resilience to similar events in the future. The paper uses Systems Thinking approach to analyse influence of COVID-19 pandemic on business operations and to show the importance of the proper government response to the COVID-19 crisis. A causal loop diagram is used to show the complicated mechanisms behind the impact of pandemic on several aspects of business operation and management. Perceptions of some variables play more important roles than actual variables and it often requires more than one actor to solve a particular problem. Adaptive business management may prove to be a particular challenge for small business owners. The paper provides useful insights into the complex nature of contemporary business operation and management in the wake of a major epidemiological crisis. It may contribute to a better understanding of important factors that often tend to be disregarded and not paid enough attention to. It offers food for thought not only for academics, but also to business owners/managers, aware of the complexity of contemporary world and to government-level decision makers.

Key words: COVID-19 crisis, Systems Thinking, continuous learning, adaptive business management, global knowledge economy

1. Introduction

The year 2020 marked its place in the contemporary history through the outbreak of the COVID-19 pandemic. Looking for an event of a similar character, one has to go over one hundred years back to the pandemic of Spanish flu. But even the Spanish flu pandemic does not cast light on the current developments with COVID-19, because the way global economy works now is substantially different from the way it used to work one century ago (Fernandes, 2020). The complexity of business relations spanning across continents, the speed of the COVID-19 spread, as well as the speed and availability of information (and fake news) on this topic (Ramnath, Kairaitis, & Malhotra, 2020), they all make this pandemic an unprecedented event.

The COVID-19 pandemic, even though at the beginning perceived mostly as a challenge for public health care systems, has proven to be a multifaceted phenomenon (Donthu & Gustafsson, 2020). Currently, it seems to have influenced and transformed several areas of our life (van Bavel et al., 2020), including public transportation and education systems. However, one of the most important changes triggered by the COVID-19 outbreak refers to the business sector. Along the development of the COVID-19 pandemic, governments started to introduce numerous regulations, limitations and restrictions intended to keep the spread of the virus under control. As in the spring 2020 the situation in most countries started to deteriorate, the intensity of those government activities also increased, reaching its peak during many lock-downs, administered in many European countries. That had a very significant and negative, sometimes even devastating impact on many businesses, especially those from the SMEs sector. It shows that at the end of the first quarter of 2020 in the USA even as much as over 40% of small businesses had been temporarily closed. Some of them are

never going to reopen again. The major reason for the closure was reduction in demand, followed by employee health concerns. The industries severely impacted by COVID-19 pandemic include retail, art and entertainment, food services and hospitality businesses (Bartik et al., 2020). It should be noted, however, that professional services, finance and real estate businesses were significantly less damaged due to their greater ability to switch to remote mode of operation. With three quarters of small businesses having enough cash to last not more than 2 months, small business sector proves to be financially fragile and significantly dependent on government actions helping them to survive (Bartik et al., 2020). The scale of disruption experienced by businesses and other institutions, including governments is so massive that it cannot be handled with the use of mental models based on deterministic approach and linear thinking. In order to operate successfully in this very turbulent environment, organisations should adopt nonlinear thinking models. The complexity of changes calls for using systems thinking models (Bratianu, 2015), which is also considered as a promising framework for knowledge management intiatives, based on hollistic approach (Rubenstein-Montano et al., 2001).

In the spring and summer 2020 numerous "shield programmes" were launched world-wide to protect the business sector against the most severe economic consequences of the imposed restrictions. The autumn 2020 brought a further increase in the number of new active cases of COVID-19. The spring 2021 is characterised by three elements. The third wave of pandemic hits many European countries, further worsening the already difficult situation of businesses. Secondly, the virus mutates and new variations of COVID -19 become more and more widespread, as they are significantly more infectious (Kirby, 2021). Lastly, the vaccines currently used protect against those new variations (Conti et al., 2021), but the rate at which vaccinations are administered is slower than expected, as the producers lag behind and are unable to supply the vaccinations as planned. Providing a world-wide access to the vaccines needed for herd immunity is challenging in a number of aspects (Wouters et al., 2021). Therefore, the COVID-19 pandemic seems to become a long-term issue and the COVID-19 crisis in most countries will not be a matter of weeks or months, but rather quarters or even years.

The impact of COVID-19 on the situation of businesses is significant and usually perceived as negative (e.g. hospitality industry, tourism, art and entertainment, e.g. cinemas and theatres). However, it can also be positive, like in the case of for example some software producers, including producers of internet communicators, tools for remote work and home office, or digital entertainment suppliers such as Netflix). But still, for the sake of economy and those entities that have been negatively affected by COVID-19, there is an urgent need to help organisations in their functioning. Also, there is a need for researchers to apply the available tools and methods to handle the COVID-19 crisis, which is the unprecedented challenge for our economies.

Therefore, taking the above into account, the following research questions can be formulated: How do businesses respond to the prolonged exposure to the COVID-19 crisis? What kind of actions are they prone to undertake and what are the drivers of those actions?

This paper aims at answering these questions by the application of systems thinking theory and the usage of Vensim PLE tool. The paper develops as follows. First, the brief characteristics of the COVID-19 crisis is presented. Second, the systems thinking approach is discussed and its applicability to the COVID-19 crisis analysis is justified. Then, the proposed model of business response to the COVID-19 crisis is presented and explained. Finally, in the conclusion section the paper is summarized, theoretical and practical contributions are presented along with some recommendations, paper limitations, and avenues for the future research.

2. The COVID-19 crisis

A new coronavirus SARS-COV-2 appeared in Wuhan, China in December 2019. It started an epidemic of a respiratory syndrome of COVID-19 that has spread from China reaching 114 countries in three months, hence causing a global pandemic declared by the World Health Organisation (van Bavel et al., 2020). The seriousness of the COVID-19 crisis is also reflected by the rapidly growing body of literature dedicated to this topic; it is estimated that since January 2020 during two quarters the number of papers on the COVID-19 doubled every twenty days (Ramnath et al., 2020).

The economic impact of the COVID-19 crisis is so far very significant, and since the crisis is not over yet, the ultimate effects remain unknown and business forecasts remain highly ambiguous (Baker, Bloom, Davis, & Terry, 2020). The lock-downs introduced in the spring 2020 already decreased consumption and had dramatic effects on some sectors, especially small scale services. Supply chains that span globally were disrupted, introducing chaos in business operations in virtually all countries (Hoek, 2020). Consumption patterns were changed rapidly, creating numerous shortages of many goods, while at the same time leaving markets with substantial surpluses of other goods. Volatility in global financial markets rose to the levels recorded during the last financial crisis of 2008 (Fernandes, 2020). This volatility suggests that apart from the clearly adverse influence of the COVID-19 crisis on the global economy, this crisis has caused also a lot of uncertainty. Similar conclusions come from analysing newspaper feeds and business expectation surveys (Baker et al., 2020). Nevertheless, the progression of the pandemic can be modelled and for example SIR models are used for this purpose by public health experts. They may also serve economists as a source knowledge on trade-offs between the public health and economic consequences of COVID-19-related restrictions and social distancing measures (Atkeson, 2020).

Any attempt to tackle the COVID-19 crisis requires a deep understanding of its nature. According to Bratianu (2020), this crisis is a typical Talebian Black Swan, because it is an outlier, it exerts an enormous impact and it is explainable and predictable *post factum*. Such a crisis makes the lack of knowledge more relevant than before and it impacts many aspects of everyday life. Public health, economics, education, culture, sports – all those systems experienced COVID-19 related hardship. Hence, a wide variety of business and non-business organisations had to face the challenge of how to operate in those difficult times. Many of them had to reinvent their business models. The Information Intensity Matrix improved by addiction of the third dimension (essential nature of the product or service) may serve as a helpful tool to explain the impact of the pandemic on business models across various industries, stressing the importance of agility and readiness to react to unexpected changes of the environment (Seetharaman, 2020). Originally, the Information Intensity Matrix was a proposal on how to categorise various industries using two dimensions: information intensity of the value chain and information content of the product. Hence, for instance, cement production would be placed low on both dimensions, oil refining would be placed low on information intensity of the product, but high on the information intensity of the refining process, whereas banking would be placed high on both dimensions (Porter & Millar, 2011), as well as public administration. Adding the third dimensions, as proposed by Seetharaman (2020), allows to understand for instance the vast difference in COVID-19 influence on hospitality industry on one hand and banking industry on the other.As the disruption brought

by COVID-19 was unexpected, all organisations including governments and businesses realised that they have no strategic knowledge on how to deal with this phenomenon. The only available solution was to switch from deliberate strategies used in "normal times" to emergent knowledge strategies, which had to developed on the spot (Bratianu & Bejinaru, 2021).

When it comes to businesses, this difficult task is to be executed by their managers (or business owners in case of small businesses). In the face of the COVID-19 crisis a lot of knowledge and routines became obsolete virtually overnight. That requires making room for new, updated knowledge, which can be achieved by extensive intentional organisational unlearning: discarding obsolete knowledge and abandoning out-dated routines, which is analogical to Schumpeterian "creative destruction" and is one of thetwo key constituents of the subsequent learning process (Cegarra-Navarro & Sabater-Sánchez, 2005). Intentional unlearning may be essential for business survival in dynamic environments and many managers may be in need to learn how to unlearn. Research shows that intentional unlearning is a complex process that takes place on various levels and depends on a number of contextual components (J. G. Cegarra-Navarro & Wensley, 2019). As for public administration, especially on local and regional levels, shifting to e-government is of utmost importance, because enabling remote mode to contact and supply both information and services to the public allows public administration to operate even in pandemic times. Yet, successful implementation of e-government services and building citizens' engagement requires using proper enablers (Moreno Cegarra, Cegarra Navarro, & Córdoba Pachón, 2014).

As the COVID-19 crisis unfolds and the uncertainty it has triggered grows, the role of mass media and – even more importantly – social media remains very important. Yet, the danger of misinformation phenomena during the pandemic is as serious as never before, leading to the new term of "infodemic" (Cinelli et al., 2020). The infodemic can be defined as "a contagious disease infecting our information culture" (Solomon, Bucala, Kaplan, & Nigrovic, 2020), which captures the essence of this phenomenon. Basically, infodemic may be perceived as similar or closely related to "counter-knowledge" (Martelo-Landroguez, Cegarra Navarro, & Cepeda-Carrión, 2019), but it differs with respect to intensity and scale in a similar way as a disease differs from a pandemic. The infodemic can speed up the epidemic process by shaping and fragmenting social response to the COVID-19 pandemic. Research show that social media are particularly prone to spread false information on this topic (Pennycook, McPhetres, Zhang, & Rand, 2020).

To sum up, even though at the time of writing this paper the COVID-19 crisis has lasted already for more than a year, the developments are still very fresh and quite often, unverified. It could be said that the state of the art is being created on our eyes and we have only limited options at hand. The scientists need to use their experience, intuition and the common sense in the analysis of the situation and in the proposal of certain solutions related to the COVID-19 crisis while maintaining integrity and high professional standards. This paper aims to contribute to the present state of the art by its critical analysis of the COVID-19 crisis with the use of systems thinking, a well-established approach, already applied for the complex problems (more details are presented in the next section). It offers new insights and solutions to the problems faced by organizations worldwide. As it has been presented above, there is a

scarcity of knowledge on the COVID-19 crisis and ways of handling it and this paper aims to fill this knowledge gap to some extent.

3. Systems thinking

Systems Thinking is a term having a few meanings. It can be treated as a perspective, a language or as a set of tools, which include causal loops used in the model presented in this paper. Systems Thinking is defined as opposite to linear thinking and offers holistic approach to the analysed phenomena. Its possible applications span across various fields and disciplines (Monat & Gannon, 2015).

Systems Thinking approach has already been used with regard to public health problems before the COVID-19 crisis. It is mostly because the improvement of public health requires deep understanding of system complexity behind public health problems (i.e. their causes and ways of solving them). It was in 2008 when Leischow et al. claimed that collaboration across a wide array of disciplines and fields is necessary for preventing and containing pandemic influenza, pointing out that each separate activity to address this disease is necessary but insufficient in itself (Leischow et al., 2008). All the observations made in this paper are fully applicable to the COVID-19 crisis. Particularly valuable in the current situation, the fundamental systems-thinking perspectives and approaches include: attention to how new knowledge is gained, managed, exchanged, interpreted, integrated, and disseminated, a network-centric approach based on building relations among and between individuals and organizations, the development of models and projections, using a variety of analytic approaches (Leischow et al., 2008).The usefulness of systems thinking-based tools and strategies for conducting transformational changes in health systems is undoubtful, especially when those changes are to address the overall complexity of such systems, including health practice, education, research and policy (Swanson et al., 2012).

Systems thinking creates a powerful context for knowledge management, encompassing the people; the knowledge they have, share, and need; the culture for knowledge sharing; organizational business strategies; as well as the technological infrastructure for knowledge management. Systems thinking may improve knowledge management through its ability to capture dynamic processes characterised by complexity. In this way it may also improve understanding and the ability of knowledge management initiatives to respond to the needs of the organization (Rubenstein-Montano et al., 2001). The systems thinking framework for knowledge management is perceived as important and useful for practitioners, creating solid and comprehensive foundations (Fei, Meng, & Yoshiteru, 2002; Kawalek, 2004)

In the wake of the COVID-19 crisis, more papers on System Thinking appeared, showing the potential of this approach in addressing complicated interrelations triggered by the pandemic. This kind of perspective was presented in the case of healthcare mask production in Korea (Lee, Chen, McDonald, & O'Neill, 2020). A more comprehensive attempt to employ Systems Thinking can be found in the paper on drive-through testing sites (Araz, Ramirez-Nafarrate, Jehn, & Wilson, 2020), where a conceptual framework for addressing disease dynamics and logistics of mass distribution was provided. A causal loop diagram showing societal response to the COVID-19 threat serves as an example that Systems Thinking approach may bridge public health issues with social relations, perceptions, attitudes and actions undertaken on their basis (Bradley, Mansouri, Kee, & Garcia, 2020). A very general and hence hardly useful

view on the use of Systems Thinking in the current situation was presented by Hassan et al. (Hassan et al., 2020). Far more useful is the contribution on COVID-19 management and communication with the proposed systemic stocks-and-flows diagram (Gonella, Casazza, Cristiano, & Romano, 2020). Probably the most inclusive effort to capture the complexity of the COVID-19 crisis was made by Sahin et al. (2020). Their causal loop diagram includes four areas: economy, environment, health and society. They are inter-related and all linked to the fifth element, which is government activities performed due to the COVID-19 outburst. The sixth element is the individual perspective on pandemic, recently added by Klement (2020a).

Klement (2020b) claims that most Western countries try to solve COVID-19 related problem using a reductionist approach, referring to single, isolated scientific disciplines rather than using transdisciplinary approach. This reductionist virus-centred approach is presented by scientists, made popular by media and then used by politicians and decision makers. The lack of holistic approach may lead to taking excessive anti-COVID-19 measures resulting in high social and financial costs and misallocation of resources (Ioannidis, 2020). The reductionist approach also poses an ethical question on whether basic civil rights or social contact should be sacrificed for the sake of infection avoidance. Systems Thinking may be perceived as a certain kind of epistemological antireductionism and serve as a way of solving complex problems by "seeing both the forest and the trees" (Klement, 2020b). Even though Systems Thinking may offer an effective way to investigate upon the causes of the COVID-19 crisis, to diagnose the present situation and to propose possible and sustainable solutions, it should not be treated as the panacea for the pandemic (Haley, Paucar-Caceres, & Schlindwein, 2021). The quality of the proposed solutions greatly depends on how adequately complexity is defined and conceptualised (Jackson, 2020).

So far, there are hardly any scientific papers using Systems Thinking approach to explain in a more detailed way business behaviour during the COVID-19 crisis. Scarce examples of utilising Systems Thinking in the business management domain include rather preliminary considerations on the COVID-19 impact on food production philosophy (Loker & Francis, 2020) and waste generation and composition (Naughton, 2020).

The above mentioned attempts to use this methodology in the fields other than business management suggest that the characteristics of the current situation makes System Thinking a very suitable framework for studying also business management in these turbulent times. The current situation is multifactorial, dynamic and nonlinear, hence compartmental knowledge originating from scientific silos is likely to obstruct understanding of the inter-relations among all the significant variables (Leischow et al., 2008). Therefore, the Systems Thinking approach can be considered as the one offering adequate tools for analysing business operations and management in the wake of the COVID-19 spread.

4. Business response to the COVID-19 crisis

The current COVID-19 crisis affected many aspects of everyday life, bringing significant changes. As presented above, businesses around the world have had to respond to those changes. To offer a better understanding of the complexity of the situation, a **model of business response to the COVID-19 crisis** has been created. Following the logics of system dynamics modelling, two first stages of modelling processes have been completed:

conceptualisation and formulation (Martinez-Moyano & Richardson, 2013). At those two stages the most important inputs are of qualitative nature, based on mental data base, observation and intuitive approach. The conceptualisation phase is claimed to be the most important part of system modelling, as it creates a theory of behaviour representing the way the real system works (Forrester, 1994). Soft variables based on qualitative data – like the ones used here – are often used in social systems modelling (Luna-Reyes & Andersen, 2003). To make the model more complete and useful, some reinforcing and balancing loops have been identified and described, which is not typical at this stage of model development (Forrester, 1994) but offers additional insights. The application of this approach has resulted in the model presented below (Figure 1).

The actions companies had to undertake can be divided into two categories. The first one ("Business Actions Aimed at Compliance") comprises of actions that were forced by regulations, restrictions and limitations imposed by the authorities. In most cases their direct impact on business performance was harmful, yet those actions were carried out either entirely voluntarily or in the fear of legal sanctions and reputation risk (pressure from various stakeholders to comply). The other category ("Business Actions Aimed at Survival & Development") include all the actions that were undertaken to protect the business from the adverse impact of the COVID-19 pandemic. Some of them were intended to achieve or continue firm growth in spite of the unfavourable external conditions, while others were meant to save the business from discontinuance or bankruptcy. Naturally, some of the actions from this category may be contradictory with compliance actions or can be even illegal (e.g. breaking quarantine or concealing the fact of being infected). The intensity of both types of actions mentioned above depends heavily on the question of how serious in the perception of business owners, managers and employees, the COVID-19 crisis and its impact on businesses are. Perceptions may play a more important role than their real analogues (van Bavel et al., 2020). That is why "Perceived Seriousness of COVID-19 Crisis" is the central part of the proposed **model of business response to the COVID-19 crisis** – see Figure 1.

FIGURE 1. ABOUT HERE

The general concept of this model is that the real danger resulting from the pandemic is filtered by three different channels (media, personal experience and business impact), through which the knowledge is passed to business owners, managers and employees building their awareness about the current situation. On the basis of this awareness, business activities are planned and carried out and that refers to the both above-mentioned categories of actions. Those actions, in turn, have their – positive and negative – consequences for the development of pandemic situation in the country, hence closing feedback loops.

The perception of the seriousness of the COVID-19 crisis is based on how serious it really is. Two important elements illustrating the spread of the virus, which are understandable to the general public, are the number of newly detected infections and the number of fatalities. Both numbers are published and widely discussed over the media – traditional mass media and social media as well. In this way, the media serve as a kind of relay, transmitting the description of the reality to their recipients. Furthermore, the real impact of COVID-19 is filtered by personal experiences regarding severity of the pandemic: personal knowledge of people infected (how many and how seriously impacted), own experiences of infection or those related to the closest family members). In addition to that, the perceived seriousness of

the COVID-19 crisis is to a high extent influenced by the negative impact of COVID-19 on business conduct and performance; this can be called the professional experience of the pandemic.

The scale and seriousness of the COVID-19 crisis can be influenced by the government (in the broad sense of this term, including the central government as well as regional and local governments and other public institutions) in two ways. Firstly, the number of newly infected people (cases) can be to some extent controlled via restrictions and regulations imposed by the government (obligatory face masks, limitations regarding attendance in public places, restrictions applied to bars, restaurants, banned mass events, etc.). This number of new cases is obviously related to the number of fatalities, but additionally, a rapid accumulation of active cases can result in exceeding the capacity of the health care system and increased number of deaths, hence the effectiveness of public health care system is vital when it comes to restraining the number of fatalities. Appropriate preparations, proper organization and management of hospitals should be the priorities for the government (McKibbin & Fernando, 2020).

The government imposed restrictions are generally triggered by seriousness of the COVID-19 crisis – governments respond to the growing number of active cases and COVID-19-related deaths by issuing regulations aimed at getting pandemic under control, including even full lock-down, when necessary. This is shown in the model by the **balancing loop B1**. It should be noted here that there is a significant delay between introducing restrictions and their visible consequences, expressed in the decrease in the growth of active COVID-19 cases. What is more, the impact of the most restrictive nonpharmaceutical interventions (mandatory stay-at-home and business closures) on epidemic case growth is found to be insignificant in a number of countries (Bendavid, Oh, Bhattacharya, & Ioannidis, 2021). On the other hand, all those restrictions have immediate, negative impact on businesses and their performance. The delayed influence on the number of active COVID-19 cases combined with the immediate negative impact on businesses may result in undermining trust in government. People in business sector may challenge the imposed regulations, when they see they are costly to their business and yet they do not improve the pandemic situation in any visible way. The level of trust to the government will influence the efforts made both to comply with restrictions (the greater trust, the greater efforts) and to survive and develop businesses (the smaller trust, the greater efforts). This relation between the trust to the government and both types of efforts seems also to be time dependent: business owners and managers tend to become tired of prolonged restrictions and constant financial loses. They start ignoring restrictions and running their businesses without paying much attention to government rules compliance. That applies mostly to small business and particularly to small scale services (Healy, Datar, Dooling, & Willmsen, 2020).

The government imposed restrictions force businesses to perform actions aimed at compliance with these restrictions. The scale of those actions will be dependent not only on the scale of restrictions, but it will also reflect the level of trust in the government (i.e. the belief that restrictions are necessary, adequate to the current situation and effective). Another important determinant of those actions is the perceived seriousness of the COVID-19 crisis – if business owners, managers and employees perceive situation as serious, they are more engaged in compliance-oriented activities. If the actions aimed at compliance (such as wearing masks,

maintaining social distancing, adhering to other rules and norms) are popular in the business sector, they contribute to lowering the level of seriousness of the COVID-19 crisis (Atkeson, 2020), therefore closing the **balancing loop B2**.

The perception of how serious is the COVID-19 crisis is, as mentioned before, built partly on the basis of information revealed by the media, both traditional and social ones. The impact of the media is dependent of their popularity and their perceived credibility, between which there are the **reinforcing loops R1 and R2**. The more popular the medium is, the more tight the information bubble created by this medium is and hence, its perceived credibility grows (Kaakinen, Sirola, Savolainen, & Oksanen, 2020). The more credible the medium is in the perception of the user, the more often it is used. Technological changes, including growing availability of stable Internet connection, continuously improved algorithms of content selection and general social tends make social media more and more popular, which reduces the popularity of traditional mass media (Pentina & Tarafdar, 2014; Spohr, 2017). Therefore, it seems that social media are likely to play the leading role in formulating opinions on the COVID-19 crisis, which brings well-known concerns about the accuracy, reliability and truthfulness of information they present (Cinelli et al., 2020; Pennycook et al., 2020). If the share of fake news presented in social media grows, then the perception of the COVID-19 crisis may be to a great extent based of the false picture created by those media. One of the most important research challenges here should be to determine how people decide to look for information and how those decisions influence their behaviour. Their individual behaviours translate into mass reactions of the society to the government measures intended to tackle the pandemic. In fact, those mass reactions decide to great extent on how efficient the government regulations can be. Some models used for forecasting the spread of COVID-19 already try to incorporate behavioural response of the society that is based on communication dynamics. Social media allow to access unprecedented amount of information, filtered by AI algorithms, increasing polarisation between various groups of their users. The increased polarisation facilitates in turn proliferation of misinformation (Cinelli et al., 2020). Studies show that the COVID-19 crisis set many Internet users for the quest of COVID-19 related information and that the share of "infodemic monikers" in social media contents is significant (Rovetta & Bhagavathula, 2020).

If the business sector perceives the COVID-19 crisis as a serious threat, then the tendency to undertake actions that are aimed at compliance with the imposed restrictions and rules is stronger, as the need to protect business partners, employees and customers is more evident. Most of such actions have adverse impact on businesses, as they usually result in increasing the costs of business operations which is additionally accompanied by a decrease in revenues. Hence, the greater adherence to the restrictions and rules imposed for protecting the society against COVID-19 infections, the more perceptible is the negative influence of this crisis on business sector. This, in turn, leads to the increased level of the perceived seriousness of the COVID-19 crisis and in this way the **reinforcing loop R3** is closed.

However, if the perceived seriousness of the COVID-19 crisis is low, then naturally businesses would rather focus on the actions that are aimed at their survival and development, reducing their efforts to comply with the restrictions to the necessary minimum that is forced by e.g. legal sanctions. In this case the negative impact of the COVID-19 crisis is less perceptible for businesses and that leads to two different outcomes. Firstly, the less severe is

the negative impact of the crisis, the less incentives appear to try and save the business, as it does not seem to be endangered that much. That is the mechanism grasped by the **balancing loop B3**. Secondly, the less severe is the negative impact of the crisis, the less seriously it is perceived by businesses, closing the **reinforcing loop R4**, leading to even greater disproportion between the efforts to successfully run businesses in spite of the COVID-19 crisis and the efforts to comply with the policies adopted to protect the society against the pandemic.

5. Conclusions and Recommendations

As it can be seen from the proposed model, the response of the business sector to the current COVID-19 crisis and its development may be channelled into two streams of actions, aimed at either compliance (with the primary view on protecting own staff as well as other members of the society) or business survival and development (with the primary view on business performance). To what extent businesses would engage in each of those actions depends to a great extent on their perception of how serious is the threat of the COVID-19 crisis. This perception is formed by media and by experiencing the reality by personal and business experiences. Additionally, the question of how adequately the government reacts to the crisis and its perception of the business sector remains an important factor. From the proposed model it is clear that there are many actors involved in shaping the business response to one of the most challenging events in our recent history.

With regard to the academic contribution, it should be noted that using systems thinking approach to analyse the consequences of the COVID-19 outbreak is relatively novel and not extensively used. The characteristics of systems thinking makes this methodology particularly useful when applied to complex relations, interdependencies, positive and negative feedback loops and delays. The knowledge developed by scientists is very much needed now, both by businesses and the governments.

From the practical point of view, this paper may be helpful in achieving better understanding of how businesses may react to some changes initiated by other businesses, government institutions or media. It emphasises the fact that the perceptions of some phenomena are a far more important determinant of actual actions than the real phenomena as such. For business owners and business managers this paper offers a reflection on how they may respond to what they know about the COVID-19 crisis in their country and how their knowledge on that is shaped.

The proposed model suggests a few recommendations for the governments. One of the most important tasks for the government during the COVID-19 pandemic is to maintain societal trust in their decisions and actions. The level of trust in government is crucial for the proportion of efforts made by businesses to survive and to comply with restrictions needed to tackle the virus spread. Therefore, the decisions of the government should be predictable (as much as possible in those turbulent times), transparent, adequate and timely. Even drastic restrictions such as nation-wide lockdown may actually increase the level of trust, if carried out properly (Sibley et al., 2020). The lack of transparency as well as hiding knowledge may not only lower the trust, but also diminish citizen engagement in complying with the imposed restrictions (J.-G. Cegarra-Navarro, Vătămănescu, & Martínez-Martínez, 2021).

Government response to the spread of COVID-19 needs to be well balanced. The most restrictive interventions, such as mandatory stay-at-home and business closures may be less effective than expected (Bendavid et al., 2021) and they are very costly in terms of financial and also non-financial loses (Kontoangelos, Economou, & Papageorgiou, 2020; Mackolil & Mackolil, 2020). As it can be seen from the model, if the government restrictions place too much of a burden on business owners and business managers, they are likely to evade those restriction, especially when they feel the restrictions are not properly justified. Business owners and managers also need to learn how to act in an unknown situation – they need to learn fast and be able to unlearn the previous routines and behaviours. The process of unlearning is an important element of knowledge management and can be of special importance in the COVID-19 crisis and after it.

The current COVID-19 situation is new to us all. There are many unknown elements (both the known unknowns and unknown unknowns). A lot of new knowledge is being created. It is of the utmost importance that this new knowledge is shared with and translated to government decision makers, because only under such circumstances the decisions may be made in the adequate way (Gombos et al., 2020). Hence, the governments should create mechanisms of effective knowledge sharing and absorption, as they are crucial for the management of the COVID-19 pandemic.

The last important concern that may be addressed by the government is the role of social media in creating and disseminating knowledge on the COVID-19 crisis. The growing popularity and importance of social media combined with the doubtful quality of knowledge produced by them pose a significant problem. It is necessary for the governments to take the active role in preventing fake news and infodemic monikers from spreading. Promoting relevant, accurate and up-to-date information on the COVID-19 pandemic shapes social responsibility, which is essential in fighting COVID-19 (Hosseini Bamakan & Haddadpoor Jahromi, 2021).

The role of the government in tackling the COVID-19 crisis is very significant, as the government can influence the overall situation in a number of different ways. This crisis is yet another “black swan” and its exceptionality requires facing challenges never faced before. The case of South Korea shows not only that the role of the government is vital, but also that agile, transparent and participatory government policy may effectively fight this crisis (Moon, 2020).

The paper is not free from some limitations. First of all, it is a conceptual work. Making a complete systems thinking model requires extensive and accurate data, which may be difficult to obtain especially when the situation is very dynamic. Furthermore, there are some more elements that can be potentially included in the model, such as factors capturing cultural differences; research suggest that cultural aspects are important in this context (van Bavel et al., 2020). Hofstede cultural dimensions, including individualism, could help explaining differences in attitudes towards the pandemic between countries. Finally, the proposed model is of a preliminary character and it can – and should – be developed to offer more in-depth insights into the business response to the COVID-19 crisis.

The classical Systems Thinking approach presented in this paper can be enriched by a complexity approach (Bratianu & Bejinaru, 2021). This can be beneficial for both

governments and businesses, as it allows to develop new, nonlinear and probabilistic mental models, helping to tackle challenges posed by the COVID-19 crisis.

This paper offers several potential research avenues to follow. As mentioned above, a more detailed version of the proposed model can be created. When fed with the sufficient data, the model can contribute to a much deeper understanding of how business react to the pandemic and how their response can changed to suit the current social and economic situation in a better way. The model can also be further modified with an emphasis on different aspects of economic activity. Some new variables can be also added in the future, depending on the development of global situation and applied measures. The attitude of particular business owners and managers might also be affected by their background, their experience with unknown situations, used mental models, as well possessed knowledge. Those factors could also be added at the level of individual cases analysis and constitute the food for thought in future research. All in all, the potential misinformation and lack of previously created patterns of action make the understanding of the whole COVID-19 crisis a challenge and there is a broad field for potential research opportunities.

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