Identifying Factors Increasing and Decreasing Economic Resilience During COVID-19 Crisis

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Summary
The article contains an overview of the results of recent research by think tanks in different countries, devoted to the analysis of economic resilience factors in the Covid-19 crisis and the development of recommendations for improving preparedness for the next crises. The authors consider and propose a theoretical framework for the concept of the resilience of economic systems. The impact of the COVID-19 crisis on national economies is analyzed. Factors explaining the different cability of economic systems to withstand shock in the short and long term are identified. The reactions of market participants and national governments to the crisis are assessed. It is shown how the COVID-19 crisis has affected the digital transformation of economic systems, and how digital transformation helps to increase the resilience of national economies so that the latter can emerge from the crisis even stronger.

Keywords:
complex economic systems, COVID-19 pandemic, crisis, resilience, digital transformation.

1. Introduction

The COVID-19 crisis has reduced the resilience of key economic systems, and in search of ways to solve the problems that have arisen, researchers have focused on the concept of *resilience development* which promotes efforts to increase the resilience of interconnected systems at various levels [1]. It is recognized that future threats that can have a strong negative impact on the development of complex economic systems cannot be adequately predicted, measured, their impact and consequences cannot be assessed. However, one can be prepared by increasing the resilience potential of systems [2]. Part of this preparation is simulation exercises that show how crises like Covid-19 can unfold. Such exercises were carried out for the countries in the Organization for Economic Co-operation and Development (OECD), but their results, judging by how politicians acted during the pandemic, were not sufficiently considered [3].

Initially, the resilience of an economic system was understood as its ability to recover to its previous state after a shock [4], later resilience has been defined as the potential of the system, due to which shocks will not lead to long-term negative consequences for its development [5, 6]. To put it broader: resilience is the ability to survive and thrive in the face of unpredictable, constantly changing, and potential adverse events. The main conceptual models of resilience agree that an increase in the quality of life or well-being of people is the most important goal (end result) of managing the resilience of economic systems [7]. Three system resilience potentials are analyzed, each contributing to the overall resilience potential, reflecting one of three shock response strategies [1].

Absorption potential is created to maintain the viability of the system: this is the ability of the system to prevent a shock or mitigate (minimize) its impact. This approach is the basis of traditional risk management. It is recognized that the level of preparedness for a new crisis or the next phase of the current crisis determines the ultimate success of all crisis management: preparation for a shock is much more effective than a spontaneous reaction to a crisis that has come. Therefore, some researchers single out the company's ability to prevent shocks and create the necessary level of preparedness from the absorption potential [8, 9]. The extent of damage done is used as an indicator of absorption capacity. The point is determined at which the deterioration must be stopped before the system

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becomes incapable of further response and recovery. It is a measure of the sensitivity or vulnerability of a system to shocks.

The adaptive potential is created to establish resilience: it is the ability of the system to make such changes in its characteristics and behavior that will allow the system to return to its previous state with less loss (without losing critical functions) and as quickly as possible. This potential is measured by the time needed to overcome the effects of shocks (speed of recovery).

The transformational potential is created to increase the vitality of the system: it is the ability of the system to change under the influence of a shock so that the system is more prosperous than before by strengthening the existing and creating new functions that are critical for future resilience development ("bounce forward"). Nassim Taleb called such a reaction overcompensation, working at the breaking point; the risk analyst sees in it a form of redundancy that, under regular conditions, seems like a waste of resources but in fact creates new capacities and forces, a practically new system that can successfully respond to more powerful future shocks [2, pp. 77-79] Some researchers, accepting this concept, refer to the transformation of systems as their adaptation to new conditions to move forward [3, 10].

Globalization gives businesses access to cheaper labor and materials and opens up huge new markets for them; but globalization also increases the complexity of supply chains, the likelihood and impact of disruptions that may have remained locally isolated in the past. In today's hyper-connected supply chain environment, risks evolve at breakneck speed and can strike from almost any direction, including new and unexpected ones [11]. Many company executives have expressed a desire to learn from this crisis to improve preparedness for future crises [12].

The purpose of the article is to select best practices for responding to the COVID-19 crisis for different countries and, based on them, offer recommendations for improving the preparedness of the economy for the next crises.

The article provides an overview of the latest findings by the largest Russian and foreign think tanks devoted to the analysis of economic resilience factors in the Covid-19 crisis.

Theoretical concepts of the resilience of economic systems are considered; we analyze the impact of the COVD-19 crisis on the resilience of companies and households in the short and long term, the reactions of market participants to the shock, the possibilities of digital technologies in supporting productivity and resilience; recommendations are given to improve the resilience of economic systems in the long term.

2. Methods

To achieve the goal of our research, a qualitative study of the impact of the COVID-19 pandemic on the state of the global economy was carried out. Structurally, the study consisted in analyzing the trend of the influence that the resilience factors of economic systems have. The factors were considered both in the short term (outbreaks, restrictions, lockdowns, viability maintenance) and in the long term (recovery and sustainable growth).

We consider it necessary to clarify what we mean by resilience factors of economic systems. Resilience factors are phenomena and processes that have an impact (influence) on the ability of economic systems to withstand a crisis. Factors capture and explain the varying degrees of shock resilience of market participants. All factors are divided into two groups: the ones that increase the resilience of industries, regions, companies, and households, help them overcome the crisis; the ones that reduce the resilience of market participants, create difficulties in their crisis management. In the study, we assumed that the impact of the COVID-19 crisis depended on the ability of national health systems to respond to outbreaks, on the characteristics of industries, companies, workers, and households that determined their response to the crisis [13].

The source framework of the study consisted of research on various aspects of the functioning of the economy (monographs, articles from scientific peer-reviewed journals Scopus and Web of Science), as well as reviews by markets and think tanks in the USA, Russia, and OECD countries. The source framework was updated by the time of publication of the articles and is also limited by the requirement for free access to the necessary materials.

3. Results

3.1 Resilience of economic systems during crises

Over the past 100 years, epidemics have only temporarily deflected the economic cycle with short, sharp shocks without changing its shape. What is the COVID-19 crisis in terms of economic crisis theory? The COVID-19 crisis is an exogenous (external) shock that hit the global economy at a time of increased vulnerability. The trajectory of the spread of the virus and its influence depend both on the properties of the virus itself and on the characteristics of the environment where it spreads. As globalization progresses, interdependent systems become more complex, which increases the risks of unpredictable shocks with cascading effects. The crisis arose against a backdrop of increasing global economic vulnerabilities as the growth of developed countries slowed and many other countries did not grow enough to withstand severe shocks. Is this crisis economic, political or financial?

The COVID-19 crisis caused a reduction in capital expenditures and the subsequent inevitable recession, turning into a *proper economic* crisis (in the traditional sense). The risk that central banks will set repo rates too high, thus tightening financial conditions (monetary policy) and slowing down growth, is assessed as low for developed countries; on the contrary, strong financial support was provided to the economies. Consequently, this crisis is not in the *political* category for them. However, if a major policy error is made, such as a sharp slowdown/contraction in the real money supply, then the recession can be deep and prolonged; it was this mistake that caused the Great Depression.

Financial imbalances, as a rule, grow slowly and over a long period, so just a year and a half ago it was difficult to talk about financial risks and the COVID-19 crisis as a *financial* one. It was obvious that the financial stress was due to the tightness of cash flows, primarily in small and medium-sized enterprises. Financial crises are dangerous because they create structural problems (closing enterprises, mass layoffs of workers, and others), which may take a long time to correct [14]. The coronavirus is causing liquidity and capital problems for the real economy, in response, "discount windows" are being created to provide liquidity in the required volumes to healthy companies and households.

When we try to answer the question of whether and when economies will manage to return to their pre-shock levels of production and growth rates, we analyze the "*shape or geometry of the impact*." Three main scenarios are considered, which are referred to as V-U-L:

- V-shaped: describes a "classic" shock to the real economy, many previous shocks have taken this form, including epidemics;
- U-shaped: although the pre-shock growth trajectory is recovering, there is an irreversible loss in production level; a much more expensive scenario;
- L-shaped: the most dangerous scenario, when the pre-shock growth trajectory does not recover, production losses are constantly increasing, capital investment, labor costs, and productivity are constantly declining.

At the height of the pandemic, the scenario for the crisis unfolding in each country was not obvious, but the expectations of potential investors that determined their behavior were being set. BCG's COVID-19 Investor Pulse Check in May 2020 and February 2021 gave the following distribution of responses to the question about the likely shape of the US economic recovery: V-shaped – 9% (15%), U-shaped - 37% (29%), L-shaped – 24% (23%), W-shaped (another drop after the initial recovery) – 25% (25%) [15]. Figure 1 shows that most investors expect a U-shaped recovery.

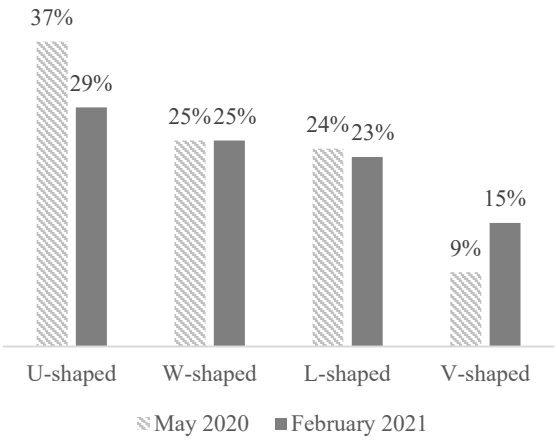

Fig. 1 Investors' expectations regarding the shape of recovery of the US economy, % to the number of respondents (May 2020 and February 2021) [16, 17]

Shocks can have different intensities – the depth and speed of the economy's decline. The intensity of the shock is determined by the properties of the virus and the resilience potential of the economy at all levels. As one can see, efforts in the US are focused on preventing an intense U-shaped scenario, moving closer to the desired V-shaped scenario.

3.2 Preparedness of national health systems to respond to a pandemic: managing strategic reserves

The COVID-19 crisis showed that national health systems were not prepared for an unexpected and rapidly spreading pandemic, which instantly caused a huge surge in demand (ten times in the US) for hospital beds, personal protective equipment, ventilators, medicines, and other supplies urgently needed to save the lives of many people. With the stocks of medical supplies available in countries built for relatively frequent (once every two, three, five, or ten years) and relatively small outbreaks of diseases, such an explosion in demand could not be satisfied in the shortest possible time. For example, at the beginning of 2020, the total global capacity of ventilator manufacturers was insufficient even for the United States [18]. Under these conditions, thanks to the huge and energetic concentration of forces of national research centers, medical institutions, organizations from various sectors of the economy, government bodies in several leading countries (the USA, China, Russia, India, Germany, Great Britain, Sweden), new vaccines and the necessary additional production capacities were created in an incredibly short time.

Keeping a lot of complex and expensive items in stock requires a significant and ongoing investment in their inspection, repair, and replacement, the return on which is not known. Private companies sought to reduce these costs and shift them to the state budget, as a result, strategic

reserves are reduced. M.S. Sodhi and C.S. Tang note that a surge in demand during a shortage leads to a panic increase in demand and misallocation of existing stocks. Thus, in a hurry, unusable ventilators were sent to the states; supplies were made that were neither necessary nor suitable; quality and performance requirements for ventilators were reduced, and ventilators were purchased in various configurations from at least 11 different manufacturers. Maintenance costs have risen and there was an acute shortage of trained personnel across the country for all models [18].

The experience of industries dealing with atypical spikes in demand that occur at different amplitudes and at different time intervals, as well as the experience of mobilizing national resources during periods of escalation of military conflicts between countries suggested how national stocks could be turned into strategic national reserves in case of emergencies. M.S. Sodhi and C.S. Tang proposed a three-tiered system to ensure sufficient medical supplies in the short, medium, and long term.

The first crisis level. For frequent diseases and local epidemics, an annual supply sufficient to cover demand during a typical year is maintained. All units must be fully functional, operate in the same way to minimize the need for staff training, and have interchangeable parts to make maintenance easier and cheaper.

The second crisis level is the use of reserve (duplicate) production facilities for rapid replenishment. Once every few years, a surge in demand can exceed the country's available reserves; it is too expensive to maintain the stocks needed to cover this surge, and therefore it is necessary to have reserve capacity to replenish them. Production must be domestic because imports of goods from countries with lower prices may be disrupted or deliberately interrupted.

The third crisis level is using reserve internal capacities to create new (corresponding to a powerful surge in demand during a pandemic) additional capacities at the national level. This happens when the demand for medical supplies is growing rapidly and exceeds not only stocks but also reserve capacity, and when there is a need for new medical supplies that are qualitatively different from those in stocks. At the third level, years before the start of the pandemic, with the participation of the national government, consortiums of enterprises and organizations from various sectors of the economy (industrial communities) are created, for which the characteristics of new medical devices are determined, as well as the resources necessary for their development and production, rules of interaction and responsibilities during a pandemic and other emergencies. Special measures will be required to stimulate innovation in products and manufacturing for domestic manufacturers of medical supplies [18].

Recognizing the need to improve the resilience of healthcare systems (the pandemic increased the average number of deaths in 33 OECD countries by 16% between March 2020 and early May 2021 compared to the same period in the previous four years), national governments have dramatically increased health spending. With economic activity contracting, the share of health spending in the gross domestic product (GDP) in OECD countries increased from 8.8% in 2019 to 9.7% in 2020 [19].

3.3 Short-term production and supply options

Many countries went from normal working conditions to lockdowns almost instantly, causing a sharp contraction in supply and demand, with wide variations across industries. The most critical operations have been shielded by governments from the direct impact of measures to contain the spread of COVID-19, making these industries more resilient in the short term. Remote work is becoming critical to seamless operations across the economy.

Increasing the level of remote work. Economic resilience depended on the extent to which companies could quickly switch from on-site to remote work. All OECD countries saw an increase in the level of remote work during 2020. The ability to work remotely – in OECD countries, on average, about 31% of employees were able could work remotely – depends on the availability and accessibility of appropriate technology and communications infrastructure, as well as the skills of employees and types of tasks and activities required at work. Some industries have a higher potential for remote work (70% of jobs in IT and financial services), others have a low potential (less than 20% of jobs in hospitality and catering, agriculture, and construction). The actual experience of working remotely before the pandemic was far below the estimated potential level; during the pandemic, many countries peaked close to the maximum potential for remote work [20]. The key question is whether these teleworking trends will continue post-pandemic. Data available in several countries suggests that both workers and employers intend to use remote work more widely than before the pandemic. Policymakers can help businesses maintain the benefits of remote work into the future.

Less important industries with low potential for working remotely which have a fairly high share of employment in most countries have been hit hard by the initial effects of the crisis; such industries are likely to be more vulnerable in the medium to long term.

Remote delivery options. E-commerce has made it possible to switch to contactless methods of sales, the overall volume of e-commerce has increased, and goods have appeared in e-sales that had not been previously bought on the Internet. However, the transition to e-commerce is not possible for all types of products and firms, the transition is due to the degree to which the purchase of a product or service depends on personal contact as well as the ability of consumers and households to move to online ways of identifying, ordering and consuming goods and services.

Susceptibility to potential disruptions in supply chains. Industries have varying susceptibility to potential supply chain disruptions, a simple measure of which is the degree to which different industries rely on intermediate goods from other industries. The crisis has shown that disruption is more likely when intermediate resources come from other industries, with overseas supplies carrying higher risks.
Sensitivity to changes in demand. The crisis has led to changes in demand due to declining household incomes and wealth and increased overall economic uncertainty. The industries that are more sensitive to changes in demand are subject to much stronger recessions or fluctuations than industries with inelastic demand or those producing essential goods. In response to an actual or expected decline in their income, households reduce spending on luxury and durable goods [7]. Firms producing basic durable goods are experiencing increased uncertainty about the future and reduced willingness to invest, even if the companies are not directly under the pressure of the crisis. Essential household services such as health care, education, care, social work, utilities, and food production tend to be relatively insulated from fluctuations in aggregate demand. Most manufacturing industries, especially those producing investment durable goods (machinery and equipment), have been hit hardest during the recession.

3.4 Spending on innovations and research and development

During the COVID-19 crisis, the disruptive force of innovation has increased significantly, the pace of bringing new developments to the market has accelerated, and the obstacles to this have decreased [21]. Government support for innovation must become more extensive and counter-cyclical [22], i.e. as companies cut research and development (R&D) spending, governments should further increase public spending on innovation (even as public debt rises). It has been shown that direct government funding of R&D is more efficient than tax incentives, which are less suitable for supporting innovation spending in cash-strapped or unprofitable companies.

There has been a significant increase in investment in innovation in industries related to health, including those aimed at preparing for future pandemics: biotechnology, pharmaceuticals, and medical devices. Successful digital companies are increasing spending on digital technology, which is in increasing demand, on the assumption that these investments increase readiness for future shocks and challenges.

The pre-pandemic decline in information technology capital expenditures has intensified during the COVID-19 crisis. According to a survey conducted by BCG on May 5, 2020, nearly 60% of companies have put new technologies on hold, 54% have put off updating existing hardware, and 44% have put off adding features or updating existing software. Even companies whose businesses have not been affected by the pandemic have retreated: 45% of these companies have put new technologies on hold and nearly 20% are postponing maintenance spending. At the same time, investments are growing in remote work, application migration to the cloud, communication tools, and cybersecurity. There is reason to believe that the reduction in capital expenditures on information technology will be replaced by their growth during the economic recovery [8].
Company bankruptcies and financial difficulties. In 2020, the number of corporate bankruptcies in 12 OECD countries was lower than in the previous year; in Russia, according to the Federal Resource, the number of bankruptcies decreased by 19.9% in 2020, and by 8.1% in the first quarter of 2021 compared to the first quarter of 2020. This was the result of an emergency support package from national governments. It is believed that limiting bankruptcies is beneficial to the economy in the short term, as it allows one to maintain viable firms that would otherwise exit the market or reduce production and employment. At the same time, there is concern that if unviable businesses remain afloat, capital and labor will not be diverted to new business opportunities and more productive uses. There are concerns that the current decline in bankruptcies could quickly turn into an increase if support and regulatory moratoriums are abruptly lifted (there is evidence of this); the departure from the emergency support policy should be gradual.

The rapid bounce-back of many companies suggests that, despite the high level of uncertainty and falling demand in industries (in Russia, as in other countries, these are the two main factors holding back the growth of industrial production), the crisis has opened up new opportunities for companies, as it used to before. Many national economies have shown greater resilience than anticipated (the pace of their recovery in 2021 is ahead of forecasts), partly due to successful government support policies. The competitive landscape is changing: one of the main lessons of the COVID-19 crisis is that competitors and firms from completely different industries, through the mediation of the state, can suddenly become allies in solving pressing problems.
In OECD countries, there were 60% more unemployed at the end of 2020 compared to 2019. Around 114 million jobs were lost globally, and by the end of 2020, about 22 million jobs were lost in industrialized countries. Young people and low-skilled people from the poorest social classes were hit the hardest; long-term unemployment has been rising. Employment resilience during the COVID-19 crisis has been higher in countries relying on job retention schemes rather than unemployment insurance schemes.

Unemployment in the OECD countries in April 2020 amounted to 8.4%, in the USA – 14.7%, in Russia it is significantly less – 5.8%. In Russia, the peak of unemployment was recorded in August 2020 at 6.4%; in the following months, unemployment continuously decreased,

and in June 2021 amounted to 4.8%, coming close to the pre-crisis (4.7%) value; in the US in June 2021, unemployment decreased to 5.9% [23-26]. Unemployment fell much faster and earlier than expected. Countries are moving towards more targeted support for people.

At the same time, the global labor shortage is growing. The pandemic has fundamentally changed the industries and regions in which people want to work. During the pandemic, 20% of workers changed jobs, including their profession and industry; in the United States, more than three million people stopped working due to fear of contracting COVID-19; working mothers quit their jobs to stay at home with their children for their safety. The heightened risk of contracting COVID-19 has made some jobs riskier than others, making it harder to attract workers to such jobs by offering the same pay as before the pandemic. Workers are more attracted to less risky jobs that can be done remotely.

The easiest way to increase the size of the workforce available to employers is to increase the vaccination rate of the population, make work schedules more flexible, increase wages, and make unemployment benefits less generous as unemployment rates decrease.

Calculations show that decisive government support for enterprises that are potentially solvent but do not have sufficient collateral to cover liquidity shortages will halve the number of companies that run out of liquidity in two months, from 26% to 13% [27]. Modeling has helped one conclude that after a sharp decline in profits, seven to nine percent of viable firms will become distressed (their net worth may be negative, they will be unable to cover interest costs), and their recovery will be incomplete throughout the rest of 2020 [27]. Older, more productive, and larger firms are relatively better placed to withstand the shock than younger, less productive, and smaller firms, which have fewer cash reserves and face greater financial constraints.

Governments are seeking a balance between prematurely withdrawing support from viable firms (which will lead to their liquidation) and providing comprehensive support for unviable firms for too long (which will slow down the reallocation of resources). This balance takes on special features in different regions [28, 29].

3.5 Productivity during and after the crisis

A March 2021 survey in the UK by the Bank of England, Nottingham, and Stanford Universities (using a Decision Maker Panel sample) shows that executives in the private sector attribute "internal" declines in productivity primarily to cost increases driven by measures to contain Covid-19. Covid-19 is estimated to have increased unit costs by around seven percent in 2020; an increase of another four percent is expected in 2021 and just under two percent in 2022 [30]. Accelerating the digital transformation of companies and comprehensive government assistance support productivity.

Remote work can increase productivity but this depends on the circumstances and additional factors; we have yet to see how this dramatic shift in operations will affect the performance of firms post-crisis. It is assumed that there is an optimal level of remote work – when there is too much or too little, it leads to a less desirable impact on productivity (an inverse U-shaped relationship between remote work and efficiency). A productivity analysis conducted by the OECD Global Forum with trade unions found that managers and workers expect regular remote work to become the norm for post-COVID-19 employees and lead to increased productivity [10].

Growing labor shortages are forcing businesses to invest in the latest labor-saving technologies to increase the productivity of existing workers. Thus, labor productivity in the manufacturing industry in the US has reached its highest level in more than a decade.

If the transformations in companies were primarily aimed at reducing costs, this may increase productivity in the short term but will not lead to greater resilience to future crises; on the contrary, transformations that accelerate growth increase the potential for resilience. Debt-reducing reforms soften the initial impact of a future crisis; transformations that reduce fixed costs (intensity of use of existing fixed assets), increase operational flexibility, adaptability, and speed of recovery both make companies more resilient to crises [31].

Productivity will remain below its potential if the financial deficit turns into long-term financial constraints that discourage productivity-enhancing investment; this is more likely if it is not possible to remove the surge of uncertainty, organize retraining and advanced training of workers whose jobs have become redundant. Conversely, some changes in the behavior and demand of consumers and firms can change the way entire industries operate, creating valuable business opportunities for start-ups and chances for radical and disruptive innovation.

Supporting productivity and resilience with digital technology. Before the COVID-19 shock, digital transformation was distributed unevenly across countries, sectors, and companies and proceeded at different paces. The crisis has exacerbated the difficulty that young, smaller, and less productive firms face in adopting and using new digital technologies, and has accelerated the digital divide (inequality) between firms within industries in favor of larger, more digitally mature firms that can better withstand the shock. and even use it to their advantage, increasing their productivity and competitiveness. In more digital and knowledge-intensive industries, lagging firms are catching up with digital leaders at a relatively slow pace, indicating barriers to technology and knowledge proliferation [32, 33]. The decline in business entry was more pronounced in digitally-intensive sectors.

Encouraging the proliferation of technology and knowledge and ensuring that the benefits of digital

transformation are more evenly distributed across companies and within companies among employees are key priorities for policy-makers.

The pandemic has made it clear that the corporate future will be even more digital than previously thought. According to a survey conducted by Deloitte from November 2020 to February 2021 (in which 2,860 CEOs from companies from different industries and regions of the world with annual revenues of at least $100 million took part), digitally mature companies are more are resilient (able to thrive in an environment of uncertainty), better cope with rapid change, significantly improve their financial performance, and put digital transformation at the center of their strategy. The rapid adoption of digital innovation was critical during the pandemic (social distancing restrictions caused a surge in the need for remote work and e-commerce), the positive results of digital initiatives appeared immediately; outdated IT systems have proven to be inflexible and expensive to maintain. The crisis has accelerated existing trends in digitalization: OECD countries saw tremendous growth in internet traffic in 2020, with average internet bandwidth growing by 58% between December 2019 and December 2020 [34].

Digital technologies have become a key element of organizational resilience during the COVID-19 crisis. More than three-quarters of executives surveyed, speaking about resilience, said that their organization's digital capabilities have significantly helped them cope with the challenges posed by the pandemic through greater agility, scalability, the ability to maintain operational excellence in a rapidly changing environment, and the ability to leverage the strengths of others digital ecosystems [35].

A 2020 Gartner survey of CEOs found that over 80% of organizations planned to increase their investment in digital transformation; in a 2021 Deloitte survey, 69% of CEOs said they planned to increase spending on digital transformation in response to the pandemic. Enterprise digital transformation investment is expected to grow at a compound annual growth rate of 15.5% from 2020 to 2023, with total investment over this period reaching US$6.8 trillion [35]. Successful companies – leaders in digital transformation (there are 30% of them) have profits growing 1.8 times faster, and company value – twice as fast as the lagging ones. Enterprises lagging in digital transformation are less successful in customer acquisition, process efficiency, and innovation [36].

Business leaders believe that the post-pandemic world will bring ever more rapid change: more than three-quarters (76%) of them expected their organizations to change more in the next five years than in the last five. At the same time, more than half (52%) believe that the rapid pace of change in technology is not suitable for their organizations or their clients [35].

While digital technologies have the potential to improve productivity and reduce entry costs, recent decades have shown that industries requiring digital technologies experience a faster increase in concentration and dispersion in productivity growth, as well as a significant decrease in business dynamism [32, 37]. Therefore, the ability of firms to access and benefit from new technologies may become even more important in the post-crisis period.

According to the latest (2021) Edelman Trust Barometer, the Covid-19 crisis has caused a drop in trust in digital technologies, despite their outstanding technical capabilities and clear need; the decline in trust in technology has been more significant in developed markets than in emerging markets [38]. This is primarily due to the fear of losing a job (as indicated by 84% of respondents), then the loss of human rights, and increased inequality between social groups; this situation creates new social risks for companies if they do not know how to deal with this problem.

COVID-19 has forced one to rethink and strengthen cybersecurity. Today, the damage from cybercrime is estimated at six trillion dollars a year, which is almost 10 percent of the global economy. Many governments anticipate an increase in the frequency and severity of digital security breaches, which could lead to large-scale disasters. According to the October 2020 S&P Global 451 CEO Survey, the COVID-19 pandemic has increased the priority of such tasks as information security (45% of respondents), business continuity and resilience (42%); 71% of security professionals reported an increase in digital threats since bans began. To maximize the potential of new digital technologies, it is necessary to ensure the security of enterprises at a qualitatively new level, creating reliable protection in the long term (this refers to fifth-generation security).

4. Discussion

4.1 Opportunities for business

The history of crises shows that companies tend to underestimate the urgency, scale, and breadth of the response needed to cope with a crisis and succeed in the future. Companies' responses to downturns are often defensive, belated, and inadequate. During the 2007-2009 recession, companies prioritized short-term actions over long-term initiatives, tended to be reactive rather than proactive, expecting their business to be unaffected by the downturn, and were reluctant to take bold steps to protect themselves from the negative effects or reap the benefits of the recovery [39]. However, recessions present new opportunities, and to use them, companies must move beyond the defensive.

During the past four downturns, an average of 14% of companies have increased both sales growth rate and

earnings before income tax (EBIT) margin. Crisis winners are companies that can [40]:

- prepare for the next recession, not the previous one, by adapting their strategies to the unique aspects of today's development context; the next economic downturn is likely to increase potential risks and rewards;
- during a recession, all companies are preoccupied with solving acute short-term problems to ensure their viability (cutting costs in some places and supporting spending on still attractive growth opportunities); but those companies that manage to use the downturn to accelerate large-scale change, invest in new drivers of growth, have the most success;
- anticipate and prepare for a wide range of scenarios by actively building resilience development capacity; resilience to a range of scenarios is more important than following a point forecast and plan; strong corporate profits and liquidity, the implementation of a long-term digital strategy to keep pace with the accelerating pace of technology development, enhance the opportunity for companies' offensive position, failure detection and prevention;
- start acting as early as possible, capturing weak signals of unmet market needs, changing beliefs and consumer behavior based on the analysis of a large amount of detailed information; the actual range of possible outcomes is often wider than one thinks;
- rethink their business models, identify new pillars for growth, and innovate at high speed ahead of the crisis.

4.2 State policy

The COVID-19 crisis has exposed cracks and failures in many countries, the vulnerability of these countries; governments have responded first to human suffering and economic loss by healing wounds and vulnerabilities. At the same time, the pandemic has given a strong impetus to change, giving national governments the opportunity to implement bold, far-reaching positive structural transformations that will bring long-term benefits to citizens, companies, communities, and nations as a whole. Countries can emerge from the crisis stronger, ready to create competitive, innovative, resilient national platforms in the future. For this, there are technologies, raw materials, human capital, ideas, institutions, and networks, the most important is the willingness to actively participate in transformation and faith in success.

OECD experts recognize that without effective public policy measures, market forces alone are unlikely to ensure sustainable economic growth, as evidenced by pre-crisis trends. The slowdown in productivity growth and investment was expected to continue into the 2020s, with potential production volume in OECD countries growing by just 1.8% in 2020 and 1.7% in 2021, the slowest pace in more than 40 years excluding the global financial crisis [41]. Even more government intervention proved necessary and life-saving in the crisis caused by the pandemic.

Studies of resilient systems show that such systems have common characteristics [42]:

- *redundancy:* access to additional manufacturing capacity can help smooth supply-chain fluctuations, thereby increasing system resilience;
- *diversity:* having multiple approaches to fulfillment can be less efficient but more flexible and resilient in crisis situations;
- *modularity:* highly integrated systems may be efficient, but they are vulnerable to avalanches of knock-on effects; a modular system where organizational units can be combined in different ways offers greater resiliency;
- *evolvability:* systems can be built for optimization and peak efficiency (then they prove fragile under increased pressure) or they can be built for evolvability – constant improvement in the light of new opportunities and problems; the latter are more resilient since each shock is unlike the previous one and there is no single recognizable true answer;
- *prudence:* one cannot predict the course of events in a crisis or their impacts on the system, but we can envision plausible downside scenarios and test resilience under these circumstances; scenarios need to be updated and adjusted to address the most significant risks at any given point in time, practicing one's actions in each of the scenarios.

We believe that government efforts will be focused on pursuing known and new growth paths:

- bridge the digital divide between companies, social groups, and regions by increasing investment in digital infrastructure elements, balancing the use of big data to combat COVID-19, and protecting people's rights to privacy;
- create a deeply diversified economy with many interconnected ecosystems;
- develop a national strategic reserve management system by rethinking the strategic links between industrial policy and national security policy, strengthening domestic sources of essential components and materials, localizing the production of medical equipment, pharmaceuticals, and more in the first place, and reducing dependence on a few mega-manufacturers;
- reduce economic inequality, which has intensified during the COVID-19 pandemic, to increase the social resilience of society; all the necessary tools for this are available.

To prepare for a future crisis, company executives must think through three phases of crisis management at the same time: maintaining viability, building resilience, and increasing company vitality. However, only 10% of executives plan their actions in all time intervals of working with the crisis. The shock can develop with high speed and unpredictability, "long-term" and "short-term" converge in

time; strategic processes should be carried out in accordance with the rhythm of changes in the external environment.

5. Conclusion

Based on the best practices for responding to the COVID-19 crisis in different countries, the framework of the modern economic system resilience paradigm that we have presented has made it possible to offer recommendations for making economies and private businesses more prepared for the next crises.

The ideas we received from think tanks about the impact of various factors on the stability of economic systems occurring under the influence of the COVID-19 crisis allowed one to uncover methodological problems and identify ways to solve them to increase the preparedness of national economies for new crises.

We believe that the systems for ensuring the resilient development of national economies will radically change in the next decade. The efforts of governments and market participants will be aimed at creating deeply diversified economies with many interconnected ecosystems. We plan to explore the development of national strategic reserve management systems as a tool for national security policy and reducing economic inequality, and bridging the digital development gap between companies, industries, social groups, and regions.

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