VILNIUS TECH
Vilnius Gediminas Technical University

Journal of Business Economics and Management
ISSN 1611-1699 / eISSN 2029-4433
2023 Volume 24 Issue 2: 199–220
https://doi.org/10.3846/jbem.2023.18819

WHY CAN ORGANIZATIONAL RESILIENCE NOT BE MEASURED?

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Received 20 June 2022; accepted 10 March 2023

Abstract. Our aim is to justify why organizational resilience cannot be measured in an ex-ante way and the consequences we can draw from it. To achieve this goal, we examine the relations between different approaches to organizational resilience and the tight interrelation between organizational resilience and organizational and dynamic capabilities. We argue that most proposals about organizational resilience conceptualization, and the metrics derived from them, are closely related. They represent the same core concepts, facts, and relations. Additionally, far from there being no consensus about organizational resilience, researchers are presenting the same ideas with different terms. This implies that there are no better or worse definitions or conceptualizations for organizational resilience, but models are more or less suitable depending on the approach to be established. We agree with the proposal that organizational resilience is a dynamic capability and, as such, it should be studied and considered. This review led us to conclude that because organizational resilience is a dynamic process, it cannot be measured or estimated in an ex-ante way. The fact that organizational resilience cannot be measured brings us to the question of how organizations can address organizational resilience improvement, evaluate their progress, and the tools they can use.

Keywords: organizational resilience, conceptualization, measurement, models, dynamic capabilities, risks, firm behavior.

JEL Classification: H12, L20, L21, L29.

Introduction

What is organizational resilience? How can it be measured? These questions have been widely discussed in the literature for the last few years, including the publication of ISO standards: International Organization for Standardization (2017), which focuses on the nature and scope of resilience, and International Organization for Standardization (2019), which cen-

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ters on the business continuity model. Business continuity is defined as an organization's capability to keep delivering its products or services at an acceptable predefined level after a disruptive event (Păunescu & Argatu, 2020). Therefore, it is somewhat related to organizational resilience. Despite all these efforts, it seems that no consensus has yet been reached about what organizational resilience really is. For example, Yao and Fabbe-Costes (2018) review the concept of organizational resilience because it is understood differently in five different science and knowledge areas. These authors ask if it can even be possible to define organizational resilience univocally.

Why do we need to understand and define organizational resilience? Lee et al. (2013) posit that there are two major reasons for the study of organizational resilience following Dalziell and McMannus (2004), and Parsons (2007). First, Dalziell and McMannus (2004) argue that organizational resilience and social-community resilience are interdependent when both a community and society can be seen as organizations. Second, according to Parsons (2007), organizational resilience can be a source of competitive advantage. Competitive advantage is an organization's ability to outperform its competitors (Porter, 2011). Mitchell and Harris (2012) state that resilience relates to how a single individual or a community deal with disturbance, surprise, and change. They suggest that to be sustainable, we must handle risk and uncertainty. The idea of being able to survive in a constantly changing environment is widespread in the academic literature about organizational resilience. We are interested in organizational resilience because we want to know what an organization can or must do to maximize the probability of keep operating in the near future. The previous paragraph highlights the importance of measuring organizational resilience because, if we could measure it, we would have an extremely useful indicator to evaluate the probability of an organization's survival.

To find a useful indicator, if at all possible, we first need to understand what the best approach to organizational resilience is, and what its focus and roots are. Some authors look for the common sources and roots of the organizational resilience concept in different areas. For example, Yao and Fabbe-Costes (2018) analyze different areas, such as ecology or psychology. Mitchell and Harris (2012) point out that the organizational resilience concept emerges as the merging of ideas from distinct disciplines, such as mechanical and infrastructure engineering, or psychology. Others, like McManus et al. (2007) or, more recently, Werner et al. (2021), rather than looking for the roots and foundations of organizational resilience, focus on the relevant factors or indicators in resilience management. Others have approached organizational resilience from a dynamic process perspective. Béné et al. (2012) and Béné (2013) propose organizational resilience as a dynamic process within the natural disaster management framework, while Duchek (2020) and Yao and Fabbe-Costes (2018) follow a similar idea and develop it beyond the limits of communities' resilience to natural disasters.

The metrics used in the literature for measuring organizational resilience emerge from the framework (concept, model, or conceptualization) used to describe organizational resilience. Therefore, we cannot separate the conceptualization from the measurement. An open question is *what is the best (or at least more useful) conceptualization approach we can rely on to measure and manage resilience in any given organization?*

It also seems that organizational capabilities and organizational resilience are related. According to Escamilla-Solano and Plaza-Casado (2020), "*organizational capabilities refer to the establishment of actions, routines, or processes within a company with the objective of achieving competitive advantages*". Therefore, they can be seen as the resources and assets that an organization deploys to get the job done. They are a mandatory tool for the organizational development process, and their study is continuously underway. Scholars distinguish different types of organizational capabilities. In particular, the dynamic capabilities proposed by Teece et al. (1997) seem to be quite relevant from the organizational resilience perspective. Denrell and Powell (2016) state that dynamic capabilities are a competitive advantage in rapidly changing environments. From our point of view, this idea is completely consistent with the notion of resilience. It suggests a way to explore organizational resilience and its assessment and measurement from the organizational capabilities domain.

The starting point of this research is to address an open research question presented by Ruiz-Martin et al. (2018). More specifically, the aim of this paper is to justify whether organizational resilience can be measured in advance or not. We derive the discussion using the concept of dynamic capabilities. If we can justify that organizational resilience is a dynamic capability, that will mean that it cannot be measured and evaluated in advance (i.e., before a disruptive event). This result will have a deep impact on organizational resilience management. As engineers, we are primarily interested in developing and deploying tools and techniques that allow organizations to improve their resilience. However, if there are pieces of evidence that point out that organizational resilience cannot be measured in advance, then, there is no guarantee about the level of an organization's resilience capacity and how to deal with uncertainty.

As far as we know, no one has considered under which circumstances organizational resilience can be effectively tackled from a practitioner's perspective. It means, there are no works that set the circumstances under which all the proposed theoretical models can be implemented in the organization's daily activities. This is a fundamental aspect that has to be considered if we want to develop useful and reliable tools and techniques for improving organizational resilience.

We approach this justification by addressing the following research questions:

- **RQ1**: What is the most suitable definition or conceptualization of organizational resilience for developing useful metrics?
- **RQ2**: Can organizational resilience be considered a dynamic capability?
- **RQ3**: Can we effectively measure organizational resilience?

RQ3 is key for this paper, while RQ1 and RQ2 establish the foundations to be able to answer RQ3. As the three questions are closely related, in the rest of the paper, we focus not only on the question itself but on the interrelation with the other research questions.

The findings presented in this paper will benefit anyone interested in organizational resilience improvement and evaluation, from organization managers to consultants in the area of quality and business continuity. Even though we concluded that organizational resilience cannot be measured in an ex-ante way, being conscious about the true nature of organizational resilience and the fact that it cannot be measured in advance will help organization managers to adequate their resilience policies and strategies.

The rest of the paper is organized as follows. In Section 1, we present the state of the art. In Section 2, we describe the research methodology. Section 3 provides the results and Section 4 a discussion on the results. Finally, we conclude the paper with the conclusions and future research directions.

1. Literature review. State of the art for the research questions

1.1. Organizational resilience

Since 2011, papers have been periodically published focusing on summarizing the proposals and open questions about organizational resilience. The most recent ones are dated: 2021 (Ahmed et al., 2021; Bento et al., 2021; Bhamra et al., 2011; Chen et al., 2021a; Corrales-Estrada et al., 2021; Goldschmidt et al., 2019; Hillmann, 2021; Ruiz-Martin et al., 2018). In these papers, questions and digressions about how organizational resilience is conceptualized, what fields contribute to organizational resilience or how organizational resilience proposals can be categorized, are commonplace. This suggests a lack of scholars' agreement about the nature and fundamentals of organizational resilience.

We agree with Chen et al. (2021a, 2021b) and Liu et al. (2021) that organizational resilience conceptualizations can be classified into two main groups: static and dynamic. This classification allows us to discuss whether or not all organizational resilience models or conceptualizations share a common core. From the static point of view, some indicators and factors can be used to study an organization's resilience. The dynamic point of view considers organizational resilience to be something that evolves and adapts over time, and is merely a process or ability.

1.1.1. The static point of view

The authors that follow the static approach propose some sets of variables or indicators whose values can be used in conjunction to understand an organization's resilient behavior. For the static approach, most papers propose centering the study on the statistical significance of the proposed indicators. Three of the works (Chen et al., 2021a, 2021b; McManus et al., 2007; Werner et al., 2021) deploy a more complete framework, which is also statistically tested. We chose these three frameworks for the following reasons: McManus et al. (2007), and their subsequent related papers (Brown et al., 2017; Lee et al., 2013), are cited more than 1000 times. Therefore, they can be considered the most relevant works on organizational resilience. Werner et al. (2021) and Chen et al. (2021a, 2021b) are the latest published works we found that follow the static approach. They include and cover the main ideas on organizational resilience proposed in the last few years. In the Discussion section (Figure 1), we summarize the indicators proposed by the three works, and we discuss the relationships between them.

1.1.2. The dynamic point of view

For the dynamic approach to organizational resilience, three authors, Béné (2013), Duchek (2020), Yao and Fabbe-Costes (2018), propose a three-stage conceptualization for resilience, while Koronis and Ponis (2018) describe a four-stage process. For the four-stage process, in

practice, the second and the third stages take place simultaneously, and we can merge them so that it becomes a three-stage process. Béné et al. (2012) deploy their proposal while studying the behavior of communities that are shocked by natural disasters. They propose that organizational resilience consists of three stages: absorptive coping *capability*, adaptive *capability,* and transformative *capability*. All those components are deployed depending on the intensity of the shock and the type of responses required for the shock. For Duchek (2020), resilience implies effectively responding to adverse events, not only after the event but also before, during, and after it. This author proposes a three-stage framework that spans from before the unexpected event happened (Anticipation) to the time of the unexpected event (Coping), and to the time after the unexpected event (Adaptation). The proposal of Yao and Fabbe-Costes (2018) is restricted to resilience in supply chain management, and they also propose a three-stage process. They talk about Absorbing Capability, Responding Capability, and Capitalizing capability. Those capabilities continuously flow one after the other. Finally, Koronis and Ponis (2018) present what they call key drivers of resilience, which are Preparedness, Responsiveness, Adaptability, and Learning.

Table 1 summarizes the resilience stages identified by the four authors. In the Discussion section, we compare the definitions of each author for all the stages and discuss if they refer to the same or different processes.

Table 1. Summary of the stages of organizational resilience from the dynamic point of view

Author	Stage 1	Stage 2	Stage 3
Béné et al. (2012)	Absorptive	Adaptive	Transformative
Duchek (2020)	Anticipation	Coping	Adaptation
Yao and Fabbe-Costes (2018)	Absorbing	Responding	Capitalizing
Koronis and Ponis (2018)	Preparedness	Responsiveness Adaptability	Learning

1.2. Organizational resilience and organizational capabilities

As mentioned in the introduction, our aim is to justify whether organizational resilience can be measured in an ex-ante way or not. We will justify this in the context of organizational capabilities. In this subsection, we present a review to understand what an organizational capability is and how dynamic capabilities emerge from the set of organizational capabilities. This is needed to understand if organizational resilience is a dynamic capability. We also discuss the papers that have presented arguments or have previously considered that organizational resilience can be seen as an organizational capability.

Before starting the discussion, we want to highlight the difference between capacity and capability. According to Vincent (2008), capacity is the power to hold, receive or accommodate, while capability is a feature, faculty, or process that can be developed or improved. While capacity refers to the maximum output an organization can yield and deliver, capability refers to the organization's ability to do something. Therefore, organizational resilience is a capability, but we try to measure resilience capacity.

The study of organizational capabilities can be traced back to the beginning of the 1990s (Amit & Schoemaker, 1993; Stalk et al., 1992; Ulrich & Lake, 1991), far before organizational resilience drew researchers' attention.

What is organizational capability? Stalk et al. (1992) and Stalk, Evans, and Shulman (2012) define organizational capabilities as a set of business processes from the strategical point of view. According to Amit and Schoemaker (1993), organizational capabilities are the firm's *capability* to unfold resources to achieve a target, and organizations deploy them through organizational processes. Ulrich and Lake (1991) argue that organizational capabilities are the result of an organization's adaptation to the changing demands in its environment and from its customers; organizations achieve them by establishing internal structures and processes that influence their members to create organization-specific competences. Grewal and Slotegraaf (2007) define organizational capabilities as the ability to perform productive tasks that are intended to create added value by transforming inputs into outputs. For them, organization's resources would be inputs and, therefore, the source of the firm's capabilities. Similarly, Helfat (2003) defines organizational capabilities as the ability to perform a task in a coordinated way and to use the organization's resources toward a desired end. Javidan (1998) identifies organizational capabilities as the ability to exploit the organization's resources. Finally, Nagarajan and Prabhu (2015) define organizational capabilities as the qualities, abilities, *capability* and potential to be developed. They point out that capabilities provide means to grow and flexibility to meet future needs.

Dynamic capabilities emerge from a set of competences. Nagarajan and Prabhu (2015) state that competences are the tools that enable someone to do a job. For these authors, the definition of competency is the possession of skills, knowledge, and *capability* to meet current needs. Teece et al. (1997) state that competences appear when an organization's assets are grouped in such a way that they enable distinctive activities to be performed. Zhang, Vonderemse, and Lim (2002) point out that competences are internally focused, while capabilities are externally focused. Therefore, competences are related to an organization's internal resources, while capabilities are how an organization uses its competences to deal with the world.

What is the purpose of organizational capabilities? Many authors have addressed this topic. For example, Lam (2002) and van Oppen and Brugman (2011) agree that the purpose of organizational capabilities is to guarantee an organization's sustainability and survival in the long term. This idea is aligned with the notion of business continuity presented by Aleksandrova et al. (2018), Engemann and Henderson (2014), Lam (2002) and Păunescu and Argatu (2020). Barreto (2010) points out that dynamic organizational capabilities are identified as tools with which to explore and understand how organizations manage in changing environments.

How are organizational capabilities classified? Organizational capabilities are classified as static and dynamic capabilities. Static capabilities can be seen as any resource, information, knowledge, or intelligence built over time that has become inherent to an organization. Dynamic capabilities are related to what people and the organization can do. The dynamic capability concept was first introduced by Teece et al. (1997) as "*the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environ-*

ments". In other words, dynamic capabilities are the capabilities that allow an organization to adapt and change its current organizational capabilities. They are directly related to how the organization faces changes and uncertainty.

Is there any relation between organizational capabilities and organizational resilience? Several authors have related organizational resilience to organizational capabilities, more specifically to dynamic capabilities. Duchek (2020) states that organizational resilience can be seen as a set of organizational capabilities (Anticipation Capability, Coping Capability, Adaptation Capability). Corrales-Estrada et al. (2021) build their work around the principle that organizational resilience is a dynamic capability. These authors state that organizational sustainability and organizational resilience are critical dynamic capabilities for business continuity management. Birkie et al. (2017) argue that dynamic capabilities are a source of organizational resilience. For them, the routines that develop in an organization can be the source of dynamic capabilities that, in turn, help to improve the organization's resilience. Finally, following the ideas presented by Lengnick-Hall et al. (2011), Ortiz-de-Mandojana and Bansal (2016), and Samba and Vera (2013), van den Berg et al. (2021) state that organizational resilience can be considered a dynamic capability.

Although organizational resilience appeared some years after the theory of organizational capabilities was outlined, the literature contains a common branch between organizational capabilities and organizational resilience. According to the literature, their purpose overlaps to some extent.

In the Discussion section, we explore if this overlapping is because organizational resilience is indeed an organizational capability, and because of the implications that this has on understanding and managing organizational resilience.

1.3. Measurement of organizational resilience

Several works propose metrics and indicators for measuring organizational resilience. Ruiz-Martin et al. (2018) provide a thorough summary of these proposals. We focus on a literature review within the scope of the two organizational resilience characterizations we present in Section 1.1: static and dynamic views.

1.3.1. How do we measure organizational resilience from a static point of view?

Static approaches to organizational resilience usually evaluate survey answers on a Likert scale (Likert, 1932). According to Joshi et al. (2015), this kind of scale is used to measure "attitude" in a way that can be scientifically accepted, which means that it can be validated. They define attitude as the preferential ways of behaving and or reacting in a specific circumstance. They point out that the endurance of the belief and ideas is rooted in the attitude.

We found three articles that we consider relevant to this topic: Lee et al. (2013), Werner et al. (2021), and Chen et al. (2021a, 2021b).

Lee et al. (2013) propose a framework called BRT (Benchmark Resilience Tool) to measure and evaluate organizational resilience. They start from the resilience model proposed by McManus et al. (2007) and present a questionnaire to evaluate all the 15 resilience indicators proposed by the McManus model. An application example of the BRT can be found in Brown

et al. (2017), who conducted a survey based on its questionnaire using an eight-point Likert scale. After completing the survey, responses are statistically analyzed and classified. Organizational resilience is measured by comparing performance on the survey against a benchmark, which is usually a previous survey. Vulnerabilities or improvements are identified in those areas whose indicators present considerable variance. Subsequent surveys are used to track how indicators evolve over time. They measure organization's adaptation capability as the time indicators take to return to a normal value.

Werner et al. (2021) propose a different set of indicators. They conduct a survey that is not directly related to indicators, but contains a set of eight questions about the organization's management and performance. They evaluate the set of indicators presented in Figure 1 (Discussion section) from the answers to the survey question. They suggest that the results of the survey can help managers. By monitoring the leading indicators, they can identify vulnerabilities early and take actions that reduce the impact on operational and financial systems.

Chen et al. (2021a, 2021b) evaluate the five areas presented in Figure 1 using a survey made up of 31 questions evaluated on an eight-point Likert scale. The questionnaire results are used to statistically estimate the performance of the five factors.

Other works (Hundal et al., 2021; Pathak & Joshi, 2021) conduct surveys that are also evaluated on a Likert scale. They do not attempt to measure organizational resilience itself, but provide evidence that supports the notion that some indicators can be used to improve organizational resilience.

In the Discussion section, we focus on the relationship between the indicators proposed by the three above-mentioned authors and the consequences we can derive from it.

1.3.2. How do we measure organizational resilience from a dynamic point of view?

Within the dynamic approach point of view to organizational resilience, we first consider three works (Cimellaro et al., 2010; Ilseven & Puranam, 2021; Baghersad & Zobel, 2022) that implicitly imply learning and adaptation stages. Cimellaro et al. (2010) measure organizational resilience using a civil engineering approach. They characterize organizational resilience by recovery time: the time needed to restore to the same (or even higher) level the services and processes affected by the disruptive event. Ilseven and Puranam (2021) focus on the organization's performance outcome. According to these authors, the better the results are, the more resilient the organization is. Once again, the organization could perform even better after the disruptive event. Finally, Baghersad and Zobel (2021) argue that average, maximum, and total losses can be employed as a consistent measure of organizational resilience. In the end, all these proposals assume that the organization is capable of learning and improving during a critical event, which is consistent with the dynamic proposals for resilience that we have reviewed in previous sections.

Béné (2013) evaluates how to measure any community's resilience to natural disasters quantitatively. It is not our purpose here to discuss if community and organizational resilience are the same things, but a community can be seen as a form of organization. Therefore, up to a certain point, community and organizational resilience can be compared. Thus, in the next paragraph, organizational and community resilience are synonymous. For Béné, resilience cannot be measured by considering only ex-post responses. To assess resilience, it

is necessary to consider ex-ante actions, such as community investment in protective actions and infrastructure. Béné proposes a quantitative metric for resilience: the sum of the total economic costs of recovery. This cost includes anticipation costs, impact costs, and post-event recovery costs. We can clearly see the three stages proposed by their model.

Not all scholars agree that organizational resilience can be measured. For example, Yao and Fabbe-Costes (2018) indicate that no consensus has been reached on the definition and conceptualization of organizational resilience as an indication that it may not be possible to measure it. In the Discussion section, we explain how these proposals are interrelated and how the organizational resilience measurement is affected by our findings about the two previous research questions.

2. Research methodology

As we mentioned in the introduction, our aim is to justify if organizational resilience can be effectively measured in an ex-ante way or, if it is a dynamic capability and, therefore, it cannot be measured or quantified in advance.

To address this research question, we followed the research protocol based on Tranfield et al. (2003), following the same research method as in Ruiz-Martin et al. (2018).

The first step was defining the research questions. We built the assumption that organizational resilience could be a dynamic capability and, therefore, it cannot be measured in advance, as suggested by Ruiz-Martin et al. (2018). This idea contradicted the fact that in a certain number of papers, we found different proposals for metrics that can be used to quantify the resilience of an organization. We noted that none of the works we found about measuring resilience seem to consider whether the measure they propose can or cannot be done. This suggests the following question: *under which circumstances, if any, would it be possible to measure organizational resilience effectively?* The metrics proposed in the literature were highly dependent on the underlying organizational resilience model. Therefore, the three research questions exposed in the introduction emerged one after the other: RQ1: What is the most suitable definition or conceptualization of organizational resilience for developing useful metrics? RQ2: Can organizational resilience be considered a dynamic capability? And RQ3: Can we effectively measure organizational resilience?

In the second step, we set the research scope. As we are primarily interested in business management and the way we could deploy tools and techniques to improve it, we set our research scope on organizational resilience and dynamic capabilities.

The third step was defining the search criteria. We selected Scopus because it indexes ACM Digital Library, IEEE Xplore, and ScienceDirect. We searched on Scopus for any document written in English in the area of "Business, Management, and Accounting". We did two searches, one for organizational resilience and another one for dynamical capabilities. These searches returned 3,948 matches for organizational resilience and 1,152 matches for dynamical capabilities.

The fourth step was defining the exclusion criteria. We refined the search based on the paper keywords, title, and abstract. We searched for papers that cover organizational resilience and its measurement and papers covering the dynamical capabilities characterization

and how they can be applied to organizational resilience. When the title and abstract did not help to decide if the paper was of interest, we read the full paper. We selected 41 papers related to organizational resilience and its measurement or improvement, plus 18 papers addressing dynamic capabilities questions and their relationship with organizational resilience.

In the fifth step, we replicated the search and the refinement to validate the results. Finally, we read all the selected papers and included some additional papers found among the cited works of the selected ones, which we considered relevant for our study. The data retrieved is mostly qualitative. To analyze it, we followed these steps:

Step 1 – Data classification: We considered the following categories:

- Category 1: Point of view used on organizational resilience:
  - Category 1A: Static point of view.
  - Category 1B: Dynamic point of view.
- Category 2: Organizational resilience measurement.
- Category 3: Organizational capabilities.

Step 2 – Data organization and connection: In each category, the data is clustered and connected according to the following criteria:

- Category 1A: (1) Paper proposes a complete model for Organizational Resilience; (2) Statistical testing for the model or assumptions; (3) Organizational resilience indicators proposed.
- Category 1B: Organizational resilience stages proposed.
- Category 2: Type of organizational resilience metric proposed.
- Category 3: Organizational Resilience is presented as an organizational capability. Examples given

Step 3 – Category synthesis: Papers and data in each category are compared among them to search for similarities between the conclusions and findings.

Step 4 – Cross category synthesis: Papers and data are compared across categories. We search for connections between different approaches to Organizational Resilience.

Once the papers were categorized under at least one qualitative category, we selected the main references for the category. We use two criteria: *relevance* (measured by the number of citations) and *usefulness* of the findings presented in the context of our research.

3. Results

In this section, we briefly present the answers to the RQ obtained by our analysis The answers to this research questions come from synthesizing the dynamic (Table 1) and static (Figure 1) points of view of organizational resilience, and the fact that organizational resilience is a dynamic capability as it is derived from the analysis of the literature review.

RQ1 investigates the most suitable approach for measuring OR. Our answer to this question is: *None*. The theoretical frameworks and models are not valid tools to measure OR in an ex-ante way. They can just provide valuable insights about the OR after the recovery process has finished.

RQ2 asks if OR is a dynamic capability or not. Our answer to this RQ is *yes*. According to Teece et al. (1997) and considering the analyzed OR models, OR is a dynamic capability because it helps the organization to improve its existing capabilities.

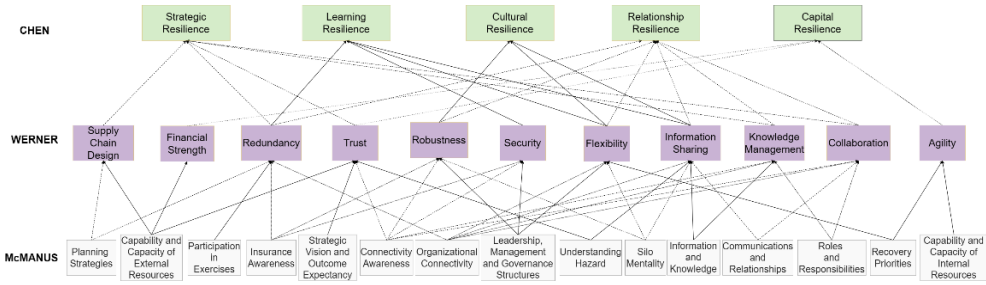

Figure 1. McManus et al., Werner et al. and Chen et al. correspondences

Finally, RQ3 asks if OR can be reliably measured in an ex-ante way. Our answer to this question is *no*. The answer to RQ3 can be inferred from the answers to RQ1 and RQ2. Being a dynamical capability, OR can only be measured in a binary mode: it is present, or it is not present, and this can only be determined after the disruption. This is why no framework can be formulated to predict the OR response of an organization.

We elaborate on these results in the Discussion section.

4. Discussion

In this section, we first discuss RQ1 by presenting the relations between the static and dynamic approaches to organizational resilience and how they indeed overlap. Then we focus on RQ2 and why we defend that organizational resilience is a dynamic capability. Finally, RQ3 is addressed. We argue that according to the findings on the previous research questions, organizational resilience cannot be measured in an ex-ante way.

4.1. What would be the most suitable approach to organizational resilience if we aim to measure it?

Following some reviewed works (Goldschmidt et al., 2019; Ruiz-Martin et al., 2018; Yao & Fabbe-Costes, 2018), we are still far from obtaining an acceptable and functional resilience model. According to some authors, the variety of definitions and conceptualizations indicates the fuzzy nature of the organizational resilience concept, which makes it hard, if not impossible, to set a unique or global definition of organizational resilience.

Our assumption is that, despite the many apparently different proposals and models about organizational resilience, a common core is present in them all, and indeed most of the works on organizational resilience manage and develop the same core ideas.

In Section 1.1, we review the two main approaches to organizational resilience: static view and dynamic view. The static approach attempts to answer the question *What is organizational resilience?* by identifying constitutive elements and properties. The dynamic approach focuses on *How is organizational resilience deployed?* by looking at the path organizations follow to be resilient.

In the rest of the section, we examine how both approaches are similar and are naturally complementary.

4.1.1. Organizational resilience: the static view

The works that focus on the static approach look for indicators that can be used to identify resilient-prone characteristics, attitudes, or behaviors. The three authors we center on during the literature review (McManus et al., 2007; Werner et al., 2021; Chen et al., 2021a, 2021b) present their own proposals about these indicators. McManus and Werner present indicators, while Chen identifies fundamental organizational resilience components. The three works statistically test the validity of their proposals by using a survey to collect data. McManus presents 15 indicators, Werner 11, and Chen considers only five factors. The question that arises is: are these proposals completely unrelated?

The proposals of these three papers suggest that the models are not as different as they would seem. We mapped the indicators/factors in these proposals, as shown in Figure 1.

Figure 1 shows our proposed mapping between the models. We do not argue that this is the only possible mapping between the three authors, but this overlapping is plausible and coherent with the definitions that the authors provide for each indicator. It is not our purpose to analyze in detail correspondences and the degree of overlap between them. The relevant aspect of this mapping is that models indeed overlap in most of their indicators and, in their own way, each one measures a large common set of behaviors and organizational abilities.

As it is impossible to forecast all the sources of risk and uncertainty in an organization, it seems natural for several authors to propose different models with distinct attributes. It also seems natural that not all the attributes proposed by one author are completely represented by another author's model. However, a common core is recognized and represented by all the models as can be seen from the relationships presented in Figure 1.

4.1.2. Organizational resilience: the dynamic view

The authors who postulate organizational resilience as a dynamic process attempt to identify how it is deployed and developed by organizations. Table 1 shows the stages that all the considered authors identify during the resilience process. They all agree that there are three stages in the resilient process so, in this case, the consensus seems clearer and wider than in the static approach. It is noteworthy that no author cites any of the others. Obviously as Béné et al. (2012) is the oldest reference, it cannot cite any of the following authors, but cites Walker et al. (2002) as a reference for his model. Duchek (2020) roots the origin of his proposal in Linnenluecke and Griffiths (2012). The other authors do not provide any reference about the origin of their idea.

Proposals differ slightly in the concept and processes that they identify in each resilience stage. According to Béné et al. (2012), the first stage is the set of strategies adopted by an organization to moderate and mitigate the impact of shocks. Duchek (2020) cites Somers (2009) and states that it refers to the ability to detect and anticipate critical events in an organization or its environment to proactively react. Yao and Fabbe-Costes (2018) cite Caniato and Rice (2003), and refer to this stage as the ability to absorb the disruption and to withstand the consequences of shock. Koronis and Ponis (2018) refer to the crisis management literature by pointing out that planning strategies and training increase organizational survival and sustainability capacity.

For the second stage, and following the International Panel for Climate Change, Béné et al. (2012) state that this stage is characterized by a system's ability to adjust to change, and to buffer or reduce potential damage. In this stage, the organization has to make the most of opportunities or, if this is not possible, to cope with the consequences. Duchek (2020), citing Wildavsky (1991), Home and Orr (1997) and Mallak (1998) as references states that the organization has to deal with unknown hazards, productively respond to significant changes, and design and implement positive adaptive behavior that matches the situation. Yao and Fabbe-Costes (2018) recall that response measures in this stage need to be put in place to "bounce back". Finally, Koronis, and Ponis (2018) indicate that it is characterized by being the stage in which the organization develops its ability to understand what challenges and problems it has to face, and being able to analyze their impact and maintain social cohesiveness when under time and psychological pressures to finally be able to recover by returning to "normal conditions" and "bouncing back".

According to Béné et al. (2012), the third stage is where the organization has to show its *capability* to create a fundamentally new system, and it is when environmental conditions and economic or social structures make the existing one untenable. Duchek (2020) states that adjustment occurs in this stage after a crisis and should be reflected in organizational advancement. This is a long-term learning process that increases a firms' knowledge base and can be used to anticipate new disruptive events. Following Caniato and Rice (2003), Yao and Fabbe-Costes (2018) characterize this stage as a proactive process during which the organization learns from experience of disruptions, and builds and consolidates knowledge that will be used to anticipate future challenges. The characterization of Koronis and Ponis (2018) for this stage is similar to that of the other authors. They state that the organization has to develop learning systems that support risk assessment, problem acknowledgement, impact analyses and possible solutions. They also recall that the organization has to act as an open system by absorbing external knowledge and making the right assumptions.

Despite all the details, we consider that the four proposals have a common ground. The first stage is identified as a preparation and anticipation process to be able to absorb the strongest possible impact. This stage includes all the things that an organization does or considers to forecast, and to anticipate any future disruptive event. The second stage is only deployed if the measures and procedures of the first stage cannot contain the disruptive event. In this stage, the organization develops and deploys new measures and processes to cope with the event. Initiative, innovation and creativity seem to play a relevant role in this stage. The third stage is the process that integrates and consolidates all the new knowledge and learning that the organization has gained from the two previous stages. The purpose of this stage is to reinforce the organization so that it is more resilient in the future and less prone to failure.

Béné et al. (2012), Duchek (2020) and Yao and Fabbe-Costes (2018) explicitly propose a recurrent never-ending process. This means that organizational resilience is a continuous never-ending process, and one that is reinforced if the organization is able to learn, integrate and manage acquired knowledge. These three authors also agree that there is some degree of concomitance among the three stages, with a mutual influence and overlap among them.

4.1.3. Organizational resilience: conceptualization summary

The static approaches to organizational resilience that we have explored are, despite looking different, coherent and concordant with one another. They all refer to a common core and only differ in the way that they depict and model that core. We also argue that it seems impossible to completely characterize the core and that not all the identified factors have the same degree of relevance in all organizations.

In dynamic approaches, the concordance among all the models is more evident. It is quite surprising that none of the cited papers about state of the art in organizational resilience research has pointed this out. Although there are differences in details, we consider that they are minor concerns, and all the reviewed models represent the same process.

For the relation between static and dynamic approaches, we found that they are complementary. This idea is also found in Werner et al. (2021). These authors suggest that some of the indicators that they propose are more or less relevant depending on the dynamic stage of the resilient process the organization finds itself in. This idea is completely coherent with our findings. We propose that static factors are not only relevant depending on the dynamic stage that the company is in, but this also depends on the nature, size, activity, and other intrinsic factors that are not considered by the analyzed static frameworks.

We propose that after the same disruptive event, not all the companies need to deploy the same functions and processes to cope with it but will span out in the three-stage sequence that we have seen. The abilities needed to deploy these processes will not be the same for all the companies, not even if recovery processes are the same.

Based on the above discussion, we support the notion that there are no better approaches than others for conceptualizing organizational resilience. They are all complementary, and it would seem that organizational resilience is a vast and wide concept that is probably impossible to summarize in one single formulation. Accordingly, the research question examined in this discussion paragraph (*What is the most suitable definition or conceptualization of organizational resilience for developing useful metrics?*) is answered by stating that there are no good or bad approaches, and the most appropriate one will depend on the circumstances.

4.2. Is organizational resilience a dynamic capability?

Our objective is not to go into detail about organizational capabilities, but to address if organizational resilience can be considered a dynamic capability. To do so, we first need to establish if organizational resilience is an organizational capability and, if indeed it is, then we have to address this question: Does organizational resilience help the company to adapt and improve its existing capabilities?

Some scholars like Lam (2002) and van Oppen and Brugman (2011) consider that the purpose of organizational capabilities is to ensure an organization's continuity and survival in the long term. A similar idea is found in Amit and Schoemaker (1993) and Grewal and Slotegraaf (2007). Stalk et al. (1992, 2012) emphasize the influence of organizational capabilities on organization development and sustainability. Based on the above statements, organizational resilience can be considered an organizational capability.

In practice, this means the ability to modify an organization's existing capabilities because that is the only way to adapt to a changing environment when something new and unknown disrupts. The point we make is that, despite no precise definition for the organizational resilience concept being available, the idea expressed by Teece (2007) is coherent with the wide concept of organizational resilience, and it underlies any of the proposed definitions for it. Regardless of the possibility of offering a precise definition of the organizational resilience concept or not, we consider that an organization's performance and attitude when under pressure due to critical and disruptive events are reasonable to describe organizational resilience. We support that this idea coherently aligns with the definitions and expositions about the organizational and dynamic capabilities that we present.

Some authors (Corrales-Estrada et al., 2021; Duchek, 2020) take for granted that organizational resilience is an organizational, or even a dynamic, capability. van den Berg et al. (2021) refer to a list of scholars who recall that organizational resilience properties can be considered organizational capabilities.

According to what we have presented, we can affirm that organizational resilience is an organizational capability. Moreover, it is an organizational capability oriented "*to purposefully create, extend, or modify its resource base*" (Helfat et al., 2009). As we have seen in the three-stage dynamic models, the purpose of the resilient process is not only to survive, but to adapt and modify the organization. This implies that organizational resilience changes processes and adapts the organization's resources and capabilities when a disruptive event shakes it. Therefore, we conclude that organizational resilience is a dynamic capability.

4.3. Can organizational resilience be measured?

If we can obtain an ex-ante quantitative measure of resilience for any given organization, then we can use it as a reference to monitor and improve its resilience. Obviously, a measure of that kind would be very helpful to understand why some organizations survive the changes that occur during a crisis while others do not.

In the literature review, we present a large set of proposals for measuring organizational resilience. All of them are ex-post metrics and measurements. This means that the metrics or measuring procedure can only be applied once the organization has been exposed to a disruptive event. The same consideration can be made with all the metrics in Ruiz-Martin et al. (2018). This fact leads us to state the following: according to Béné et al. (2012), there are ex-ante factors that need to be considered when measuring organizational resilience. Therefore, the exposed metrics and procedures do not seem to be what we are looking for because we seek an ex-ante measurement of organizational resilience. Therefore, our research question must be reformulated as follows: *Can resilience capacity be estimated before any disruptive event?*

Based on our review, no one seems to know how to measure the resilient *capacity* of a given organization ex-ante. Lee et al. (2013) say the proper way to use its resilience profiles technique is to compare the organization's performance before and after the disruptive event. So, it seems that any ex-ante usage is discarded.

If we consider other metrics used to measure resilience, such as the recovery time needed by the organization to reach an acceptable performance level after the disruptive event (Ci-

mellaro et al., 2010), we can see that they are also ex-post metrics. The metrics based on economic indicators and performance outcomes, as proposed by Baghersad and Zobel (2022) or Ilseven and Puranam (2021), are also ex-post measures. They can only be computed after the disruptive event. As with the proposal by Cimellaro et al. (2010), these metrics can be used to test if an organization is stronger after a crisis. In this case, the benchmark would be the value of the indicators and the outcome of the organization before the shock.

According to this Bené (2013), the total resilience cost is the sum of the costs associated with each resilience stage: preparation and forecasting costs, plus absorption costs, plus learning and adaptation costs. This proposal clearly integrates the three-stage dynamic resilience model. However, from our research point of view, it suffers from the same problem as all the other reviewed metrics: it is an ex-post measure. Additionally, some of the concepts that the authors propose to be considered in the metrics are hardly measurable because they are intangibles. Therefore, they cannot be accurately computed. We found that there is no proposal about how to measure resilience in advance. No one seems to offer a proposal about how to predict the potential resilience of a given organization. So, we must consider whether it is possible to measure, or at least estimate, resilience before a disruptive event. At this point, we must consider two facts. First, the lack of agreement reached by scholars about the true nature of resilience. We provide evidence that there seems to be a common core for most of the proposals we review but, as the discussion of RQ1 clearly states, the concepts used by scholars to model resilience are fuzzy and complex and, consequently, are hard to measure. The second fact is related to the dynamic nature of resilience. As organizational resilience is a dynamic process, there is no guarantee at some point in the process the organization will not fail, and this cannot be known in advance. As we find in the discussion of RQ2, organizational resilience is a dynamic capability and, according to the most important authors in the dynamic capabilities field, dynamic capabilities cannot be measured. Following Eisenhardt and Martin (2000), Laaksonen and Peltoniemi (2018) state that: "*logic of best practices suggest that dynamic capabilities should not be measured by their quantity, but rather through a binary variable: a firm either has a best practice, process or routine constituting a dynamic capability or it does not*". Therefore, here we conclude that resilience cannot be measured ex-ante; i.e., before a disruptive event occurs.

Conclusions and future research suggestions

We aimed to define whether organizational resilience can be measured and/or assessed in an ex-ante way. Based on the review presented in Section 1 and the discussion in Section 4, we conclude that organizational resilience cannot be measured before a disruptive event occurs. It is only possible to know if the organization is resilient (or not) after a disruptive event. Furthermore, and as we find in the discussion about resilience metrics, metrics are sometimes partial or incomplete, ambiguous at times, and hard to compute. This means that a precise measure of organizational resilience probably cannot be achieved, not even in a post-disruptive event way.

This conclusion is supported by two findings. First, despite the notion of resilience not apparently admitting a single definition and formulation, there is a better consensus than would appear at first sight about what organizational resilience is and how to model it. It would seem that the main approaches to organizational resilience are complementary. This suggests that there are no best or worst approaches to either organizational resilience or its measuring. Second, organizational resilience is an organizational capability and, more precisely, a dynamic capability. As organizational resilience is a dynamic capability, it cannot be measured.

The main impact and originality of these findings is a new perspective from which to manage organizational resilience from a practical point of view. Justifying that organizational resilience is a dynamic capability and, therefore, cannot be measured in an ex-ante way suggests that only empirical and continuous improvement frameworks could be useful when dealing with resilience management. Additionally, this research also reveals that, in the end, there is no guarantee about the organizational resilience capacity of any given organization. None of the authors in our literature review focused on this point. A few of them refer to organizational resilience as a dynamic capability, but no one gets into the real implications of this fact, as we did in this research.

During this research, we found that several authors consider that there is a close relationship between organizational resilience and risk management. Some of them even pointed out that effective risk management contributes to increasing organizational resilience. A limitation of this work is investigating the relationship between risk management and organizational resilience.

- The findings presented in this paper pose some new research questions. How do we identify the most relevant indicators in any given organization?
- What are the conditions that make a resilience indicator relevant?
- At which point in the resilience process is a given indicator the most relevant one?
- If organizational resilience cannot be measured ex-ante, what can we do?
- What are the best practices that characterize organizational resilience? How should they be implemented? How do we evaluate their implementation?
- Is risk management a subset of organizational resilience, or *vice versa*?
- The different frameworks we have reviewed in this paper provide a solid basis to answer the above questions. These questions open a new research branch.

The main limitation of the current research is that, due to the nature of the concepts involved, only qualitative data and documented organizational resilience failures can be used as research material. Furthermore, our analysis is limited to currently available data. When new data becomes available, the results of this research analysis should be revised.

Acknowledgements

The authors acknowledge their colleagues at INSISOC (University of Valladolid) and LAGE-PYME (University of Malaga) for fruitful discussions around the research questions presented in the paper, especially to Natalia Martin, Javier Pajares, and Juan Carlos Rubio. They have been very active discussants in the research workshops.

Author contributions

Jose Sevilla (JS) and Adolfo Lopez Paredes (ALP) conceived the study and were responsible for the design and development of the research questions. JS and Cristina Ruiz Martin (CRM) contributed to the discussion for RQ1. JS and Jose Juan Nebro (JJN) have been involved in the discussion for RQ2 and RQ3. JS and ALP wrote the first draft of the paper. CRM and JJN reviewed the manuscript in sequential iterations.

Disclosure statement

The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

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