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# “Resilience as an attitude: the role of resilience in innovation and how to nurture it”

TESI DI LAUREA MAGISTRALE IN  
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# Abstract

The concept of resilience is crucial for the success of innovation projects, as it refers to the ability to adapt to changing circumstances and overcome obstacles in order to achieve innovation goals. This study explores the determinants of resilience in innovation projects across the individual, team, and organizational levels. The findings show that companies with more innovative environments should be more resilient to respond to adversity and recover quickly. It also became evident that the concept of resilience and the way in which it is nurtured differs at each of the levels of analysis. Using a systematic literature review approach, this study examines the relationship between the stages of innovation and resilience, and identifies the determinants of resilience in the context of innovation, taking into consideration waves of resilience. Therefore, it is analyzed the resilient qualities, the coping processes that help strengthen those resilience qualities, and the motivational forces that drive people to grow and move forward after a disruptive event. From a managerial perspective, our study suggests that managers should create a culture of resilience where learning from mistakes, communication, and motivation to innovate without fear of failure prevail.

**Key-words:** resilience, innovation, project termination, innovation failure, innovation crisis.



## Abstract in italiano

Il concetto di resilienza è fondamentale per il successo dei progetti di innovazione, in quanto si riferisce alla capacità di adattarsi a circostanze variabili e di superare gli ostacoli per raggiungere gli obiettivi di innovazione. Questo studio esplora i fattori determinanti della resilienza nei progetti di innovazione a livello individuale, di team e organizzativo. I risultati mostrano che le aziende con ambienti più innovativi dovrebbero essere più resilienti per rispondere alle avversità e riprendersi rapidamente. È inoltre emerso che il concetto di resilienza e il modo in cui viene coltivato differiscono a ogni livello di analisi. Utilizzando un approccio sistematico di revisione della letteratura, questo studio esamina la relazione tra le fasi dell'innovazione e la resilienza e identifica i fattori determinanti della resilienza nel contesto dell'innovazione, prendendo in considerazione le onde della resilienza. Vengono quindi analizzate le qualità di resilienza, i processi di coping che aiutano a rafforzare tali qualità e le forze motivazionali che spingono le persone a crescere e ad andare avanti dopo un evento dirompente. Da un punto di vista manageriale, il nostro studio suggerisce che i manager devono creare una cultura della resilienza in cui prevalgano l'apprendimento dagli errori, la comunicazione e la motivazione a innovare senza paura di fallire.

**Parole chiave:** resilienza, innovazione, cessazione del progetto, fallimento dell'innovazione, crisi dell'innovazione.



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# 1. Introduction

## 1.1. Introduction to the chapter

This section aims to provide a comprehensive general overview of the relationship between resilience and innovation, exploring its various dimensions and theoretical underpinnings. Specifically, it will present the current state of knowledge regarding the concepts of resilience, innovation, and the intersection that results from them, as well as the importance of their study. Furthermore, this chapter presents a detailed explanation of the two primary dimensions of resilience – stability, and adaptability - and their interdependence. It is argued that organizations need to effectively integrate stability and adaptability to become innovation resilient, and how the integration of these dimensions could ensure that autonomous innovation could be strictly controlled while enterprises can operate stably and adapt to changes simultaneously.

Moreover, in the following chapter, a deeper analysis of the research gap, research question, and contributions to managers and scholars will be presented. This will help to identify the key areas where previous studies have fallen short and clarify the direction of this research. By doing so, this section will provide a more comprehensive understanding of the importance of resilience as an attitude and its potential impact on the innovation context.

Finally, the purpose and objectives of this literature review are outlined. This chapter sets the foundation for the subsequent chapters, which delve deeper into the relationship between resilience and innovation at different levels of analysis.

## 1.2. Why resilience and innovation matter: an overview

In today's rapidly changing and unpredictable world, the ability to be resilient and innovative has become essential for individuals, teams, organizations, and societies to thrive. Resilience is not something that can be planned for but is instead a realization that one has the capacity to be robust under conditions of enormous stress and change. Scholars have defined resilience as the capacity to adjust to threats and mitigate or avoid harm, while others view it as an individual, team, or organization's ability to adapt, recover, and grow in the face of adversity or significant challenges [1], [2].

Innovation, on the other hand, is the process of creating new and better ways of doing things. It often emerges from discretionary practices rather than planning and is critical for organizations to thrive in the complex reality of the 21st century [3], [4]. Innovations can vary considerably in their inherent riskiness, and their effects upon overall risk exposures may be mixed [5]. The ability to innovate adds value to a company's product, service, or process and is necessary to anticipate and respond to the speed of change in our time [6]–[8].

However, innovation projects fail at an astonishing rate, and setbacks can be demotivating for project members [9], [10]. Therefore, it is vital to maintain or even strengthen project members' innovative capabilities for subsequent innovation projects. Resilience and innovation are interrelated concepts, with resilience being an outcome of the processes that underlie effective human responses to adversity [11]–[13].

## 1.3. The intersection of innovation and resilience

Exploring the intersection between innovation and resilience can provide valuable insights into how organizations can manage the challenges and uncertainties of innovation. Before assessing what links these two concepts, it is necessary to clarify their definitions.

Innovation is considered by some to be the process of introducing something new or improved, whether it is a product, a service, or a process. At its most practical level, innovation involves the application of knowledge to improve existing goods and services, making them more effective, efficient, or desirable [12]. This innovation can take different forms such as incremental innovation where improvements are made to existing products, or radical innovation that can transform an industry or disruptive innovation that reaches new markets, among other existing classifications in the literature [14], [15]. Regardless of its typology, innovation is a powerful tool to grow, create value competitively and stand up in this turbulent world [16].

Table 1: Definitions of resilience by context.

Context	Definitions
<b>Individual</b>	Resilience is not only to survive, but also to thrive through handling risks and stresses; it is a life-long learning process which is based on two essential characteristics of resilience: optimism and hope [17]
<b>Disaster management</b>	The ability of social units to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities that minimise social disruption and mitigate the effects of future events [18]
<b>Physical system</b>	The speed at which a system returns to equilibrium after displacement, irrespective of oscillations, indicates its elasticity (resilience) [19]
<b>Socioecology</b>	The capacity of a system, enterprise, or person to maintain its core purpose and integrity in the face of dramatically changed circumstances [20]
<b>Ecological Systems</b>	The capacity of a system to withstand a disturbance and reorganise itself while retaining function, structure, identity, and feedback [21]
<b>Innovation Project termination</b>	Organization's ability to learn from the failure of an innovation project, adapt to changing circumstances, and continue to pursue innovation with renewed energy and focus [9]
<b>Employee</b>	Capability to utilize resources to continually adapt and flourish at work, even when faced with challenging circumstances [22]
<b>Entrepreneurship</b>	Dynamic adaptation process that helps business owners move forward in the face of complex, continuous and unstable market conditions as well as manage difficult market conditions and unpredictable future events [23]
<b>Business</b>	Business's ability to survive, adapt, and innovate in the face of turbulent environment [24]

Resilience, on the other hand, is a dynamic process that refers to an individual or system's ability to respond to change, recover from adversity, and continue to function effectively [25], [26]. Historically, the word resilience comes from the Latin verb “resilire” – to jump back, rebound, recoil, resume original shape – and was initially used in physics and engineering [27]. However, the concept of resilience has since evolved and is now recognized as a broader concept that encompasses the ability to adapt to changing circumstances and recover from setbacks. Resilience can be viewed as a personal trait, but it is more commonly understood as a dynamic process of positive adaptation that enables individuals and organizations to maintain or regain mental health despite experiencing adversity [17], [27]–[29].

Given the complexity and multifaceted nature of resilience, definitions of resilience can vary depending on the field of study, the population being studied, and the purpose of the study. To illustrate this diversity, Table 1 presents some examples of resilience definitions from various fields.

After analyzing both concepts, it can be noted that innovation and resilience are interconnected concepts that are essential for organizational success. While innovation is focused on creating new products, services, or processes, resilience is the ability to respond to disruptions or setbacks and recover quickly, this term has been a critical factor in enabling organizations to pivot their operations and find new ways to overcome. These two concepts are complementary, as innovation requires resilience to overcome obstacles and setbacks, and resilience is necessary to sustain innovation efforts over time.

With a solid understanding of both innovation and resilience, it becomes clear that these concepts are intricately linked. This is the case of Borda Rodriguez A., and Vicari S [12] that in their qualitative study of 2015 highlights the development of adaptive capacity. They affirmed that adaptive capacity refers to an organization's ability to learn and respond to change, and it entails a set of skills, processes, and culture that enable an organization to detect and respond to changes [12], [30]. Organizations with high adaptive capacity can quickly identify new opportunities and pivot their operations to respond to changing circumstances. It can then be inferred that organizations with strong adaptive capacity are better equipped to deal with disruptions and setbacks, as they can quickly adapt to changes in the environment and adjust their strategies accordingly [31], [32]. This makes them more resilient and able to sustain innovation efforts over time. In other words, adaptive capacity is a key factor that enables organizations to develop both resilience and innovation, as it allows them to identify potential problems, develop innovative solutions, and quickly respond to changes [27], [33]. Therefore, cultivating adaptive capacity should be a priority for organizations that want to remain competitive.

While innovation is crucial for organizational success, it's important to note that innovation itself is not immune to setbacks and obstacles. Some authors have noted

the importance of both terms when it comes to setbacks in innovation projects, because these activities generally include a high level of risk and uncertainty [9]. There are different types of setbacks, and they can come in different ways such as technical failures, sudden changes in the market, or internal changes that prevent to continue operate. Therefore, it is necessary a quick response from the project managers to review the contingency plan, verify the viability of the project and evaluate if the direction of the project should change [34], [35]. This is where resilience comes into play, as it behaves as a capacity to respond to disruptions or setbacks and recover rapidly and as a strategy that will lessen the impact of these sudden changes, allowing them to quickly detect potential problems that could jeopardize the project [9].

In summary, exploring the intersection between innovation and resilience is essential for organizations to navigate the complexities and uncertainties of innovation, not only in response to external changes but also in managing setbacks within innovation projects. It can provide valuable insights into how to foster a culture of resilience that supports innovation efforts, and how to manage innovation during times of crisis, adversity, and unexpected challenges. Moreover, continued research in this area is indispensable for organizations to build resilience and respond quickly to changes, adapting to both internal and external factors that can impact innovation operations.

## 1.4. Innovation resilience

After analyzing the connection between innovation and resilience, it has become clear that organizations need to adopt a more comprehensive approach to managing innovation projects. To enhance their ability to adapt to unexpected challenges and disruptions, organizations are increasingly turning to a new concept called "innovation resilience" [36].

Stability and adaptability are integral parts of resilience in the context of innovation management [37]. The first refers to an organization's ability to withstand stress and avoid loss of function during times of turbulence, also it involves a systematic planning [36], [38]–[40], while adaptability describes an organization's capacity to adjust to the actual or expected environmental changes and take advantage of opportunities, this term refers to flexibility and innovative mechanisms, like exploration, experimentation and improvisation [1], [41]. Other authors define it as the ability of a firm to reconfigure itself in response to unforeseen changes [42].

According to Wen-Dong Lv et al. [36], innovation resilience is an organization's capability to cope with the risks associated with its innovative activities by effectively integrating stability and adaptability. This means that organizations need to balance the need for stability to cope with disturbances through buffering impacts, absorbing shocks, and returning to a pre-shock situation, with the need for adaptability to create foresight, recognize, anticipate, and defend against adverse consequences, and keep pace with environmental change while even creating new opportunities [36].

Innovation resilience is not just about bouncing back from a failure, but also about proactively adjusting to environmental risks and uncertainties and seeking opportunities from them. The integration of stability and adaptability is critical to achieving innovation resilience, as these two capabilities are interdependent and enable each other. Resilient organizations could embrace this paradox and effectively control innovation processes.

## 1.5. Research question

In a changing world such as the one we live in, accelerated by technological advances and driven by the cutting-edge, it is not always easy to innovate. Most innovation projects tend to fail and have setbacks that lead to potential detrimental effects for everyone involved such as lack of motivation and risk aversion. In addition, innovation crises are often caused by internal factors, are difficult to predict and require a long-term strategic approach to overcome them, unlike other crises that may occur [35]. Resilience plays a critical role in overcoming these crises by enabling organizations to adapt to change and recover from setbacks. That is why the interest in this concept as a fundamental pillar of human development has had a great boom in the last decade, as it is proposed as an ability to decrease and avoid adverse effects after a setback [9]. However, being a concept in development, there is still no absolute clarity about the roles and behavior of resilience. This has certainly impeded the development of a unified understanding of this field. As a result, our understanding of resilience is still fragmented, with a significant gap in the understanding of how resilience functions at different levels of analysis in organizations and how these levels interact [43]. While there is a growing body of literature on resilience in organizations, most of it has focused on the individual and organizational level, with limited attention paid to the team level. This gap is significant, as organizations increasingly rely on teamwork to accomplish their innovation goals. Therefore, understanding resilience at the team level is critical to building more robust and effective teams.

Moreover, scholars have noted that most of the research on resilience at the team level has been an adaptation of the individual-level model, which may not fully capture the unique dynamics of teams [44]. As such, there is a need for more research that focuses specifically on resilience at the team level, considering the unique characteristics of teams and the interactions between team members.

Furthermore, there is a need to understand how resilience operates across different levels of analysis and how these levels interact. Most of the existing research on resilience has focused on either the individual or organizational level, without considering the interactions between them. However, understanding how resilience operates across these different levels is crucial, as individuals operate within teams, which, in turn, operate within organizations [43].



Likewise, there are two critical gaps in the existing literature on the relationship between innovation and resilience. First, while some studies have examined the relationship between these two concepts, little attention has been paid to specific types of innovation (e.g., process, product, radical, incremental) and their unique effects on resilience. This lack of knowledge is important, as understanding how different types of innovation affect resilience can provide a basis for developing specific strategies to strengthen resilience in organizations subject to specific types of innovation [45]–[47]. Second, there is a lack of research on the relationship between resilience and the stages of innovation, such as generation and implementation. Addressing these gaps in the literature can contribute to a more comprehensive understanding of the role of resilience in promoting successful innovation in organizations [48].

Although there are many critical research gaps in the literature, it is not possible to cover them all in a single study. Therefore, our study aims to identify the initial basis for future studies by answering the following research question: Which are the determinants of resilience in innovation for individual, team, and organizational levels of analysis? To achieve this goal, a literature review will be conducted that synthesizes the existing knowledge on resilience and innovation, with a focus on the individual, team, and organizational levels of analysis.

## 1.6. Practical and academic contributions

This literature review is expected to contribute to the existing knowledge by synthesizing and consolidating relevant studies and providing insights into the current state of research in the resilience and innovation fields in multiple ways. By conducting a comprehensive literature review, this study provides a systematic and rigorous synthesis of the existing knowledge on the subject, which is essential for developing a strong theoretical foundation and identifying existing gaps in the literature. This approach allows for a deeper understanding of the critical role of resilience in the context of innovation and helps to ensure that the findings are based on the most current and reliable evidence available, making this study a valuable resource for both practical and academic audiences.

The contributions of this research to the field of resilience and innovation can be summarized as follows:

Firstly, this study provides a comprehensive overview of the concept of resilience, highlighting its origins, definitions, and different perspectives. In addition, this study aims to contribute to the understanding of resilience in the context of innovation by demonstrating the strong relationship between the two concepts. This is accomplished by presenting the ways in which organizations can develop and nurture resilience in the context of innovation as a mean to adapt to disruptions and improve their overall innovative capacity.

Furthermore, this study identifies the key determinants that contribute to the development of resilience in individuals, teams, and organizations. This will contribute to the literature by providing a comprehensive understanding of the factors of resilience for each of the levels independently. By highlighting these determinants, the literature review can help scholars and practitioners develop specific strategies, processes, and interventions that enhance resilience in individuals, teams, and organizations by considering the particularities and behavior of each unit.

In addition, this research exposes the relationship between the stages of innovation and resilience that will contribute to the literature by providing a deeper understanding of how the different stages of innovation affect the resilience of an organization. This knowledge can help managers develop effective strategies to improve the resilience of organizations and teams during the different stages of innovation, which will result in better outcomes and success of innovation projects.

Finally, this study can contribute to the progress of this field by offering a new perspective and a theoretical framework that can enrich the literature. By investigating this underexplored approach and highlighting possible research directions, this study may foster a deeper understanding of resilience in the context of innovation and stimulate future research. Ultimately, the findings of this study may have practical implications for managers, the human resources department, and other stakeholders, enabling them to make informed decisions and take effective action. Therefore, this research has the potential to make a significant contribution to the literature and have a lasting impact on this field.

## 1.7. Purpose and objectives

After understanding the crucial relationship between resilience and innovation in today's changing world, the need for further study of the subject is now evident.

Therefore, writing about the relationship between innovation and resilience is important because it can help individuals, teams, and organizations learn from their experiences and prepare for future challenges. It can provide insight into strategies and practices that have proven effective in the face of adversity and help identify areas for improvement and innovation going forward.

Given the growing importance of resilience in today's fast-paced and rapidly changing world, the purpose of this literature review is to examine the concept of resilience in the context of innovation and identify the determinants and best practices for building and nurturing resilience at the individual, team, and organizational levels. To achieve this purpose, several objectives will be pursued.

Firstly, to provide an overview of the concept of resilience and its evolution over time. Secondly, to explore the relationship between resilience and the stages of the innovation process. Thirdly, to identify the determinants of resilience in innovation at

the individual, team, and organizational levels in relation to the waves of resilience. Fourthly, to determine the best practices for building and nurturing resilience in individuals, teams, and organizations in the context of innovation. Finally, to identify gaps in the current understanding of resilience and innovation, and to propose directions for future research in this area.

## 1.8. Structure of the literature review

The content of this literature review is structured as follows:

### Chapter 2: Theoretical background

In this section there will be an analysis of the concepts and relevant insights of the articles present in the literature that have a clear connection between resilience and innovation.

### Chapter 3: Methodology

This section explains the process to obtain the sample documents for the study. It shows the final formula that was used to find the results, the inclusion and exclusion criteria and data extraction.

### Chapter 4: Results

The descriptive results of the study are presented here, where different characteristics of the sample are visualized through tables and graphs, for example, the growth in the number of publications in recent years, the methodologies used, the units of analysis most used by the authors, among others.

### Chapter 5: Discussion: the role of resilience in innovation

This section describes the relationship between the stages of innovation and resilience and presents in detail the determinants of resilience in innovation considering the waves of resilience for the units of analysis, the individual, the team and the organization.

### Chapter 6: Conclusions

This section provides a summary of the main findings, limitations of the study, managerial implications, and recommendations for future research are also presented.



## 2 Theoretical background

### 2.1. Introduction to the chapter

The objective of this theoretical background section is to explore the concept of resilience in innovation and to identify the different definitions, concepts and frameworks associated with resilience at each of the levels of analysis.

The chapter is structured as follows:

- Section 2.2 presents the evolution of resilience theory throughout history and explores its various dimensions.
- Section 2.3 examines the metatheory and waves of resilience that will serve as the basis for the framework to be presented in the discussion section.
- Section 2.4 focuses on individual resilience and its relationship to innovation. To this end, the concept of resilience at the individual level and the associated frameworks will be explored.
- Section 2.5 examines how the concept of resilience is applied to teams and some associated practices.
- Section 2.6 explores the different concepts of organizational resilience found in the literature: Additionally, organizational resilience in relation to startups is presented.

Overall, this chapter will provide a more comprehensive understanding of the relationship between resilience and innovation at the individual, team, and organizational levels of analysis. It will highlight the importance of resilience as an attitude and its potential impact on innovation context.

## 2.2. From crisis to opportunity: the evolution of resilience theory

Over the past few decades, resilience theory has undergone a significant evolution from its origins in the field of ecology to its current application in psychology, sociology, and organizational studies [49], [50]. Initially, resilience referred to the ability of ecosystems to recover after a disturbance or crisis. However, in recent years, the concept of resilience has been extended to human systems, including individuals, teams, and organizations [51], [52].

Resilience is seen as a developmental or progressive concept that is formed over time and involves a series of adaptive responses to stress and adversity. Over time, this concept has evolved from a static trait [43] to a dynamic process [50], [53] that involves ongoing adaptation to changing circumstances [54]. This recognition has led to the concept of "waves of resilience," which suggests that individuals and teams go through cycles of resilience and recovery in response to stress and adversity [55].

Another important aspect of the evolution of resilience theory is the recognition that resilience is influenced by a range of factors, including individual characteristics, social support networks, and cultural and organizational contexts [17], [56], [57]. This has led to a more nuanced understanding of resilience as a multi-level construct that operates at the individual, team, and organizational levels [43].

Overall, the evolution of resilience theory has highlighted the importance of viewing crises and disruptions as opportunities for growth and development, rather than simply as threats to be avoided. This perspective has led to a greater emphasis on the role of innovation in promoting resilience, as individuals and organizations seek to adapt and thrive in the face of uncertainty and change.

## 2.3. Waves of resilience

The metatheory of resilience also emphasizes the importance of context in shaping resilience, arguing that resilience is not simply an individual trait or characteristic, but is rather a dynamic interaction between individuals and their environment. In this sense, the metatheory of resilience takes a systems approach to understanding resilience, recognizing that resilience is shaped by the interactions between individuals and their social and physical environment [55].

Moreover, Richardson's metatheory of resilience proposes the idea of the "three waves of resilience," which refer to the different stages of resilience that individuals or communities may experience in response to adversity and describes the evolution of research on resilience over the years. This framework identifies three waves of resilience research [55].

The first wave of resilience research focuses on identifying the qualities of resilience, or protective factors and support systems. It challenges the traditional approach of solely focusing on risk factors and instead recognizes the strengths and positive qualities that individuals possess [55].

The second wave of research explores the resilience process in the context of coping with stressors, adversities, and changes. This is a process of coping with adversity in a manner that results in the identification, fortification, and enrichment of resilient qualities or protective factors of the first wave. This is one of the most important contributions of the author. In Figure 1 it can be appreciated that the process begins at a point in time when a person has adapted mentally, physically, and spiritually to their life situation, which Richardson calls "biopsychospiritual homeostasis." This stage represents a person's adaptation to a set of circumstances that can be positive or negative, and it is continually challenged by internal and external stimuli, including stressors, adversities, and opportunities for change. These stimuli are perceived differently depending on the person's level of resilience and previous experiences with resilience. The next phase involves the occurrence of a stressful event that disrupts an individual's biopsychosocial-spiritual homeostasis. This can include physical, emotional, and spiritual responses that impact the individual's sense of well-being. Finally, in reintegration the individual works to reintegrate the various aspects of their biopsychosocial-spiritual being that have been disrupted by the stressor. This can involve a variety of strategies, including seeking social support, engaging in self-care activities, and developing new coping skills [55].

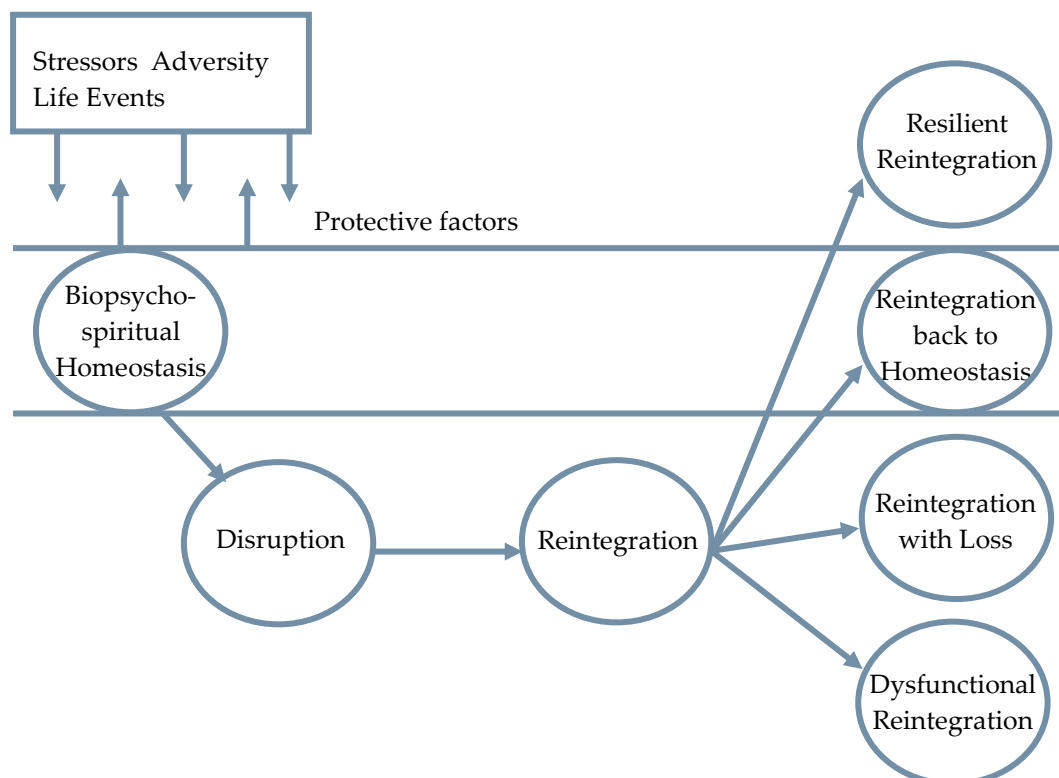


Figure 1: Richardson's resiliency model. Adapted from Richardson (2002).

Returning to the waves, the third wave of research, innate resilience, examines the motivational forces within individuals and groups that promote the activation of resilience.

Overall, Glenn E. Richardson's metatheory of resilience and the three waves of resilience provide a comprehensive framework for understanding resilience across different levels of analysis and highlight the importance of context in shaping resilience [55].

## 2.4. Individual resilience and innovation

Individual resilience plays a critical role in creating an environment that fosters innovation in the workplace. Resilience can be defined as the capacity "to utilize resources to continually adapt and flourish at work, even when faced with challenging circumstances" [22]. Resilient individuals are capable of overcoming setbacks related to their personal and professional lives and have a greater ability to renew themselves over time through innovation and adaptation to diverse and turbulent changes in the environment [27]. Other scholars affirmed that resilience refers to the capacity or process of dynamic adaptation to change. It encompasses positive adjustments, not only to survive but also to thrive through handling risks and stresses [17].

Conservation of Resources (COR) theory is a theoretical framework that underpins resilience at this level. It posits that individuals are motivated to increase, replenish, and safeguard resources that help them meet job demands. COR theory has primarily focused on the dispositions, motivation, skillsets, and behavior of individuals to identify and utilize organizational resources effectively to handle stressful situation [22].

Therefore, organizations can unleash the full potential of their employees, promoting risk-taking and experimentation that drives innovation. Investment in employees' training and development, as well as the creation of a supportive organizational culture, can help foster resilience and drive sustainable growth and success [58].

## 2.5. Team resilience and innovation

Team resilience plays a critical role in fostering innovation within organizations. Some authors have highlighted the importance of team resilience as a shared capacity and analyzed its influence on positive outcomes in general. Research also indicates that team resilience is positively linked to team attitudes and behaviors, such as cohesion and cooperation, leading to better team performance [43].

In the context of innovation, team innovation resilience behavior (Team IRB) is particularly relevant. This is considered as the capacity of a team to withstand and overcome critical incidents that threaten the innovation project, team cohesiveness,



and performance [59]. By handling and bouncing back from challenges, teams can achieve critical recoveries that sustained activity toward the goals of the innovation project [48].

## 2.6. Organizational resilience and innovation

The concept of organizational resilience has quickly become a recognized and important term because of its "number of unforeseen factors which can impact on daily life, and differences in the way surprise manifests in different organizations" [37], [60]. The organizational level resilience has heterogeneous research and presents different conceptions of the term as for example some authors affirm that it is an ability and others are inclined for a capability, this is presented in Table 2. For example, for Ciasullo et al. [39] it represents an adaptive capability that is strongly linked to the environment. The authors describe it as that capacity that allows rebounding from a trauma and returning to the initial conditions. Moreover, Hajishirzi et al. [8] and Tejeiro et al. [61] have emphasized that resilience at this level is an incremental ability that anticipates, recovers, and flourishes from crises and disasters.

Several authors consider resilience is the ability of organizations to avoid discontinuation, by adapting with changes major events, continuously renewing business operations and maintaining above average returns [28], [40], [62], [63]. Resilience for Vainauskienė and Vaitkienė [37] is also conceived as an essential ability that allows companies to expect, design, respond, survive adverse forces, and adapt to all disturbances that arise. Likewise, Donelli et al. [32] in their study describes resilience as the ability to maintain reliable functioning despite adversity and points out its importance in times of crisis. Only a few researchers provided deeper insights into the resilient system, for example, Cardoso and Ramos [64] stated that the major characteristics of this system were that resilience was constituted by different abilities; one to respond to events avoiding the greatest number of losses, one to recover as quickly as possible and finally the ability to re-organize, learn and adapt to the new to ensure the continuation of operations and retain control over the entire functioning of operations. Likewise, Rehman et al. [65] in their research stated that resilient behavior was "the ability of an organization to overcome the problem of crises. Resilient behavior is also needed in organizations at times of transformation" and that it allows employees, teams, and organizations to learn new work methods, implement innovative routines and make the most of all resources to achieve a competitive advantage [40].

Table 2: Resilience as a capability or ability.

Authors	Title	Year	Definition of resilience
Ciasullo M.V., Montera R., Douglas A.	Building SMEs' resilience in times of uncertainty: the role of big data analytics capability and co- innovation	2022	Capability [39]
Vainauskienė V., Vaitkienė R.	Challenges to the learning organization in the context of covid-19 pandemic uncertainty: Creativity-based response	2022	Ability [37]
Donelli C.C., Fanelli S., Zangrandi A., Elefanti M.	Disruptive crisis management: lessons from managing a hospital during the COVID-19 pandemic	2022	Ability [32]
Hajishirzi R., Costa C.J., Aparicio M.	Boosting Sustainability through Digital Transformation's Domains and Resilience	2022	Capability [8]
Rehman K.U., Mata M.N., Martins J.M., Mariam S., Rita J.X., Correia A.B.	Shrm practices employee and organizational resilient behavior: Implications for open innovation	2021	Ability [65]
Cardoso M., Ramos I.	The resilience of a small company and the grounds of capitalism: Thriving on Non-Knowledgeable Ground	2016	Ability [64]
Tejeiro Koller M.R., Morcillo Ortega P., Rodríguez Antón J.M., Andrada L.R.	Corporate culture and long-term survival of Spanish innovative firms	2017	Capability [61]

What most concepts have in common is that they treat resilience as a vital factor for the existence of organizations not only during the crisis but also in the daily base operations [66], [67]. A resilient company, according to Reeves M. [68], is able to perceive risks and opportunities more clearly and responds much more effectively due to its agility in adjusting to the competitive environment in which it is exposed. And now, how do we define if the company is resilient or not? The authors Sanchis et al. in their study [69] pointed out that in order to evaluate how resilient a company is, it is necessary to have a clear picture and deep knowledge of the origin, characteristics and disruptions. On the other hand, Bravo and Hernandez [70] throughout his research states that there are other lines of conception about organizational resilience i) as a feature of an organization, ii) as an outcome of the activities that the organization execute iii) a competitive advantage that must be exploited by the company to survive, grow and strengthen from the disturbances, as described by Ciasullo et al. [39] in his study.

Several studies of organizational resilience have also focused on SMES and startups as they are good examples of resilient companies mainly because they have business models based on continuous innovation [71]. That is why this group of companies must anticipate and adapt more quickly than other companies. Rezaei-Moghaddam et al. [72] defines this type of resilience as "entrepreneurial resilience" which is a "dynamic adaptation process that helps business owners move forward in the face of complex, continuous and unstable market conditions as well as manage difficult market conditions and unpredictable future events". The Covid-19 pandemic is very present in the research carried out between 2020 and 2022, as it is an event that has had major repercussions on all sectors of society, especially the economic sector. The COVID-19 crisis has caused behavioral changes, which affect entrepreneurship, and particularly SMEs [73]. The author asserts that SMEs are currently navigating a crisis of innovation and creativity and the ability to move forward is directly linked to entrepreneurial resilience. Moreover, the authors Aldianto et al. [74] further stated that for SMEs to keep their businesses afloat, agile leadership and knowledge management are essential to foster innovation in situations of uncertainty.



## 3 Methodology

### 3.1. Introduction to the chapter

The purpose of this research is to investigate which are the main determinants that allow the generation and conservation of resilience in innovative projects at different levels of analysis. The objective of this chapter is to explain the entire process carried out to answer the research question.

In this way, this chapter seeks to fully show the methodology used to achieve the conclusions of this thesis. A qualitative literary review about resilience in innovation was carried out, separating the information belonging to different units of analysis to later extract the most important determinants. The literature review sought to understand the information and the analysis that have been carried out to acknowledge how resilience interacts in innovative projects in people, teams, and organizations.

The chapter is structured as follows:

- Section 3.2 presents the different research approaches and confronts them to conclude that the qualitative method is the most appropriate in this study, since human phenomena and not numerical data are evaluated.
- Section 3.3 presents the selection of the methodology, as well as the main functions of a literature review, including the possibility of synthesizing information and transforming it to obtain important conclusions.
- Section 3.4 describes the entire data collection process, from the keywords used to search for articles, to the different filters used to refine the results and consider only the relevant articles.

## 3.2. Research method

To delve into the research question, it is essential to start the investigation by defining the methodology, and specifying whether it will be a qualitative or quantitative method, and to make this decision, it is necessary to know each of these approaches in depth.

### 3.2.1. Qualitative research

Qualitative research is defined in literature as the examination of the characteristics and characteristics of phenomena, such as their context and different perspectives [75]. Another definition, more practical in nature, is that qualitative research involves using words instead of numbers to collect data [76].

Qualitative research involves collection, analysing and making sense of a variety of nonnumeric data such as language. It can clarify people's perception of and reaction to their societal experience [77].

The objectives of quantitative research are to study in detail and with a high degree of precision how the individuals affected experience Social Reality in their natural environment. This approach is exploratory and seeks to clarify the causes of a phenomenon or behaviour, as well as how it happens in an individual case. Based on qualitative data, it can be used to develop theories and hypotheses [78].

Qualitative research may be carried out using different methods, such as in-depth interviews, focus groups, case studies and ethnography [77].

Qualitative research does not require as rigid a sequential approach to data collection and analysis as quantitative research, which means that it is more flexible, open, or responsive to the context. As noted in studies the phases of sampling, data collection, analysis, and interpretation are interconnected and cyclical in nature, rather than occurring in a strict, linear sequence. In other words, qualitative research is often a continuous and iterative process of collecting and analyzing data [79]

In addition, as more knowledge and encounters are acquired the original plan may have to be adjusted and broadened [79]

### 3.2.2. Quantitative research

Quantitative research comprises the collection and analysis of numerical data with an objective aim to describe, predict or control variables of interest. As noted by McLeod [78], the main objective of quantitative research is to test causal relationships between variables, to make predictions and to generalize findings to larger populations.

Methods like experiments are usually used to gather data, with an objective of accurately measuring the variables. However, there is also the possibility of producing

qualitative data by means of further methods like questionnaires or controlled observations. Quantitative data may be generated from questionnaires, rating scales, or closing questions which result in numerical figures or categorical answers [78].

### 3.3. Defining methodology

Considering then that qualitative methods are mainly based on information on human behaviour, this approach is the most appropriate for the purpose of this research, which aims to collect non-numerical data. On the other hand, Sarkar and Fletcher [80] explicitly suggest that in order to carry out research relevant to resilience, qualitative research should be carried out.

The methodology used in this research is a literature review, which allows providing a complete overview of the literature related to a specific topic or several related topics. A literature review can be a qualitative or quantitative method depending on the research question, and in this case a qualitative literature review is proposed, this has the ability to synthesize previous studies to strengthen the knowledge base and be able to draw conclusions [81].

After carrying out the data collection, and finding the relevant information, a framework is carried out that allows the independent identification for each level of qualities, processes, and motivational forces that nurture and develop resilience in the context of innovation.

### 3.4. Data collection

Two categories of data collection techniques, as cited by researchers, may be employed in research: Primary and Secondary Data [82]. According to scholars, primary data includes information that the researcher himself independently obtains through interviews or questionnaires Bryman and Bell [83]. On the other hand, secondary data refers to information which has been previously collected by different researchers or organizations such as literature, documents, and articles. Secondary data were collected and used for the purposes of this thesis.

In this research, a literature review was conducted considering various quantitative, qualitative, conceptual studies and other literature reviews on resilience to deductively extract current knowledge and terminologies of resilience at the individual, team, and organizational levels.

In order to establish the determinants of each level of analysis, it was necessary to integrate different theories, frameworks, definitions and concepts. In this way it was possible to recognize how the behavior is and how the relationship between innovation and resilience changes at each level.

### 3.4.1. Sample selection

Firstly, based on some preliminary readings, a first formula was developed that considered keywords related to resilience and innovation. From there, terms that were not specific and did not contribute to the research were removed.

Secondly, the search phase took place in April 2022, therefore, the literature found is updated until the beginning of the same year. The review process was conducted by searching the SciVerse Scopus online database for scientific articles. Within this database, Boolean terms were applied to identify all publications that contained the keywords obtained in the publications title, keywords, or abstract. The following steps limited the results to the areas “Business, Management, and Accounting” and “Social Sciences” and the language (English).

The following is the final formula with 1838 results obtained:

```
( TITLE-ABS-KEY ( "resilien*" ) OR TITLE-ABS-KEY ( "thriv*" ) ) AND ( TITLE-ABS-KEY ( "innovat*" ) OR TITLE-ABS-KEY ( "innovation failure" ) OR TITLE-ABS-KEY ( "innovation setback*" ) OR TITLE-ABS-KEY ( "innovation crisis" ) OR TITLE-ABS-KEY ( "project termination" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( SUBJAREA , "SOCI" ) OR LIMIT-TO ( SUBJAREA , "BUSI" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) )
```

Afterward, the abstracts of the publications were subjected to screening to ascertain their suitability for inclusion in the final dataset. The primary inclusion criterion was the presence of a clear linkage between innovation and resilience. Articles covering subjects beyond the scope of this research, such as supply chains, tourism, education, and natural disasters, were excluded from consideration. A total of 1,720 publications were excluded according to these criteria. After screening, 112 studies were selected, of which 10 were preliminary documents deemed relevant to the study. All the process is represented in a funnel in Figure 2.



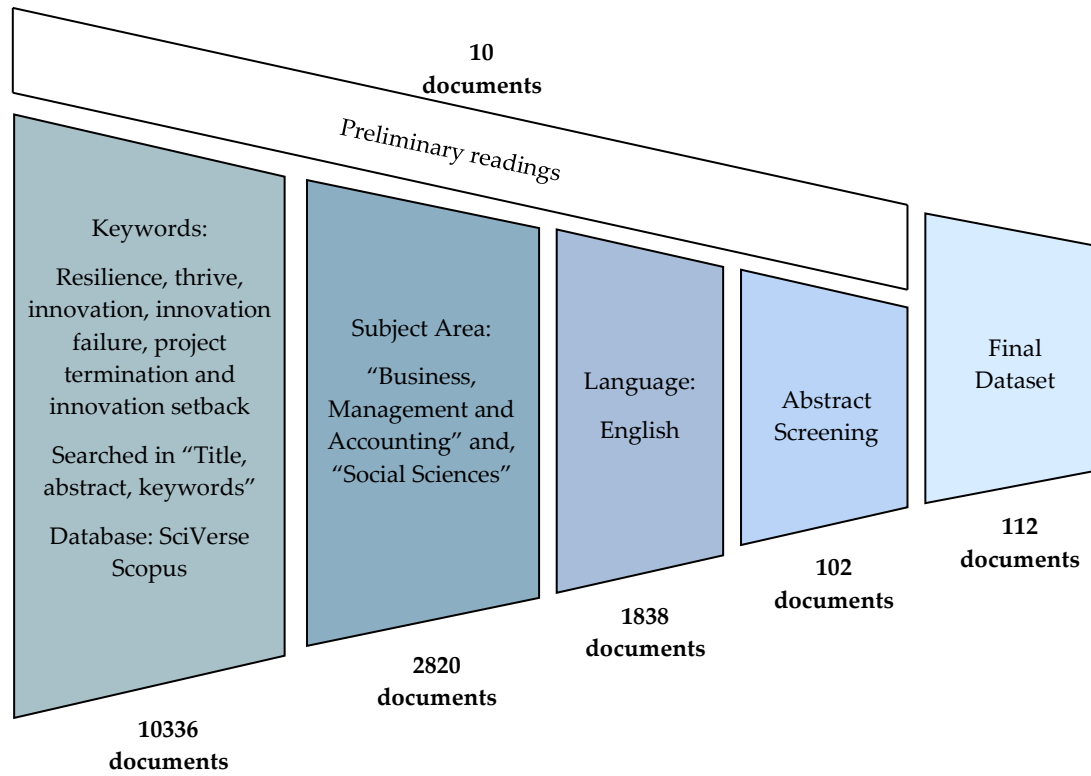


Figure 2: The filtering process and definition of the final dataset.



## 4 Results

### 4.1. Introduction to the chapter

In order to create a framework and be able to relate all the information about resilience and innovation, it is necessary to understand how research on resilience has evolved, where this information comes from, what methodologies other researchers used to obtain it, and in what unit of analysis is located.

In this way, the purpose of this chapter is to understand in depth the origin of all the articles found in the literature review process, and to analyze which factors currently stand out when studying resilience.

The chapter is structured as follows:

- Section 4.2 describes how the number of publications per year on resilience in innovation has evolved, and points to an apparent paradigm shift.
- Section 4.3 explains how articles from various journals are distributed during this literature review, and it suggests the topic of resilience in innovation as an interest for scholars and practitioners across a range of fields. The broad scope of research in this area is highlighted by the presence of journals dedicated to innovation management, organizational management and multidisciplinary issues.
- Section 4.4 describes the distribution of sample research methodologies and the distribution in the unit of analysis within the dataset. It gives an overview of research methodologies used to study innovation resilience and provides valuable information on the unit of analysis where it has been shown that most articles focus mainly on organizational levels, which underlines the need for more comprehensive understanding of factors contributing to innovations' resilience.

## 4.2. Descriptive results: publications evolution

Researchers in the field of management have investigated the concept of resilience as a means of enabling companies to effectively respond to disruptions. The concept of resilience in the organizational area has seen significant growth in the last decade. As shown in Figure 3 generated using the dataset of this research, there is a significant increase between 2020 and 2022 in the number of articles related to resilience in management, business, and social journals. The year 2020 was characterized by major disruptions such as the COVID-19 pandemic and its social, economic, and political impacts. These events highlight the importance of resilience in organizations, as they had to rapidly adapt to changing circumstances to remain competitive. As a result, many authors focused their attention on this topic and studied how resilience capabilities should be built to better respond to future crises and sudden changes. In response to sudden change and disruption within the business environment, pandemics proved that organizations had to be resilient and flexible.

Moreover, there appears to be a growing interest in this subject among researchers. This interest is likely to increase over the following years, as organizations increasingly recognize the importance of resilience against uncertainty and disruption. A paradigm shift in the way organizations approach resilience, which resulted in an increased number of studies and publications on this subject, could be observed with slow growth between 2004 and 2017 followed by a sudden rise from 2018 onwards.

## 4.3. Descriptive results: journals and fields

### 4.3.1. Sample journals

In the literature review on resilience in innovation, Figure 4, and Table 3 show how articles are distributed among various journals. Articles in different areas, such as innovation management, organizational management and multidisciplinary issues have been published in a variety of journals. This implies that there is a broad range of scholars and practitioners interested in the question of resilience to innovation from many different fields.

Sustainability (Switzerland), which accounted for nine articles in the database, is one of the journals that makes a difference when it comes to the number of articles included in this review. This does not come as a surprise, given that sustainability and resilience are closely related concepts with their emphasis on the importance of adaptability and capacity to cope with disruptions. The fact that these articles have been included in this Journal indicates an increasing recognition among scholars of the importance of resilience to support sustainable innovation.

Another interesting finding from the graph is the presence of several journals focused on innovation management, including *Creativity and Innovation Management*, *Journal of Open Innovation: Technology, Market and Complexity*, and *International Journal of Innovation Science*. It also reflects a growing recognition of the role that resilience in innovation, as well as an urgent need for research on how to foster innovation when faced with challenges.

The importance of understanding organizational factors that contribute to resilience in innovation is also highlighted by the fact that there are journals devoted to organizational management, such as *Management Decision*, *Strategy and Leadership*, and *International Journal of Organizational*.

#### 4.3.2. Sample fields

The articles obtained from the sample using the formula allowed for the identification of the main fields of study in which the research was focused. This information can be clearly seen reflected in Figure 5, which shows the different fields of study and the number of articles in each field.

In entrepreneurship, resilience is essential for navigating the ups and downs of starting and running a business. Entrepreneurs must be able to adapt to changing market conditions, overcome setbacks, and persist in the face of failure [72], [84].

Furthermore, leaders and managers who exhibit resilience can create a culture of innovation by empowering individuals and teams to take risks, learn from their mistakes, and generate new ideas. By providing continuous communication and feedback, leaders can help employees remain resilient and adapt to changing circumstances [4], [85]–[87].

In the field of education, resilience is linked to a growth mindset that views failures as learning opportunities and emphasizes the importance of persistence and adaptability [88].

Moreover, resilience in relation with psychology is seen as a key factor in promoting mental health and well-being. Individuals who exhibit resilience are better equipped to manage stress and cope with adversity, leading to greater happiness and productivity [89].

Finally in the sustainability field, resilience is critical for ensuring the long-term viability of ecosystems. By building resilience into systems and processes, it is easier to adapt to the effects of challenges [8].

## 4.4. Insights on research design

### 4.4.1. Sample research methodologies

The widespread use of various research methods in the study of resilience to innovation is illustrated by a circle graph shown in Figure 6. As noted, the largest proportion of research on this topic is accounted for by quantitative studies, accounting for 44% of articles examined which use such a methodological approach. The findings are consistent with the trend of evidence-based decision making at organizations, which has resulted in a greater emphasis on quantitative research methods.

In the articles reviewed, qualitative research accounted for 25% of these and has been shown to be a key factor in researchers taking account of the importance of looking at individual or group experiences as part of innovation processes. Qualitative methodologies such as interviews and observation allow researchers to collect a wide range of detailed data that can inform the development of interventions aimed at promoting resilience in innovation.

In order to strengthen our understanding of resilience in innovation, concept studies representing 21% of the articles examined are also useful. The purpose of those studies is usually to synthesize and analyze current theories and concepts to generate new ideas and perspectives on the subject. For the purpose of identifying gaps in literature and developing theoretical frameworks that can be used to guide future research, conceptual studies are particularly effective.

Lastly, the literature reviews accounts for only 10 % of the articles covered and it indicates that more comprehensive and systematically synthesized research into resilience in innovation is needed. Review of literature is important for determining the existing state of knowledge on a given topic and to synthesize findings from several studies. By integrating and analyzing the results of previous research, literature reviews can provide valuable insights into the determinants of resilience in innovation and the effectiveness of different interventions aimed at promoting resilience.

### 4.4.2. Unit of analysis in the dataset

The graph in Figure 7 provides valuable insights into the units of analysis used in research on resilience in innovation. As shown above, most of the articles focus on the organizational level of analysis, suggesting that researchers are particularly interested in understanding how resilience can be promoted at the level of the organization as a whole. Given that organizations are at the forefront of innovation, and therefore responsible for creating conditions which allow it to thrive, this finding is not surprising.

In addition, the growing recognition that organizational factors are an important part of promoting innovation resilience is also reflected in this focus on organizational level. It has been shown that organizational factors such as culture, management and resources have a crucial role to play in enabling innovation and promoting resilience when faced with challenges and disruption. Researchers can assess these factors at organizational level, identifying strategies and interventions that could be carried out to encourage resilience and support innovation.

At the same time, less than 6% of articles focus exclusively on team analysis, suggesting that this is an area which needs more attention from researchers. With the responsibility to generate and implement these ideas as well as collaborate with other teams and stakeholders, a team plays an important role in innovation. It is therefore a fundamental area of investigation to understand how teams can be made more responsive and better able to cope with problems and disruptions.

Finally, 21% of the articles reviewed focus on the individual level of analysis, highlighting the importance of understanding the individual factors that contribute to resilience in innovation. This might involve, for instance, individual skills and competences.



Figure 3: Yearly publication paper sets.

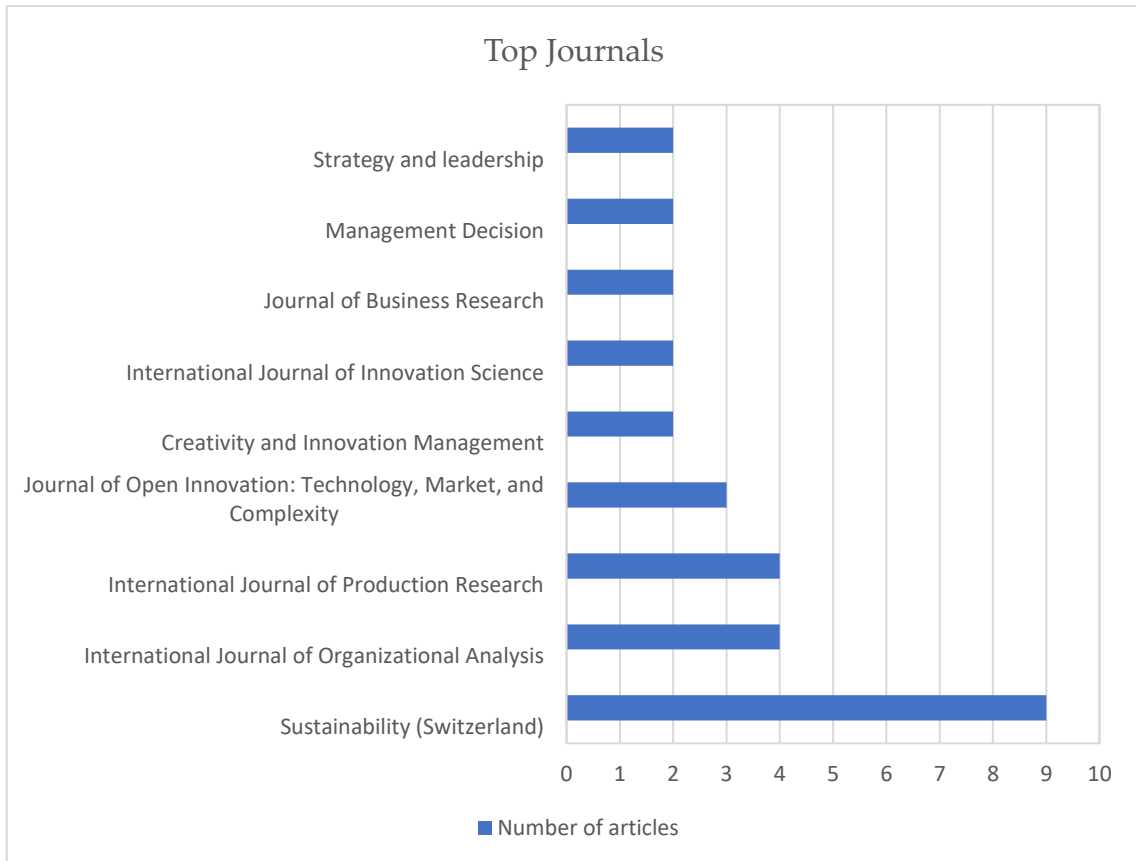


Figure 4: Top journals in the dataset.

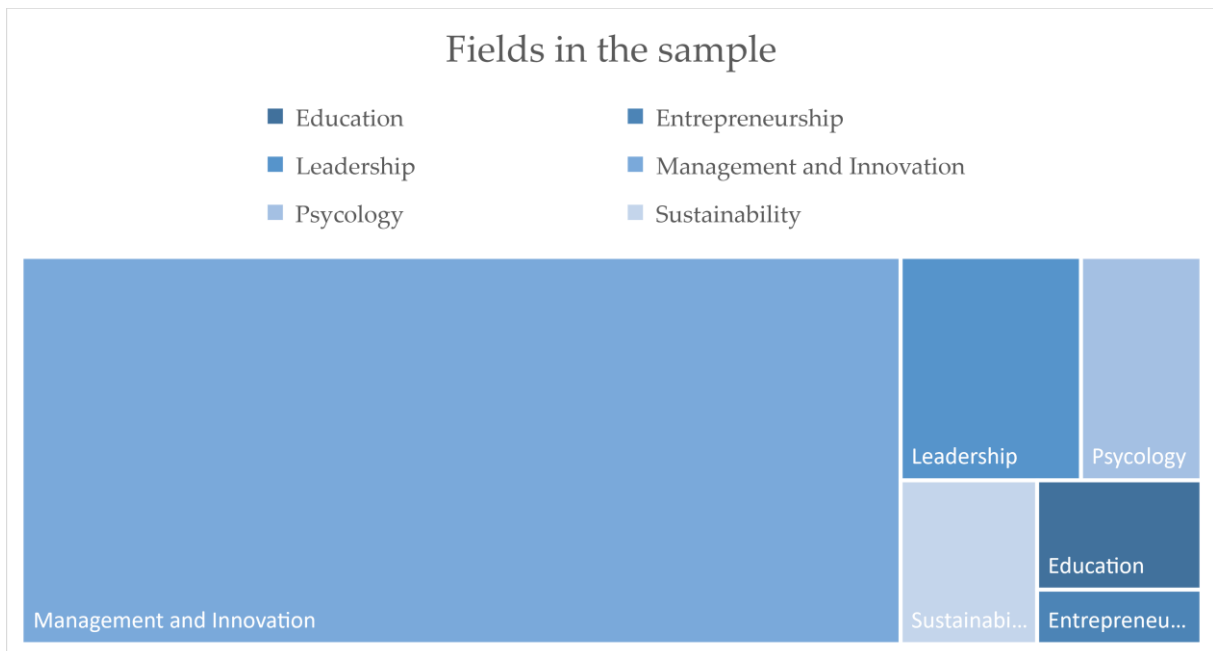


Figure 5: Fields in the sample.



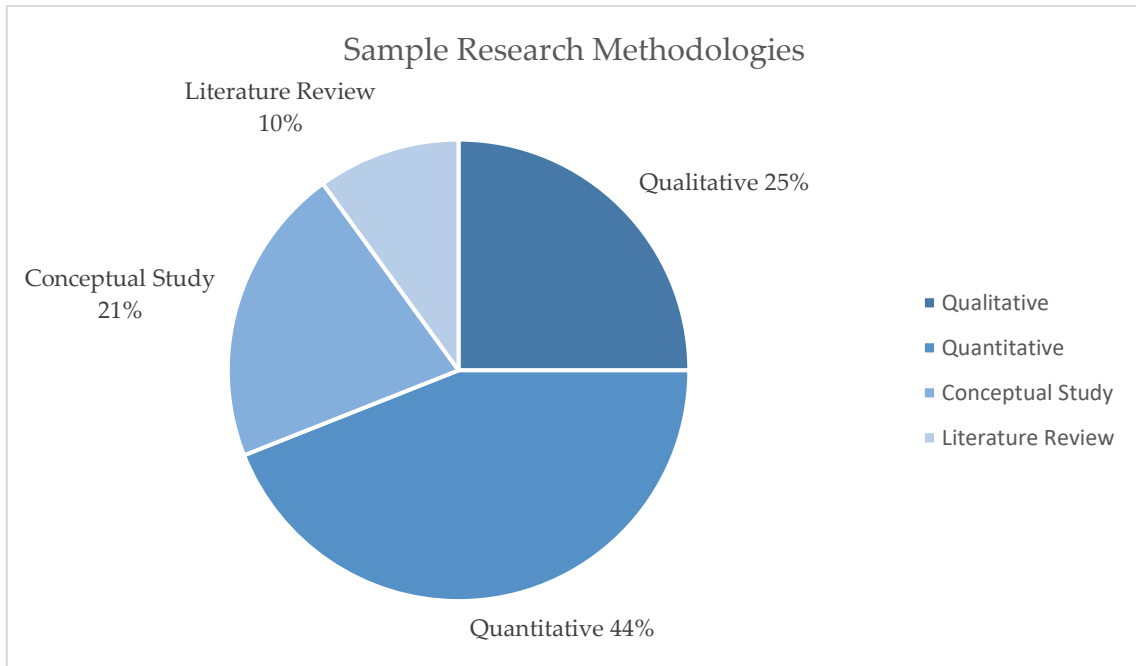


Figure 6: Sample research methodologies.

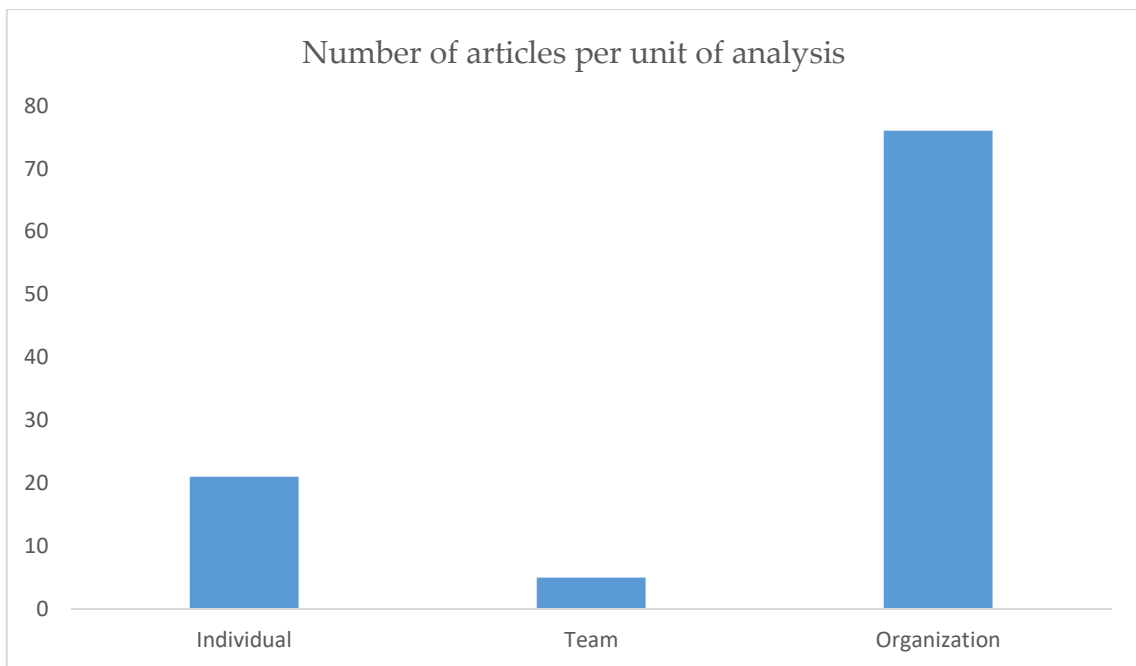


Figure 7: Unit of analysis in the dataset.

Table 3: Most cited papers in the dataset.

**Most cited articles in the sample**

<b>Author</b>	<b>Title</b>	<b>Year</b>	<b>Journal</b>	<b>Cited by</b>
Carmeli A., Spreitzer G.M.	Trust, connectivity, and thriving: implications for innovative behaviors at work	2009	Journal of Creative Behavior	239
Wallace J.C., Butts M.M., Johnson P.D., Stevens F.G., Smith M.B.	A Multilevel Model of Employee Innovation: Understanding the Effects of Regulatory Focus, Thriving, and Employee Involvement Climate	2016	Journal of Management	170
Ates A., Bititci U.	Change process: A key enabler for building resilient SMEs	2011	International Journal of Production Research	139
Vargo J., Seville E.	Crisis strategic planning for SMEs: Finding the silver lining	2011	International Journal of Production Research	85
Akgün A.E., Keskin H.	Organisational resilience capacity and firm product innovativeness and performance	2014	International Journal of Production Research	77
Teixeira E.D.O., Werther W.B.	Resilience: Continuous renewal of competitive advantages	2013	Business Horizons	69
Sabahi S., Parast M.M.	Firm innovation and supply chain resilience: a dynamic capability perspective	2020	International Journal of Logistics Research and Applications	59
Demmer W.A., Vickery S.K., Calantone R.	Engendering resilience in small-and medium-sized enterprises (SMEs): A case study of Demmer Corporation	2011	International Journal of Production Research	56
Obrenovic B., Du J., Godinic D., Tsoy D., Khan M.A.S., Jakhongirov I.	Sustaining enterprise operations and productivity during the COVID-19 pandemic: "Enterprise effectiveness and sustainability model"	2020	Sustainability (Switzerland)	54
Tsai K.-H., Yang S.-Y.	The contingent value of firm innovativeness for business performance under environmental turbulence	2014	International Entrepreneurship and Management Journal	46

## 5 Discussion: the role of resilience in innovation

### 5.1. Introduction to the chapter

Innovation and resilience are closely related concepts that are essential for success in today's fast-paced environment. Innovation is about creating or improving products, services, or processes to meet changing needs or demands [61], [90]. However, innovation projects are often complex and unpredictable, and crises can arise at any time. These crises can be unanticipated high-impact events that threaten the viability of the project. Dealing with crises in innovation projects is much more complicated than any other task or initiative, as innovators must overcome hurdles from both inside and outside the project [9]

This is where resilience comes in resilience is the ability to anticipate, cope with, and adapt to crisis environments to survive, recover, and grow, thereby achieving a competitive advantage. Resilience is vital for innovators to maintain or strengthen their innovation capabilities after a setback or crisis. In this sense, innovators must be resilient to continue innovating and creating value in the long term [50], [91].

Crises that occur within an innovation project are especially difficult for innovators to deal with. They must not only persist through the challenges but also question whether the innovation project is still feasible. They may not have an immediate answer as to whether to continue or not and may have to change direction entirely. Innovators need resilience to adapt to changing circumstances and come up with innovative solutions to continue creating value and succeed [35].

According to Borda-Rodriguez A. and Vicari S. [12] both concepts " share a common ground in so far as they both rely on the ability of an organization to develop adaptive capacity which is defined as the ability of a system or organization to learn and respond to change". As a conclusion it could be said that innovation is both a vehicle of strategic resilience as well as a requisite of competitive advantage in a context of environmental turbulence, complexity, and uncertainty [31].

This section will answer the research question: Which are the determinants of resilience in innovation for individual, team, and organizational levels of analysis? It will begin by examining the stages of innovation and their relationship to resilience, highlighting the key factors at each of these stages. In addition, the specific determinants of innovation resilience at each level of analysis, including the

individual, team, and organizational levels, will be explored and established through a framework. This will encompass a number of factors that influence resilience, such as resilient qualities, resilience processes and motivational forces. The objective is to provide a global understanding of these factors in order to know how their behavior varies and to identify which processes should be followed to nurture it at each level of analysis.

The chapter is structured as follows:

- Section 5.2 examines the stages of innovation and their relationship with resilience.
- Section 5.3 explores the specific determinants of resilience in innovation for each level of analysis, including the individual, team, and organizational levels, taking into consideration the waves of resilience.

## 5.2. Stages of innovation and resilience

The innovation process can generally be divided into two main stages: the generation stage and the implementation stage.

In the generation stage the employee initially recognizes the problem and starts looking for solutions or imagines new opportunities of improvement for processes, products, or services. This phase can be driven by a variety of factors such as customer needs, technological advancements, changes in the market or industry, and creative thinking. The goal of this stage is to come up with a pool of ideas that have the potential to create value for the organization and its customers [34], [92]. There are several techniques that can be used to generate ideas, including brainstorming, ideation workshops, customer feedback, open innovation, and trend analysis. The key is to create a diverse range of ideas and to evaluate them based on their potential for success. It is important to emphasize the role of creativity in the generation stage, which is linked to imagination and is part of the cognitive process through which the individual passes. Creativity is an indispensable prerequisite for innovation, and it is necessary to mark the difference between both terms because while creativity is an imaginative process, innovation is a productive process [93].

The second stage is the implementation of those ideas, where the ideas generated in the previous phase are transformed into products, services, or processes. This phase involves planning, organizing, and executing the necessary activities to make the idea a reality. At this point, people involved in the innovation process had to seek support for this new idea, either from colleagues within the company or different stakeholders. This implementation stage includes all the processes to apply this new initiative [34]

By connecting the stages of innovation with the waves of resilience, it can be established that the first wave is related to the generation stage, since the characteristics that strengthen the resilience of an individual are the same ones that allow the identification of innovative solutions or opportunities. That is, personality traits and skills influence the generation stage.

On the other hand, the implementation stage, which includes all the necessary processes for the promotion and execution of innovative projects, is closely related to the second wave of resilience, since the processes used to overcome stress and obstacles can be applied within innovative projects. In the same way, this stage of innovation is also related to the third wave of resilience, because while a project is being developed, the climate, leadership, and social capital play an important role as motivational forces. These relationships between waves of resilience and stages of innovation are represented in Table 4.

### 5.3. Resilience determinants in innovation: waves and units of analysis

Following the identification of the relationship between the stages of innovation and the waves of resilience, it is important to further explore how resilience and its determinants play a role in innovation. In this section an analysis of resilience is presented from different concepts, and a model is proposed (Table 4) that encompasses the three units of analysis: individual, team, and organization, and their relationship with the three waves of resilience (resilient qualities, resilience as a process, innate resilience) described by author Glenn E. Richardson in their conceptual study of 2002 [55].

Table 4: Resilience determinants in innovation: waves and units of analysis.

Wave	Stage of Innovation	Unit of analysis	Determinants
Wave I	Generation Stage	Individual	Personality traits (self-efficacy, outcome expectancy, optimism, hope, risk propensity, and self-esteem) [9], [34], [94], [95]
			Skills (problem solving and self-motivation) [43], [96]–[99]
			Structure (diversity, size, and composition)[41], [43], [100]
		Team	Dynamics (coordination, cohesion and cooperation) [41]
			Adaptability (learning orientation and flexibility) [44]
			Organizational
		Organizational	Agility [46], [47], [101]
			Ambidexterity [38], [74]
			Flexibility [47], [71], [102]
			Rigidity [58]
			Politics [58]
			Learning culture [37], [41], [103], [104]
Adaptability [42], [53]			
Creativity [30], [37], [43], [54]			
Collaboration [36], [41]			
Innovation ecosystem [14], [15], [38], [40], [90], [105]–[108]			
Wave II	Implementation Stage	Individual	Adversity assessment [43]
			Well-being engagement [11], [66]
		Team	Behavioral strategies (minimizing, managing, and mending actions) [48]
			Organizational
		Organizational	Strategic planning [43], [109]
			Risk management [102]
			Change management [43], [110]
			Quality management [111]
			Crisis management [16], [31], [109]
			HRM practices [14], [65]

<b>Wave III</b>	<b>Implementation Stage</b>	<b>Individual</b>	Climate (trust, connectivity and communication) [9], [112]–[114] Leadership (servant, ethical and supportive) [85], [86], [115]–[119] Social Capital [34], [84]
		<b>Team</b>	Perceived efficacy of team members [43], [44], [120] Perceived efficacy for collective team actions [43], [44], [121]
		<b>Organizational</b>	Structural resources [43], [54], [122]–[124] Cognitive resources [33], [37], [41], [45], [54], [64], [66], [67], [87], [124]–[126] Relational resources [43], [54], [124], [127]–[130] Emotional resources [11], [43], [54], [61], [87], [89], [94], [95], [112], [124]

### 5.3.1. Wave I: Resilience qualities

The following section presents the determinants in innovation of each unit of analysis that belongs to the first wave of resilience.

#### 5.3.1.1. Resilience as a quality in innovation

Innovation requires that people and organizations embrace change and disruption and continually adapt and evolve in response to new challenges and opportunities. In this context, resilience can be described as the ability to bounce back quickly from setbacks, learn from failure, and persist in the face of obstacles. Resilience enables individuals, teams, and organizations to maintain a positive mindset and the right direction, even in the face of the greatest obstacles.

#### 5.3.1.2. Qualities determinants at individual level

The individual level of innovation is undoubtedly the starting point for the understanding of subsequent levels such as group, team, or organizations, since here begins the generation stage of innovation where an individual cognitive process is required. In the literature, personality traits are commonly identified as determinants for an individual's potential to carry out innovation activities and cope with future setbacks. These traits determine the behavior and actions of an individual in the different situations that arise [34].

One group of scholars have studied the relationship between these characteristics and the resilient behavior of people. For example, Moenkemeyer G., et al. [9] in their qualitative study expose the term Innovator Resilience Potential (IRP) which is a construct composed of a set of components that captures the potential for innovative functioning after project termination and for coping with future setbacks. The first of the components is self-efficacy which is considered an individual's belief that he or she has the capabilities to fulfill the assigned tasks in an innovation project; the second component is outcome expectancy, which represents the belief that the fulfillment of one's assignments produces the desired outcomes, such as recognition and project

completion. Additionally, risk propensity is another characteristic which is strongly correlated with flexibility and promoting innovation, as well as recovery after a failed attempt or setback. Other characteristics that also belong to this group of traits are optimism, hope, and self-esteem [94].

The IRP construct is closely linked to innovation projects that have a high probability of ending in failure, especially projects that aim to adapt or develop a product or service through radical or discontinuous innovation [9]. That is why, after possible setbacks, the innovative capabilities of each team member must be maintained and strengthened so that they can continue to develop projects in the future without being affected by previous results. Todt G., et al. [95] in their quantitative study state that IRP is positively associated with an innovator's current project involvement, especially if they have previously experienced termination of an innovation project.

In addition to personality traits, researchers also viewed developmental skills and abilities as precursors of individual resilience.

In this conceptualization, Soto et al. [96] affirm that people differ in social, emotional, and behavioral (SEB) skills, which refer to the abilities that each individual has in maintaining social interactions, regulating their feelings, emotions, and being able to adequately manage a goal and learning-directed behaviors. The main difference between personality traits and SEB skills is that the first represent how a person tends to think, feel, and behave in averaged across situations, whereas the second describe how and individual is able to think, feel and act in situations of need. The authors organize these skill facets into 5 groups (i.e., social engagement skills, cooperation skills, self-management skills, emotional resilience skills, and innovation skills) and proposed the Behavioral, Emotional, and Social Skills Inventory (BESSI) as a method of measuring an individual's ability to perform a given action, which provides a flexible, reliable, valid, and efficient assessment [96].

Besides these SEB skills, scholars also considered problem-solving skills as antecedents of individual resilience. This is the case of Abukhait R., et al. [97] who in their quantitative study pointed to the importance of career adaptability which is the ability to change one's behavior in response to the demands of a changing work environment. In addition, McIntyre L.S., et al [98] who stated that the more humans adapt, the more resilient they become. Also, Pulla V. [99] explains a series of practices or specific negative tendencies that individuals adopt when coping with a setback or failure, such as self-distraction, denial, substance use, and self-blame. Therefore, it is important to be able to identify these practices to facilitate skills development to cope and bounce back in an effective and healthy way.

An important and widely made distinction skills area is the division of self-motivation, which comes from the individual commitment to the task. One group of scholars linked motivation to the regulatory focus, which is the individual disposition that can



represent two approaches to motivation in a person, the promotion focus and the prevention focus. The first focus is aligned with the aspirations of the being, and the second is aligned with the need to feel safe at work [113].

#### 5.3.1.3. Qualities determinants at team level

After studying the individual level, it is necessary to continue with the team level because although ideas can be generated individually, it is essential to find support from other actors inside and outside the company to carry out their implementation. Furthermore, an individual's ability to cope with adversity depends on their interactions with their environment and the types of demands they encounter over a period [34].

A group of scholars determined a relationship between team resilience and its structure, i.e., diversity, size, and composition. For example, a study revealed that the team's ability to recover was affected by the size of the team, as this led to a delay in the consensus of decisions [43]. Moreover, a group of authors stated that maintaining diversity is crucial for enhancing the capacity of a complex system to cope with change and decrease its vulnerability to crises [41], [100]. Additionally, others highlighted that internal dynamics of the team were positively related to resilience; here it is possible to distinguish coordination, cooperation, and cohesion [43]. Another key factor for a team is adaptability, which is composed of learning orientation and flexibility. Both refer to attitudes and behaviors that promote continuous improvement of the team and the self-development of each member [44].

#### 5.3.1.4. Qualities determinants at organization level

In this section, it will be discussed the relationship between innovation and organizational resilience. After seeing the behavior of resilience with the individual and the team within the company, it is essential to analyze it now in the global picture, that is, to obtain a holistic view of the entire organization, its gears, and the role that each link plays in achieving a more resilient company.

Studies defined several determinants for resilience, one of them is agility which is considered a crucial factor that determines a firm's ability to react quickly to a crisis and adapt to new circumstances [101]. Additionally, some authors have focused their attention on the influence of agile workforces on innovation and resilience, asserting that agile workers are better equipped to effectively respond to unpredictable changes, are more proactive, and can quickly adapt to challenging circumstances. Research shows that agility mediates the relationship between firm innovativeness, workforce agility, and firm resilience, suggesting that firms that foster an agile workforce and a culture of innovation are better able to adapt to changing circumstances, and therefore more resilient in the face of adversity [46], [47].

In this wave is also found the ambidexterity, which refers to a firm's ability to explore and exploit simultaneously and adapt over time, significantly influences resilience [38], [74]. Other studies have shown that flexibility mediates the relationship between firm innovativeness and firm resilience [47]. Flexibility refers to the ability of an organization or firm to quickly adapt to changing circumstances and respond to disruptions in a timely and effective manner, while still maintaining its core functions and achieving its objectives. This is a key component of organizational resilience, particularly in critical infrastructure systems, as it can enable organizations to anticipate and respond to unexpected events, minimize the impact of disruptions on their operations and stakeholders, and maintain their essential functions [47], [71], [102]. Two other determinants that belongs to this wave are organizational rigidity which refers to a workplace culture or structure that is resistant to change, lacks flexibility, and inhibits creativity among employees and organizational politics which is a group of informal power dynamics and relationships that exist within a workplace, which can sometimes lead to conflicts of interest, favoritism, and other forms of unethical behavior. These politics can create a culture of fear and distrust among employees, which can inhibit innovation [58].

Learning culture is also important when it comes to managing resilience. Organizational learning, which involves sharing knowledge, believing in new ideas, and accumulating practical skills, can facilitate behavior changes and improve performance. Learning organizations encourage open communication, risk-taking, and support for learning, which can lead to improved performance and innovation [37], [41], [103], [104]. Another concept very close to learning is adaptability, which has two components: knowledge acquired from past events and the ability to learn. Although most research defines adaptability as a company's ability to adjust to unexpected changes, it is important to note that adaptability and learning are distinct concepts. Learning can be considered a precursor to adaptability and should be treated as such [42], [53].

On the hand, resilience is viewed as a process involving many factors, including creativity, which plays a role in it [37]. According to Anders Richtnér and Hans Lofsten, resilience and creativity complement each other and offer insights on managing in a turbulent environment. Other authors defined organizational creativity as the ability of an organization to generate new and innovative ideas that create value and have a positive impact on the organization, its stakeholders, and society as a whole. The article emphasizes that organizational resilience is important for responding to challenges and uncertainties, such as those posed by the COVID-19 pandemic [37]. Organizational creativity captures the interaction between the creative processes, the product being developed, the people involved, and the creative situation [54]. Overall, these concepts suggest that organizations can enhance their

resilience by fostering creativity [43], [30]. Similarly, collaborative processes allow partners to communicate more efficiently, share resources and knowledge, and work together to reach a consensus on priorities and strategies for resilience. Collaboration and partnership provide businesses with increased resilience, enabling them to recover more effectively from external disruptions [41], [36].

Finally, ecosystem innovation is also a determinant in the first wave. Organizational innovation encompasses a wide range of activities that involve the collaborative creation and implementation of new products, services, and ideas in the market [105]. This ecosystem plays a crucial role in enhancing a company's resilience by providing access to resources, expertise, and networks that enable firms to adapt and innovate in response to changes in the environment.

The type of innovation pursued by an organization can also impact its resilience. Innovation activities or projects have different classifications according to their nature, such as technological, commercial, or organizational, according to the degree of novelty, such as incremental, radical, or disruptive. There is also continuous or discontinuous, competence-enhancing or competence-destroying. These classifications have focused on which types of innovating activities are most important for sustaining organizational success [14]. In the sample taken for this literature review we found mostly articles related to technological, product, process, disruptive and radical innovations. Some of the articles also studied social innovation which is "design and implementation of new products, processes and methods that, in a creative and sustainable manner, offer a better solution to one or several social demands" and some others on open innovation which "has been widely acknowledged as the new imperative for organizing corporate innovation, in line with the fundamental premise that firms can improve their innovativeness, and therefore their competitive position, by establishing collaborative and interactive interorganizational arrangements with external knowledge sources" [15].

After finding so many classifications and types of innovation in the literature, it was necessary to reclassify all innovations into two large groups that share similar characteristics: exploitative innovation and exploratory innovation. The former refers to the use and potential of the organization's resources and capabilities: It is the ability to commit to improve quality and cost reduction, improve automation levels through the use of different technologies. This innovation approach [38], [40] "alludes to the enhancement of the organization's existing resources and capabilities", is generally associated with incremental innovations that seek to improve quality, decrease production costs, increase automation, among other practices [108]. On the other hand, exploration capability is the firm's ability to reconfigure the organization's existing assets, through the search for new technological ideas, creation of new products, services or processes, generation of innovative ways to meet customer needs [38]. In

this innovation approach, new market segments and niches, changes in strategic direction, opening up new industries are also sought [106]. Both exploration and exploitation are considered mutually reinforcing, it is a mistake to focus only on the exploitation approach because as announced by Gayed S. and Ebrashi R. [40] it can lead to "success traps, where successful exploitation of a firm's resources might prevent it from further exploring new resources in a dynamic environment" while focusing too much on the exploratory approach is likely to generate "failure traps", where the uncertain results of exploration would eventually result in failure and minimize the levels of efficiency. Therefore, it is important at the organizational level to implement a common language for both approaches, an ability that allows organizations to explore and exploit simultaneously, that can be adapted over time. For many authors this ability is called "Ambidexterity" [38].

An important factor to highlight about innovation is its high degree of losses, setbacks, failures, and problems during execution that generally impact the company's performance. The most common examples are delays in the development or implementation of new products or services. In this study we are analyzing the incidence of resilience with all these "negative" events that can delay or kill many large innovation projects. Although in the literature there are many studies that have concluded that these failure experiences cause positive effects in the company, since after these events organizations begin to streamline their feedback and learning processes, leading them to create more useful routines and explore new technologies to implement in the future [107]. So, if companies really take advantage of and learn from innovation failures, they can reach potential development opportunities and new growth directions.

Innovation is part of the first phase of this model because there is a clear relationship between it as a quality of organizations and resilience. Some authors have shown that innovative companies are much more flexible, take greater advantage of environmental opportunities and use resources to implement new ideas[90]. Additionally, they can adapt quickly to changes, in other words, they have the ability or capacity for resilience.

### 5.3.2. Wave II: Resilience as a process

In the second wave, it is stated that resilience is a process in which individuals overcome obstacles, adversities, and setbacks, identifying opportunities for improvement and growth within an innovation project. Additionally, upon completing this process, the resilience qualities presented in "Wave I" are strengthened [55].

It can be noted that in this wave of resilience, the information available about the processes that lead to the reintegration of the individual, the team and the organization are not very specific and have limited depth.

### 5.3.2.1. Resilience as a process in innovation

Resilience in innovation has been studied in organizations as a trait or resource possessed by individuals, which can enable them to cope with and recover from challenging situations. However, recent research has begun to highlight the dynamic nature of resilience, suggesting that it should be conceptualized as a process rather than a stable trait. This process-based view of resilience recognizes that both personal resilience and the nature of the challenging situation interact to shape the ultimate outcomes [9]

In the context of workplace resilience, adaptive resilience has emerged as a useful construct for understanding the dynamic nature of resilience. Adaptive resilience involves a process of continuous transformation and learning in the aftermath of disruptions, rather than a simple return to the pre-disruption state. This implies that resilience is a malleable construct that can be shaped by the actions of individuals and organizations during and after a disruption [53].

### 5.3.2.2. Process determinants at individual level

At the individual level, there are two processes that can enhance resilience: well-being engagement and adversity assessment. Firstly, well-being engagement refers to the willingness of individuals to take an active role in building their own resilience. This involves taking initiative and engaging in activities that promote wellbeing, such as self-reflection and personal mindfulness practices. The first is a set of exercises that can help them to think about their past thoughts, behaviors, and emotions in different work situations and to understand how they can use what they learned to facilitate their performance in future situations [11]. Personal mindfulness practices, on the other hand, help individuals develop a greater sense of self-awareness, which can improve their ability to recognize and manage stressors, regulate their emotions, and respond to challenges in a more effective way [66].

Secondly, some scholars propose the adversity assessment as an affective, cognitive, and behavioral process that people might apply to maintain or restore functioning in response to adversity. It refers to the personal evaluation and interpretation of a difficult situation or adversity an individual is facing, including their perception of the severity of the situation, their beliefs about their ability to cope with it, and their understanding of the resources available to them to deal with the challenge. Adversity assessment is a crucial aspect of resilience as it influences how individuals respond to challenges and how they adapt to the situation [43].

In summary, both well-being engagement and adversity assessment are important processes that can enhance individual resilience. By actively engaging in activities that promote well-being and developing a greater sense of self-awareness through personal mindfulness practices, individuals can better manage stress and respond to challenges in a more effective way. Moreover, by applying the process of adversity

assessment, individuals can better evaluate and interpret difficult situations, which can help them adapt and restore functioning in the face of adversity [11], [43]

#### 5.3.2.3. Process determinants at team level

At the team level, Peter R. A. Oeij, et al. in their article of 2017, they presented three behavioral strategies for dealing with pressures, stressors, and difficult circumstances: minimizing, managing, and mending actions. Resilient teams perform minimizing actions by anticipating challenges and planning for contingencies, assessing, and understanding the team's current readiness, vigilantly identifying early warning signs of potential problems, and preparing to handle difficult situations. The second set of actions is carried out during the crisis, here the teams execute managing actions by assessing challenges, addressing chronic stressors, providing backup and assistance, and seeking guidance and support when needed. Finally, they perform mending activities by regaining situational awareness as quickly as possible, debriefing by reviewing their actions, ensuring they address concerns and risk points, and expressing appreciation to build bonds and team norms [48]

#### 5.3.2.4. Process determinants at organizational level

In the last unit of analysis, different organizational processes are found in the literature that share a common goal of enhancing firm performance [88]. These processes include strategic planning [43], [109] change management [43], [110], quality management [111], risk management [102], and crisis management [16], [31], [109]. For example, the authors Vargo J. and Seville E. [109] in their study stated that resilience in an organization is not only surviving, but also thriving in times of uncertainty or in times of prosperity. For them, surviving would be associated with crisis management, while thriving would be the strategic planning approach. These two processes should be integrated, both would complement each other perfectly in "strategic crisis planning", where the speed of change in today's world will be considered, the opportunities that can be obtained from the crisis will be found and, in this way, a resilience planning process could be obtained. Other scholars highlighted the role of Human Resources since they are responsible for creating practices that support and improve the well-being and engagement of employees, such as training, employment security and result-oriented appraisals [14], [65].

#### 5.3.3. Wave III: Innate resilience

The third wave of resilience emphasizes the importance of external motivational forces within innovation projects that develop and nurture individuals' resilience mindset [55]. In this section will be developed the determinants for the three units of analysis of this research.

### 5.3.3.1. External motivational forces determinants at individual level

At this level, it can be highlighted three determinants: climate, leadership, and social capital. They encompass all the motivational forces witnessed by individuals that help them to reintegrate after having witnessed a disruption, an unexpected change, or adversity that alters their environment [55].

The organizational climate that surrounds individuals is a source of energy and motivation because it generates an open space that promotes creativity, connectivity between colleagues that facilitates the exchange of ideas, and the confidence to try without fear of failure. Several studies have also focused on the connection between individual resilience, trust, and connectivity. For example, in a quantitative study, Carmeli A., et al. [112]. found that trust and connectivity will be essential to generate spaces open to creativity, for the exchange of ideas. The author affirmed that trust would provide employees with psychological insurance to help them develop ideas and generate momentum for execution. On the other hand, connectivity in the field of interpersonal relations is important because it can give rise to different influences from others, that is, connectivity is seen as a learning opportunity. For this reason, the authors state that supervisors should strengthen connectivity with their subordinates, showing empathy, this would help relieve stress and pressure, typical sensations of people who undertake innovation projects.

The benefit of a high employee involvement climate is that workers feel free to make decisions since they have the necessary autonomy, competence, and relatedness [113]. To generate this climate, it is necessary to improve communication and the learning experience for all employees. For this, Chauvet S., et al. [114] propose to use humor and laughter in the learning process as they can improve health and well-being, as well as strengthen social connections. Other factors that would be influenced are the performance, problem-solving, and stress levels of employees. Moenkemeyer G., et al. [9] also discuss the important role of communication in their qualitative study where they indicate that managers should communicate information about the termination process in a concrete way and should convey accurate future performance expectations and should reassure employees that they are capable of success, despite suboptimal circumstances.

Several scholars place more emphasis on the specific role of leaders and managers in developing resilient employees [117]–[119]. They are claimed to be able to build positive work environments and implement supportive strategies which allow employees to shape their well-being and resilience. Such research focused mainly on leadership styles. As one of the first, Iqbal A., et al. [85] proposed servant leadership as a style that has a direct and positive relationship with employees' innovative behavior since this style can foster psychological safety by showing empathy, encouraging questions, and soliciting feedback from subordinates. In this way, servant leadership is very conducive to the discovery and creation of novel ideas by all

employees. Additional studies conducted by Wang Z., et al. [86] pointed out that employees who are led by a servant leader are more likely to be successful at work and exhibit more innovative behaviors afterward and this indirect influence became more effective with the presence of high team reflexivity.

A second group of scholars asserts that one of the most effective and influential leadership styles in Innovative Work Behavior (IWB) is ethical leadership which is positively linked to thriving at work. Iqbal Z.A., et al. [115] defined it as a “demonstration of normatively appropriate conduct through personal actions and interpersonal relationships and the promotion of such conduct to subordinates through two ways of communication, reinforcement and decision making”, this leads to the creation of more honest relationships, less turnover intention, increased satisfaction, and engagement of all employees. Ethical leadership will be critical when it comes to innovation project termination as it will help employees bounce back faster and more effectively. This leadership style is appropriate for all stages of the innovation process.

Moreover, Bani-Melhem S., et al. [116] stated that a supportive supervision is needed because it has a positive relationship with employee self-esteem. Likewise, the authors affirmed that abusive supervision reflects employees' perception of the degree to which their supervisors verbally or nonverbally engage in hostile behavior, for example, when employees are publicly ridiculed or shamed. These types of practices make the resilience process difficult and increase turnover intention in response.

Finally, employees need to have confidence in their workplace, in their abilities, knowledge, and skills in order to effectively develop the innovation process for which the perception of being valued by their supervisors is essential for the display of innovative behaviors [116].

Finally, social capital also be part of the third wave, since in this case, the network will also be a motivating force that provides support to individuals, where they can build resilience from the support for the development of ideas, and support in case of setbacks.

It is necessary to emphasize that innovation is a social process because initially the idea of innovation can be born from the individual but to reach its execution the individual must promote his idea, this requires interaction, networking, and social influence to advance the idea generated [34]. Ideas to promote behaviors during the stakeholder persuasion process are driven by positive emotions. In a qualitative study, Santoro G., [84] determined the relationship between entrepreneurial resilience and success states that a broad network of stakeholders helps entrepreneurs to build resilience and increase perceived success and that following the logic of open innovation, entrepreneurs should be able to open critical and entrepreneurial thinking to increase



social capital and improve attitudes towards resilience, thus contributing to the business.

#### 5.3.3.2. External motivational forces determinants at team level

Team resilience is the ability of a team to adapt, persist, and thrive in the face of adversity. It involves the ability of team members to effectively navigate challenges and setbacks, maintain a sense of cohesion and unity, and work together to achieve their goals. One important factor in promoting team resilience is collective efficacy, which is a shared belief among team members that they have the capacity to organize and execute actions that will produce desired outcomes. It is an important factor in promoting team resilience because it can help to foster a sense of unity and cohesion among team members, even in the face of adversity.

There are two subdivisions of collective efficacy: perceived efficacy of team members and perceived efficacy of collective team action. The first one refers to the belief that each individual team member has the necessary skills and abilities to contribute to the team's success. This includes both technical skills and interpersonal skills, such as communication, problem-solving, and cooperation. Lin M., et al. [120] conducted a qualitative study exploring the relationship between team behavior, innovation, and cooperative and competitive orientations. The authors found that cooperation among team members is crucial for achieving common objectives and promoting interdependent work, while competition is essential for individual growth and continuous improvement. Lin M., et al. [120] propose that they are two opposing energies that can coexist harmoniously, like the yin-yang duality. Therefore, it is necessary to foster a work environment that embraces both cooperative and competitive orientations, as this will encourage members to have a collective vision of their achievements while also driving them to develop and demonstrate their skills to achieve desired resources or rewards [120].

On the other hand, perceived efficacy of collective team action refers to the belief that the team as a whole has the capacity to work together effectively to achieve their goals. This includes a belief in the team's ability to coordinate their efforts, to communicate effectively, and to adapt to changing circumstances[43], [44], [121].

#### 5.3.3.3. External motivational forces determinants at organizational level

Organizational resilience is a critical capability for modern organizations to thrive in a constantly changing environment. To develop this capability, organizations need to possess specific resources that enable them to cope with various challenges and remain adaptable to unexpected changes. These resources play a crucial role in building and sustaining organizational resilience, acting as forces that influence an organization's ability to bounce back from adversity and disruptions. In this context, this section will explore the four distinct resources for organizational resilience, which include

structural resources, cognitive resources, relational resources, and emotional resources [54], [67], [72].

Firstly, structural resources refer to an organization's clear structures that facilitate and motivate activities. These structures include having solid visions, which are clear and compelling statements of an organization's long-term aspirations that inspire employees and guide decision-making [122]. Adequate financial resources are also important, as they provide the necessary funds to support an organization's operations, investments, and growth plan [43]. Additionally, having a legitimate position, which means having a recognized and respected place in the market or industry, gives the organization credibility and authority. A clear mandate, which is a well-defined and understood purpose or mission statement outlining the organization's reason for existence and guiding its actions, is also crucial [54], [123], [124].

Secondly, cognitive resources refer to an organization's capacity to process and use information effectively. These resources imply that the organization has adequate skills, knowledge, and competence to perform the necessary tasks and functions. Additionally, cognitive resources can also mean having easy access to expert knowledge, experienced mentors, or smart people to discuss critical issues. In today's rapidly changing business environment, having the right knowledge and skills is essential for success [33], [37], [41], [45], [66], [87], [125], [126]. To develop cognitive resources, organizations can invest in training programs and continuing education for their employees [64], [67]. Moreover, organizations can foster a culture of learning and innovation by encouraging employees to share their knowledge and expertise and by creating opportunities for cross-functional collaboration [54], [124].

Thirdly, relational resources refer to the relationships that an organization has both within and outside of its boundaries [127]. Within an organization, relational resources can include strong and positive relationships among employees, which can foster collaboration, information sharing, and mutual support [43]. Additionally, having effective communication channels within the organization can help ensure that information flows smoothly and that critical issues are identified and addressed in a timely manner [128]. Outside of the organization, relational resources can include relationships with customers, suppliers, regulators, and other stakeholders. Having robust relational resources can help organizations respond quickly and effectively to changing circumstances [54], [124], [129], [130].

Finally, emotional resources are defined as the intangible elements of an organization's culture that contribute to the well-being and satisfaction of its employees. These resources include feelings of friendship, support, trust [61], [87], [112], respect [87] and collegiality. Emotional resources are essential for maintaining a positive workplace environment and can have a significant impact on employee productivity, engagement, and satisfaction. When employees feel valued, supported, and respected,

they are more likely to be committed to their work and to go above and beyond in their efforts. Emotional resources can also help foster a sense of belonging and community within the organization, which can contribute to employee retention and reduce turnover. To develop emotional resources, organizations can invest in creating a positive workplace culture that values employee well-being and promotes open communication, collaboration, and inclusivity [11], [61], [89], [95]. Additionally, organizations can provide opportunities for employee development and growth, which can help foster a sense of purpose and engagement [43], [54], [124].

Each of these resources plays a crucial role in building and sustaining organizational resilience. By developing and leveraging these resources, organizations can enhance their capacity to adapt and thrive in challenging environments.



## 6 Conclusion

### 6.1. Introduction to the chapter

This concluding chapter serves to highlight the contributions of this study to both theoretical and practical perspectives. With a framework in place for identifying the determinants that contribute to resilience in innovation across different levels of analysis, this chapter summarizes the key findings and highlights their significance. Furthermore, the limitations of the study are addressed to provide a more informed understanding of the results. The managerial implications of the research findings are discussed, and suggestions for future research are presented.

This chapter is structured as follows:

- Section 6.2 describes the concluding remarks of the study, the most relevant determinants by level of analysis are shown in a synthesized manner.
- Section 6.3 introduces the limitations of the study. This will help to provide results transparently and to inform about the constraints under which the research was conducted.
- Section 6.4 describes the managerial implications to be provided. Here are suggestions of practices that can be carried out in an organization to develop resilience in an innovation environment.
- Section 6.5 describes guidelines for future research for scholars and practitioners.

## 6.2. Final remarks

Resilience at the different levels of individual, team, and organizational analysis is indispensable for survival in the context of innovation and for that reason, it is important to know how it is developed and nurtured. This study has provided a novel contribution to the resilience literature by filling in the gaps on how the stages of innovation relate to resilience and investigating the determinants of resilience in the context of innovation for the different levels of analysis, and its relationship with the waves of resilience.

At the individual level, resilience is considered a stable trait that is influenced by different factors: personality traits such as optimism, self-esteem, and hope and skills such as problem-solving. In order to nurture resilience at this level it is necessary that individuals perform adversity assessment processes and have well-being engagement. In addition to this, there are other factors that influence resilience in the individual such as the climate to which the employee is exposed, the interactions with other members both inside and outside the organization, and the type of leadership that directs them.

Analyzing the team level, resilience is marked by elements of their dynamics, their structure such as size and diversity, and their adaptability when a disruptive event occurs. Team resilience exhibits three behavioral processes for dealing with pressures, stressors, and difficult circumstances: minimizing, managing, and mending actions.

At the third level of analysis, the organization presents different characteristics throughout the literature that greatly influence resilience, such as agility, ambidexterity, flexibility, and learning culture. Different practices were also identified by the organization before, after, and during a disruptive process such as strategic planning, risk management, and crisis management, and the key role of the human resources department in the development of resilience was also evidenced.

## 6.3. Research limitations

Having presented the results and discussion of this study in Chapters 4 and 5, it is important to recognize that this study has limitations. Even though the findings presented in this research will be useful for researchers, academics, and practitioners, it is essential to be aware of its potential shortcomings. Therefore, the limitations will be presented below to facilitate a more informed understanding of the results.

The first limitation of our research was bias, as the literature review and article selection process were conducted by a single person, which made several aspects of the study subjective. This was particularly evident in the selection of the final sample, as the inclusion and exclusion criteria applied during the search formula may have led to the exclusion of articles that could have provided valuable information. Similarly,

the identification and establishment of determinants of resilience in innovation for the different levels of analysis in this study was also subject to bias. This process involved interpreting data and determining each factor based on the researcher's understanding of what was stated in the articles, supported by prior knowledge in the field.

Another limitation of our study is the potential impact of using a single database, SciVerse Scopus, to extract articles. While Scopus is a comprehensive database, its coverage may not be complete, and there may be relevant literature in other databases that was not included in our review. As a result, our final sample may not fully represent the breadth of available literature on the topic, which could constrain the depth of our analysis.

This study is subject to several other limitations, including time constraints that can make it difficult to review all available literature in detail. As a result, the comprehensiveness of our review may be limited, and we may have missed important findings or insights. Additionally, our results are limited by language, as we only considered articles published in English. This means that relevant literature in other languages may not have been included in our analysis, which could restrict the application of our results to other contexts.

Despite these limitations, the findings presented in this literature review will be useful for scholars and professionals who are interested in understanding the determinants of resilience in innovation across different levels of analysis. Moving forward, it will be important for future studies to address the limitations identified in this research, such as the potential impact of bias and the limited coverage of the literature review. By doing so, researchers will be better equipped to build on the findings of this study and expand our understanding of the complex factors that contribute to resilience in innovation.

## 6.4. Managerial implications

This study has pertinent implications for managerial practice that help mitigate the adverse effects after a setback or termination of an innovation project [71]. These measures help people to reintegrate, to continue innovating without fear of failure, and to learn from mistakes. Managers must provide a culture of resilience, where all members of the organization can develop their quick learning skills from an agile development with a feedback loop, where detailed information is collected on mistakes, a deep understanding of them is made and employees are informed how they can be corrected and prevented for future occasions [71].

In addition, it is important to encourage employees to be dedicated to learning, create shared perspectives, and be open-minded and willing to try new ideas. Managers can also create a positive appraisal of these situations and develop new adaptive procedures and routines to contribute positively to the organization's overall resilience

capability [66]. Likewise, managers should communicate information about the termination process in a concrete way and should convey accurate future performance expectations, and reassure employees that they can thrive, despite suboptimal circumstances [9], [45].

## 6.5. Future research

Although research on resilience as an attitude in the context of innovation has advanced significantly in recent years, there are still many gaps in the understanding of this construct. Future research should study the three levels independently - individual, team, and organizational - as the study revealed that their behaviors and determinants are distinct [43]. This includes a particular focus on team resilience, which was found to be the unit of analysis with the fewest findings in the literature.

In addition, future research on resilience should look at its behavior in the context of different types of innovation, such as product innovation, process innovation, radical innovation, incremental innovation, and business model innovation [45]–[47]. Thus, more research is needed to determine the extent to which resilience predicts positive outcomes for each type of innovation and protects individuals, teams, and organizations against negative outcomes such as fear of failure, risk aversion, and innovation inertia.



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