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## **Degree of Technology, Adequacy of Infrastructure, and Stimulus Rainy-Day-Fund as Determinants of a Firm's Performance during a Pandemic**

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

DEGREE OF TECHNOLOGY, ADEQUACY OF INFRASTRUCTURE, AND  
STIMULUS/RAINY-DAY-FUND AS DETERMINANTS OF A FIRM  
PERFORMANCE DURING A PANDEMIC

A dissertation submitted in partial fulfillment of  
the requirements for the degree of  
DOCTOR OF BUSINESS ADMINISTRATION

by

Palpouguini Georges Idani

2022

To: Dean William G. Hardin III  
College of Business

This dissertation, written by Palpouguini Georges Idani, entitled Degree of Technology, Adequacy of Infrastructure, and Stimulus/Rainy-Day-Fund as Determinants of a Firm's Performance during a Pandemic, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Date of Defense: May 13, 2022

The dissertation of Palpouguini Georges Idani is approved.

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and Dean of the University Graduate School

Florida International University, 2022

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## DEDICATION

I dedicate this dissertation to my wife and my children. They gave me the most needed support and comfort to complete this research.

## ACKNOWLEDGMENTS

I would like to recognize the crucial contribution, suggestions, advice, and guidance of my dissertation committee. Dr. Arun Upadhyay's financial knowledge contributed to grasping financial measurement steps in the research. Dr. Ronald Mesia's competence in marketing and logistics provided a solid incentive to my dissertation. Dr. George Marakas, as my program director, consolidated my progress in the program and the completion of my research. Above all, I would like to thank my major professor, Dr. Fred O. Walumbwa. He has been an exceptional and the most essential leader in the completion of my research. He did not hold back his knowledge while guiding me to the finish line.

FIU's DBA curriculum tremendously built and remade my intellectual thinking, conception, and view of the world of business and research.

ABSTRACT OF THE DISSERTATION  
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This research aims to use a quantitative research method to measure the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-fund as determinants of a firm's performance during a pandemic. The paper draws from the contingency theory, which focuses on situational variables and leadership styles for effective leadership in managing events. The theory describes that "there is no single right method of doing things and it's the context which decides the best approach" (Kureshi, 2013). Leaders guide every innovation and change in an organization for the purpose of self-enhancement (Özkan, et al., 2017). Although abundant research exists on managing internal organization crises, disasters, and unexpected events, existing research on managing pandemic crises is relatively little. This paper uses COVID-19 as a base for testing a firm's performance during a pandemic, which, the paper argues, cannot be managed through standard crisis management. COVID-19 impacted the world and employees' health. Various methods have been applied to protect employees from being sick, including remote work and social distancing. In this paper, technology such as

automation and digitalization, adequacy of infrastructure for social distancing, and stimulus/rainy-day-fund are proposed as alternatives to manage pandemic crises. A survey was designed and sent to the leaders of United States' corporations through Qualtrics, a web-based survey software. The data collected was analyzed using SmartPLS 3 to test the hypothesized relationships. Overall, the results supported the hypothesized relationships, including (1) direct relationship between the adequacy of infrastructure and a firm's performance and (2) indirect relationships between the degree of technology and stimulus/rainy day fund determinants and a firm's performance during a pandemic. Although predicted, the results did not support the hypothesized direct relationships between the degree of technology and stimulus/rainy-day-fund determinants and a firm's performance during a pandemic.

Keywords: Degree of technology, adequacy of infrastructure, stimulus/rainy-day-fund, firm's performance, pre-pandemic preparedness, infrastructure users' well-being, firm's performance evaluation, post-pandemic evaluation, crisis management, contingency theory, pandemic management, COVID-19.



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## ABBREVIATIONS AND ACRONYMS

Anno Domini	AD
Analysis of variance	ANOVA
Average Variance Extracted	AVE
Chief Executive Officer	CEO
Chief Financial Officer	CFO
Coronavirus Disease 2019	COVID-19
Heterotrait-Monotrait Ratio	HTMT
Internet and Communication Technology	ICT
Infrastructure	Infras
Kaiser-Meyer-Olkin	KMO
Latent Variable Correlation	LVC
Performance	Perf
Partial Least Squares Structural Equation Modeling	PLS-SEM
Severe Acute Respiratory Syndrome Coronavirus 2	SARS-CoV-2
Statistical Package for Social Science	SPSS
Stimulus	Stimu
Technology	Tech
Upper-Room Ultraviolet Germicidal Irradiation	Upper-room UVGI

## CHAPTER I. INTRODUCTION

### **Problem Statement**

This research study intends to measure the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-fund as determinants of a firm's performance during a pandemic, using a quantitative research method. To do so, the study draws from the contingency theory. The contingency theory focuses on situational variables and leadership styles for effective leadership in managing events. According to Özkan et al., (2017) leaders guide every innovation and change in an organization for the purpose of self-enhancement. Based on their leadership style, leaders are also flexible in adopting the appropriate pandemic strategy. Pandemic management is not standard, and flexibility in contingency decision-making can be the perfect foundation for leaders to seek alternatives when a pandemic strikes. A pandemic is an unusual event and a different crisis that needs bold and adaptable leadership decision-making. As the COVID-19 pandemic unleashes its fury on human society, corporations worldwide are deeply struck by its consequences, such as economic and financial downturns. Top leadership and the entire management are disoriented as they fight to protect their lives and manage their organizations smoothly to fulfill their duties. While pandemics are not a new concept for humans and organizations, Harper (2015) mentions that pandemics are rare, and they impact lives when they occur. For example, in 250–70 AD, the Plague of Cyprian claimed 15–25 percent of lives in the Roman World (Harper, 2016). The Plague of Justinian in 541 AD wiped out between one to two-thirds of the Roman population, waxing and waning throughout (Harper, 2016).

In the 14th-century, the Black Death wiped out half of the European population. Schamiloglu (2017) notes that the plague impacted the world economically, which led to inflation, shortage of food supply, and a social crisis. Likewise, the Spanish Flu of the 19th century killed more than 50 million people worldwide (Karlsson et al., 2014).

As solutions to these crises and plaques, four major approaches are available for crisis management: preemptive, proactive, responsive, and reactive crisis management. These approaches reveal the need to rethink the best approach to managing pandemics. The existing approaches to pandemic management are useless and have failed (Dobrowolski, 2020). The intensity, duration, and magnitude of pandemics have led several organizations to lose growth or bankrupt. Therefore, this paper proposes an assumption based on the facts of our new-age technologies such as automation, digitalization, and infrastructure of social distancing and workers' safety. Pandemics have the potential to disrupt and destroy the performance of businesses. For instance, the ongoing COVID-19 pandemic has all the means and power to reverse firms' plans and strategies for growth. It also affects human interaction, which is required in every level human society. Rethinking strategies to facilitate or temporarily replace human interaction is primordial in such a situation. The emergence of new technologies can help to accomplish this. Testing the efficacy of the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-funds determinants with respect to the degree of automation and digitalization, the adequacy of infrastructure for social distancing, and the availability of stimulus/rainy-day-funds when managing pandemics is appropriate. A firm-level of technology, such as the degree of automation and digitalization, can replace complete and partial human interaction. Further, appropriate infrastructure can reduce the

risk of indoor airborne transmission of the disease. Financial independence, such as the company stimulus/rainy-day-fund can provide additional resources as needed.

### **Relevance of the Research**

COVID-19 and all other pandemics in the past have tested humans' resilience in keeping up with the average life span and economic and market stability and focusing on the world's vision of human well-being. Every pandemic has revealed that there is a need for salvific strategies to support organizations. Researchers implemented several theories to deal with the world's pandemics. However, the consequences during each pandemic remained troubling. A review of the existing strategies available to deal with pandemics shows no salvific pandemic plan for businesses. Existing crisis management methods used by businesses are inadequate as pandemics always impose recession, depression, bankruptcies, and damage to the world's economy. Therefore, integrating a suitable approach for protecting lives in workplaces by using innovative strategies seems crucial. The degree of technology, adequacy of infrastructure and stimulus/rainy-day-fund determinants appear to be necessary for handling this type of crisis.

Consequently, the aim is to enable the top management and shareholders of organizations to navigate safely through any pandemics. The determinants such as the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-fund are lifesaving for businesses, communities, and customers. The world economy will be better off when each business implements this strategy. In addition, this method will provide researchers with a new way of theoretical thinking by introducing a new approach of crisis management that integrates pre-pandemic preparedness, infrastructure users' well-being, a firm's performance evaluation, and post-pandemic evaluation. Pre-pandemic

preparedness intends to ensure a firm has the appropriate degree of automation and digitalization, adequate infrastructure for social distancing, and available stimulus/rainy-day-fund in case of cash shortages. Infrastructure users' well-being ensures that the infrastructure is safe to use, remote work is available for employees, machines are adequate to replace human workforce, and virtual activities are available for firm operations. The firm's performance evaluation involves observing the determinants' influence on the firm's performance during the pandemic. Finally, the post-pandemic evaluation will help understand the financial outcomes during the pandemic and make necessary adjustments for future pandemics.

Further, exploring the prowess of organizations by studying their approaches to the COVID-19 pandemic can extend the availability of useful managerial tools for upper management staff, shareholders, and decision-makers to capitalize on future pandemics. They will have access to technology, infrastructure, and stimulus/rainy-day-fund to manage pandemics.

### **Research Question**

What are the roles of a firm's technology, infrastructure, and stimulus/rainy-day-fund in predicting a firm's performance during a pandemic?



## CHAPTER II. LITERATURE REVIEW

In recent years, several researchers have extensively crafted theoretical assumptions on crisis management. They based their reasonings on the availability of strategies to manage general and pandemic crises. A pandemic is destroyer of financial layers and cannot be ignored by organizations. Numerous events can result in crises such as a disaster, pandemic, or internal and external organizational predicaments. Yet, researchers oriented their studies on two domains, the planning of crisis management and the study of contingencies to manage a crisis. Their frameworks proposed measuring the efficiency of plans to respond to emergencies, identifying crisis early signs, and implement a strategy for post-crisis management (Lalonde, 2007). It is known that COVID-19 is impacting public health and economies worldwide, which has resulted in the loss of millions of lives, increase of worldwide unemployment, decrease in production, manufacture, and goods and services, and gridlock of supply chain. Khan et al. (2021) used descriptive analysis to explain the changes that affected the growth of world economy, trade, unemployment, and foreign direct investment during COVID-19. They also showed that the pandemic also affected public health, tourism, and travel sectors. Incidentally, governments, economists, business leaders, and researchers failed for centuries to bring an anticipative strategy to avoid the panic that a disease creates during each pandemic. The literature review below aims to understand researchers' views on pandemic crises and the strategies adopted by organizations to deal with them.

Dobrowolski (2020) states that COVID-19 has impacted organizations despite the general conception of the availability of crisis management preparedness plans. His conviction is that organizations are unprepared for crisis even though business leaders

believe in their preparedness to deal with sudden pandemics. He insisted that there is no appropriate strategy for businesses to control unpredictability due the pandemics. To test his claim, Dobrowolski reviewed secondary data and observed the worldwide restrictions introduced due to COVID-19. He found that crisis management should be redesigned from the [current] relational model, built on risk management, to a three-dimensional model proposed by him. In contrast to the relational model, Dobrowolski's model is built on the foresight of three-dimensional crisis management that focuses on crisis prevention, crisis e-management, and post-crisis management. The review of secondary data showed that the success of crisis management is based on the culture's openness to experience, innovativeness, and ethical conduct. Dobrowolski acknowledged that crisis management strategies have failed to deliver an adequate path to control the internal and external events that shape organizations' growth. Dobrowolski's three-dimensional crisis management model seems to add an unwanted strategy in the management of a pandemic like COVID-19. The facts reveal that the fury and nature of COVID-19 are the nullifiers of current crisis management models, and that rethinking alternative models is needed.

Johansen et al. (2012) conducted an extensive survey on internal crisis management and communication with 367 private companies in Denmark in 2011. The survey gave them the initial impression of how companies or organizations perceive, design, manage, and implement internal crisis management and communication actions preceding the crisis, during a crisis, and after a crisis. The results showed that most companies had an integrated crisis management plan. The size of an organization was found to be a factor in designing a crisis management strategy. Crisis plans were available in larger organizations as compared to small companies. The authors added that

organizations were quite active in improving their preparedness for crises (Johansen et al., 2012). A crisis preparedness plan is a formal managerial readiness approach adopted by firms. Nevertheless, the authors fail to include that not all crises have the same characteristics. COVID-19 is an unusual crisis, and it is critical to integrate technological, infrastructural, and stimulus/rainy-day-fund determinants in management preparedness plans.

Williams et al. (2017) found a lack of agreement on the definition of crisis management, leading to fragmented literature on crisis management. The researchers added two conceptual frameworks on crisis management, grouped as “crisis-as-an-event and crisis-as-process.” The concept of “crisis as an event” asserts that crises cannot be totally planned because these events are unexpected, sudden, and non-schedulable. Since crisis events are unexpected, crisis management should focus on the repercussions of the crisis, learn from them, analyze their dynamics, and plan to bring organizations back to normality. The concept of “crisis as a process” focuses on the event before it happens, during its occurrence, and after it has ended. Therefore, a crisis can be addressed before, during, and after the event. The research revealed that the researchers used “crisis-as-an-event and crisis-as-process” to analyze three topics: “crisis management as a normative and staged activity to restore equilibrium, the role of leaders in crisis management, and the importance of crisis management teams” (Williams et al., 2017, p. 736). Their suggestion included not overlooking the importance of resilience in crisis management. Resilience is the means to thwart weaknesses and strategy misalignment.

Jaques (2010) reviewed the literature on pre-crisis and noted a lack of taxonomy in crisis management. While crisis preparedness and prevention are part of each

organization's integrated approach, a proper methodology does not exist. Thus, there is no effective strategy to deal with a pandemic in the absence of a formal methodology.

Jaques (2010) discussed the evolution of crisis management, which has its footprint in the United States' Tylenol poisoning crisis in 1982. The scholar noted that crisis management began as an event's approach. In this approach, a crisis is viewed as a hostile event before finally being seen as a process event that advises strategizing a crisis plan to avoid it. This strategy is viewed as a proactive crisis management. For crisis management success, the researcher recommended institutionalizing a legitimate crisis prevention mindset and recognizing that crisis management cannot be guided by a crisis response alone (Jaques, 2010). For effective crisis management, he suggested addressing the core systemic causes of possible crises proactively, creating effective processes to acknowledge and react to red flags, appropriately detect stakeholders and their perceptions, and implementing methodical organizational learning and unlearning. These four steps are needed in every crisis management irrespective of the nature of the crisis. Pandemic crises need to be recognized and accepted to build a strategy for preparing and responding to them.

A heuristic method is crucial in crisis management. This type of method helps crisis managers with approaches that can eventually lead them to discover the ideal strategy to manage a crisis. The method is a core element in solving problems and making self-discovery. In this regard, competencies in crisis management can support an organization's leaders in providing a clear path for solutions. Van Wart and Kapucu (2011) assume that emergency managers do not discard their duties but adapt them according to each event instead. They employed a quantitative and qualitative method to

test leadership competencies in managing crises, such as disasters and extreme events, and the variation of competencies based on the crisis. A survey was sent via email to 51 emergency managers. The results confirmed the hypothesized constructs. They found the need for calmness in the leadership in case of disasters or significant crisis events that affect millions of people. In addition, leaders must demonstrate self-confidence and resilience to manage the crisis. Further, they must make bold decisions in limited time during a crisis and financial distress. Leaders must also control any chaos and disruption that they may encounter while accomplishing their duties. Leader competencies are critical in managing a pandemic. Calm leadership, enhanced with self-confidence and control on confusion and disruption, solidifies the strategy for pandemic preparedness and management, as well as controlling the pandemic's consequences. The lack of an adequate strategy and preparedness to handle a crisis, and calmness when monitoring a pandemic such as COVID-19 do not help sustain an organization's performance.

Obrenovic et al. (2020) write that corporations that use crisis management theories survive the pandemic. They proved this concept by analyzing and measuring the "Enterprise Effectiveness and Sustainability Model". The model is based on the network structure, supply chain resilience, organizational culture, distributed leadership, digitalization and ICT, and financial contingency plan. Their findings indicate that organizations that employ the "Enterprise Effectiveness and Sustainability Model" (Obrenovic et al., 2020, p. 1) can survive pandemics. Their finding aligned with their hypotheses as organizations with distributed leadership associated with the workforce and adaptive culture maintain their operations when a pandemic occurs. When an organization is resilient, it leads to informed and decentralized decision-making. They

concluded that financial contingency is a critical factor to sustain operations during a pandemic (Obrenovic et al., 2020). For the researchers, informed and decentralized decision-making and financial contingency plans are fundamental to surviving a pandemic. However, they missed out on testing organizational capabilities in maintaining social distancing. COVID-19 is all about social distancing, and any model that omits social distancing in managing COVID-19 undermines an effective strategy to manage firms during a pandemic. It also shadows the trust that firms cannot perform in case of there is a lack of appropriate social distancing measures, coupled with technological, infrastructural, and stimulus/rainy-day-fund determinants that enable firms to replace their human workforce with a technological workforce during the pandemic. As such that, new technologies impose a new way of thinking and managing crises. The degree of automation, in this current paper, is the robots and machines that can replace physical labor (Volkova et al., 2020). The power of this new tool encourages the accommodation of firms' human workforce. It replaces human resources, offers better service quality, reduces the cost of production, and enhances environmental safety. Farley et al. (1987) announce that automation offers lower cost, adequate flexibility, and suitability even though it has some failures and risks. The scholar found an apparent risk in the adoption of the innovation along with behavioral resistance toward changes. However, the benefit remains asserted as automation helps several organizations to improve performance and growth. They add, "while there have been some failures, significant benefits have been realized even from individual elements of automation. Robots have replaced workers in dirty, hazardous, unpleasant, and monotonous jobs, in many cases providing two-year investment paybacks" (p. 4). An exploratory study was used to measure the hypothesized

model. They found that the attitude toward automation correlated to the benefits from automation and the learning of knowledge (p. 8). Thus, automation contributes to organizations' goal of profit maximization.

Furthermore, artificial intelligence is fully used in several organizations for various purposes. In this research, the degree of digitalization refers to artificial intelligence that allows employees to have workplace flexibility. Digitalization is positively and negatively appreciated. The main reason for its negative approval includes its impacts on employment, the demand for new knowledge, and the cost of implementing it. However, digitalized organizations run their businesses as usual because of digitalization, which helps distance socially. Vasilescu et al. (2020) reveal that around one-fifth of the workers in Europe are working from home, using devices such as mobile phones and laptops. These technologies provide them flexibility with respect to work locations. COVID-19 makes social distancing essential for protecting workers in workplaces. For this, remote working is the best approach to maintain social distance. Tanpipat et al. (2021) note that the implementation of remote work in organizations responds to the need for urban industrialization, adapts to the rise of digitalization for remote work, and provides flexible work locations. Remote work is the best strategy to provide flexibility for workers and implement social distancing when a pandemic like COVID-19 occurs.

Relying on technology is essential for organizations' success. Without technological reliance, businesses are left with fewer options in case they want to compete and stay performant. Most firms in the United States depend on new technologies for growth. The dependence on technologies makes it easy for businesses to

integrate technological factors during a crisis such as COVID-19. Isobe et al. (2008) argue that the refinement and reconfiguration of technological capabilities support operational efficiency and organizational performance. The refinement capabilities target refining proprietary assets for operational efficiency, while reconfiguration capabilities help to replace existing proprietary assets with new assets to increase organizational performance. The method is built on the resource-based view and the capability theory. The results of the measurement confirmed the hypotheses. The refinement capability has a strong relationship with operating efficiency, and reconfiguring capability is strongly linked to organizational performance. In this regard, technological dependence is essential to maintain firm performance during a pandemic. The dependence on automation and digitalization is, therefore, essential to maintain a firm's performance during a pandemic.

In addition, the technological expertise is another essential factor for an organizational strategy in implementing helpful technology and maintaining a firm's performance. Having adequate technological expertise can help businesses recover and deal with technological innovations. SubbaNarasimha et al. (2003) studied the breadth and depth of knowledge in the pharmaceutical industry to measure the effectiveness of knowledge expertise on a firm's performance. They found that a firm with lower breadth and depth in knowledge scored lower efficiency in performance. They also found that the amount of technology used impacts how performant a firm is in using technology. The use of technological determinants will be helpful if there is adequate expertise. Technological expertise is, thus, an essential factor in terms of technological determinants for successfully replacing human workforce during a pandemic.



When COVID-19 invaded the world, humankind's protection, interaction, health, and well-being became the topmost priority worldwide. Infrastructure built as a place of human interaction for businesses proved unsafe as buildings, warehouses, stations, and other infrastructures lacked socially distanced accommodations. A Pandemic is rare, but when it occurs, it creates a crisis. The EPA [United States Environmental Protection], (2020) affirms a need to have adequate buildings that integrate social distancing measures. The EPA adds that building a multifaceted layered building is crucial to reducing the virus's transmission. In addition, adequate infrastructure during a pandemic includes a facility that contains air cleaning mechanisms such as air cleaning and filtration technologies, and ventilation (Tang et al., 2021). Beggs and Avital (2020) highlight the effectiveness of using "Upper-room UVGI" to inactivate the SARS-CoV-2 virions in the air, which can lead to reducing the infections in buildings and other confined spaces. However, the construct has not been tested for its impact on firm performance. If social distancing infrastructure is implemented, the indispensable human workforce can be maintained at workplaces. The adequacy of infrastructure is an unavoidable mediator between technological determinants and any firm's performance, as it facilitates the use of technologies.

The concept of stimulus is currently a transaction from governments to organizations during significant crises. However, this transaction is crucial for saving businesses during situations of economic recession due to financial, social, disaster, pandemic, and emergency events. A stimulus is a salvific resource for businesses during crises. During the Great Depression of 2007–2008, the stimulus by the United States, Europe, and several other nations was used to rescue several organizations and avoid

businesses' financial downturn (Karger et al., 2014). Organizations and small and large businesses failed to bail themselves out. They sought government stimulus to not go out of business. Stimulus/rainy-day-fund is crucial for businesses to be financially ready for future crises. It allows firms to set aside an autonomous fund to use or seek government help when pandemics strike. Since pandemics do not happen often, setting aside an autonomic fund is a part of a long-term strategic planning. For this, the governmental stimulus will serve as a second help. It will also be beneficial to save the interest on the government loans.

When the COVID-19 pandemic stormed the world, government leaders implemented social isolation policies to contain the transmission of the virus without implementing a similar measure to support the world economy. Rocha et al. (2021) researched 149 countries to measure the impact of these policies. Using a linear regression analysis, researchers discovered that the effects are heterogeneous among the sample collected. Implementing said policies negatively impacted the world economy. The financial support from the government was a stimulus for firms. However, 80% of the firms in the sample received government assistance. According to scholars, firms that implemented remote work were able to increase sales growth (Rocha et al., 2021).

Top management preparedness is all that is needed to manage crises in organizations. The top management must manage preemptive, proactive, responsive, and reactive crisis management plans. Palumbo (1990) highlights that the fundamental concept of crisis management is to ensure the readiness of the management. It also implies the planning and anticipation of inevitable events and using them as an opportunity. Fowler et al. (2007) analyzed organizational preparedness for dealing with a

major crisis or disaster to assert the preparedness of the top management during a crisis. ANOVA was used to analyze top- and middle-level managers' perceptions and readiness for crises. The research demonstrated that the level of preparedness depends on the level of leadership. So, top-level managers exhibited a perception of preparedness for a crisis, while awareness in the middle-level managers was insignificant. They also found that the organization's size reflected a high perception of preparedness for a crisis if it had over 500 employees.

Researchers believe that a firm's size can have an impact on an organization's performance. Tang et al. (2020) note that factors such as organization size, technological capabilities, and innovation culture are part of the fundamentals of an organization's performance. They hypothesized that the size of an organization could positively affect the performance of small and medium enterprises in China. The result of the regression analysis shows that organization size moderates a company's performance. The level of firm size means more capabilities to achieve the scheduled performance. Other scholars argued that firm size and age are not moderating factors for firm performance when a firm is in an adaptative capability stage. Ngatno and Dewi (2019) say that previous empirical studies revealed that the firm's age did not influence the firm's performance.

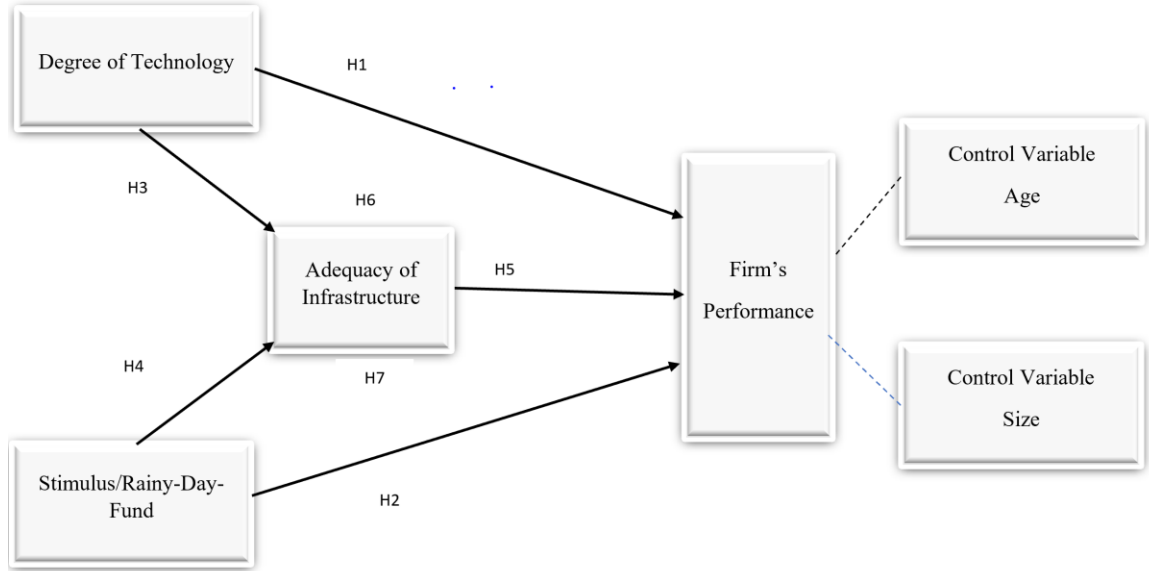
Crisis management of any kind demands the involvement of a transformational leadership to provide meaningful means to be used in any crisis. A transformational leadership guides to see a crisis from problem-based crisis to opportunity-based crisis management. Leadership skills are valuable for implementing strong preparation measures to counter the crisis. Keeffe and Darling (2008) suggest that crisis management needs transformational leaders to nurture attitudes, positive feelings, and robust

engagement of leaders to deal with a crisis. Transformational leadership is valuable when managing a pandemic crisis. Leaders need to transform the problem-based crisis to an opportunities based-crisis. The researchers gave the example of the Microsoft corporation crisis on acquiring and retaining skilled engineers, and researchers for product innovation in this world of continuous technological transformation. The firm lost over 100 employees, who quit their jobs to join Microsoft's competitors. The firm slashed its incentives and benefits to retain the best employees and led the company into an innovation capability crisis (Keeffe & Daring, 2008).

Navavongsathian et al. (2020) employed a stratified sampling method to test the impact of COVID-19 on the performance of auto-parts firms in Thailand through an online questionnaire. The empirical data collected led to the assertion that the COVID-19 pandemic negatively affected auto-parts firms as the pandemic created supply shortages, making it difficult for these firms to meet their operation needs. They noted that the auto-parts sector is deeply affected as the outcomes revealed a pattern of negative performance. The impact of COVID-19 does not limit itself to the auto-parts sector; industries were affected worldwide due to the lack of appropriate strategies to manage the pandemic crisis. The lack of technological determinants is, thus, a major issue for organizations who wish to maintain their production, service, and manufacturing levels.

## CHAPTER III. RESEARCH MODEL AND HYPOTHESES

### Research Model



**Figure 1: Hypothesized relationships**

### Justification of Hypotheses

As an alternative to maintaining a firm's performance, the technological determinants are intended to be used by businesses to have a higher degree of automation and digitalization. The goal of the determinants is to increase firms' technological dependence by installing innovative technology that can facilitate workers' social distancing and ensure the availability of technological expertise. The dependence on technological determinants is critical for an organization's technological transformation. As it is, technological transformation is understood as the level of dependence on technological determinants. In the same mindset, the stimulus determinant is projected to infuse financial capability to organizations to overcome financial challenges during pandemics. At the same time, the adequacy of infrastructure as a determinant is expected

to be used to carry out social distancing and guarantee the safety of infrastructure users. The projected goal of the analysis of this study is to use two predictor variables, one mediating variable, one criterion, and two control variables.

## **Independent Variables**

### **Degree of Technology (Automation and Digitalization)**

The goal for the implementation of automation is to replace human workforce in industries during pandemics. Several businesses, such as production companies, struggle to keep up with the impact of the disease. A high-level automatized organization can contribute to COVID-19 crisis management if it has a proven capability. The goal is to avoid or minimize physical interactions among employees and circumvent the spread of diseases and contamination among employees. Connolly-Barker (2018) informs that advanced automation leads to capital accumulation, which impacts productivity. Digitalization is the use of work-related technologies for/by employees to work remotely or maintain less interaction. Digitalized firms reduce human interactions in data and software functionality. Technological dependence enables organizations, employees, as well as governments to efficiently accomplish their duties and interact without the location barrier, as tasks can be accomplished remotely using the implemented digitization (Vuori et al., 2019).

### **Stimulus/Rainy-Day-Fund**

Companies are unable to bail out themselves during situations involving widespread diseases. Most of them turn to government stimulus to receive funds to solve problems of cash shortages. As a pandemic strategy, adding a stimulus/rainy-day-fund as part of the financial strategy will allow organizations to anticipate cash shortages and

avoid premature bankruptcy. The stimulus/rainy-day-fund is economically the best available tool to build a financial reserve for unexpected critical events such as a pandemic. It helps an organization to avoid interest-bearing on loans borrowed from government institutions through the stimulus strategy. Limited financial resources during the current pandemic pose as a principal challenge for small businesses (Dewan et al., 2020).

### **Mediating Variable**

#### **Adequacy of Infrastructure**

The adequacy of infrastructure in this project refers to upgrading or building adequate infrastructures for social distancing and users' safety, such as buildings, stations, warehouses, airports, and other infrastructures that involve close contact between people. During pandemics, several businesses are challenged by their inadequate infrastructures to deal with spreading diseases. For example, stores, restaurants, airplanes, schools, offices, cruises, and several other businesses are forced to close because they lack adequate infrastructure to operate safely. Moreover, organizations must install the technologies (automation and digitalization) needed during a pandemic crisis.

Technologies (automation and digitalization) usefulness is linked to the adequacy of infrastructure as it can facilitate social distancing among facility's users because of the availability of virus and air disinfecting technologies (CDC [Centers for Disease Control and Prevention], 2021; EPA [United States Environmental Protection], 2020; Beggs & Avital, 2020; Tang et al., 2021). Thus, organizations will have appropriate facilities that guarantee required social distancing and disinfecting systems to avoid spreading viruses in their daily operations.

## **Dependent Variable**

### **Firm's Performance during a Pandemic**

Based on the proposed strategy in this paper, the financial outcomes of organizations during COVID-19 were used for the performance measurement. Financial performance refers to the positive results of an organization's capacities for production and operations. Production capability involves the extractive sector, such as mining and agricultural industries, and the goods-producing sector, such as manufacturing and construction industries. Operation capacity refers to the service sector such as wholesale trade, retail trade, utilities, transportation and warehousing, information, financial activities, professional and business services, education and health services, leisure and hospitality, and other services. Maintaining the level of production or operations of an organization is crucial to prove that despite human workforce shortages, technological determinants, infrastructure to maintain the social distancing, and stimulus/rainy-day-funds are adequate to support an organization's operations. Two types of financial information were queried to measure organizational performances during the COVID-19 pandemic, financial performance in 2019 (before the pandemic) and financial performance in 2020 (during the pandemic).

## **Control Variables**

### **Firm's Age**

The age of a firm justifies its maturity, expertise, experience, and endurance. However, it is not expected that these potential resources can impact the use of technology, infrastructure for social distancing, stimulus/rainy-day-fund determinants during a pandemic. In this study, the age of a firm is used as a control variable.



## **Firm's Size**

In this paper, firm size is defined as a firm's annual revenue and a firm's number of employees. The revenue of a business plays a decisive role in its performance, although it is not expected to impact the implementation of structural and technological determinants. Therefore, the firm's size is used as a control variable.

## **Hypotheses**

H1: A firm's degree of technology will be positively related to its performance during a pandemic.

H2: A firm's availability of stimulus/rainy day fund will be positively related to its performance during a pandemic.

H3: A firm's degree of technology will be positively related to its adequacy of infrastructure during a pandemic.

H4: A firm's availability of stimulus/rainy day fund will be positively related to its adequacy of infrastructure during a pandemic.

H5: A firm's adequacy of infrastructure will be positively related to its performance during a pandemic.

H6: A firm's adequacy of infrastructure will mediate the positive relationship between the firm's degree of technology and its performance during a pandemic.

H7: A firm's adequacy of infrastructure will mediate the positive relationship between the firm's availability of stimulus/rainy day fund availability and its performance during a pandemic.

## CHAPTER IV. METHODOLOGY

This research aims to measure the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-fund as determinants of a firm's performance during a pandemic. A quantitative cross-sectional research design has been used for this purpose. The method involves non-experimental data collection, which is adequate to collect data from subjects and measure the outcome (Babbie, 2017). The process has been applied to (1) define the unit of analysis, (2) collect the data, and (3) analyze the collected data.

### **Unit of Analysis**

Uniformed managerial structures do not exist in the world of business. There are various types of organizational structures. Thus, the sampling of the participants was based on each organization's hierarchical concept. As a result, organizations were retained as the unit of analysis in this study. The sample is comprised of small, medium, and large organizations in the United States. The sample size was important to get extensive detailed facts of the events related to each company strategy for managing the pandemic crises. Parenthetically, having a vital sample size could solidify the result. In the data collection process, the United States' local Chambers of Commerce's websites, LinkedIn, Facebook, acquaintances, and the Companies Market Cap website have been utilized as sources to obtain the company's email addresses.

### **Data Collection**

The data collection involved the design of the survey document and the identification of the best source for data collection to safeguard the validity and reliability of the data to be collected.

## **Survey Design and distribution**

Damrau's (2005) five stages of survey design were used to structure the survey. The first stage involves making sampling decisions, designing the questionnaire, and defining the analysis and report of the data processes. The second stage requires defining pretest processes, such as formative research and final pilot. The third stage identifies the final study, which is the main study. The fourth and fifth stages comprise of the collection and analysis of the data. The pilot survey was limited to 42 questions, while the main study was increased to 63 questions, including 3 distracting questions.

The participants received the surveys through Qualtrics, a highly secured web-based data collection and analysis software. The survey was used to gather data that could answer questions based on two independent variables, one mediator, one dependent variable, and two control variables defined in the model. Following this, extensive data collection was conducted. The responses to the survey were crucial to discover whether the degree of technology determinant, the availability of stimulus/rainy-day-fund, the mediation of the adequacy of infrastructure for social distancing, and the firm's age and size contribute to maintaining the firm's performance during COVID-19 pandemic. In the meantime, the response rate was cautiously monitored. Rogelberg and Stanton (2007) note that nonresponses affect the validity of the data to be collected and nonresponses are on the rise. Finally, they suggested monitoring the survey progress to increase the response rate. Therefore, reminder emails were sent to each participant twice a week to increase the response rates. Table 1 below summarizes the specimen of the survey.

Items	Number of Items in Survey	Construct Name	Abbr.	Questionnaire Specimen	Likert Scale	Type of Construct
Q1.1-Q1.22	22	Degree of automation & digitalization	Tech	Q11: Degree of Automation transformation influenced positively my Firm's financing Q12: Degree of Digitalization transformation influenced positively my Firm's delivery	5pt-scale ranging from Strongly disagree (1) to Strongly agree (2)	Exogenous
Q2.2, Q2.5-6, Q2.9-10	9	Adequacy of infrastructure	Infra	Q2.2: Adequacy of Infrastructure influenced positively my Firm's services	5pt scale ranging from Strongly disagree (1) to Strongly agree (2)	Exogenous
Q3.1,9	2	Stimulus/Rainy-Day-Fund	Stimu	Q3.9: Availability of Stimulus/rainy Day Fund influenced positively my Firm's virtual networking	5pt scale ranging from Strongly disagree (1) to Strongly agree (2)	Exogenous
Q4.1-4	4	Firm's Age		Q4.4: My firm age was a factor that influenced the use of stimulus/rainy day fund and my firm financial performance during Covid-19	5pt scale ranging from Strongly disagree (1) to Strongly agree (2)	Control
Q5.1-4	4	Firm's Size		Q5.1: My firm size was a factor that influenced the degree of automation transformation and my firm financial performance during Covid-19	5pt scale ranging from Strongly disagree (1) to Strongly agree (2)	Control
Q6.1-4	4	Firm's performance during a pandemic	Perf	Q6.2: My firm financial performance during Covid-19 improved compared to pre-covid-19 financial performance because of the degree of digitalization transformation	5pt scale ranging from Strongly disagree (1) to Strongly agree (2)	Endogenous
Q7, Q8, Q9, 10, & 11	5	Demographics		Organization's characteristic such as job position, size, age, income, & sector.	Multiple-choice format	Demographic

**Table 1: Specimen of the survey**

## **Validity and Reliability of Data Collected**

As a highly secured web-based software, Qualtrics, has been used to collect the data because it bears strong reliability. Participants were sampled based on their knowledge of their firms' operations, production, and performance. The participants are owners, CEOs, CFOs, and top-level managers. Drost (2011) pointed out that reliability is a crucial concern in research and that validity reflects the meaningfulness of research components. Still, with the survey questionnaire, the internal validity can be darkened by the trustfulness of the responses from the subjects. Blind trust can be misleading, and the compilation of the sample can be selective. If so, the reliability of the data may be tainted, and the responses may not be accurate or complete.

## **Data Analysis**

The collected data were analyzed in two sections, the pilot and main studies, using the Statistical Package for Social Science (SPSS) and the SmartPLS-SEM. SPSS' principal axis factoring with the direct Oblimin was run for exploratory data analysis. Masood and Lodhi (2016) asserted that SPSS is the most widely used software by postgraduates. The frequencies of organizations' characteristics were also extracted. The assessment focused on descriptive statistics, correlation matrix, Kaiser-Meyer-Olkin (KMO) and Bartlett's test, pattern matrix, and frequency tables. The descriptive statistics provide an outlook of each variable, such as the mean, standard deviation, and the numbers analyzed. Observing the correlations table for individual items helps identify variables that are not correlated. At the same time, the KMO test indicates the level of variance between the variables that the factors cause. Bartlett's test of sphericity tests the assumption that the correlation matrix is an identity matrix, which indicates that the

variables are unrelated and inappropriate for discovering the structure. The frequency tables provide a statistical overview of the demographic information. A PLS-SEM was used to test the hypotheses. Rodríguez-Entrena et al. (2016) highlighted that it can handle complex relationships among latent variables, configure the link between indicators and constructs, and calculate various forms of errors, making it a robust statistical method.

### **Pilot study**

A pilot study is a research strategy to assess the practicality of recruitment material and review processes and the execution of the research (Leon et al., 2010). The pilot study was performed by conducting formative and final pilot research. The formative research reviews the model and the survey for the model's suitability. Zoom meetings were held in July 2021 with selected participants to review the model and the recruitment instrument. The experimental, exploratory test was conducted in August 2021, and the data were collected to detect any weaknesses in the instrument's design. The recruitment focused on 172 participants from United States' small, medium, and large business leaders. Thirty-four responses were received, transferred to SPSS, and analyzed to capture the quality of the outcomes. The most important outcome was the KMO test. The KMO (Kaiser-Meyer-Olkin) test for the pilot is 0.564, which, based on Kaiser's measurement, is considered miserable. Measurement of .90s, .80s, and .70s is said to be marvelous, meritorious, and middling, respectively, for factor analysis suitability. Measurements of .60s, .50s, and below .50 are considered mediocre, miserable, and unacceptable factors regarding factor analysis suitability (Kaiser, 1970). The p-value of Bartlett's test of sphericity is  $<.001$ , which indicates that the correlation matrix of the construct diverges considerably from the identity matrix. Accordingly, the

correlation coefficients are not orthogonal. Automation and digitalization loaded as one factor when the pattern matrix from the factor analysis was extracted.

Table 2 below summarizes results of KMO & Bartlett’s test from the pilot study.

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.564
Bartlett's Test of Sphericity	Approx. Chi-Square	4993.509
	df	1540
	Sig.	.000

**Table 2: Pilot study KMO & Bartlett’s test outcomes**

The model and measurement instruments were updated by combining automation and digitalization to create a new variable, named ‘degree of technology’. The same update led to the use of the ‘adequacy of the infrastructure’ construct as a mediating variable. The questions on the survey increased from 4 questions for each variable to 22 questions for the degree of technology variable, 11 questions for the adequacy of infrastructure variable, and 11 questions for the stimulus/rainy-day-fund variable. The firm’s performance during a pandemic, firm’s age, and firm’s size constructs were not changed.

### **Main Study**

Valuable information was obtained during the pilot study, leading to the restructuring of the model to account for the mediating effect of infrastructure adequacy and adding more questions to the survey instrument. In addition, the survey contained three distracting questions. Cialdini (1993) notes that when participants are stressed, rushed, or fatigued, they tend to miss the flow of the survey. Podsakoff et al. (2012)

suggest that the systematic error in the dataset can be cured by introducing a time-lag in the questionnaires to increase the reliability of the data.

### **Data Selection and Collection (Main Study)**

The same method used in the pilot study was applied to select and collect data. The recruitment targeted 925 leaders from organizations in the United States. Each of them received the survey through emails sent by Qualtrics. The complexities of collecting data from this type of subject led to extensive collection time from September 2021 to November 2021. Seventy-five responses were received, with 12 incomplete responses. Therefore, 63 responses, representing 63 companies, are reliable and valid for use in this study.

### **Analyzing the Data (Main Study)**

The SPSS's exploratory factor analysis and the PLS-SEM's algorithm and bootstrapping are the two techniques highly recommended by researchers to measure these categories of data. The first analysis aided in reviewing the behaviors of factors and making any necessary adjustments to the collection instruments. The second phase was conducted for the final study. The first analysis revealed the need to remove items with lower values. Six items from the adequacy of infrastructure and 9 items from the stimulus/rainy-day-fund constructs that were loading very low have been removed.

The exploratory factor analysis involved extracting the descriptive statistic, the KMO, and the frequencies statistics. The descriptive statistic provides an overview of the central tendency and measures of variability. The central tendency describes the dataset and summarizes the mean, median, and mode, while the measure of variability describes the data distribution. The final study showed a KMO (Kaiser-Meyer-Olkin) and Bartlett's



test of .755 and  $<.001$ , which improved from the pilot study KMO of .564. Table 3 exhibits the Kaiser-Meyer-Olkin and Bartlett’s test outcomes.

<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.755
Bartlett's Test of Sphericity	Approx. Chi-Square	3088.389
	df	820
	Sig.	$<.001$

**Table 3: Main study KMO & Bartlett’s Test Outcomes**

### **Demographics**

Demographic data provides an essential description of the phenomenon of the samples and assists researchers in assessing the quantifiable statistics of the sampled population (Connelly, 2013). The data describe the respondents’ job positions, number of employees, annual revenue, age, and organizations’ sectors.

### **Company leaders’ job positions**

Table 4 recapitulates the statistics of company leaders’ job positions. The results revealed that the participants include 20.6% of chief financial officers, 30.2% of production, operations, service, human resource, and IT managers, and 49.2% of others. The 49.2% marked as others include the company's chief executive officers, managing partners, managing directors, certified public accountants, investor relations managers, project managers, marketing managers, and medical managers. The participants’ jobs were part of this research-centered sampling decision to ensure that knowledgeable sources responded.

<b>Which option best describes your job position?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chief Financial Officer	13	20.6	20.6	20.6
	Production Manager	5	7.9	7.9	28.6
	Operations Manager	9	14.3	14.3	42.9
	Service Manager	3	4.8	4.8	47.6
	Human Resource Manager	1	1.6	1.6	49.2
	IT Manager	1	1.6	1.6	50.8
	Other	31	49.2	49.2	100.0
	Total	63	100.0	100.0	

**Table 4: Company leaders' job positions**

### Company's employees

Table 5 displays the number of employees of each participating company: 66.7% have less than 200 employees, 11.1% employ less than 500 employees, and 22.3% have over 501 employees.

<b>Which option best describes the number of your employees?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 200 employees	42	66.7	66.7	66.7
	201 to 500 employees	7	11.1	11.1	77.8
	501 to 1000 employees	3	4.8	4.8	82.5
	1001 to 2000 employees	3	4.8	4.8	87.3
	Over 2000 employees	8	12.7	12.7	100.0
	Total	63	100.0	100.0	

**Table 5: Company's employees**

### Company's annual revenue

Table 6 provides the range of the annual revenue of each company: 60.3% of the sampled firms made less \$50,000,000; 9.5% earned between \$50,000,001 and \$500,000,000; 4.8% received between \$100,000,001 and 1,000,000,000; and 25.4% gained over \$1,000,000,000. Most firms earned less than \$50,000,000 with less than 200 employees in 2020.

<b>Which option best describes your company annual revenue?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than \$5,000,000	25	39.7	39.7	39.7
	\$5,000,001 to \$50,000,000	13	20.6	20.6	60.3
	\$50,000,001 to \$100,000,000	6	9.5	9.5	69.8
	\$100,000,001 to \$500,000,000	2	3.2	3.2	73.0
	\$500,000,001 to \$1,000,000,000	1	1.6	1.6	74.6
	Over \$1,000,000,000	16	25.4	25.4	100.0
	Total	63	100.0	100.0	

**Table 6: Company’s annual revenue**

### Company’s age

As table 7 below highlights, 38.6% of the participating firms have less than ten years’ experience, 39.6% with 11 to 30 years’ experience in business, and 31.7% over 30 years’ experience.

<b>Which option best describes the age of your company?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5 years	10	15.9	15.9	15.9
	5 to 10 years	8	12.7	12.7	28.6
	11 to 20 years	12	19.0	19.0	47.6
	21 to 30 years	13	20.6	20.6	68.3
	Over 30 years	20	31.7	31.7	100.0
	Total	63	100.0	100.0	

**Table 7: Company’s age**

### Company’s sector

Table 8 features the sector of each organization. The sampling of participants focused on the sectors of each company. The well-known sectors in the United States are the goods-producing, service, and extractive sectors. The goal was to ensure that each

industry was represented in the study. As pandemics do not select sectors or industries to strike, omitting some industries in the tests could hide the global effects of using the modeled variables. Two sectors, the goods-producing and service sectors, responded to the invitation to participate in the research. However, the surveys sent to the extractive sector did not result in any responses. The extractive sector is very selective and has fewer businesses than the goods-producing and service sectors. The responses show that 76.2% of the respondents are affiliated with the service sector and 22.2% with the goods-producing sector.

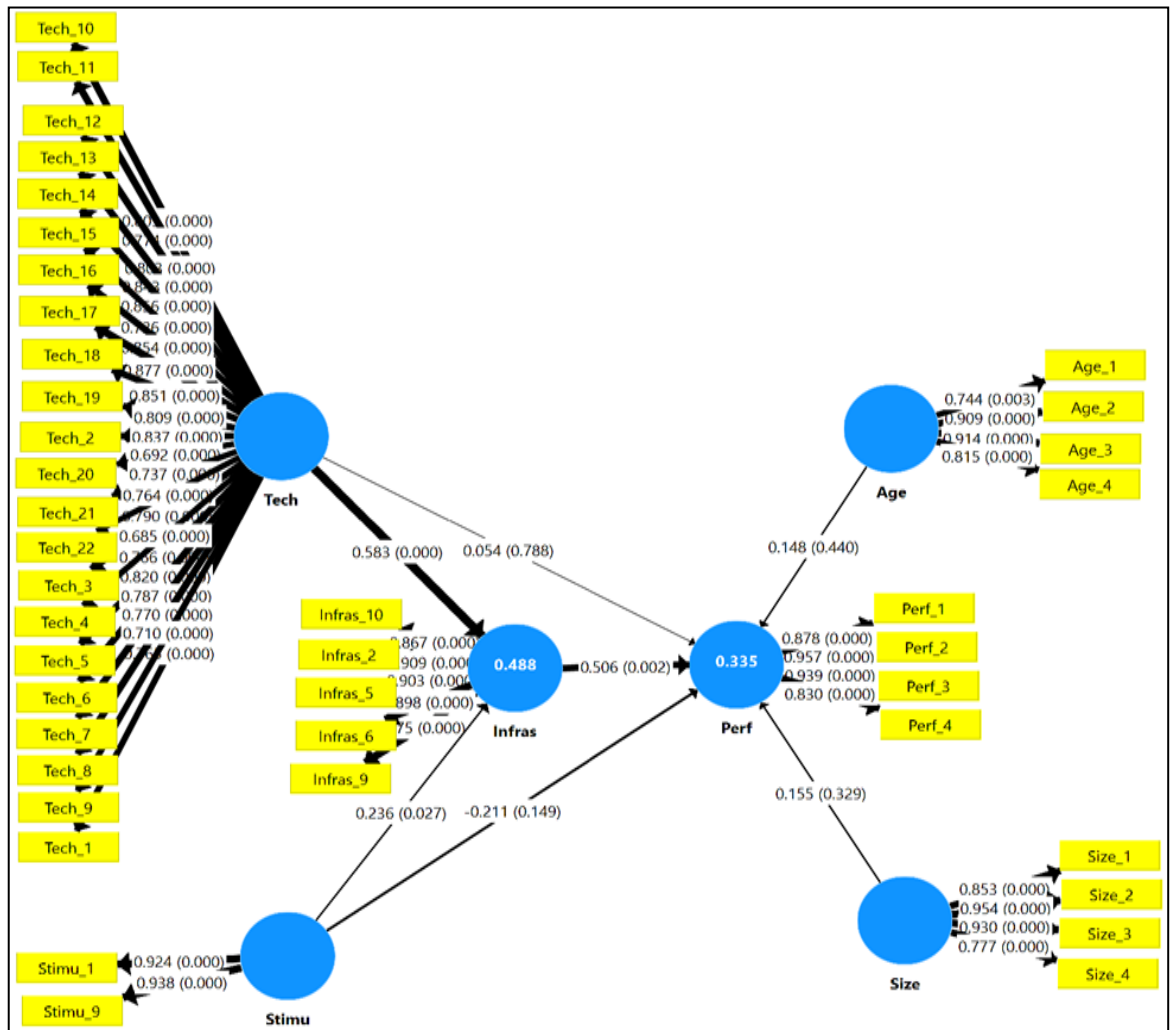
<b>Which option best describes the sector of your firm?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Goods producing sector (Construction & Manufacturing)	14	22.2	22.2	22.2
	Service sector (Wholesale trade, Retail trade, Utilities, Transportation and warehousing, Information, Financial activities, Professional and business services, Education and health services, Leisure and hospitality, Other services)	48	76.2	76.2	98.4
	4	1	1.6	1.6	100.0
	Total	63	100.0	100.0	

**Table 8: Company’s sector**

**Smarts-SEM (PLS-SEM’s algorithm and bootstrapping)**

The advantage of using the SmartPLS-SEM for the final study was assessed. Researchers who analyzed their data using SmartPls-SEM models for constructs measurement sometimes overlook the effect of mediating factors (Hair et al., 2013). The

model was updated to account for the mediating effects, as Figure 1 of the hypothesized model describes. The firm's age and size were used as control variables. Figure 2 below underscores the hypothesized model using the partial least square-structural equation modeling.



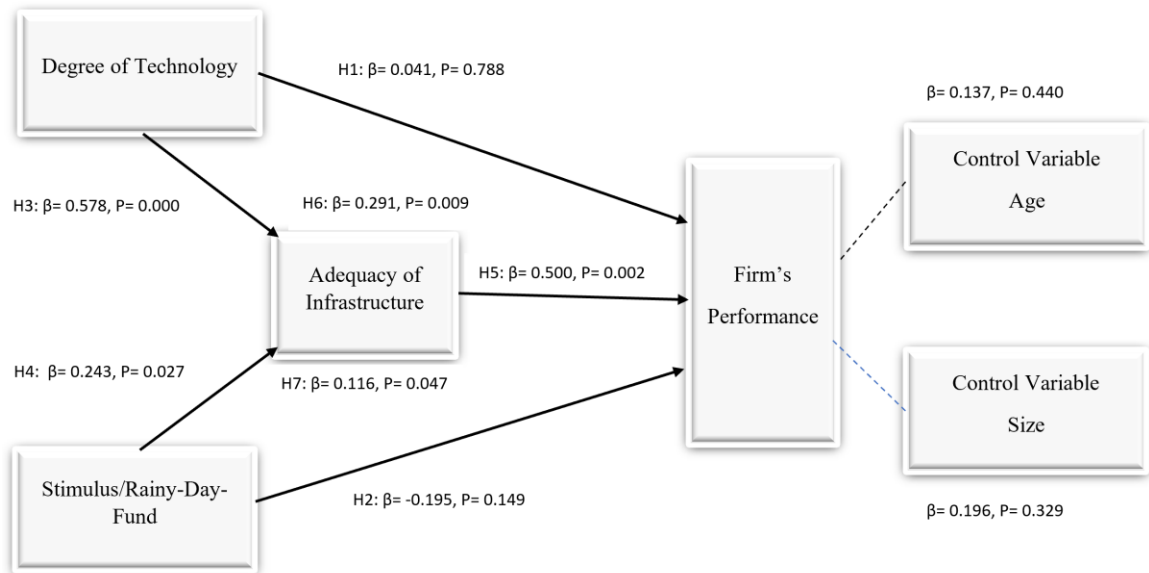
**Figure 2: Partial Least Square-Structural Equation Modeling (PLS-SEM)**

The PLS algorithm is the best tool when a researcher wants to calculate the outer and inner approximations of the latent variable scores and the estimations of outer and inner weights. Therefore, an analysis of the outer loadings, construct reliability and validity, discriminant validity, and the collinearity statistics (inner VIF values) was

conducted. Because the data are nonparametric, the PLS-SEM bootstrapping analysis acts as a guide to retrieve the metrics by running the path coefficients, the direct and indirect effects between the independent constructs and the mediating construct, the R square, the average variance extracted (AVE), the composite reliability, the Cronbach's alpha, and the heterotrait-monotrait ratio (HTMT). Finally, the extracted path coefficients define whether the variables meet the assumption confirming or disconfirming the hypothesized model.

## CHAPTER V. RESEARCH RESULTS

Figure 3 shows the predictors and criterion variables that were tested to define the suitability of (1) technologies, for instance, automation and digitalization, (2) the adequacy of infrastructure for social distancing, and (3) fund determinant such as stimulus/rainy-day-fund as a substitute for managing and assuring businesses' performance during a pandemic comparable to COVID-19.



**Figure 3: Results of Hypothesized Relationships**

### Partial Least Squares Structural Equation Modeling (PLS-SEM) Results

The PLS-SEM has two components of analysis that can be used when measuring the data: the PLS-SEM algorithm analysis and the PLS-SEM bootstrapping analysis. In this study, the PLS-SEM algorithm and bootstrapping assessments were done.

#### PLS-SEM Algorithm Analysis

The algorithm analysis generated the indicator loadings, the internal consistency using Cronbach's Alpha and composite reliability, the convergent validity through the

indicator reliability and the AVE, and the discriminant validity (Sarstedt & Jun-Hwa, 2019).

### **Construct Reliability and Validity**

#### **Outer Loadings**

According to Hair et al. (2017), an indicator loading greater than 0.70 signifies that the variable explains more than 50% of the indicator variance, demonstrating that the indicator displays an acceptable degree of reliability. As Table 9 displays, the analysis of the four constructs of this study shows a satisfactory degree of reliability as each variable is above the rule of thumb of 0.70. The percentage explains more than 50% of the indicator variance.



	Age	Infras	Perf	Size	Stimu	Tech
Age 1	0.745					
Age 2	0.909					
Age 3	0.914					
Age 4	0.815					
Infras 10		0.867				
Infras 2		0.908				
Infras 5		0.903				
Infras 6		0.898				
Infras 9		0.875				
Perf 1			0.878			
Perf 2			0.955			
Perf 3			0.935			
Perf 4			0.838			
Size 1				0.852		
Size 2				0.954		
Size 3				0.930		
Size 4				0.778		
Stimu 1					0.924	
Stimu 9					0.938	
Tech 10						0.809
Tech 11						0.774
Tech 12						0.803
Tech 13						0.843
Tech 14						0.856
Tech 15						0.726
Tech 16						0.854
Tech 17						0.877
Tech 18						0.852
Tech 19						0.809
Tech 2						0.837
Tech 20						0.692
Tech 21						0.737
Tech 22						0.764
Tech 3						0.790
Tech 4						0.685
Tech 5						0.766
Tech 6						0.820
Tech 7						0.787
Tech 8						0.770
Tech 9						0.711
Tech 1						0.765

**Table 9: Outer loadings**

## **Cronbach's Alpha, rho\_A, Composite Reliability, and Average Variance Extracted (AVE)**

Cronbach's alpha is an internal consistency reliability that researchers assert to measure constructs' reliability. It is the magnitude with lower values than the composite reliability (Sarstedt & Jun-Hwa, 2019). Robert (2019) notes that a high Cronbach's alpha suggests that the variables are highly correlated. The normal range is between 0 to 1, and an acceptable value is 0.7 and 0.8 and above. Table 9 shows that Cronbach's alphas are relatively high as the values are above 0.7 but less than 1, as the rule of thumb recommends.

The assessment of the internal consistency reliability is also crucial. Evaluating it using the composite reliability is recommended by researchers. If the composite reliability criterion has a higher value, it indicates a higher level of data reliability. The rule of thumb considers values between 0.60 and 0.70 as acceptable and values between 0.70 and 0.95 as very good for levels of reliability (Hair et al., 2017). The analysis of the composite reliability did not reveal any problematic values in the four constructs analyzed. All the constructs' composite reliability values are between 0.90 and 0.95. The data was therefore considered to be reliable.

The AVE is one way to have an essential view of the data orientation and testing data reliability. An AVE value greater than 0.5 is viewed as satisfactory reliability (Bagozzi & Yi, 1988). The data herein show a satisfactory reliability. The values are above the threshold of 0.5. The data collected bear strong reliability, as the values shown in Table 10 below are between 0.6 and 0.8.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Age	0.876	0.939	0.911	0.720
Infras	0.935	0.935	0.950	0.793
Perf	0.925	0.958	0.946	0.815
Size	0.903	0.949	0.933	0.777
Stimu	0.847	0.853	0.929	0.867
Tech	0.971	0.973	0.973	0.623

**Table 10: Cronbach's Alpha, rho\_A, Composite Reliability, and AVE**

**Discriminant Validity (Fornell Larcker Criterion and Heterotrait-Monotrait Ratios)**

Discriminant validity is a statistical tool to test whether the theories and measurements that are not supposed to be related are not related. Fornell Larcker Criterion and HTMT were included in testing the discriminant validity in this study.

**Fornell Larcker Criterion**

The criterion is a numerical procedure to check the discriminant validity of the model. The AVE square root should be larger than the latent variable correlations. For the discriminant validity to be met, the AVE value must be at least 0.50 (Fornell & Larcker, 1981). The results shown in Table 11 confirm that the discriminant validity requirements were met, as the square roots of AVE are greater than the latent variable correlations.

	Age	Infras	Perf	Size	Stimu	Tech	Discriminant Validity Met? Square Root of AVE >LVC*
Age	0.848						Yes
Infras	0.107	0.890					Yes
Perf	0.246	0.507	0.903				Yes
Size	0.627	0.275	0.318	0.881			Yes
Stimu	0.335	0.432	0.140	0.411	0.931		Yes
Tech	0.265	0.662	0.402	0.298	0.336	0.789	Yes

\*Latent Variable Correlation

**Table 11: Fornell-Larcker Criterion**

### Hetereotrait-Monotrait Ratios (HTMT)

While assessing discriminant validity, it is imperative to ensure that each construct in the analysis is strictly and empirically unique. The HTMT is a different methodology to accomplish that purpose. A predefined threshold below 1 has been proposed by Henseler et al. (2015) as essential, and the threshold needs to be met to have discriminant validity. The analysis of the HTMT in Table 12 reveals that the technology, stimulus, age, size, infrastructure, and performance constructs meet the required threshold for discriminant validity.

	Age	Infras	Perf	Size	Stimu	Tech
Age						
Infras	0.156					
Perf	0.244	0.521				
Size	0.713	0.297	0.331			
Stimu	0.398	0.484	0.156	0.475		
Tech	0.306	0.685	0.396	0.305	0.355	

**Table 12: Hetereotrait-Monotrait Ratios (HTMT)**

### Collinearity Statistics (Inner VIF Values)

In research, it is imperative to evaluate the collinearity in the predictors to ensure the predictors do not measure the same thing. If predictors are highly correlated, it can lead to multicollinearity. Multicollinearity can affect the outcome of a study; its presence can also skew the outcome by increasing the standard deviation errors, leading to inaccurate results of the study (Alin, 2010). The rule of thumb is that there is a multicollinearity problem if the VIF is  $>10$  (Gokmen et al., 2020). The factors in this measurement show that there are no multicollinearity issues, as the VIF is between 1 and 2, which is less than 10 as shown in Table 13.

	Age	Infras	Perf	Size	Stimu	Tech
Age			1.776			
Infras			2.067			
Perf						
Size			1.839			
Stimu		1.127	1.42			
Tech		1.127	1.912			

**Table 13: Collinearity Statistics (Inner VIF Values)**

### **Structural Equation Modeling: PLS-SEM Bootstrapping Analysis**

As part of the Structural Equation Modeling analysis, bootstrapping is a resampling practice used to produce a significant number of subsamples from the original data to calculate models of each subsample (Hair et al., 2014). The method is vital for measuring the path coefficients such as the means, standard deviation, T-value, P-value, confidence intervals, and direct, indirect, and total mediating effects. The same method is also needed to run the R square and the direct and indirect relationships for tested hypotheses.

### **Path Coefficients (Means, Standard deviation, T-Value, P-Value)**

The path coefficients are applied to describe the population in a model. The path facilitates the understanding of the causal relationship among the constructs. There is no supported relationship between the age and size (control variables) with the firm's performance (dependent variable) because the P-Values should be below 0.05 for the relationship to be asserted. Similarly, the degree of technology and the stimulus/rainy-day-fund determinants do not show a direct relationship with the dependent variable. Nevertheless, there is a strong relationship between the mediating variable, adequacy of infrastructure, and firm's performance and an indirect relationship between the degree of

technology and stimulus/rainy-day-fund constructs with the firm's performance, as highlighted in Table 14.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Age -> Perf	0.148	0.137	0.192	0.772	0.440
Infras -> Perf	0.506	0.500	0.159	3.175	0.002
Size -> Perf	0.155	0.196	0.159	0.977	0.329
Stimu -> Infras	0.236	0.243	0.106	2.225	0.027
Stimu -> Perf	-0.211	-0.195	0.146	1.447	0.149
Tech -> Infras	0.583	0.578	0.091	6.379	0.000
Tech -> Perf	0.054	0.041	0.201	0.269	0.788

**Table 14: Path coefficients (Means, STD, T-Value, and P-Value)**

### R Square

An R square is a valuable statistical analysis tool to explain the variance of the endogenous variable (dependent variable) due to the exogenous variables (independent variables). Table 15 indicates that the variance is significant, which means that the variance in the firm's performance during a pandemic is due to the adequacy of infrastructure. It solidifies the mediating role of this determinant.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Infras	0.488	0.494	0.109	4.471	0.000
Perf	0.335	0.421	0.085	3.920	0.000

**Table 15: R Square of the Path Coefficient**

### Tested Hypotheses

The study recommends ways to ensure organizations' performances are not neglected during pandemics. Most theories suggested several strategies to coopt with crisis management. However, none of these strategies could provide an adequate and acceptable solution, as superficial strategies lead to superficial results. Pandemics like COVID-19 can be managed by suggesting strategies that can permit organizations to

continue running while the disease is punching the world. The strategy is to test some hypotheses that seem necessary to diagnose the issues and develop solutions for organizations. Crucial questions were asked to the respondents to test the hypotheses stated herein. Knowing the relationship between a firm's degree of technology, stimulus/rainy-day-fund, and a firm's performance during a pandemic with infrastructure as a mediator is needed. It was also essential to identify the role of a firm's size and age as control variables in the relationship. Table 16 and 17 highlight the tested hypotheses.

	Constructs	Beta	Standard Deviation	T Statistics	P Values	Supported	Why it supports
<b>H1</b>	Tech -> Perf	0.041	0.201	0.269	0.788	No	PV>0.05
<b>H2</b>	Stimu -> Perf	-0.195	0.146	1.447	0.149	No	PV>0.05
<b>H3</b>	Tech -> Infrs	0.578	0.091	6.379	0.000	Yes	PV<0.05
<b>H4</b>	Stimu -> Infrs	0.243	0.106	2.225	0.027	Yes	PV>0.05
<b>H5</b>	Infrs -> Perf	0.500	0.159	3.175	0.002	Yes	PV<0.05

**Table 16: Direct Relationships for Tested Hypotheses**

The use of technology dominates daily activities in every organization. There is almost zero option to function without technologies. Companies need digitalization and automation technologies for most of their productions and operations, such as banking, communications, transportation, delivery, investing, financing, remote working, virtual meetings, manufacturing, and so on.

Hypothesis 1 indicated that a firm's degree of technology would be positively related to its performance during a pandemic. This hypothesis was not supported by the study's data.

Hypothesis 2 suggested that a firm’s availability of stimulus/rainy-day-fund would be positively related to its performance during a pandemic. This hypothesis was also not supported by the study’s data.

Hypothesis 3 suggested that a firm’s degree of technology would be positively related to its adequacy of infrastructure during a pandemic. Results shown in Table 16 indicate that the firm’s degree of technology is positively related to its adequacy of infrastructure. Thus, Hypothesis 3 received support.

Hypothesis 4 suggested that a firm’s availability of stimulus/rainy-day-fund would be positively related to its adequacy of infrastructure during a pandemic. Results shown in Table 16 indicate that there is a positive relationship between the stimulus/rainy-day-fund and the adequacy of infrastructure, providing support for Hypothesis 4.

Hypothesis 5 suggested that a firm’s adequacy of infrastructure would be positively related to its performance during a pandemic. As shown in Table 16, there is a positive relationship between the firm’s adequacy of infrastructure and its performance. Hence, Hypothesis 5 received support.

**Indirect Relationships for Tested Hypotheses**

Mediating constructs are generative systems for the passthrough of an independent variable to influence the dependent variable (Shadish & Sweeney, 1991).

	Constructs	Beta	Standard Deviation	T Statistics	P Values	Supported	Why it supports
H6	Tech -> <u>Infras</u> -> Perf	0.291	0.113	2.621	0.009	Yes	P<0.05
H7	<u>Stimu</u> -> <u>Infras</u> -> Perf	0.116	0.060	1.995	0.047	Yes	P<0.05

**Table 17: Indirect Relationships for Tested Hypotheses**



Hypothesis 6 suggested that a firm adequacy of infrastructure would mediate the positive relationship between a firm's degree of technology determinants and its performance during a pandemic. The results shown in Table 17 indicate that a firm's adequacy of infrastructure mediates the relationship between its degree of technology determinants and performance during a pandemic. Therefore, Hypothesis 6 was supported.

Finally, Hypothesis 7 suggested that a firm's adequacy of infrastructure would mediate the positive relationship between its availability of stimulus/rainy-day-fund and its performance during a pandemic. The results shown in Table 17 suggest that this is indeed the case. Specifically, results indicate that a firm's adequacy of infrastructure mediates the relationship between its availability of stimulus/rainy-day-fund and performance during a pandemic. Hypothesis 7 was therefore supported.

## CHAPTER VI. DISCUSSION, LIMITATIONS, AND CONCLUSION

Researchers have for long ignored or suggested unsuitable crisis management strategies for pandemic management. As such, it is not unexpected that most (if not all) existing strategies were ineffective or failed during COVID-19, as businesses worldwide closed for several months while solutions were conceptualized to run minimal operations. Based on the results of the proposed strategy to manage pandemic crises, theoretical and practical implications are discussed, and a comprehensive examination of the limitations is debated.

### **Discussion**

The inefficacy of crisis management reveals the limit of researchers' intellectual creativity to establish a practical crisis management approach for pandemics. In this research, the proposed approach has been tested, and it offers theoretical ways to build a basis to manage pandemics. The suggested model contains pathways to thinking and acting differently to guarantee an acceptable strategy for organizations. Specifically, the study developed and tested a theoretical model that explains the influence of technologies, infrastructure, and fund determinants on a firm's performance during crises such as COVID-19. In doing so, the hypothesized model results helped explore whether the state of current knowledge on crisis management needed to be improved, corrected, maintained, or replaced. Finally, the theoretical and practical implications of using the degree of technology, the adequacy of infrastructure, and the stimulus/rainy-day-fund determinants in handling a firm's performance during pandemics are thoroughly reviewed and discussed.

## **Theoretical implications**

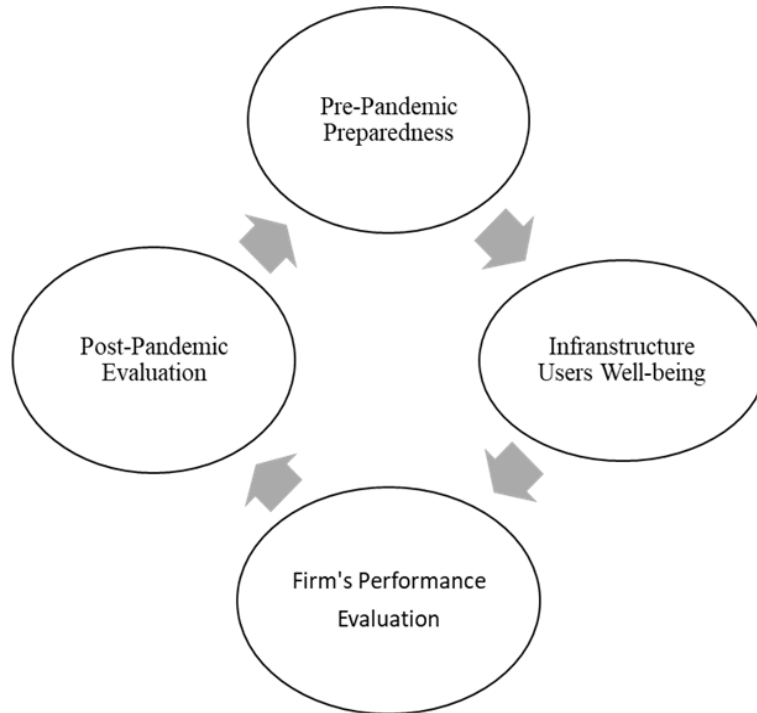
The dataset was analyzed to examine the influence of technologies, infrastructure, and stimulus/rainy-day-fund determinants on a firm's performance during a crisis. The results showed an indirect influence of the degree of technology and fund determinants on firm performance; these relationships were mediated by the adequacy of infrastructure. Notably, the technological determinant comprising automation and digitalization was tested to measure its effectiveness to maintain a firm's operations and performance during COVID-19. Although the study's data did not support this, it is worth noting that most research has identified automation and digitalization as remedies for organizations to replace the human workforce and implement remote work and operations (Farley et al., 1987; Tanpipat et al., 2021; Volkova et al., 2020). The crucial information is that the scholars did not test these technologies as an alternative to managing organizations during a pandemic. They did not also test the effect of infrastructure adequacy as a mediator construct. Nevertheless, as per the findings of this study, the technological determinant is practicable when the adequacy of infrastructure for social distancing is used as a mediator.

The reviewed literature demonstrated that stimulus availability was an important factor for some firms to survive during pandemics. Despite the previous research findings, the result showed no direct relationship between the stimulus/rainy-day-fund and a firm's performance during a pandemic. Nevertheless, the adequacy of infrastructure for social distancing is a crucial feature and a mediating construct that creates an indirect relationship between the fund determinant with a firm's performance. Without infrastructure for social distancing, organizations were forced to close their businesses

during COVID-19, even though they were provided with cash. The study's results showed that technological and fund determinants were indirectly related to the firm's performance through the mediating role of the adequacy of infrastructure determinant, which puts the adequacy of infrastructure for social distancing as an avoidable predictor when implementing and using technologies as solutions to handle pandemic crises. These findings suggested that the infrastructure determinant plays a crucial role in enabling the suitability of automation, digitalization, and stimulus/rainy-day-fund when these predictors are implemented to safeguard a firm's performance during a pandemic. This is an important finding because previous researchers omitted the role of infrastructure for social distancing while crafting the intellectual framework for crisis management in the event of pandemics. In other words, the results of this study suggested that the role of the infrastructure determinant should be incorporated in future theoretical models designed for crisis management in the event of pandemics.

The study's findings also suggested that crisis management frameworks may need to be redesigned to account for the effect of potential mediating mechanisms when researchers implement crisis management. These frameworks should be remodeled for a new strategy of pandemic management by including pre-pandemic preparedness, infrastructure users' well-being, firm performance evaluation, and post-pandemic evaluation, as highlighted in Figure 4. The pre-pandemic preparedness intends to ensure that a firm has the appropriate degree technology (automation and digitalization), adequate infrastructures for social distancing, and available stimulus/rainy-day-fund for cash shortages. The infrastructure users' well-being ensures that the infrastructure is safe to use, remote work is available for employees, machines are adequate to replace the

human workforce, and virtual activities are available for the firm operations. The firm's performance evaluation is to observe the influence of the determinants on the firm's performance during a pandemic. The post-pandemic evaluation will help understand the outcomes and make necessary adjustments for future pandemics.



**Figure 4: Proposed Pandemic Crisis Management Model**

**Practical implications**

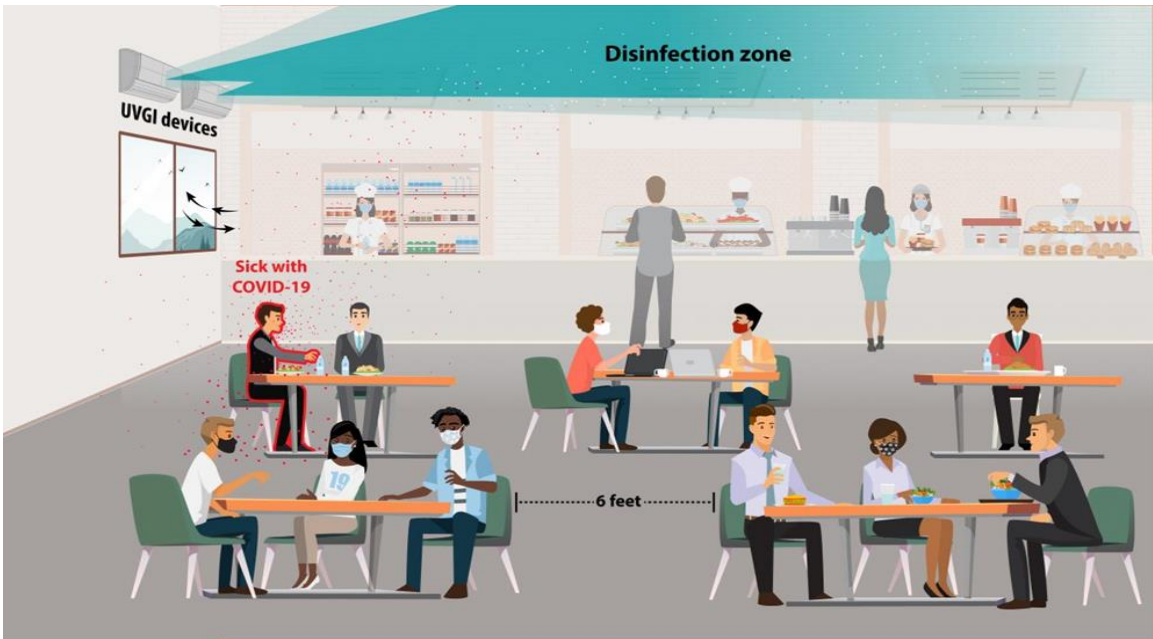
Evidence from the measured constructs demonstrates the importance of the degree of technology, adequacy of infrastructure, and stimulus/rainy-day-fund as determinants of a firm's performance during a pandemic and the proportion of their effects in relationship with the criterion variable. This study solves the lack of available theoretical framework by suggesting that the strategy's applicability depends on firms' managerial decision-making, and a contingency plan is needed to prepare for future pandemics.

The hypothesized variables show a strong direct and indirect relationships between the predictors with the criterion variable. It means that the crafted strategy stands as an alternative to crisis management when a pandemic occurs. Hence, managers have the desired approach to apply the determinants with adequate infrastructure.

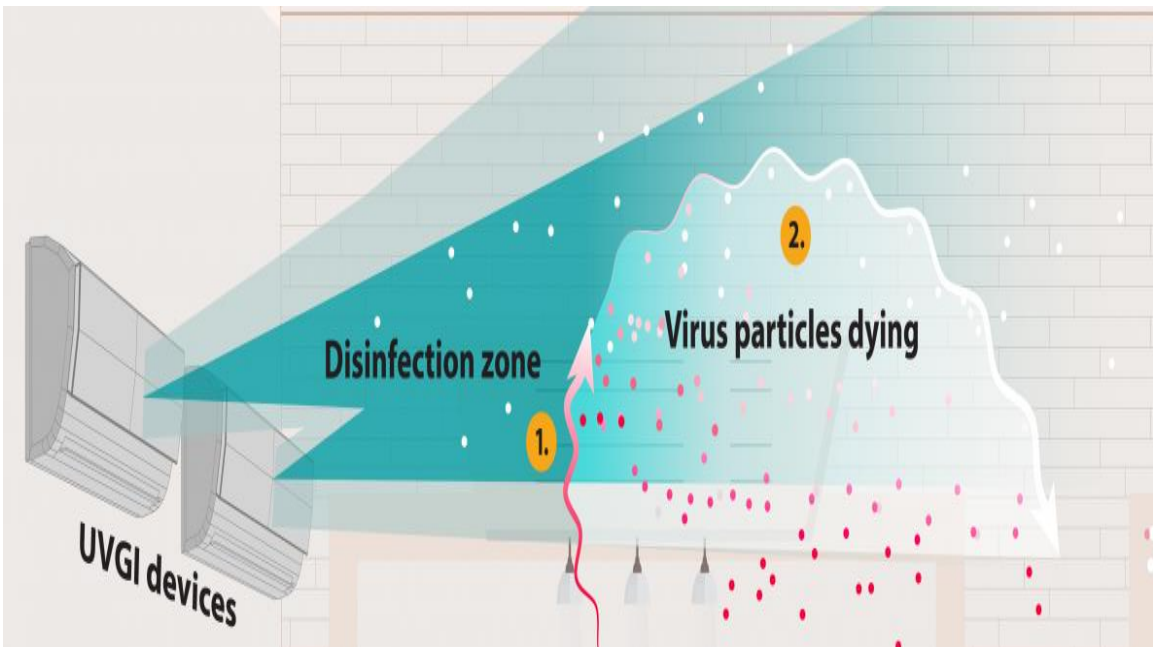
The benefit of automation and digitalization is that the factors are appropriate to manage the daily operations of organizations. For example, automation serves as working and servicing machines and robots for delivery, services, production, and manufacturing. The machines and robots simplify the stated activities without employee or human force. Digitalization achieves similar goals using different means with a substantial increase in labor and working capability, such as marketing, sales, remote work, virtual communication, virtual networking, investment, and financing. In addition, the adequacy of infrastructure for social distancing is needed for automation and digitalization to be used as an alternative to manage a pandemic crisis because it avoids immediate contact between facilities' users.

The findings also revealed that the fund determinants (stimulus/rainy-day-fund) add more options for leaders to manage pandemic crises. There is an indirect relationship between stimulus/rainy-day-fund with a firm's performance. This means that the adequacy of infrastructure for social distancing is critical to ensure that the determinant is functional. Ensuring cash reserve availability before any pandemic is creative and serves as strategic decision-making. The reserve could support the negative income inflow during the early stage of a pandemic. Still, the lack of adequate infrastructure could impact that as well.

Finally, the study findings uncovered that the adequacy of infrastructure for social distancing is crucial in this pandemic management model. There is a direct relationship of the infrastructure determinant with the predictors and the criterion variable. Appropriate facilities appear to commend the model's success. Managers need to integrate the mediating factor to obtain an appreciable result of a firm's performance during a pandemic. However, the adequacy of facilities is not limited to social distancing. For instance, the EPA [United States Environmental Protection] (2020) affirmed a need to have adequate buildings that integrate social distancing measures. The office added that implementing a multifaceted, layered building is crucial to reducing the virus's transmission. Furthermore, the CDC [Centers for Disease Control and Prevention] (2021) designed an upper-room ultraviolet germicidal irradiation (UVGI). As Figure 5 and 6 show, adequate infrastructure is a facility containing air-cleaning mechanisms, such as air cleaning and filtration technology ventilation (Tang et al., 2021). Finally, Beggs and Avital (2020) highlighted the effectiveness of using "Upper-room UVGI" to inactivate the SARS-CoV-2 virions in the air, which can ease the infections in buildings and confined spaces.



**Figure 5: CDC's Upper-Room Ultraviolet Germicidal Irradiation Model**



**Figure 6: CDC's Disinfecting UVGI Devices**

Yet, it is essential to note that the lack of good strategy and preparedness to handle a crisis and the calmness of monitoring a pandemic like COVID-19 cannot sustain an organization's performance. Leaders need to make courageous decisions. They must



prepare before the pandemic despite having limited time and financial resources. Leaders should also control any chaos and disruption in accomplishing their duties by having a contingency plan to implement the technology, fund, and infrastructure determinants as applicable. The competencies of leaders are essential in managing a pandemic. The calmness of the leadership enhanced with self-confidence and control of confusion and disruption solidify the strategy for pandemic preparedness and management, and the control of the pandemic consequences. The proposed pandemic plan demands a robust pre-pandemic preparedness, which includes installing the technological determinants such as automation and digitalization, creating a financial reserve such as cash, and updating or building facilities that incorporate social distancing measures and safety for users' well-being.

Some scholars recognize that pre-crisis preparedness is essential to getting ready for crises. In this regard, the pre-pandemic preparedness in this study integrates the installation of automation and digitalization that fully equips each department to ensure the availability of an acceptable degree of technological determinants. The installation of automation and digitalization is the most affordable thing to do for technologized firms as most of them in the United States depend on new technologies for growth, thus making the process easy to implement. The enactment of the plan also requires proper expertise to manage the process. For example, SubbaNarasimha et al. (2003) found that technology impacts how a firm is performant in using technology.

The pre-pandemic preparedness likewise includes creating salvage financial reserves to anticipate cash shortages during the first six months of the pandemic. A stimulus is most needed for many businesses during crises. Karger et al. (2014) informed

that during the great depreciation of 2007–2008, the United States, Europe, and several nations' stimulus was used to rescue several organizations to avoid a business financial downturn. Organizations, including small, medium, and large businesses, failed to self-bail out. Instead, they looked for government stimulus to not go out of business.

Stimulus/rainy-day-fund as a factor of accumulating financial reserves is crucial for businesses. It enables organizations' financial readiness for future pandemics or crises. It allows setting aside an autonomic fund or seeking governmental help when pandemics strike. Since pandemics do not often happen, setting an autonomic fund is long-term strategic planning. According to this research, the adequacy of infrastructure is the heart of ensuring the well-being of infrastructure's users. As a result, organizations must invest in modifying existing facilities or building facilities that integrate social distancing components and safety features. The design for the modification depends on the infrastructure and the purpose. For example, Figure 5 shows the CDC's upper-room UVGI model that can be used for social distancing and maintaining the safety of facilities' users.

As a rule of success, the pre-pandemic preparedness and infrastructure for users' well-being should be implemented long before any pandemics to guarantee the success of the plan. Using this strategy as an active-pandemic preparedness will be ineffective. Leaders of organizations may argue that the cash reserves will set aside substantial funds without investing them, which is not commendable. This plan aims to have enough funds to cover the overhead costs for the first six months during a pandemic. Having funds to cover the overhead costs while the plan is activated will be necessary during this kind of crisis.

For the firm's performance evaluation, management would have to assess the strategy's efficiency by evaluating the determinants' influence when a pandemic is evolving. If the plan is efficient, adverse outcomes will be minimized. However, higher adverse outcomes can result from ineffective implementation and management of the crisis. Therefore, it is worth noting that a mid-pandemic assessment is pivotal to addressing the cause of the drawbacks.

The final step is making sure that the strategy is the dream plan for an organization by conducting a post-pandemic evaluation. Any operation and performance failure should be considered after the pandemic; additionally, it should be analyzed and mitigated appropriately to avoid an escalation during future crises. The measurement should target the financial results of the year(s) during the event and the previous years out of pandemics.

### **Limitations**

As with any other study, this study has some limitations worth highlighting. The first limitation is the method and data collection because the study included three sectors, not necessarily the whole industries. Thus, the sample may not be representative. Future studies are encouraged to extend the research by increasing the sample size and including a broader array of organizations to test the relationships tested in this study. The responses of the participants may also have been affected by method bias. Although the study design attempted to address this by introducing a distraction item in between (Podsakoff et al., 2012), the fact that the responses came from the same source, common bias cannot be ruled out. Future studies are encouraged to collect data at different points in time to address this potential methodological problem to increase the accuracy of the

results. The second limitation is about the nature of the tested constructs. The constructs have not been tested as determinants for pandemic crisis management in the past. More precisely, all the previous theoretical frameworks omitted the role of the degree of technology, adequacy of infrastructure, stimulus/rainy-day-fund, and firm performance during pandemics. Consequently, this research is the first intellectual work using the stated factors to manage pandemics like COVID-19. Additional research is needed to extend the measurement and findings of this study.

## **Conclusion**

In satisfying a growing, logical, plausible, and inexorable need of proper strategies of the silent expression of the world of business to manage pandemic crises, the efficiency of technology such as automation and digitalization and fund such as stimulus/rainy-day-fund factors were studied to measure whether these determinants could be a response to maintain a firm's performance during COVID-19. A quantitative method was applied, and surveys were sent through Qualtrics to companies in the United States. The collection yielded sixty-three positive responses that were asserted useful. The data were analyzed through (1) SPSS for the descriptive statistics and frequencies and (2) the SmartPLS-3 to test the hypotheses.

A significant question was asked: whether there exists a relationship between (a) a firm's degree of technology, (b) stimulus/rainy-day-fund, and (c) a firm's performance during a pandemic with (d) adequacy of infrastructure as a mediator. Seven hypotheses were tested. The results from the measured predictors and criterion variables confirmed the relationship between a firm's degree of technology and stimulus/rainy-day-fund with a firm's adequacy infrastructure social distancing. There was also a direct relationship

between the adequacy of infrastructure and the criterion variable. The indirect relationship between a firm's degree of technology and stimulus/rainy-day-fund with a firm's performance during a pandemic was confirmed. However, the study did not confirm the direct relationship between a firm's degree of technology and stimulus/rainy-day-fund with a firm's performance during a pandemic. The explored model and the results that followed demonstrated that the degree of technology and stimulus/rainy-day-fund determinants are tangible theoretical constructs that can be effectively utilized to manage organizations during pandemics, such as COVID-19. When a new pandemic will strike the world remains a mystery. However, wisdom recommends pre-pandemic preparedness to avoid the traumatism caused by COVID-19 to humankind and specifically to businesses. It is also to anticipate by applying the theoretical framework proposed in this study.

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## APPENDICES

## Survey document

### Predicting variables

<b>Degree of Technology</b>
Degree of Automation influenced positively my Firm's delivery
Degree of Automation influenced positively my Firm's services
Degree of Automation influenced positively my Firm's production
Degree of Automation influenced positively my Firm's manufacturing
Degree of Automation influenced positively my Firm's marketing
Degree of Automation influenced positively my Firm's sales
Degree of Automation influenced positively my Firm's remote work
Degree of Automation influenced positively my Firm's virtual communication
Degree of Automation influenced positively my Firm's virtual networking
Degree of Automation influenced positively my Firm's investment
Degree of Automation influenced positively my Firm's financing
Degree of Digitalization influenced positively my Firm's delivery
Degree of Digitalization influenced positively my Firm's services
Degree of Digitalization influenced positively my Firm's production
Degree of Digitalization influenced positively my Firm's manufacturing
Degree of Digitalization influenced positively my Firm's marketing
Degree of Digitalization influenced positively my Firm's sales
Degree of Digitalization influenced positively my Firm's remote work
Degree of Digitalization influenced positively my Firm's virtual communication
Degree of Digitalization influenced positively my Firm's virtual networking
Degree of Digitalization influenced positively my Firm's investment
Degree of Digitalization influenced positively my Firm's financing

<b>Stimulus/Rainy-Day-Fund</b>
Availability of Stimulus/rainy Day Fund influenced positively my Firm's delivery
Availability of Stimulus/rainy Day Fund influenced positively my Firm's virtual networking

**Mediating variable**

<b>Adequacy of infrastructure</b>
Adequacy of Infrastructure influenced positively my Firm's services
Adequacy of Infrastructure influenced positively my Firm's marketing
Adequacy of Infrastructure influenced positively my Firm's sales
Adequacy of Infrastructure influenced positively my Firm's virtual networking
Adequacy of Infrastructure influenced positively my Firm's investment

**Criterion variable**

<b>Firm's performance during a pandemic</b>
My firm financial performance during Covid-19 improved compared to pre-Covid-19 financial performance because of the degree of automation
My firm financial performance during Covid-19 improved compared to Pre-covid-19 financial performance because of the degree of digitalization
My firm financial performance during Covid-19 improved compared to pre-Covid-19 financial performance because of the adequacy of my infrastructure for social distancing
My firm financial performance during Covid-19 improved compared to my 2019 pre-Covid-19 financial performance because of the stimulus/rainy day fund

**Controlling variables**

<b>Age</b>
My firm age was a factor that influenced the degree of automation transformation and my firm financial performance during Covid-19

My firm age was a factor that influenced the degree of digitalization transformation and my firm financial performance during Covid-19
My firm age was a factor that influenced the adequacy of infrastructure for social distancing and my firm financial performance during Covid-19
My firm age was a factor that influenced the use of stimulus/rainy day fund and my firm financial performance during Covid-19

<b>Size</b>
My firm size was a factor that influenced the degree of automation transformation and my firm financial performance during Covid-19
My firm size was a factor that influenced the degree of digitalization transformation and my firm financial performance during Covid-19
My firm size was a factor that influenced the adequacy of infrastructure for social distancing and my firm financial performance during Covid-19
My firm size was a factor that influenced the use of the stimulus/rainy day fund for my firm financial performance during Covid-19

<b>Demographic questions</b>
Which option best describes your job position?
Which option best describes the number of your employees?
Which option best describes your company annual revenue?
Which option best describes the age of your company?
Which option best describes the sector of your firm?

## VITA

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