

## Article

# Organizational Reliability Model Verification in the Crisis Escalation Phase Caused by the COVID-19 Pandemic

Agnieszka Bieńkowska , Katarzyna Tworek \*  and Anna Zabłocka-Kluczka 

Department of Management Systems and Organizational Development, Wrocław University of Science and Technology, Wyb. Wyspiańskiego 27, 50-370 Wrocław, Poland; agnieszka.bienkowska@pwr.edu.pl (A.B.); anna.zablocka-kluczka@pwr.edu.pl (A.Z.-K.)

\* Correspondence: katarzyna.tworek@pwr.edu.pl

Received: 6 April 2020; Accepted: 22 May 2020; Published: 25 May 2020



**Abstract:** This article concerns the Organizational Reliability Model (ORM) verification in the crisis escalation phase caused by critical conditions of organization functioning induced by the COVID-19 pandemic. ORM is constituted by three reliabilities, human resources, information technology, and management, which are mediators through which Type-1 and Type-2 reliability capabilities influence organizational reliability. Organizational reliability is a prerequisite for sustainability of contemporary organizations. The model was developed and verified for a variety of operating conditions. However, crisis induced by a Black Swan type of event creates conditions so critical that it calls for verification of known paradigms and models, as an element of crisis-state theory building. This is why this paper's aim was to verify the ORM and explain the mechanisms of shaping organizational reliability in such conditions in order to contribute to both theory (verifying the organizational reliability paradigm among organizations in crisis) and practice (proposing mechanisms, potentially helping them survive). The ORM is empirically verified based on the sample of 115 employees from Italy operating under critical conditions of the COVID-19 pandemic (research carried out in the week of 18–22 March 2020). In order to verify the hypothesis, the path analysis was executed using SPSS AMOS. The results confirmed that in the extreme critical conditions causing crisis escalation for the organizations, there is a need to redefine the existing paradigms, including ORM. The results show that the HR reliability role in the ORM has drastically changed and the mechanism of its influence on organizational reliability is significantly different in crisis influenced by critical conditions of organization functioning. They also confirmed that IT together with HR is dependent on management to change the way of working and until that, its reliability may be counterproductive for the reliability of organizational as a whole. Therefore, obtaining sustainability in the crisis escalation phase requires redefining the mechanisms for securing organizational reliability.

**Keywords:** management; paradigm verification; organizational reliability; organizational sustainability; COVID-19 pandemic; crisis

## 1. Introduction

Organizational reliability is understood as the organization's ability to maintain a proper organizational performance aimed at limiting the number of organizational errors [1]. Such understanding on organizational reliability is accepted by various authors (e.g., [2]), who claim that organizational reliability is connected not only with errors, but also (or above all) with proper performance. Ensuring the reliability of the organization is important in all conditions of its functioning, i.e., in a stable as well as dynamic or turbulent environment. Because of that, the Organizational Reliability

Model (ORM) was developed by Bieńkowska, Tworek, and Zabłocka-Kluczka [1]. ORM indicates elements that build organizational reliability and characterizes the relationships between these elements. There are three basic pillars of the model: the reliability of Human Resources (HR), information technology (IT), and management (MGT). All of them are influenced by organizational reliability capabilities, divided into: (1) ordinary capabilities, which are necessary and sufficient for the organization to effectively execute day-to-day tasks in normal conditions (Type-1 reliability capabilities), and (2) additional/specialized capabilities which become necessary for the organization to function in abnormal conditions (Type-2 reliability capabilities) [1]. Conditions are considered normal when they do not endanger the functioning of the organization, even if they are changing (most contemporary organizations operate in a changing or even turbulent environment). The source of abnormal conditions is called a hazard, which can be understood as an unpredicted and potentially harmful situation that is present in the environment of the organization and can potentially influence its operations (but currently it is not happening) [1].

However, ensuring reliability becomes an especially important issue in the extreme conditions of the organization's functioning, which cause crisis in those organizations. Such conditions can disturb the sustainability of the organization and thus, threaten not only its sustainability but also its sole survival by triggering a spiral of escalation of negative phenomena in the organization. Ensuring reliability is becoming a necessary condition for those organizations to overcome the crisis and restore their sustainability and balance [3]. Moreover, the sustainability of organizations forced to operate in such critical conditions is without a doubt focused on its survival itself [3] and because of that, indicating what shapes its reliability is a first step in that direction. Unfortunately, so far, there is no comprehensive presentation of the mechanisms shaping the reliability of the organization operating under crisis caused by a Black Swan type of event, what constitutes the research gap. The field of study concerning high-reliability theory (HRT) is, of course, contributing knowledge for understanding those phenomena (e.g., [2]), and even though scholars argue that those conclusions are useful for all organizations, there is a discussion in the literature stating that HRT is based mainly on studies made among high reliability organizations (HRO) and the possibility of expanding conclusions made based on those analysis for all organizations is limited [4]. The mechanisms developed for HRO known in the literature [5] are based on the fact that they are often exposed to various types of turbulence or operate in high risk conditions, and thus—as a consequence of this—are exposed to crisis situations threatening the reliability or even the sustainable continuity of their functioning [6,7]. Those mechanisms, based on 'collective mindfulness', allow HROs to stay reliable, overcome the difficulties appearing both in the environment and in the organization itself, and shift the focus from simple business continuity management [8–10] to sustainable development [3]. They also determine the specificity of HROs and distinguish them from other organizations not so obsessed with the "reliability as the primary outcome" [11]. However, there are many organizations not so focused on reliability imperative, as they are not so much exposed to factors mitigating their reliability, but they are still less or more reliable in their "business-as-usual" operations. Their reliability is created in the daily organizing and routines. What is the most important thing, is that those organizations are also exposed to crisis caused by Black Swan type of events and ensuring their reliability becomes, in these cases, the issue for them on the road of maintaining sustainability. Therefore, there is for sure a need for analyzing organizational reliability from a different point of view [4,12] than the one given by HRT, and such a point of view is offered in this article.

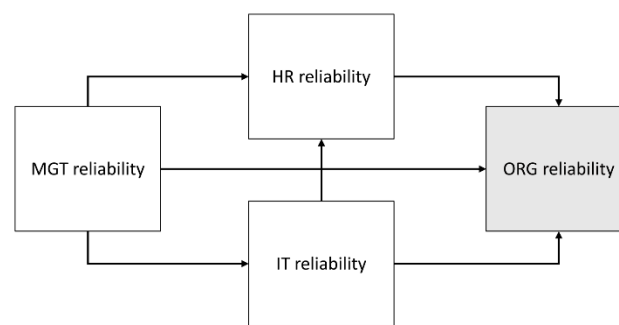
Moreover, in such extreme conditions of the organization's functioning, which cause crisis in an organization to occur, traditional models and paradigms of management do not work. They must be verified, redefined, and adapted to those extremely critical conditions. This also applies to the proposed ORM. ORM has been tested among organizations operating in a variety of environments. However, it should be assumed that in highly critical conditions of the organization's functioning caused by phenomenon known as Black Swan events, the shape of the model will be slightly different. Such conditions were generated by the state of epidemic crisis that took place in the world in 2020

because of the COVID-19 pandemic, which caused extremely critical conditions to arise for almost all organizations struggling to maintain their sustainability, or even just survive on the market. The extent and magnitude of the critical conditions went far beyond the assumption of the initial model, in which the situations characterized as abnormal conditions did not include such dire and extreme crisis. Crisis in many organizations is not only deep, but also highly dynamic, and its course is not predictable. Hence, the research gap indicated above arises from the need to verify the ORM and explain the mechanisms of shaping organizational reliability in such conditions in order to contribute to both theory (verifying the organizational reliability paradigm among organizations in crisis caused by a Black Swan type of event) and practice (proposing mechanisms potentially helping them survive). It also seems that from the perspective of shaping the organizational reliability, it is important to determine precisely in which phase of the crisis the organization is operating. This article will present research results related to the initial phase of the crisis caused by the COVID-19 pandemic. This phase of crisis escalation in organizations is characterized by maximum unpredictability, dynamic course, avalanche-like speed of action, and extreme intensity [13]. Hence, explaining how to shape reliability (allowing an organization to retain its sustainability) in this phase of the crisis is the main aim of this study. In order to achieve the indicated aim of the paper, the ORM will be described first. Next, there will be a part concerning hypotheses development, in which there will be a presentation of assumptions concerning the changes within the model caused by the organizations need for operating in crisis escalation phase. Finally, those hypotheses will be verified based on empirical research, aimed at developing the revised version for the ORM, valid for critical conditions of crisis escalation caused by a Black Swan type of event.

## 2. Organizational Reliability Model

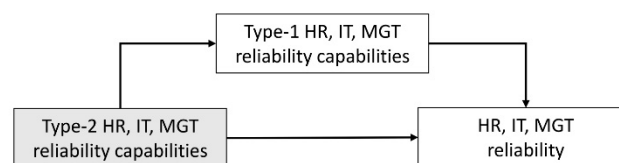
The Organizational Reliability Model is based on the assumption that organizational reliability is built primarily in three areas, human resources (HR), information technology (IT), and management (MGT), due to the perception of them as critical components of organizations that can foster its reliability [1]. These areas were not chosen accidentally. Analyzing classical organization models (e.g., Leavitt Diamond, Katz and Kahn Model, Burke and Litwin Model) and taking into account the organizational force field analysis (aimed at seeking those elements which may shape the chosen outcome variable), the elements of the organization which allow achieving and maintaining organizational reliability were selected [1]. Therefore, the ORM concerns, in particular, proper performance in these areas aimed at limiting the number of errors (or failures), which have the potential to influence organizational reliability.

ORM also assumes that it is justified for the concept of organization reliability as a whole to consider HR reliability, IT reliability, and management reliability, not only separately, but mainly in relation with each other. They constitute three main pillars of organizational reliability, which are related to each other: the management reliability influences organizational reliability through IT reliability, which acts together with management as an enabler to HR reliability [1]. It was assumed that management reliability will be treated in the model as the input force, which has the ability to influence all other elements of the model because of its decision-making powers at every management level and in relation to every area of the organization. Therefore, management reliability directly affects HR and IT reliability. It is also obvious that the reliability of HR and IT is influenced by management reliability and it is not justified to consider an inverse relationship other than based on a feedback loop (and feedbacks are not included in the model). Similarly, it is difficult to consider the purposeful and systemic impact of HR reliability on IT reliability other than based on a feedback loop (which additionally also requires causative power in the form of correct decisions of managers), i.e., situations in which employees become unreliable due to unreliable IT, and this is the basis for managers to improve IT solutions to increase their reliability (which, in fact, is included as the influence of management reliability on IT reliability). A graphic illustration of the simplified ORM structure is shown in Figure 1.



**Figure 1.** Simplified structure of the Organizational Reliability Model (ORM), source: own work based on [1].

Each reliability (HR reliability, IT reliability, and MGT reliability) is shaped by a specific type of reliability capability (Figure 2), constituting—de facto—three reliability models (for HR, IT, and management). Those capabilities, as such, should be understood as “a kind of combination of resources (as well as competences or skills) and actions taken that make resources (competences, skills) active and ready to be used in the processes of accomplishing tasks and achieving assumed purposes” [1]. Moreover, reliability capabilities are presented in two perspectives (normal and abnormal operating conditions):



**Figure 2.** Reliability capabilities building HR, IT, and MGT reliability in ORM, source: own work based on [1].

“Type-1 organizational reliability capabilities—ordinary capabilities, which are necessary and sufficient for the organization to effectively execute day-to-day tasks in normal conditions; at the same time, they become insufficient, but are still necessary in abnormal conditions of organization functioning.

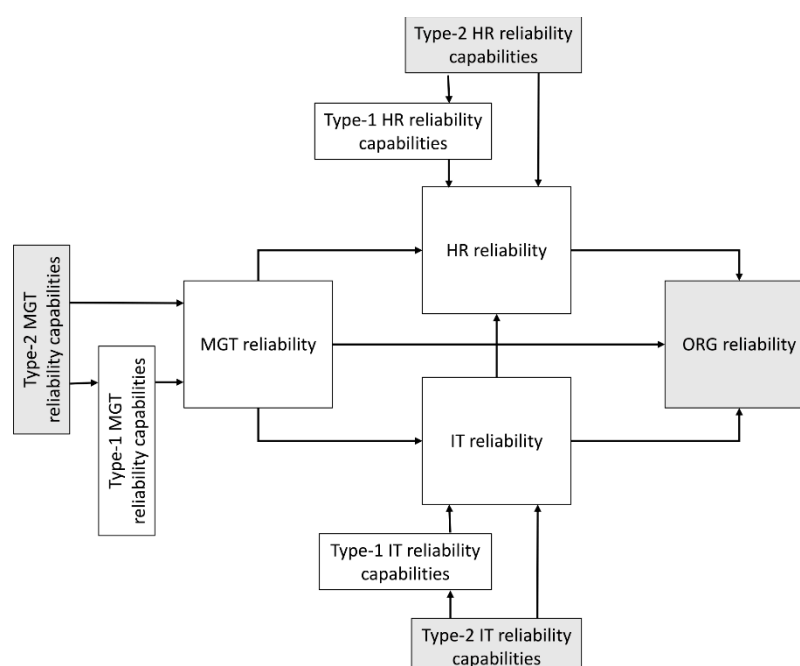
Type-2 organizational reliability capabilities—kind of additional/specialized capabilities which are/should be at the disposal of the organization in all operating conditions, but they become necessary for the organization to function in abnormal conditions” [1].

The internal structures of HR, IT, and MGT reliability capabilities, based on their role in enabling the organizational reliability, are presented in Table 1.

The structure of ORM is presented in Figure 3, showing that the path model is constituted by three reliabilities, HR, IT, and management, which are mediators through which Type-1 and Type-2 reliability capabilities influence organizational reliability. The ORM was verified empirically in normal and abnormal conditions of organization functioning. The study was conducted in 2019, in 349 organizations operating in Poland and 288 organizations operating in Switzerland [1]. The results of statistical reasoning remained in line with the theoretical ones, and this indicated the shape of the final ORM. It was derived based on the assumptions of path analysis as the most-fitted one from the set of those, whose paths depicted all the relationships needed between the three pillars of organizational reliability.

**Table 1.** Internal structure of reliability capabilities in three areas of reliability. Source: own work based on [1].

HR Reliability Capabilities	IT Reliability Capabilities	MGT Reliability Capabilities
Type-2 HR reliability capabilities connected with employees' ability to anticipate and detect hazards and disruptions, prevent disruptions, maintain functioning through disruptions as well as learn from problems/errors	Type-2 IT reliability capabilities concerning IT's ability to anticipate and detect potential hazards, prevent them from becoming a disruption for IT performance, maintain proper functioning throughout those which were not avoided, restore to proper functioning after a failure, and learn from occurred disruptions	Type-2 MGT reliability capabilities concerning managers' abilities to anticipate and detect in advance potential hazards that could threaten the achievement of their own and the organization's goals, prevent disruption from becoming the problem by modification of the management system, achieve previously achieved goals despite the occurrence of disruptions/problems, restore the management system to its normal functioning as well as the ability to learn from problems
A set of outcomes of Type-1 HR reliability capabilities (work motivation, job satisfaction, work engagement, person-job fit, and person-organization fit)	Outcomes of Type-1 IT reliability capabilities (system, information, support service, and usage reliability, including user experience)	A set of outcomes of Type-1 MGT reliability capabilities (e.g., work motivation, alignment with the core organizational values, work engagement decisiveness, managers' conceptual abilities, managers' interpersonal/relationship building abilities, and characteristics of the management system)

**Figure 3.** Structure of ORM, source: own work based on [1].

### 3. Critical Conditions of the Organization's Functioning—The Situation of Organizations during the COVID-19 Pandemic

The discussed ORM was developed for a certain continuum of two categories of operating conditions of the organization: the situations marked as “normal operating conditions” and “abnormal operating conditions”. Of course, each of these categories could have a whole range of shades: from mild to sharp. However, such an extreme situation that occurred on the market as a result of the SARS-CoV-2 coronavirus pandemic and the COVID-19 disease caused by it was not considered. That crisis, from an economic point of view, refers to all possible levels: starting from global economy, through the economy of the country, to organizations and individuals. It can be characterized as a state of radical uncertainty, in which absolutely no one decision-maker (politician, economist, entrepreneur, manager, or employee) can build on existing knowledge or predict the trends of situation

development—the range of possible choices and the risks associated with each of them, as well as their possible potential consequences, are basically unknown. Hence, it fits in the definition of crisis, which from a management theory perspective is usually defined as “a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly” [14] or an event “characterized by threat, surprise, magnitude, with a need for a quick response and high potential costs if they are not resolved effectively, and ( . . . ) as failure in a subsystem or a system as a whole that disrupts the ongoing or future output of that system” [15].

The outbreak of coronavirus named SARS-CoV-2 (causing the COVID-19 pandemic) disrupted the Chinese economy at the turn of 2019/2020 and by the end of March 2020, it spread globally to practically all countries over the world, hitting—which is exceptional—all the major economies of the world almost at the same time [16]. At the beginning of 2020, the functioning of global supply chains was disrupted, as the Chinese economy slowed down due to interruptions to production. That initially hit only organizations with a resource or production base in China. Their main concern was no longer linked to sustainable development but to maintaining any possible continuity of the organization’s operations, in the context of the lack of supply resulting from production stoppages in many provinces of China. Soon, more problems joined these ones. According to the COVID-19 pandemic development, panic among consumers created market anomalies and unusual consumption patterns. Demand for some products exceeded supply, while for others it temporarily disappeared, which left some organizations facing the inability to meet existing market demand, while others were left with full warehouses and the inability to sell the goods. The reduction in consumption expenditure resulted in a response with a reduction in corporate income. Moreover, organizations began to suffer not only due to the unavailability of physical resources (raw materials, semi-finished products, products), but also the unavailability of human resources. The first results of a study concerning 191 adults who were admitted to two hospitals in Wuhan with laboratory-confirmed COVID-19 disease between 29 December 2019 and 31 January 2020 indicate that the average time from the onset of symptoms to discharge from the hospital was 22 days [17]. Hence, when infected, employees had to be absent from work for at least three weeks, and adding recovery time—much longer. Moreover, employees who did not get sick themselves but had confirmed contact with a sick person were directed to a quarantine, whose time varied from 7 to 14 days in different countries (analysis based on 158 confirmed cases outside Wuhan showed that the incubation period of COVID-19 falls within the range of 2–14 days and has a mean of around 5 days [18], hence usually 14 days quarantine is recommended). Finally, the WHO emergency committee have stated that the spread of COVID-19 may be interrupted by early detection, isolation, prompt treatment, and the implementation of a robust system to trace contacts [19]. Hence, many countries reduced person-to-person contact in order to slow the rate of infection, and sooner or later undertook the policy of social distancing: the universities, schools, kindergartens, and nurseries were closed and citizens were ordered to stay at home (leaving them only in exceptional circumstances and in a state of higher necessity: work or shopping) and minimize their presence in public spaces. Hence, according to those regulations, another group of employees was forced to take a compulsory vacation to look after dependents. Regardless of the reasons for the absence from work, for entrepreneurs it indicated a loss of productive capacity (as absent employees “aren’t producing GDP” [16]), not followed by a decrease in employment costs. Moreover, many organizations decided to implement remote work protocols, trying to keep their employees safe from the pandemic and obey the social-distancing regulations while maintaining operations. Allowing employees to work remotely from home significantly changed the way of doing business and contributed to deep changes within those organizations, which were trying to maintain their continuity based solely on remote work of their employees. However, this also became a challenge, because many industries were not prepared for this from the formal, organizational or instrumental (tool) side. Ensuring the security of transmitted information, preventing sensitive data from leaking or even enabling remote work for large teams of employees was, in some way, a test for organizations’



IT reliability. Going further in the social distancing policies, the governments of many countries have banned doing business in some industries (e.g., gastronomy, tourism, entertainment, cultural institutions, hotels, casinos), closed the public transportation networks and the borders. “From an economic perspective, these closures and travel bans reduce productivity directly in a way that is akin to temporary drops in employment” [20]. However, this “decline in employment” was not followed by a decrease in employment (or other kind of) costs. In one short moment, the financial liquidity of many organizations has been threatened, which is particularly challenging also for the reason that “many firms have limited cash reserves, perhaps not enough to cover expenses for more than three or six months” [21], which is especially true for small and medium organizations. In conducting business, entrepreneurs were struggling every day with the collection of amounts due from customers, payment of obligations to suppliers, and inventory management. In the face of restrictions caused by a pandemic, the implementation of these tasks had become extremely difficult and many organizations faced bankruptcy. Entrepreneurs on every continent were facing the unprecedented challenge of surviving in a situation of almost complete market paralysis due to the evolution of the COVID-19 disease. The situation of many organizations (especially those functioning in the services sector or performing services personally) became extremely difficult and the future decisions that entrepreneurs make will depend on the speed with which government support instruments for them are launched. The unemployment and bankruptcy rate started to grow, as well as the number of suspensions of business activities. In a situation of very limited or no income, an attempt to cut costs (e.g., by reducing staff, holding orders or cut down spending) seems to be the “rational” (though short-sighted) alternative, however in the long-term, this can lead to loss of professionals who will be difficult to restore later and “in turn, would make it harder for firms to earn income” [22].

It obviously must be pointed that there are industries whom coronavirus has helped in business (see [23]). Moreover, the IT industry seems relatively least affected, although it depends on the clients it serves (e-commerce, online education, telemedicine, medtech—organizations from these sectors can grow solidly in this kind of crisis and the IT industry that supports them too, but those who create solutions for transport, tourism, hotel industry, gastronomy, or the entertainment industry probably lose their jobs and are likely to suffer the same as representatives of these industries).

Hence, it should be assumed that such critical conditions, causing crisis escalation for many organizations, heavily negatively influenced the organizational reliability by increasing the number of errors and decreasing the organizational performance. Based on that, the following hypothesis may be formulated:

**H0:** *Experiencing hazards caused by the critical conditions of organization functioning during COVID-19 pandemic negatively influences organizational reliability.*

The world of organizations is very diverse, including both large business giants and micro entities performing services personally, operating in very diverse industries. Although some problems they face are common (lack of earning opportunities, change in market structure, new demand trends) others seem specific to industry or size. Due to their lower resilience (caused by limited resources (i.e., cash reserves)), SMEs seem to be more vulnerable and need more support. However, giants experience decline in corporate market valuation due to collapse in financial markets and face the hostile takeover threat. All these dangers require managers and other decision-makers to formulate an appropriate response to ensure the reliability of their organization’s functioning in order to maintain its continuity, and then its sustainability, during the crisis. However, in highly critical conditions caused by the COVID-19 pandemic, which pushed many organizations into the escalation phase of a crisis, it seems at least challenging and extremely difficult. What is certain, is all organizations now need strong leadership to address the direct effects of the coronavirus pandemic and their economic consequences. Hence, the question arises: what skills and features will be decisive for achieving the reliability of the organization and to what extent can one rely on already existing models of organization reliability?

The authors who proposed the ORM predicted that Type-2 organizational reliability capabilities become crucial in abnormal conditions of organizational functioning. These concern the ability to anticipate and detect hazards and disruptions, prevent disruptions, maintain functioning through disruptions as well as learn from them, which in turn influences Type-1 organizational reliability capabilities on the way to build organizational reliability. However, the COVID-19 pandemic—an extremely abnormal situation which caused a crisis escalation for most contemporary organizations—gave rise to doubts as to whether the proposed model is valid in such conditions. That is mainly because it seems that in the context of such critical conditions, the ORM will be shaped differently, considering the specific form of operations which is allowed by the situation. The organization are forced to quickly adapt to drastically changing environment, which in most cases threatens their core activities, forcing them to change the way of their implementation or even their nature itself. Hence, it seems that there might be two types of differences between ORM obtained for variety of analyzed conditions and current critical conditions causing crisis to escalate in contemporary organizations (which was somehow suggested by [12], underlining that during the crisis there are significant changes within HR, which influence the entire organization). The first type of differences will concern some exclusions—it seems that some characteristics influencing organizational reliability will no longer have an influence on it during such conditions. It seems that such extremely critical conditions may underline the significance of Type-2 organizational reliability capabilities, showing that ability to maintain operations during crisis and adapt to unpredictable changes is key for obtaining and maintaining organizational reliability. Moreover, the crisis escalation phase is characterized by extreme unpredictability and dynamics of those changes. The second type of differences will concern changes in the nature (strength and direction) of relationships within the model—it seems that different mechanisms based on relationships among the elements of ORM may be crucial in such extremely critical conditions. Therefore, the underlined research gap causes the need for verification of those assumptions, showing that ORM—as other models known from organizational theory—may exhibit different structures and behaviors, depending on the conditions (which is in line with situational theory, gaining importance during such analysis) and acknowledging changes within the model in such conditions is a crucial contribution to the theory of management (as paradigm verification). This is mainly because the organizational reliability (being a key for its sustainability) may have different sources. Hence, the following hypothesis will be verified:

**H1:** *The structure and internal relations within ORM change when organizations are operating in crisis caused by critical operating conditions observed during COVID-19 pandemic.*

## 4. Research Methodology and Results

### 4.1. Sample Overview

In order to verify the proposed hypothesis and test whether the ORM will change its structure (and internal relations), the empirical research based on a survey (gathered using the CAWI method) was conducted. The sample covered organizations from Italy (European Union country) operating under critical conditions of the COVID-19 pandemic. The choice of Italy was deliberate, as it was a country significantly influenced by the COVID-19 pandemic, which during the performed study caused a crisis escalation for organizations operating in that country. During the study, it was announced by the World Health Organization (WHO) as the epicenter of the pandemic, with more reported cases and deaths than the rest of the world combined, apart from China. The outbreak of disease (named by WHO on 11 February 2020 as COVID-19) was declared a Public Health Emergency of International Concern on 30 January 2020. In the same day, the first three patients in Italy were reported (two Chinese tourists from the city of Wuhan and a young Italian evacuated from there. All three got infected in China). For almost three weeks, until 20 February, the situation in Italy seemed stable, as there were still only these three reported cases. That was probably the reason of the Italian authorities' moderate



reaction. Since the beginning of the 21st century, the world has experienced a series of major outbreaks of infectious diseases. All of them brought a major threat to public health and were followed by series of serious crises, however, their effects were still rather local than global and they never required such extraordinary actions as needed this time. Until 20 February 2020, the situation in Italy seemed to be under control. Everything changed from day to day. From 21 February 2020, the number of cases and deaths in Italy began to increase rapidly, and a series of restrictions of increasing severity on the spread of coronavirus began. Lombardy (one of the most affected regions) was cut off from the world on 7 March 2020 and from Tuesday, 10 March 2020, those precautionary measures were extended to the entirety of Italy. The Italian government limited the movement of individuals in the whole Italian national territory unless strictly motivated (in written form) by reasons of work or health, closed most shops and all educational, sport, and cultural centers. Due to those restrictions, the disappearance of tourist traffic, a ban on movement, and breaking of supply chains (and first of all due to the extremely high mortality rate), the operating conditions of Italian organizations became critical and most of organizations were experiencing crisis. Many sectors of the Italian economy, which is largely based on family-owned small businesses, started to suffer.

The research survey was taken in Italy, in the week of 18–22 March 2020, a few days after the restrictions were introduced (full lockdown, number of COVID-19 cases exceeded 40,000 and number of deaths from COVID-19 exceeded 4000, all organizations were forced to introduce remote work if it was possible) and the condition of organizations' functioning had radically changed, which gave the authors the possibility to test the ORM in critical conditions, which caused crisis escalation for most organizations. The characteristics of the obtained sample are presented in Table 2, showing that the sample covered 115 organizations from Italy. The survey was filled in by managers from the surveyed organizations. Several control variables were introduced to confirm the proper diversity of the sample (size and time of operations of the organization, industry type). Additionally, in order to make sure that the organizations were meeting the assumption of operating under critical conditions, additional questions concerning the negative influence of the COVID-19 epidemic on their operations were included in the research. All organizations declared enormous influence of the critical conditions of the epidemic on all areas of organizations' operations and the need for the introduction of remote work in order to ensure the continuity of operations.

**Table 2.** Size and time of operation of organizations included in the sample.

Organization Size	Time of Operations				Total
	Less Than a Year	1 to 5 Years	5 to 10 Years	More Than 10 Years	
Micro (below 10 people)	6	5	4	4	19
Small (11–50 people)	4	15	7	1	27
Medium (51–250 people)	1	8	20	7	36
Large (above 250 people)	2	4	14	13	33
Total	13	32	45	25	115

#### 4.2. Variables Overview

In order to verify the Organizational Reliability Model in crisis influenced by critical conditions of organizations functioning during COVID-19 pandemic, the following variables were analyzed [1].

Type-1 HR reliability capabilities (HRorc) is a new construct and was measured based on five items concerning five outcomes: work motivation, person-job fit, person-organization fit, job satisfaction and work engagement, based on a five-point Likert scale (from I strongly disagree to I strongly agree, with a middle point: I have no opinion).

Type-2 HR reliability capabilities (HRrc) is a new construct developed by the authors. It was measured based on six items concerning components of analyzed construct. The scale is based on

a five-point Likert scale (from I strongly disagree to I strongly agree, with a middle point: I have no opinion).

HR reliability (HRrel) was measured on a five-point Likert scale, based on the definition, as the average of HR errors (measured based on four items corresponding to those included in HR performance, however connected to the frequency of occurrence of four types of consequences of errors occurring in the organization in the case of HR) and HR performance (measured based on four items covering four areas: job quality, job efficiency, punctuality, and effectiveness of achieving goals at the workplace, which are crucial for the job performance of employees).

Type-1 IT reliability capabilities (ITorc) is a new construct and was measured based on five items concerning the outcomes of Type-1 IT reliability capabilities: system reliability, usage reliability, user experience, information reliability, and service reliability, based on a five-point Likert scale (from I strongly disagree, to I strongly agree, with a middle point: I have no opinion).

Type-2 IT reliability capabilities (ITrc) is a new construct and was measured based on seven items. The scale was based on a five-point Likert scale (from I strongly disagree to I strongly agree, with a middle point: I have no opinion).

IT reliability (ITrel) was measured, based on the definition, as the average of IT errors (measured based on four items corresponding to those included in IT performance, however connected to the frequency of occurrence of each type of consequence coming from typical errors occurring in the organization in case of IT) and IT performance (measured based on four items covering four areas of IT operations, which are crucial for building its proper support for organization).

Type-1 MGT reliability capabilities (MGTrc) is a new construct and was measured based on six items concerning six outcomes: managers' motivation, managers' alignment with the core organizational values, managers' engagement, managers' conceptual abilities, managers' interpersonal/relationship-building abilities, managers' decision-taking abilities, based on a five-point Likert scale (from I strongly disagree to I strongly agree, with a middle point: I have no opinion).

Type-2 MGT reliability capabilities (MGTrc) is a new construct developed by the authors. It was measured based on five items concerning components of analyzed construct. The scale is based on a five-point Likert scale (from I strongly disagree to I strongly agree, with a middle point: I have no opinion).

MGT reliability (MGTrc) was measured, based on the definition, as the average of MGT errors (measured based on four items corresponding to those included in MGT performance, however connected to the frequency of occurrence of four types of consequences of errors occurring in the organization in case of MGT) and MGT performance (measured based on six items covering the areas: achievement of management objectives, relationship of management costs to the obtained results, decision-making effectiveness, work efficiency, speed and precision of information transfer, effectiveness of achieving goals at the workplace, which are crucial for job performance of managers).

Organizational reliability (ORGrel) was measured, based on the definition, as the average of organizational errors (measured based on four aspects of organizational errors) and organizational performance (measured based on the Balances Scorecard concept).

The overview of the scale analysis and descriptive statistics is given in Table 3. The results show that the scales can be used for further analysis—their validity was confirmed by Bieńkowska, Tworek, and Zabłocka-Kluczka [1] in the main study and their reliability in case of this study was confirmed using alpha-Cronbach. The obtained results show that all analyzed variables had lower medium values than those obtained by authors during the study made for the initial ORM verification.

**Table 3.** Descriptive statistics and reliability of scales of identified variables.

No.	Variable	No. of Scales	Alpha-Cronbach	M	SD
1	HRorc	5	0.867	4.1614	0.89990
2	HRrc	6	0.853	3.4595	0.70561
4	HRrel	2	0.909	3.2173	0.71742
5	ITorc	5	0.863	3.5257	0.77238
6	ITrc	7	0.900	3.4626	0.70494
7	ITrel	2	0.813	3.4450	0.73153
9	MGTorc	6	0.903	3.4865	0.75047
10	MGTrc	5	0.861	3.4268	0.77923
11	MGTrel	2	0.868	3.1789	0.65669
12	ORGrel	2	0.919	3.2061	0.68117

### 4.3. Research Results

It should be underlined that the study was amended by control variables, which were used to verify whether to organizations under study were really impacted by the COVID-19 pandemic. Questions concerning the negative influence on various aspects of organization's operations were asked. In all cases, respondents confirmed that organizations were operating in crisis caused by COVID-19 pandemic. Hence, the assumed verification is possible on the chosen sample. In order to verify the H0 hypothesis and confirm that hazards occurring for the organization were indeed influencing their reliability, the correlation analysis was performed. The analysis showed that there was indeed a correlation between occurrence and strength of those hazard influence on organization and organizational reliability ( $r = -0.202, p < 0.001$ ). Therefore, H0 can be accepted, stating that experiencing hazards potentially harmful for the organization negatively influences organizational reliability.

Those results allowed the verification of the internal structure of the ORM under the given critical conditions. Hence, as a next step, in order to verify the H1 hypothesis, the path analysis was executed using IBM SPSS AMOS version 26. Based on the results, the place of each variable and direction of each relationship was established. Initially, it was established that the ORM in its given form (presented in [1]) was undefined on the obtained sample, showing that it is not valid in crisis influenced by critical conditions of organizations' functioning. Hence, in order to obtain a valid model, various changes were introduced until the obtainment of results confirming that the model was defined, statistically significant, and well-fitted. Such conditions were obtained for the model without Type-1 HR, IT, and MGT reliability capability outcomes, which confirmed the assumptions made by the authors that such exclusion may happen in crisis influenced by critical conditions of organizations' functioning. The model was verified as defined and well-fitted ( $\chi^2(9) = 62.120, p < 0.001$ ; CFI = 0.905; RMSEA = 0.228). The correlations between variables within the model are given in Table 4. As the obtained correlations coefficients were quite high, the variance inflation factor was calculated for all the variables. The test confirmed that there were no collinearity issues and the model could be built based on the given set of data (the results are shown in first column of Table 4). The results show positive and statistically significant correlations between given variables, however introducing regression analysis in the mediated path model revealed that the nature of some relationships changed from positive to negative after introducing mediation. An overview of the changed model is presented in Tables 5–7, containing the values of total and direct effects occurring among variables within the model.

**Table 4.** Correlation weights.

		HRrel	ITrel	MGTrcl	HRrc	ITrc	MGTrc	ORGrel
HRrel (VFI = 2.171)	r Sig. N	1 111						
ITrel (VFI = 3.412)	r Sig. N	0.667 0.000 105	1 108					
MGTrcl (VFI = 3.838)	r Sig. N	0.756 0.000 106	0.807 0.000 104	1 109				
HRrc (VFI = 2.171)	r Sig. N	0.388 0.000 108	0.578 0.000 106	0.587 0.000 106	1 111			
ITrc (VFI = 2.994)	r Sig. N	0.321 0.001 106	0.633 0.000 104	0.514 0.000 104	0.793 0.000 106	1 109		
MGTrc (VFI = 2.514)	r Sig. N	0.304 0.001 109	0.476 0.000 106	0.444 0.000 107	0.772 0.000 109	0.653 0.000 107	1 112	
ORGrel	r Sig. N	0.462 0.000 100	0.484 0.000 99	0.652 0.000 102	0.708 0.000 101	0.589 0.000 99	0.586 0.000 101	1 103

**Table 5.** Regression weights.

			Estimate	S.E.	C.R.	<i>p</i>
MGTrcl	<—	MGTrc	0.366	0.070	5.236	0.001
ITrel	<—	MGTrcl	0.623	0.050	12.383	0.001
ITrel	<—	ITrc	0.258	0.047	5.512	0.001
HRrel	<—	ITrel	0.225	0.124	1.809	0.010
HRrel	<—	MGTrcl	0.720	0.106	6.789	0.001
HRrel	<—	HRrc	−0.110	0.071	−1.560	0.019
ORGrel	<—	HRrel	−0.053	0.103	−0.520	0.001
ORGrel	<—	ITrel	−0.153	0.130	−1.180	0.238
ORGrel	<—	MGTrcl	0.767	0.139	5.510	0.001

**Table 6.** Standardized total effects.

	MGTrc	ITrc	MGTrcl	HRrc	ITrel	HRrel
MGTrcl	0.440	0.000	0.000	0.000	0.000	0.000
ITrel	0.301	0.305	0.684	0.000	0.000	0.000
HRrel	0.340	0.056	0.772	−0.107	0.184	0.000
ORGrel	0.272	−0.045	0.618	0.006	−0.149	−0.059

**Table 7.** Standardized direct effects.

	MGTrc	ITrc	MGTrcl	HRrc	ITrel	HRrel
MGTrcl	0.440	0.000	0.000	0.000	0.000	0.000
ITrel	0.000	0.305	0.684	0.000	0.000	0.000
HRrel	0.000	0.000	0.647	−0.107	0.184	0.000
ORGrel	0.000	0.000	0.757	0.000	−0.138	−0.059

The obtained results show that there were two types of differences occurring between the current ORM obtained for critical conditions and ORM obtained by Bieńkowska, Tworek, and Zabłocka-Kluczka [1] in a variety of so-called normal conditions. First of all, outcomes of each reliability capabilities were verified as not significant elements of the ORM in critical conditions. Second of all, the relationships between the elements which were verified to remain in the model changed significantly:

- There was no statistically significant direct influence of IT reliability on organizational reliability. IT reliability influenced organizational reliability only through HR reliability. However, there was a statistically significant influence of Type-2 IT reliability capabilities on IT reliability;
- There was a statistically significant but negative influence of HR reliability on organizational reliability. Moreover, there was a statistically significant but negative influence of Type-2 HR reliability capabilities on HR reliability. Moreover, which seems to be extremely important, there was a positive indirect influence of Type-2 HR reliability capabilities on organizational reliability, even though HR reliability itself was negatively influencing it;
- There was a statistically significant influence of management reliability on organizational reliability, both direct and indirect (through IT reliability and HR reliability). There was also a statistically significant influence of Type-2 management reliability capabilities on management reliability.

## 5. Discussion—Organizational Reliability Model Structure in Crisis

The performed study showed that in critical conditions of the COVID-19 pandemic observed in the world in 2020, the organizations found themselves in a deep and violent crisis, where the negative phenomena threatening their existence were escalating. In this context, organizations must have redefined their business assumptions as soon as possible so that they in any way matched the situation in which the organizations found themselves. In general, existing routines and procedures ceased to be effective. Striving for sustainable development had to be put on hold until survival was ensured and that very survival became a key for ensuring sustainability in crisis [3]. Survival became the most important goal in both the short and long term. What constitutes organizational reliability in such a situation? It is natural that in the initial period, employees will try to implement previously adopted tasks, minimizing errors, using the available resources and—if necessary—changed methods. However, this will soon prove to be ineffective, which should be immediately noted by the organization's management. What is more, it depends on the decisions and actions of managers whether the organization can cope with the situation in which it finds itself and be able to overcome the crisis. In extreme cases it may even be necessary and even desirable to change the business model to one that will ensure the organization's survival, and then exit from the crisis and achieve sustainability once again. That is why the obtained results and conclusions coming from them can contribute not only to building theory in the field of management science but to building some knowledge base for contemporary organizations looking for a way to survive.

### 5.1. HR Reliability, IT Reliability, MGT Reliability, and Organizational Reliability

The obtained empirical research showed, most of all, that HR reliability role in the ORM has drastically changed and the mechanism of its influence on organizational reliability is significantly different in crisis influenced by critical conditions of organizations functioning (especially in the escalation phase of a crisis, which was analyzed here), which is consistent with predictions of Bakos and colleagues [12]. That is the main difference concerning the nature of the relationships within the model—which were predicted by the authors. It seems that reliability of employees is counterproductive for organizational reliability, which is in need for new ways of operating in order to survive the crisis. It seems that in the event of an epidemic critical conditions, which causes a crisis in organization, the employees become a resource, which is firstly and primarily affected—that is mainly because of employees who either do not come to work or come and work under high pressure (insecurity) [24]. At the same time, in the initial phase of the crisis, employees are trying to perform their tasks, as if not



realizing that their performance may be incompatible with the situation in which the organization has found itself, trying to prevent losses and to achieve any gains [25]. Markovits and colleagues [26] showed “that employees, as a result of the economic crisis, become more prevention and less promotion focused”. This naturally reduces employees’ job performance. However, most of all, job performance in its previous understanding may become counter-productive in relation to the new survival-oriented goals of the organization as a whole—which was confirmed by the obtained results, which showed that HR reliability (which includes job performance) mitigates the organization’s ability to maintain reliability as a whole. This means that in the described situation of an epidemic crisis, carrying out tasks using “old” procedures and expecting employees to meet job performance requirements in the previous understanding (stiffening/freezing both methods of operation and blocking redefinition of goals) is counterproductive for the organization’s reliability as a whole.

Moreover, since HR reliability considered from the normal conditions’ perspective is not enough in the crisis situation (especially in its most turbulent phase—escalation), further conclusions are possible. Situation forces employees to start working differently, which naturally causes their job performance to decline, together with other characteristics measuring the performance of their job. Learning to do things differently takes time and causes them to work less efficiently and make more mistakes. Hence, it is important to underline that the obtained results (in which HR reliability negatively influenced organizational reliability) may be a source of further conclusions, that HR reliability not only negatively influences organizational reliability but because of that, it also has the potential to positively influence it—what translates into lower HR reliability at the same time translates to higher organizational reliability, as changes in employees’ work make it possible to maintain the continuity of business operations. Moreover, as the results show, support of IT is a factor which forces employees to do their work as previously agreed and concretizes the old way of working, which, of course, positively influences HR reliability, translating into a lower number of mistakes and higher efficiency. However, keeping in mind that in critical conditions the crucial thing to do is to change the way of working, it is not a mechanism which is positive from the point of view of reliability of the organization as a whole. That is why employees are forced to redefine their approach to use the IT available in the organization and they make additional effort to facilitate its support for their new—different—way of working. This, in turn, especially at the beginning, furthermore decreases their job performance and increases the number of mistakes, as they are learning to do things differently and at the same time, reshaping available IT to facilitate it, even though the IT is not necessarily meant to support such activities. Such mechanism is proven by the obtained results—the ORM obtained for critical conditions shows that IT reliability significantly influences organizational reliability only through HR reliability and this influence is also negative (as in the case of HR reliability). This confirms that any mechanisms concretizing the old way of working mitigate the organization’s ability to maintain its reliability, and further, retain its sustainability. This is true for escalation phase of a crisis, where not only employees, but also IT are not yet reconfigured to the new ways of operating or changed tasks which arise in critical conditions.

Thus, it is not surprising that, in the escalating crisis caused by such extreme conditions of organizations’ functioning that occurred during the COVID-19 pandemic, an organization’s survival (and its sustainability) is determined mainly by the reliability of management. Management “is superior to other systems and subsystems of the organization in the sense that it regulates their operation, and regulates itself” [27], hence organizations’ proper and reliable functioning is determined by management reliability. In normal (even stormy) conditions, some natural safeguards are built into this system. “Theoretically it is possible that, despite unreliable management mechanisms and procedures, other elements of the organization will prove to be reliable—primarily employees (but also IT)—and this will determine the reliability of the entire organization” [1]. However, in the observed, extreme conditions, management reliability not only conditions organizational reliability, but also prejudices it (and that is the difference compared to the original ORM model, where management reliability is one of three equally important factors influencing organizational reliability). The functioning

of the other subsystems of the organization and their reliability will depend on the speed with which management redefines goals, explains them to employees, indicates new methods, tools, and ways of work. If managers do not initiate and pilot changes, both employees and IT will still strive for efficiency goals, which are “old and outdated” in the new situation, which will make them simply unreliable in the context of the changed conditions.

### 5.2. Type-2 HR Reliability Capabilities and Organizational Reliability

However, it is not the end of changes within ORM concerning HR reliability. It is especially worth underlining that even though HR reliability negatively influences organizational reliability, it is not true for Type-2 HR reliability capabilities, which influence it positively. Lockwood [25] argued that an organization cannot recover without its employees. Every crisis influences individual work attitudes and as a result presses impact on organizational outcomes [26]. The threat in terms of HR may rapidly result in a crisis situation in other areas of the organization’s operation, e.g., in the scope of implementation of production plans and then sales, and finally in the area of ensuring liquidity. Nizamidou and Vouz [24] noted that the organization’s task is “to prepare its employees to act appropriately in the event of a crisis. In doing so, it will limit its company’s financial losses, and save hundreds of human lives”. Therefore, critical operating conditions force the organization, above all, to change the approach to employees, as well as to redefine the ways they work. As stated before, it is impossible to carry out accepted tasks through old routines, which is reflected in the new ORM, in which HR reliability understood from the point of view of the job performance needed before the crisis is not conducive for organizational reliability during the crisis. Various solutions are emerging, including—currently observed—change of employees’ work mode (into remote work), as well as occupational health and safety rules (e.g., work in rotational teams). It also becomes obvious not only to perform tasks in a new way (remote work, rotation), but also to take over other responsibilities, either from other employees or those new ones arising from the situation. It is extremely difficult but possible for employees to implement completely new obligations resulting from changes in the organization’s business model. However, not all reliability capabilities are needed, considering the situation from that point of view. This was reflected in the obtained results, which showed that Type-1 HR reliability capabilities are not statistically significant element of the ORM for organizations in extreme crisis influenced by critical conditions of organizations functioning occurred during the COVID-19 pandemic.

Each time, these changes make it necessary to start employees’ adaptation processes. Thus, Type-2 reliability capabilities of employees in a crisis caused by an epidemic threat have a positive impact on organizational reliability, because they allow employees to adapt faster to changes occurring in the environment and the organization, and as a consequence, start to achieve the organization’s goals in a different way or pursue other organizations’ goals. Markovits and colleagues [26] argued that shifts in regulatory focus are adaptive adjustments that—in some cases—may prevent even worse effects on employee attitudes towards work in times of crisis. The use of Type-2 HR reliability capabilities during a crisis, where changes are usually rapid and the time pressure is huge, may, as mentioned earlier, negatively affect their previous job performance related to the old quantitative and qualitative indicators regarding the assessment of their work. At the same time, employees with high Type-2 HT reliability capabilities who strive for new solutions in the workplace, by implementing a redefined set of duties or fulfilling duties previously belonging to them in a different—adapted to the new reality—way contribute to the reliability of the organization as a whole.

### 5.3. Type-1 Reliability Capabilities

However, as predicted by authors, next to crucial and important changes in the nature of relationships within the model described above, there were also changes concerning the exclusion of some elements of the model—all Type-1 reliability capabilities.

### 5.3.1. Type-1 HR Reliability Capabilities

It is clear that in the escalating phase of the crisis caused by critical conditions of the organization's functioning which occurred during the COVID-19 pandemic, employees' work-related attitudes levels, such as work motivation, job satisfaction, and work engagement, seemed significantly reduced. In the literature, a critical situation refers primarily to an economic crisis, which seems less dynamic and yet less deep than the epidemic threat situation, which was considered here. However, mechanisms related to employees are similar, but additionally sharpened. Crisis caused by critical operating conditions of the organizations primarily affects work motivation. It is particularly difficult to increase employees' motivation [28]. Závadský and colleagues [28] stated that "various incentives, extra holidays, corporate entertaining and rewards which are the most commonly used tools of motivation, seem to be less important in the atmosphere of insecurity". Moreover, Mehri and colleagues [29] also noticed a decrease in employees' motivation in times of crisis. In turn, Lee, Wang, and Ip [30] showed significant negative effects of the global economic crisis on employee job satisfaction. "An economic crisis has adverse effects on affections and moods, resulting in a downturn in employees' affective feelings of commitment towards their organization" [26]. In addition, person-job fit values are reduced when changing the mode of work, or changing the scope of duties. For employees with high Type-2 HR reliability capabilities, this is a temporary situation, because they will be able to supplement person-job fit deficits and adapt to the new reality, solving problems in an effective and innovative way (with the assumption that minimum values giving a sense of security are present).

At the same time, more than just a decrease in employees' work-related attitudes in crisis caused by critical conditions of the organization's functioning occurred during the COVID-19 pandemic. Most importantly, as confirmed by the obtained results (the study confirmed that Type-1 HR reliability capabilities are not statistically significant element of the ORM obtained for organization in crisis), they cease to be of primary importance to ensure the reliability of both HR and the organization as a whole. The main problem is to provide and build even a relative sense of security among employees (feel secure). "During the recession employees lose mainly the sense of security. This situation is very stressful for employees and consequently it affects the quality and employee productivity in a negative way [31,32]" [28]. Therefore, it is not motivation or satisfaction that affects employees, but their fear of the threat itself and its consequences, as well as the need for change that will positively affect the employees' sense of security. "Threats being strong sources of uncertainty, which impact on human motivation striving for a management of and coping with these uncertainties" [26]. Employees should be prepared to "not panic before a crisis occurs and prepare employees to cope with the psychological effects of anxiety and stress that follow a crisis, using real crisis scenarios and crisis simulations" [24]. For this reason—as stated earlier and confirmed by the obtained results—Type-2 HR reliability capabilities are critical for ensuring HR reliability and organizational reliability.

### 5.3.2. Type-1 IT Reliability Capabilities

The conditions of lockdown (which occurred during the analyzed COVID-19 pandemic) caused a type of crisis situation which was especially demanding in the case of IT support needed to maintain organizations' continuity, even though it usually means that IT support must go far beyond initial assumptions concerning its role in an organization. Hence, the role of IT reliability in ORM was likely to be changed as well. The obtained results showed that Type-1 IT reliability capabilities are not a statistically significant element of the ORM for organizations operating in crisis. It seems that when the only way of working is remote work [33], the role of their characteristics in shaping organizational reliability changes significantly. On the one hand, the need for IT solutions to perform properly is higher than usual and IT performance becomes one of the important factors influencing the performance of an organization as a whole [34]. On the other hand, employees are forced by the critical situation to use those solutions, regardless of their performance. Remote work, even when performed willingly by employees, has limitations, and even though it initially was treated as the golden solution limiting the organizational costs, nowadays it is not considered the best choice

anymore [35]. It seems that in critical conditions, when employees are not working remotely by choice but they are forced to do so by the situation, the negative aspects of such way of working are much more visible and translate into outcomes of Type-1 IT reliability capabilities. However, the ability to ensure IT performance through such critical conditions to facilitate the possibility to perform tasks by employees is far more important than the need to facilitate a positive perception of IT among employees (visible in those outcomes, such as system reliability, information reliability, support services reliability, user experience), and that is why those reliability capabilities were excluded from the ORM obtained for critical conditions. Since employees are forced to use IT anyway, their perception concerning those features of given IT solutions loses its significance, as without those IT solutions (even perceived as unreliable and inefficient), they would not be able to do their job at all. In such conditions, employees use the IT solutions to perform tasks in any way possible, even in a way in which they do not usually do, and such use becomes the most crucial for any organization which wants to survive such a crisis. Hence, it seems that Type-2 IT reliability capabilities are key for establishing reliable support of IT, since they are aimed at facilitating the possibility of IT to adapt to changes within the organization. Moreover, it is logical in this case that Type-1 IT reliability capabilities are not included in the ORM dedicated to critical conditions and the main factor influencing IT reliability in the model is identified in Type-2 IT reliability capabilities.

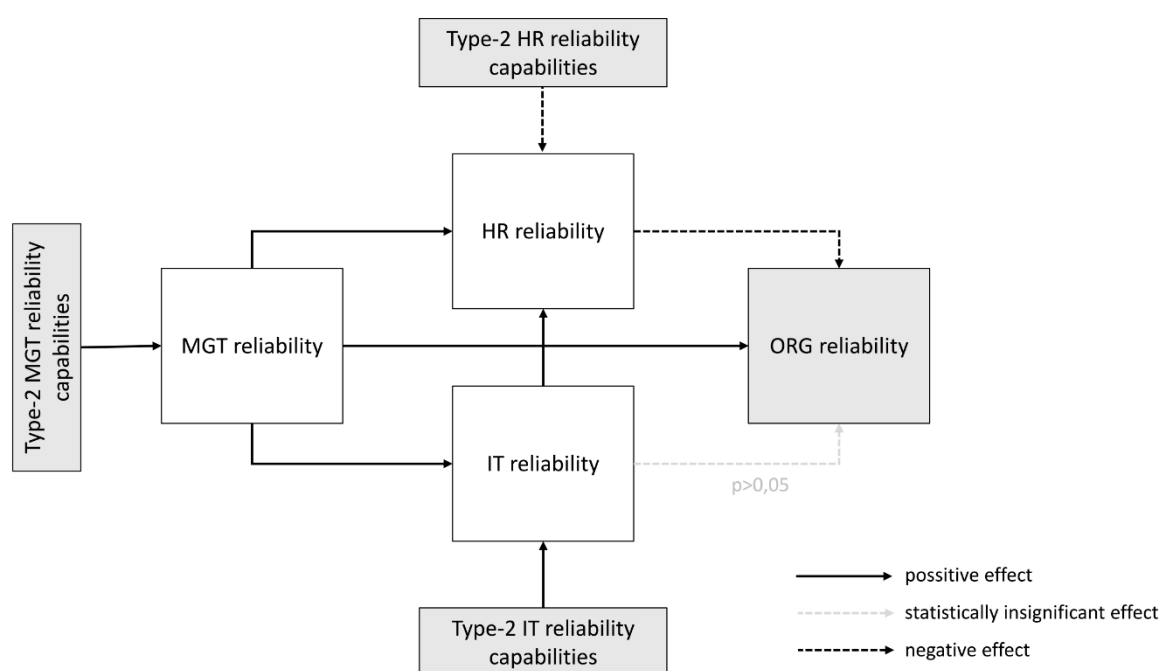
### 5.3.3. Type-1 Management Reliability Capabilities

There are various roles assigned to managers, all of them concerned with assuring the future existence and satisfactory performance of the organization. In normal conditions of organizations' functioning managers are "setting new directions, formulating and implementing strategies, managing change and transformations as well as monitoring and control to ensure that progress is made in the intended direction" [36]. Their main concern is "configuration and orchestration" [37] of human capital functioning, in particular "causing people's behavior, focused on the values and goals desired by the organization" [27], making decisions, influencing employees to get the job done, or managing information [38,39]. Usually all those activities are built in structured and formalized processes, as management should not be erratic. However, in extreme conditions of organizations' functioning, that daily routine of managerial behaviors fails, habits appears to be dysfunctional, and existing knowledge does not allow understanding of the world and previously set goals become obsolete. It is time for managers to act, as it is also a situation in which organizations' survival is determined mainly by the reliability of management, which was confirmed by the obtained results. That is the time for taking probably the most important role of managers, which is disorder management (interference prevention) [40] and dealing with uncertainty. Although such situations (severe crises) in managers' work are rather rare, it can be still understood as "normal" (inscribed in the manager's role). Thus, from first look it may seem that even escalating crisis should not significantly change the structure of the elements influencing the management reliability in the original ORM. However, the discussed critical conditions are really exceptional and that can justify changes in that part of model.

Every crisis generates pressure and a time deficit in the context of decision-making. For managers, the situation caused by the COVID-19 pandemic is at least doubly stressful. They are responsible for the survival of the organization, for the lives and health of employees, and at the same time they experience fear for their own health and (what in this specific situation is probably the least important) fear for their future career and the legal consequences of their actions or omissions. Although they are not responsible for the cause of the crisis (because the COVID-19 pandemic had an obvious external cause), they are responsible for the reaction to it. All errors made by managers (e.g., too late or too early decision on remote work) will directly affect the organization's functioning (respectively causing increased infection rate among employees in the first case or decreased organization efficiency in the second). In such a case, Type-1 MGT reliability capabilities, necessary to effectively execute day-to-day tasks, allowing managers to exploit resources in a way enabling the normal functioning of the organization connected with organizational resources and routines (Bieńkowska, et al., 2020),

seems to lose importance. Every crisis enforces a change in existing procedures, but usually there are elements of the organization (e.g., culture or some processes flow) whose behavior remains unchanged and on which future organizational efficiency can be built. This is, however, an unprecedented situation, in which managers cannot find any stable patterns of activity within or outside the organization. Type-2 management reliability capabilities are key for establishing reliable management in such critical conditions. Of the activities involved in Type-2 management reliability capabilities, the ability to anticipate and detect changes and disruptions seems to be the most important. However, when they come so rapidly and in such a diametrical and versatile way disturb the current ways of organizations' functioning, the time for preventing disruption from becoming the problem and for preparation for it is limited or is not fully possible. Thus, the ability to take harm-reduction actions and ability to maintain functioning through disruptions is becoming more important, even if it means a change of previously taken goals, technology, range of products, or production/service profile, as the non-standard, unique ways of acting can be a ticket to the survival of an organization. For this reason—as confirmed by the obtained results—Type-2 management reliability capabilities are critical for ensuring management reliability and organizational reliability under crises caused by critical conditions.

Therefore, the obtained ORM for organizations in crisis influenced by critical conditions of the organization's functioning occurring during the COVID-19 pandemic has a significantly different structure (and nature of relationships within it) than the original ORM developed by Bieńkowska, Tworek, and Zabłocka-Kluczka [1]. The version of ORM valid for organizations undergoing an escalation phase of crisis situation is shown in Figure 4.



**Figure 4.** ORM structure in crisis escalation phase caused by critical conditions of organizations' functioning which occurred during the COVID-19 pandemic.

The obtained results allow also a follow up of the initial assumptions, that in the specific type of crisis caused by a Black Swan type of event, the reliability is also a key for maintaining sustainability of organizations. HR is treated as one of the key resources in the context of business sustainability [41] but it is clearly underlined that the way of working needs to be adapted to changes occurring during crisis (as Type-2 HR reliability capabilities strengthen the organizational reliability but HR reliability itself weakens it). Therefore, the results underline the role of intellectual capital as a source of changes within the organization (allowing it to change the old way of working and assume the new way, which is allowing to retain performance). Concluding that intellectual capital (shown in MGT and



HR reliability) is important for organizational reliability makes it possible to infer that such reliability will have a positive influence on business sustainability—because intellectual capital is one of the key drivers of business sustainability [41]. Moreover, the obtained results make it possible to contribute to the theory confirming that business model innovations are treated as a lever for organizational sustainability [42], allowing an underlining of the fact that that innovations in the business model concerning HR (which must be made in order to facilitate the new way of working and obtain HR reliability conducive for organizational reliability (a “new” one)) should be treated as extremely important for organizations undergoing crisis escalation and aiming at retaining their sustainability.

## 6. Conclusions

The performed study allowed for the verification of ORM in crisis influenced by critical conditions of organizations’ functioning which occurred during the COVID-19 pandemic in the world in 2020. It turned out that in such critical conditions of organizations’ functioning, the crisis begins to escalate, which may threaten the existence of these organizations in the future (unfortunately, even regardless of the actions taken by these organizations). As expected, it turned out that in the context of a such crisis causes the need to redefine the current paradigms, in this case: the Organizational Reliability Model. Therefore, the performed research contributes to the development of the crisis-state theory in the field of organizational reliability.

The obtained results have a significant value for both theory development and practice. From the point of view of theory development in the field of organizational reliability, the research presents a point of view for organizational reliability different than the one which can be found in HRT literature. Moreover, it shows that ORM is shaped differently under a crisis induced by a Black Swan type of event (COVID-19 pandemic), which confirms that management paradigms and models tend to be reshaped under such conditions. It seems that a key factor showing the most important difference among those two situations is HR reliability, whose role in the ORM changed completely, and it underlines the role of organizational reliability in shaping sustainability during crisis. This is mainly because in the phase of escalation of the crisis in the organization, it turns out that it is counterproductive for employees to maintain their previous modes of action to ensure the implementation of previously assigned tasks. High levels of previous job performance and a focus on avoiding errors can—in such an unpredictable and highly dynamically changing situation—negatively influence the reliability of the organization as a whole. Moreover, IT only strengthens the negative effects because it naturally supports the old ways of operations and must be reconfigured and used differently by employees to start supporting new ones. In this situation, the behavior of managers is the key for retaining organizational sustainability through ensuring its reliability. Their main task is to try to restore organizational balance by redefining the tasks or ways of implementing them by employees and, as soon as possible, to adapt the organization to changes in the environment. Therefore, the results obtained showed the key role of managers in shaping the reliability of the organization in crisis influenced by critical conditions of the organization’s functioning which occurred during the COVID-19 pandemic. At the same time, the obtained results showed the significant role of Type-2 capabilities in all three areas, as well as the significantly reduced role of Type-1 reliability capabilities. Emphasizing the importance of Type-2 reliability capabilities is particularly important in the area of HR, because despite the fact that HR reliability in the conditions of escalating crisis seems to be counterproductive in relation to organizational reliability, Type-2 HR reliability capabilities have a positive impact on organizational reliability, being a de facto prerequisite for the quick adaptation of employees to the new situation. From the point of view of practice, the results should be treated as a beacon for managers—in the crisis escalation phase, the task of managers is not only to develop new ways of functioning of the organization (which of course is difficult in itself due to the need to make quick decisions and act under enormous time pressure), but also to define the roles of employees and tasks set for IT so that both areas could contribute to ensuring the reliability of the organization as a whole and retaining its sustainability during crisis. It is important to underline that the reconfiguration of the business model is needed for retaining sustainability in crisis.

The need for such reconfiguration, especially in the area of HR reliability, is underlined by the obtained results and can be treated as the main contribution for managers, who must be aware that even if conducting “business-as-usual” without any specific mechanisms ensuring organizational reliability is usually enough for maintaining sustainability, in such type of crisis the reliability maintenance needs their extra attention. It is not necessary to use advanced dedicated HRO solutions, but a reconfigured approach to employees (taking also into account the critical role of management).

The performed research had some limitations; the obtained sample of 115 organizations working under critical conditions was by far not a representative sample. However, since the COVID-19 pandemic changed the way in which Europe works and Italy as a center of the epidemic became the region which was affected by those changes to the highest extent, it seems that the obtained results show some trends which make it possible to pinpoint factors crucial for obtaining organizational reliability in such conditions, which is a prerequisite for retaining sustainability of organizations in the crisis escalation phase caused by the critical condition of organization functioning induced by the COVID-19 pandemic. The results clearly need further research and in-depth analysis, but might be useful now for proposing some actions mitigating the crisis escalation phase caused by the critical condition of organization functioning induced by the COVID-19 pandemic, which may contribute to increasing the survival rate of organizations currently trying to overcome the crisis.

**Author Contributions:** Conceptualization, A.B., K.T. and A.Z.-K.; methodology, A.B., K.T. and A.Z.-K.; validation, A.B., K.T. and A.Z.-K.; formal analysis, K.T.; investigation, A.B. and K.T.; writing—original draft preparation, A.B., K.T. and A.Z.-K.; writing—review and editing, A.B., K.T. and A.Z.-K.; visualization, A.B. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Biełkowska, A.; Tworek, K.; Zabłocka-Kluczka, A. *Organizational Reliability. Human Resources, Information Technology and Management*; Routledge: Abingdon-on-Thames, UK, 2020; ISBN 9780367483951. Forthcoming.
2. Weick, K.E.; Sutcliffe, K.M. *Managing the Unexpected*; Jossey-Bass: San Francisco, CA, USA, 2001; Volume 9.
3. Jeong, J. Enhancing organizational survivability in a crisis: Perceived organizational crisis responsibility, stance, and strategy. *Sustainability* **2015**, *7*, 11532–11545. [[CrossRef](#)]
4. Shrivastava, S.; Sonpar, K.; Pazzaglia, F. Normal accident theory versus high reliability theory: A resolution and call for an open systems view of accidents. *Hum. Relat.* **2009**, *62*, 1357–1390. [[CrossRef](#)]
5. Vogus, T.J.; Rothman, N.B.; Sutcliffe, K.M.; Weick, K.E. The affective foundations of high-reliability organizing. *J. Organ. Behav.* **2014**, *35*, 592–596. [[CrossRef](#)]
6. Miller, B.M.; Horsley, J.S. Digging Deeper: Crisis Management in the Coal Industry. *J. Appl. Commun. Res.* **2009**, *37*, 298–316. [[CrossRef](#)]
7. McKinney, E.H. Supporting Pre-Existing Teams in Crisis With IT: A Preliminary Organizational Team Collaboration Framework. *J. Inf. Technol. Theory Appl. (JITTA)* **2008**, *9*, 39–59.
8. Baba, H.; Watanabe, T.; Nagaishi, M.; Matsumoto, H. Area Business Continuity Management, a new opportunity for building economic resilience. *Procedia Econ. Financ.* **2014**, *18*, 296–303. [[CrossRef](#)]
9. Bajgoric, N. Business continuity management: A systemic framework for implementation. *Kybernetes* **2014**, *43*, 156–177. [[CrossRef](#)]
10. Torabi, S.A.; Giah, R.; Sahebjamnia, R. An enhanced risk assessment framework for business continuity management systems. *Saf. Sci.* **2016**, *89*, 201–218. [[CrossRef](#)]
11. Klein, R.L.; Bigley, G.A.; Roberts, K.H. Organizational Culture in High Reliability Organizations: An Extension. *Hum. Relat.* **1995**, *48*, 771–793. [[CrossRef](#)]
12. Bakos, L.; Dumitraşcu, D.D.; Harangus, K. Human Factor Preparedness for Decentralized Crisis Management and Communication in Cyber-Physical Systems. *Sustainability* **2019**, *11*, 6676. [[CrossRef](#)]
13. Fink, S. *Crisis Management: Planning for the Inevitable*; American Management Association: New York, NY, USA, 1986.

14. Pearson, C.M.; Clair, J.A. Reframing Crisis Management. In *Crisis Management*; Boin, A., Ed.; Sage Publications Ltd: Los Angeles, CA, USA; London, UK; New Delhi, India; Singapore, 2008; Volume II, pp. 1–24.
15. Greening, D.W.; Johnson, R.A. Do Managers and Strategies Matter? A Study in Crisis. *J. Manag. Stud.* **1996**, *33*, 25–51. [\[CrossRef\]](#)
16. Baldwin, R.; Mauro, B.W.D. (Eds.). *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*; A CEPR Press VoxEU.org eBook: London, UK, 2020.
17. Zhou, F.; Yu, T.; Du, R.; Fan, G.; Liu, Y.; Liu, Z.; Xiang, J.; Wang, Y.; Song, B.; Gu, X.; et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *Lancet* **2020**, *395*, 1054–1062. [\[CrossRef\]](#)
18. Linton, N.M.; Kobayashi, T.; Yang, Y.; Hayashi, K.; Akhmetzhanov, A.R.; Jung, S.; Yuan, B.; Kinoshita, R.; Nishiura, H. Incubation period and other epidemiological characteristics of 2019 novel coronavirus infections with right truncation: A statistical analysis of publicly available case data. *J. Clin. Med.* **2020**, *9*, 538. [\[CrossRef\]](#) [\[PubMed\]](#)
19. Sohrabi, C.; Alsafi, Z.; O'Neill, N.; Khan, M.; Kerwan, A.; Al-Jabir, A.; Iosifidis, C.; Agha, R. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *Int. J. Surg.* **2020**, *76*, 71–76. [\[CrossRef\]](#) [\[PubMed\]](#)
20. Baldwin, R.; Mauro, B.W.D. (Eds.). *Economics in the Time of COVID-19*; A CEPR Press VoxEU.org eBook: London, UK, 2020.
21. Wei, S.-J. Ten keys to beating back COVID-19 and the associated economic pandemic. In *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*; Baldwin, R., Mauro, B.W.D., Eds.; A CEPR Press VoxEU.org eBook: London, UK, 2020; pp. 71–76.
22. Gourinchas, P.-O. Flattening the pandemic and recession curves. In *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*; Baldwin, R., Mauro, B.W.D., Eds.; A CEPR Press VoxEU.org eBook: London, UK, 2020; pp. 31–40.
23. Ramelli, S.; Wagner, A. What the stock market tells us about the consequences of COVID-19. In *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*; Baldwin, R., Mauro, B.W.D., Eds.; A CEPR Press VoxEU.org eBook: London, UK, 2020; pp. 63–70.
24. Nizamidou, C.; Vouzas, F. MHR. Providing a new perspective in HR in terms of crisis management. *Int. J. Bus. Sci. Appl. Manag.* **2018**, *13*, 15–25.
25. Lockwood, N.R. *Crisis Management in Today's Business Environment: HR's Strategic Role*; SHRM Research Quarterly: Alexandria, VA, USA, 2005.
26. Markovits, Y.; Boer, D.; van Dick, R. Economic crisis and the employee: The effects of economic crisis on employee job satisfaction, commitment, and self-regulation. *Eur. Manag. J.* **2014**, *32*, 413–422. [\[CrossRef\]](#)
27. Witczak, H. *Natura i kształtowanie systemu zarządzania przedsiębiorstwem*; PWN: Warszawa, Poland, 2008.
28. Zavadský, J.; Hitka, M.; Potkány, M. Changes of employee motivation of Slovak enterprises due to global economic crisis. *Ekon. A Manag.* **2015**, *18*, 57–66. [\[CrossRef\]](#)
29. Mehri, M.; Iqbal, M.J.; Hekmat, R.K.; Ishaq, H.M. Impact of global financial crises on job security and job motivation of employees of banking sector in Iran. In Proceedings of the 2nd International Conference on Business and Economic Research, Kedah, Malaysia, 14–15 March 2011.
30. Lee, B.H.V.; Wang, L.R.L.; Ip, D.F.K. Global financial crisis and job satisfaction of atypical workers: The case of Taiwan. *J. Asian Public Policy* **2011**, *4*, 103–120. [\[CrossRef\]](#)
31. Harankhedkar, H. How to Motivate Employees During a Recession. Available online: <http://www.buzzle.com/articles/how-to-motivateemployees-during-a-recession.html/>. (accessed on 23 February 2020).
32. Meyerson, H. Keeping Employees Motivated During a Crisis. Available online: <http://www.confidencecenter.com/art24.htm/> (accessed on 23 February 2020).
33. Thompson, B.Y. The digital nomad lifestyle: (Remote) Work/leisure balance, privilege, and constructed community. *Int. J. Sociol. Leis.* **2019**, *2*, 27–42. [\[CrossRef\]](#)
34. Watkins, M. Your crisis response plan: The ten effective elements. In Practice. 2020.
35. Simons, J. IBM, A pioneer of remote work, Calls workers back to the office. *Wall Street J.* **2017**.
36. Bitici, U.S.; Ackerman, F.; Ates, A.; Davies, J.D.; Gibb, S.; MacBryde, J.; MacKay, D.; Maguire, C.; van deer Meer, D.; Shafti, F. Managerial processes: An operations management perspective towards dynamic capabilities. *Prod. Plan. Control.* **2011**, *22*, 157–173. [\[CrossRef\]](#)

37. Kor, Y.; Mesko, A. Dynamic managerial capabilities: Configuration and orchestration of top executives' capabilities and the firm's dominant logic. *Strateg. Manag. J.* **2013**, *34*, 233–244. [[CrossRef](#)]
38. Aldag, R.J.; Stearns, T.M. *Management*; South-Western Publishing Co.: Cincinnati, OH, USA, 1987.
39. Callari, T.C.; Bieder, C.; Kirwan, B. What is it like for a middle manager to take safety into account? Practices and challenges. *Saf. Sci.* **2019**, *113*, 19–29. [[CrossRef](#)]
40. Mintzberg, H.A. The manager's job: Folklore and fact. *Harv. Bus. Rev.* **1975**, *53*, 49–61. [[CrossRef](#)]
41. Gross-Golacka, E.; Kusterka-Jefmańska, M.; Jefmański, B. Can Elements of Intellectual Capital Improve Business Sustainability?—The Perspective of Managers of SMEs in Poland. *Sustainability* **2020**, *12*, 1545. [[CrossRef](#)]
42. Carayannis, E.G.; Sindakis, S.; Walter, C. Business model innovation as lever of organizational sustainability. *J. Technol. Transfer.* **2015**, *40*, 85–104. [[CrossRef](#)]



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).