



April 2023

## Entrepreneurial resilience, a key soft skill to develop in a crisis situation: Proposal for a measurement scale

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### Recommended Citation

NAJEH, Hajer and Morched, Salim (2023) "Entrepreneurial resilience, a key soft skill to develop in a crisis situation: Proposal for a measurement scale," *Journal of Business & Entrepreneurship*: Vol. 32: No. 2, Article 4.

Available at: <https://repository.ulm.edu/jbe/vol32/iss2/4>

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## Introduction

There are multiple essential aspects to the notion of resilience, some are related to an individual's personality and others to external dimensions called external resources (Boris Cyrulnik, 2012). What is interesting in this notion of resilience is that it expresses both specific dimensions of an individual's personality and involves a process of self-reconstruction.

Several studies (Leimeister, 2010; Levy, 2015; Malone & Bernstein, 2015; Mulgan, 2018; Valencia, Roberto, & Garcia, 2015; Boubakary, 2022) have worked on entrepreneurial resilience and have been very interested in dynamic capacities and shared issues as privileged vectors for building collective competence and increasing resilient postures in complex situations (Akgüna and Keskina, 2015; Altintas, 2015; Alphonse-Tilloy and Altintas, 2018).

The aim of these studies was to show that entrepreneurial resilience is a key soft skill that is developed during the critical state, particularly through the dynamics of peace, integration, sharing, etc. However, these studies only focus on entrepreneurs operating in quasi-stable ecosystems. In the context of the Covid-19 pandemic, economic operators are almost non-existent because government measures have a negative impact on company values. Moreover, the few results on entrepreneurial resilience seem contradictory. Therefore, as Love and Roper (2015) and recently Boubakary (2022) have pointed out, it is unclear why in a crisis like Covid-19 some entrepreneurs suffer huge loss of value while others do not, as they all suffer from the same government measures (Academy of Entrepreneurship and Innovation et al., 2020; Boubakary, 2022).

Taking into account the literature and the current pandemic, further empirical research is needed to determine whether collective intelligence is worth integrating into entrepreneurs' survival strategies in a changing environment to make them more resilient.

Nowadays, recent economic models are imposed because of the health crisis, including those counting on flexibility, identifying the profile of entrepreneurial adaptability. Moreover, several studies consider resilience as an essential quality of entrepreneurs in a crisis situation (Bernard, 2015; Bernard et al., 2016; Academy of Entrepreneurship and Innovation et al., 2020; Boubakary, 2022).

According to Manciaux (2001: p 331), this concept refers to "the ability of a person or a group to develop well in the presence of unstable events, difficult and sometimes disastrous circumstances, and to continue to project themselves into the traumatic future.

Given the importance of this concept, the Academy of Entrepreneurship and Innovation (2020), in collaboration with a team of researchers, proposes to test the effectiveness of the educational tools commonly used in the field of entrepreneurship, in the development of the resilience capacity of student-entrepreneurs. It is in this context that our work fits, by trying on our part, to develop this concept and this, by proposing an operational measure that allows entrepreneurs to test their level of resilience. Indeed, since 2009, in the wake of Fayolle's work, learning methods and techniques as well as the range of skills to be acquired have been both enriched and diversified. The ability to measure entrepreneurial resilience is still not very present in this palette. If the Entrepreneurship Academy has focused its intention on the capacities of absorption, renewal and appropriation, as dimensions of resilience defined as a process, the emphasis is placed in this work on all the soft skills that are directly related to this concept. Thus, rather than a process, resilience will be defined as a skill to be acquired and developed.

Our core research question is then how to measure entrepreneurial resilience.

The development of resilience, which allows entrepreneurs to face crises, is an essential quality of the image of an entrepreneur. In this regard, we rely on the perspective of entrepreneurial resilience to examine the stages of construction of a measurement scale to assess the level of entrepreneurial resilience in Tunisia.

As it is mentioned, the question of the choice of entrepreneurial resilience was inspired by several aspects, firstly by human and professional experiences of support, then by a desire to give the concept a more visible dimension. On the one hand, we aim to make resilience an essential quality for the success of entrepreneurs as well as student entrepreneurs who wish to create projects for the future. On the other hand, we aim to educate entrepreneurs who will be encouraged to acquire and develop their resilience in order to be able to resist and prevent crises.

The first part of this article will be devoted to the theoretical framework, where we examine the theoretical foundations of the concept of entrepreneurial resilience and the definition of its dimensions. We then lay the conceptual foundations that will be developed and complemented by our empirical study, with a detailed explanation of our methodology given in the second section. The third section presents the results of our study by presenting the scale for measuring entrepreneurial resilience that we have constructed. We conclude this article with an in-depth discussion of the findings of the study.

## 1. Literature review

Health crises can have both positive and negative consequences (gratitude, curiosity, affection, anger, worry, anxiety, sadness, etc.) (Tedeschi and Calhoun, 2004; Boubakary, 2022). It is a positive emotion that serves to protect resilient people from negative reactions and allows them to thrive rather than weaken (Fredrickson et al., 2003; Academy of Entrepreneurship and Innovation et al., 2020). In difficult times, resilience is particularly linked to business intention and is often associated with positive emotions.

### 1.1. Definition of entrepreneurial resilience

Resilience, as defined by Koninckx and Teneau (2010, p151), is “the ability to succeed, live and thrive in a socially acceptable way despite stress or adversity”.

Many disciplines indicate the concept of resilience, including economics, society and ecology. Recent researches have shown the relevance of this concept in times of crisis of personal and organizational instability (Academy of Entrepreneurship and Innovation et al., 2020; Bernard, 2021). Some works focus on organizational resilience (Montet, 2020; Hien, 2020; Kurschad, 2020), others address the entrepreneurial aspect of resilience (Bernard and Dubard Barbosa, 2016; Boubakary, 2022). It is on the last aspect that we have focused our work and in particular on the psychic side of the concept, taking it as a behavioral quality or even a skill.

The literature dealing with the concept of resilience is considered very rich. Indeed, its conceptualization was first in the field of ancient physics and later in psychological writings. Social scientists have integrated resilience, revealing a wealth of research in economics, management, education, and more. Overall, several authors (Duchek, 2018; Bernard and Barbosa, 2016; Mignenan, 2021) argue that resilience performance can be considered in two ways: (i) the presence of adversity reflects a strong concurrent threat of significant stress, trauma and (ii) positive adaptive postures characterized by rebound, evolution, despite obvious risks (Bernard and Dubard Barbosa, 2016).

In this framework, Psiuk (2005) defines it as a two-step process: facing the trauma and being able to overcome it. According to the author, facing a trauma requires resistance to mental confusion, while overcoming it requires the ability to reorganize and reproduce. Later, Begin and Chabaud (2010) emphasized entrepreneurial resilience, instead assuming that it manifests itself in a process that includes the following three stages: The first stage of reflection requires the ability to absorb shocks and be adapted to the part of the entrepreneur who lands immediately. Adaptation extends to the second long-term phase, which requires the revision of entrepreneurial projects to be adapted to the new environment and requires entrepreneurs to have new capacities. A third phase which leads to a process of legitimization of the actions taken previously within a larger project, as well as a better understanding of its capacities by the entrepreneur, in particular during the crisis, which requires a capacity of appropriation.

Many authors have highlighted different aspects of resilience, including cognitive abilities and personality traits, which are associated with a positive ability to be adapted to risky or high-stress situations (Santoro et al. 2020). In the field of entrepreneurship, in order to evoke entrepreneurial resilience, the literature emphasizes traits, capacities and qualities. Other work evokes responses to entrepreneurial failure, stress and resistance to describe entrepreneurial resilience (Corner et al. 2017).

According to Davoudi (2016), entrepreneurial resilience can be explained as a structure that shapes the opportunity of entrepreneurs, marked by a feeling of rebound. For this author, entrepreneurs are agents of change who propose and apply innovative solutions so that the consequences of crises are well remedied and mitigated. Another author (Duchek, 2018) argues that: (i) entrepreneurial resilience generates a complex interaction due to many factors and the contribution of each factor; (ii) entrepreneurial resilience is multidimensional and results from the common point of view of several interacting stakeholders.

On the other hand, entrepreneurial resilience is about overcoming adversity, adapting to uncertainty and learning from failure. Work on resilient entrepreneurs examines the level of business success between resilient and inelastic entrepreneurs (Taifur et al., 2020) or the way resilient entrepreneurs adapt to change and bounce back in difficult circumstances (Liu et al., 2019) of uncertainty. Entrepreneurial resilience is the key to their constant experimentation and success.

Entrepreneurial resilience is thus defined as “a form of emotional and cognitive capacity useful for the entrepreneur, in particular when he bounces back after failures related to his entrepreneurial initiative” (Bernard and Dubard Barbosa, 2016, p. 89)

In the words of Boubakary (2022, p. 135), entrepreneurial resilience is defined as “the ability to overcome entrepreneurial challenges and to persist in the entrepreneurial process in the face of adverse situations and unexpected results”.

Thus, and in the light of these different definitions attributed to the concept in question, let us specify that in the context of this study, we define entrepreneurial resilience as a behavioral quality or even a skill acquired by the entrepreneur allowing him to face, overcome the crisis and to learn from this crisis. This definition leads us to explore multiple dimensions of entrepreneurial resilience.

## **1.2. The dimensions of entrepreneurial resilience**

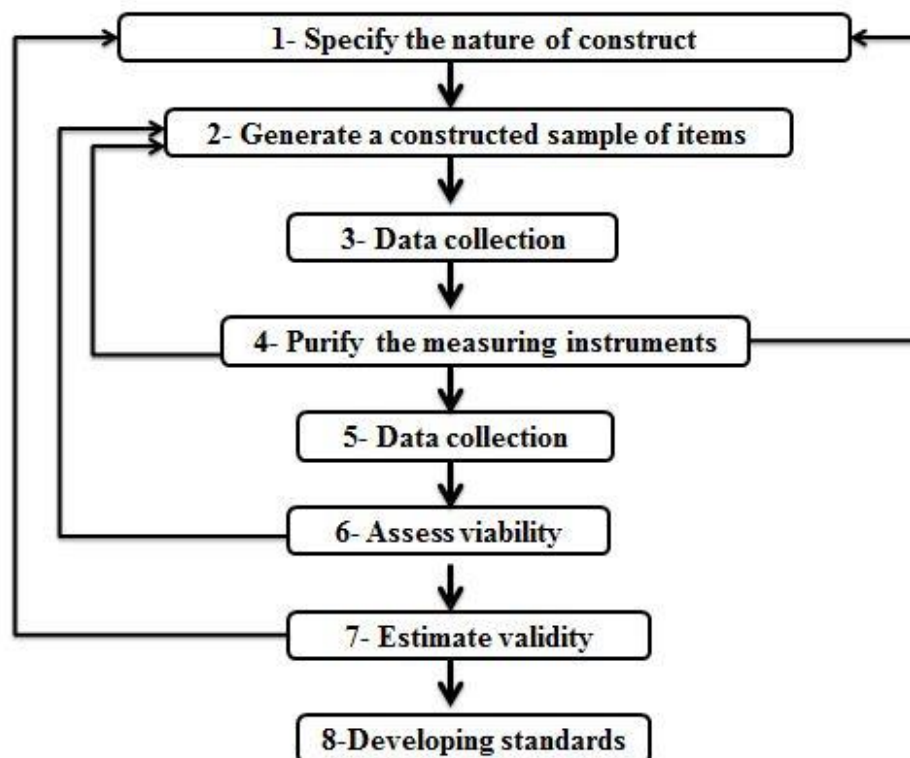
According to the previous analyses, the principle of resilience is multidimensional. Indeed, a resilient entrepreneur must know how to handle his stress (Drnovsek et al., 2010; Boubakary, 2022), he is therefore persistent (Bullough and Renko, 2013; Bullough et al., 2014); the ability to adapt and learn is important for developing creativity (Davoudi, 2016; Duchek, 2018). A resilient entrepreneur must be hopeful, possessing a sense of autonomy and having a certain level of risk tolerance (Shigley, 2010; Bernard and Dubard Barbosa, 2016; Boubakary, 2022).

## **2. Research Methodology**

Based on the paradigm of Churchill (Churchill Jr., 1979) (Figure 1), this study focuses on the proposal to remove the most representative, ambiguous and redundant elements of this theory in order to ensure a complete measure of the phenomenon under study and obtain content validity.

<b>Dimension</b>	<b>Definition</b>
<b>stress management</b>	“The ability to reduce perceived stress” (De La Rupelle et al., 2014: p 137)
<b>Perseverance</b>	“Perseverance refers to the ability to act over time despite difficulties”. (Bouret et al., 2018: p 176)
<b>Adaptability</b>	“Adaptability is the ability to adapt quickly to new situations and/or to change according to situations or circumstances”. (Kurschad, 2020: p 13).
<b>Learning</b>	“Learning to learn” refers to the ability of the individual to acquire useful information to develop throughout his professional career” (Duening, 2010: p 253)
<b>Creativity</b>	“Creativity is the ability to produce and generate new and useful ideas, having regard to flexibility, originality and sensitivity to problems” (Moreau and Delalandre, 2019: p 81).
<b>Emotional intelligence</b>	"Emotional intelligence is the ability to perceive and express emotions, to integrate them into one's thoughts, understandings and reasoning, and to regulate one's emotions and those of others" (Bouret et al., 2018: p 21) .
<b>Audacity</b>	"Boldness or audacity is the ability to overcome difficulties, by daring to propose new ideas or solutions".(Frimousse et al., 2018: p 161)
<b>Optimism</b>	“By optimism or positivity, we mean the ability to feel psychological well-being and to have positive emotions” (Ryff, 1989: p 199).
<b>Sense of autonomy</b>	“To be autonomous is to have the capacity to act by oneself without needing others”. (Forary, 2017: p 290)
<b>Risk tolerance</b>	“Risk tolerance is the level of risk that the individual will be willing to take and accept”. (Legault, 2019: p 237).

**Table 1. Dimensions of entrepreneurial resilience**



**Fig 1. Paradigm approach of Churchill.Jr (1979)**

This study belongs to the exploratory phase, which includes four phases: identification of the construction site, generation of items, collection of sampling data and purification of measurement instruments by implementing an exploratory factor analysis using Cronbach's alpha.

## 2.1. Item generation

Assessing the level of resilience of entrepreneurs is the goal of our work. In this regard, a questionnaire survey of Tunisian entrepreneurs is conducted. This questionnaire was developed based on research on the work of Bernard, et al, (2016), Boubakary (2022) and the scale. This allowed us to keep the 60 elements listed in the table below.

For each statement, respondents had five possible choices (“1: Totally disagree”, “2: Somewhat disagree”, “3: Generally agree”, “4: Somewhat agree”, “5: Totally agree”. “agreement.” One component of these multiple scales is to arrive at a set of statements that must characterize the structure.

Resilience across the ten dimensions	Codification	Sources
<b>Stress management</b>		
I maintain my working abilities in situations of continuous stress.	GS1	Berthaud (2017) DeLarupelle et al. (2014)
I am able to adapt to short-term stressful situations	GS2	
I know how to control my emotions in stressful situations	GS3	
I help others to control themselves during stressful situations.	GS4	
I make decisions easily	GS5	
<b>Perseverance</b>		
I have the will to keep my strength despite the difficulties that are present	PERS1	Bouret et al. (2018) Bergé (2010)
I resist failures and I keep going forward	PERS2	
I pursue my goals and I remain firm and constant in my efforts	PERS3	
In difficult situations I often find a way out.	PERS4	
I'm sometimes jealous of people who always know how to solve their problems themselves.	PERS5	
I firmly believe in the proverb "after the rain, the good weather": I think that after a period of problems, positive things can happen to me again.	PERS6	
When I think about my life, I see that there have been events that have upset me a lot.	PERS7	
I often tend to focus on what's wrong, and therefore forget that many things are going well.	PERS8	
<b>Self-confidence</b>		
I believe in my own skills	CONF1	Seys (2011) Wenger (2017)
I set achievable goals given the abilities and resources at my disposal	CONF2	
I never make self-critical judgments.	CONF3	
I have always discarded negative thoughts, I positively apprehend the unexpected by analyzing failures and looking for solutions in order to overcome them	CONF4	
I am able to say no gently and calmly.	CONF5	
<b>Optimism</b>		
I trust my opinions and I impose myself without being influenced by others.	OPT1	Ryff (1989)
I assume my responsibilities and I resist the demands of daily life	OPT2	
	OPT3	

I want to improve myself and develop my learning skills.	OPT4	
I am liked by society and I develop good relations.	OPT5	
I set ambitions and I strongly believe in them.	OPT6	
I appreciate most aspects of my personality		
<b>Autonomy</b>		
I am able to decide for myself	AUT1	Hebert et al. (1988)
I am able to carry out my actions	AUT2	
I connect with others and take my place in society	AUT3	
I am able to support myself materially	AUT4	
<b>Adaptability</b>		
I accept changes in work situations.	ADAP1	Savickas and Porfeli (2012)
I adapt my working methods to new situations.	ADAP2	
I look for opportunities to work in new situations	ADAP3	
I anticipate potential changes in work situations.	ADAP4	
<b>Learning</b>		
I am able to self-evaluate	APP1	Gerard and Roegiers (2009) Stone (2019)
I seek to improve myself	APP2	
I take advantage of every learning opportunity to improve myself.	APP3	
I envision what will be required of me in the future to improve myself.	APP4	
<b>Creativity</b>		
I am open to new ideas and methods	CREA1	Berthaud (2017) Moreau and Delalandre (2019) Pierre-Blons (2019)
I know how to critical a situation by proposing new solutions	CREA2	
I experiment with new things while respecting the constraints of a situation	CREA3	
I am able to widen the field of thoughts and develop the problem beyond its limits and means.	CREA4	
I encourage creativity, questioning and experimentation.	CREA5	
I know how to free myself from the framework when the situation requires it.	CREA6	
I am sensitive to cultural expressions	CREA7	
<b>Risk taking</b>		
I like adventures and I feel a taste in confronting danger	RISQ1	Facchini (2007)
I have an energy that motivates me and gives me the courage to move forward	RISQ2	
I am able to maintain overview and control of my own behavior	RISQ3	
I act without thinking, I go for it, I say whatever I think	RISQ4	
I adopt innovative behaviors to respond to uncertainty	RISQ5	
<b>Emotional intelligence</b>		
I know when to talk about my personal problems to others	INTEL1	Schutte et al. (1998)
When I encounter an obstacle, I try to remember the obstacles I have already encountered and so I can overcome them.	INTEL2	
I know how to control my emotions	INTEL3	
Most people trust me	INTEL4	
I am able to interpret the non-verbal messages of the people who send them	INTEL5	
Feeling emotions is something that I particularly appreciate in life	INTEL6	
I am able to adapt my behavior to the emotions of others	INTEL7	
<b>Audacity</b>		
I am able to seize opportunities	AUD1	Bouret, Hoarau and Mauleon (2018)
I know how to adapt to changes in the environment	AUD2	
I anticipate new opportunities in the face of failure	AUD3	

I positively apprehend the unexpected	AUD4	Frimousse and Peretti (2018)
I step out of the status quo and evolve	AUD5	

**Table 2. Generation of entrepreneurial resilience items**

## 2.2. Collection of data

Data collection was done through questionnaires. We first distributed the paper questionnaire to the entrepreneurs who made up the sample, which was then completed by e-mail and disseminated on social networks. The survey began on May 15, 2021 and ended on July 15, 2021. Out of the entire sample, 154 entrepreneurs returned the questionnaire, i.e. a return rate of 95%; excluding two very incomplete questionnaires, the total number of valid questionnaires reached 152.

	Percentage
<b>Activity area</b>	
Studies, advice and training	19.74%
industry sector	59.21%
Trade and distribution	21.05%
<b>Age of the entrepreneur at the date of creation of the business</b>	
Less than 30 years old	138
30 years and over	14
<b>Company creation date</b>	
Between 3 and 10 years	94
10 years and over	58
<b>Gender</b>	
male entrepreneur	67%
female entrepreneur	33%

**Table 3. Population characteristics**

## 2.3. Purification of measurement scales

To refine the measurement tools, we used factor analysis. Originally, principal component analysis (PCA) made it possible to delete items whose quality of representation was judged to be less than 0.5 for each tool. Two additional checks were then carried out: the total variance explained by Cronbach's alpha taking into account the satisfactory reliability rate beyond a threshold of 0.6; then the internal consistency measured by the KMO index (Kaiser, Meyer and Oklin).

## 3. Result and discussion

### 3.1. Search results

#### ▪ Validity and reliability of the stress management scale

The stress management variable was measured by five items. The KMO index is equal to 0.885, and values greater than 0.5 are considered satisfactory. The Bratlett test for sphericity was statistically significant ( $p < 0.000$ ). These values indicate that a factor analysis can be performed on these data and can validate the conduct of the factor analysis. Thus, a PCA analysis was performed on these five elements.

The results for the total variance explained indicate that there is a single component with a cumulative percentage of 80.784%, which is well represented. All values representing mass and factor contributions are greater than 0.5.



Items	Representation quality	Factor contributions
GS1	0.838	0.916
GS2	0.716	0.846
GS3	0.760	0.872
GS4	0.927	0.963
GS5	0.798	0.893
<b>KMO index</b>	0.885	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	80.784%	
<b>Reliability test (Cronbach's alpha)</b>	0.939	

**Table 4. Purification and reliability of the stress management scale**

The reliability of the stress management variable scale was verified by Cronbach's Alpha, giving a value equal to 0.939 greater than 0.7. This value is considered very satisfactory and verifies good internal consistency. It is therefore concluded that the five items have been selected.

▪ **Validity and reliability of the adaptability scale**

The adaptability variable is measured by four items. The KMO index is equal to 0.767, and values greater than 0.5 are deemed to be satisfactory. The Bratlett test for sphericity was statistically significant (p<0.000). These values indicate that a factor analysis can be performed on these data and can validate the conduct of this analysis. For this reason, a PCA analysis was performed on these four elements. The results for the total variance explained show that there is a single component with a cumulative percentage of 78.158%, which is well represented. All values representing mass and factor contributions are greater than 0.5.

Items	Representation quality	Factor contributions
ADAP1	0.843	0.918
ADAP2	0.524	0.724
ADAP3	0.831	0.912
ADAP4	0.928	0.963
<b>KMO index</b>	0.767	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	78,158	
<b>Reliability test (Cronbach's alpha)</b>	0.900	

**Table 5. Purification and reliability of the adaptability measurement scale**

The reliability of the adaptability variable scale was verified by Cronbach's Alpha, giving a value equal to 0.900 greater than 0.7. This value is considered very satisfactory, so good internal consistency has been verified. In the end, the four items were retained.

### ▪ Validity and reliability of the persistence measurement scale

Eight items measured the persistence variable. The KMO index is equal to 0.914, a value greater than 0.5 is considered acceptable. From a statistical point of view, the Bratlett test of sphericity was significant ( $p < 0.000$ ). These values indicate that a factor analysis can be performed on these data and can validate the conduct of the factor analysis. Therefore, a PCA analysis was performed on these eight items.

The results for the total variance explained show that there is only one component with a cumulative percentage of 63.536%, which is moderately representative. We noticed that the items "PERSEV1" and "PERSEV4" had poor quality factorial representations, so we decided to remove them.

Items	Representation quality	Factor contributions
PERSEV1	0.321	0.567
PERSEV2	0.644	0.803
PERSEV3	0.686	0.828
PERSEV4	0.417	0.646
PERSEV5	0.876	0.936
PERSEV6	0.649	0.806
PERSEV7	0.774	0.880
PERSEV8	0.716	0.846
<b>KMO index</b>	0.914	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	63.536%	

**Table 6. Purification and reliability of the persistence measurement scale**

Verification of the reliability of the scale of the perseverance variable by Cronbach's Alpha gives a value equal to 0.878, greater than 0.7. This value is considered to be satisfactory, and validates good internal consistency. In the end, six items were retained.

### ▪ Validity and reliability of the optimism scale

The optimism variable is measured by six items. The KMO index is equal to 0.642, a value greater than 0.5, considered acceptable. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, PCA analysis is conducted on these six items. The results of the total explained variance show the existence of a single component with a cumulative percentage of 50.747%, which is moderately represented. We notice that the items "OPT1" and "OPT2", show a low quality of representation and factorial contribution, consequently, we decide to remove them.

Items	Representation quality	Factor contributions
OPT1	0.142	0.377
OPT2	0.689	0.830
OPT3	0.777	0.882
OPT4	0.737	0.858
OPT5	0.691	0.831
OPT6	0.009	0.093
<b>KMO index</b>	0.642	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	50.747%	

**Table 7. Purification and reliability of the optimism measurement scale**

Verification of the reliability of the scale of the optimism variable by Cronbach's Alpha gives a value equal to 0.878, greater than 0.7. This value is considered to be satisfactory, and validates good internal consistency. In the end, four items were retained.

▪ **Validity and reliability of the self-confidence measurement scale**

The self-confidence variable is measured by five items. The KMO index is equal to 0.849, a value greater than 0.5, it is considered acceptable. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, a PCA analysis is conducted on these five items.

The results of the total variance explained, show the existence of a single component with a cumulative percentage of 72.3367%, which is well represented. We notice that the item "CONF1" shows a low quality of representation and factorial contribution, consequently, we decide to delete it.

Items	Representation quality	Factor contributions
CONF1	0.452	0.672
CONF2	0.719	0.848
CONF3	0.750	0.866
CONF4	0.907	0.953
CONF5	0.789	0.888
<b>KMO index</b>	0.849	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	72.336%	

**Table 8. Purification and reliability of the self-confidence measurement scale**

Verification of the reliability of the scale of the self-confidence variable by Cronbach's Alpha gives a value equal to 0.920, greater than 0.7. This value is considered to be satisfactory, and validates good internal consistency. In the end, four items were retained.

▪ **Validity and reliability of the learning measurement scale**

The learning variable is measured by four items. The KMO index is equal to 0.777; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, PCA analysis is conducted on these four items.

The results of the total variance explained, show the existence of a single component with a cumulative percentage of 69.213%, which is well represented. All values of representation quality and factorial contributions are greater than 0.5.

Items	Representation quality	Factor contributions
APP1	0.836	0.915
APP2	0.534	0.731
APP3	0.752	0.867
APP4	0.646	0.804
KMO index	0.777	
Bratlett sphericity test	(p<0.000) significant	
Variance explained	69.213%	
Reliability test (Cronbach's alpha)	0.900	

**Table 9. Purification and reliability of the learning measurement scale**

Verification of the reliability of the scale of the learning variable by Cronbach's Alpha gives a value equal to 0.900; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, all four items were retained.

▪ **Validity and reliability of the creativity measurement scale**

The creativity variable is measured by seven items. The KMO index is equal to 0.873; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant (p<0.000). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, an PCA analysis is conducted on these seven items.

The results of the total variance explained show the existence of a single component with a cumulative percentage of 58.783%, which is moderately represented. We notice that the items "CREA6" and "CREA7", show a low quality of representation and factorial contribution, consequently, we decide to remove them.

Items	Representation quality	Factor contributions
CREA1	0.835	0.914
CREA2	0.764	0.874
CREA3	0.764	0.874
CREA4	0.925	0.962
CREA5	0.790	0.889
CREA6	0.029	0.170
CREA7	0.008	0.089
KMO index	0.873	
Bratlett sphericity test	(p<0.000) significant	
Variance explained	58,783	

**Table 10. Purification and reliability of the creativity measurement scale**

Verification of the reliability of the scale of the creativity variable by Cronbach's Alpha gives a value equal to 0.943; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, five items were retained.

▪ **Validity and Reliability of the Boldness Measurement Scale**

The audacity variable is measured by five items. The KMO index is equal to 0.885; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, a PCA analysis is conducted on these five items.

The results of the total variance explained, show the existence of a single component with a cumulative percentage of 80.784%, which is very well represented. All values of representation quality and factorial contributions are greater than 0.5.

Items	Representation quality	Factor contributions
AUD1	0.838	0.916
AUD2	0.716	0.846
AUD3	0.760	0.872
AUD4	0.927	0.963
AUD5	0.798	0.893
KMO index	0.885	
Bratlett sphericity test	(p<0.000) significant	
Variance explained	80.784%	
Reliability test (Cronbach's alpha)	0.939	

**Table 11. Purification and reliability of the Audacity Management Scale**

Verification of the reliability of the audacity variable scale by Cronbach's Alpha gives a value equal to 0.939; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, all five items were retained.

▪ **Validity and Reliability of the Emotional Intelligence Measurement Scale**

The emotional intelligence variable is measured by seven items. The KMO index is equal to 0.894; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, PCA analysis is conducted on these four items.

The results of the total variance explained, show the existence of a single component with a cumulative percentage of 60.473%, which is well represented. We notice that the items "INTEL2" and "INTEL7", show a low quality of representation and factorial contribution, consequently, we decide to remove them.

Items	Representation quality	Factor contributions
INTEL1	0.636	0.798
INTEL2	0.342	0.584
INTEL3	0.770	0.877
INTEL4	0.724	0.851
INTEL5	0.634	0.796
INTEL6	0.697	0.835
INTEL7	0.430	0.656
KMO index	0.894	
Bratlett sphericity test	(p<0.000) significant	
Variance explained	60,473	

**Table 12. Purification and reliability of the emotional intelligence measurement scale**

Verification of the reliability of the scale of the emotional intelligence variable by Cronbach's Alpha, gives a value equal to 0.899; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, five items were retained.

- **Validity and reliability of the sense of autonomy scale**

The autonomy variable is measured by four items. The KMO index is equal to 0.770; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, PCA analysis is conducted on these four items.

The results of the total explained variance show the existence of a single component with a cumulative percentage of 74.629%, which is well represented. All values of representation quality and factorial contributions are greater than 0.5.

Items	Representation quality	Factor contributions
AUT1	0.711	0.505
AUT2	0.885	0.784
AUT3	0.951	0.905
AUT4	0.889	0.791
<b>KMO index</b>	0.770	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	74.629%	
<b>Reliability test (Cronbach's alpha)</b>	0.937	

**Table 13. Purification and reliability of the sense of autonomy scale**

Verification of the reliability of the scale of the sense of autonomy variable by Cronbach's Alpha gives a value equal to 0.937; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, all four items were retained.

- **Validity and reliability of the risk tolerance measurement scale**

The risk tolerance variable is measured by five items. The KMO index is equal to 0.889; a value greater than 0.5; it is considered satisfactory. The Bratlett sphericity test is statistically significant ( $p < 0.000$ ). These values show that these data can be factored, and make it possible to validate the conduct of a factorial analysis. Therefore, a PCA analysis is conducted on these five items.

The results of the total variance explained, show the existence of a single component with a cumulative percentage of 81.737%, which is very well represented. All values of representation quality and factorial contributions are greater than 0.5.

Items	Representation quality	Factor contributions
<b>RISQ1</b>	0.840	0.917
<b>RISQ2</b>	0.757	0.870
<b>RISQ3</b>	0.762	0.873
<b>RISQ4</b>	0.929	0.964
<b>RISQ5</b>	0.799	0.894
<b>KMO index</b>	0.889	
<b>Bratlett sphericity test</b>	(p<0.000) significant	
<b>Variance explained</b>	81,737	
<b>Reliability test (Cronbach's alpha)</b>	0.939	

**Table 14. Purification and reliability of the risk tolerance measurement scale**

Verification of the reliability of the scale of the risk tolerance variable by Cronbach's Alpha gives a value equal to 0.939; which is greater than 0.7. This value is considered to be very satisfactory, and validates good internal consistency. In the end, all five items were retained.

	Ladder	KMO	Variance	Cronbach *	Number of items
stress management	Berthaud (2017) Likert	0.885%	80.784%	0.946	5
Adaptability	Savickas and Porfeli (2012) Likert	0.767%	78.158%	0.900	4
Perseverance	Created Likert	0.914%	63.636%	0.927	6
Positivity	Ryff (1989) Likert	0.642%	50.747%	0.878	4
Self-confidence	Created Likert	0.849%	72.336%	0.920	4
Learning	Created Likert	0.777%	69.213%	0.900	4
Creativity	Berthaud (2017) Likert	0.873%	58.783%	0.943	5
Audacity	Created Likert	0.885%	80.784%	0.939	5
Emotional intelligence	Schutte et al. (1998) Likert	0.894%	60.473%	0.899	5
Sense of autonomy	Created Likert	0.770%	74.629%	0.937	4
Risk tolerance	Created Likert	0.889%	81.737%	0.939	5

**Table 15. Summary of results**

▪ **Correlation analysis**

To verify the strength of the links between the different dimensions of resilience, we used the correlation study (Table 16). A fundamental conclusion emerges from this measurement; in fact, all the dimensions of resilience are significantly linked. The perfect correlation between these dimensions allows us to affirm that there is a link between them. We can say that a resilient entrepreneur is able to manage his stress, he is optimistic, he has enough self-confidence, he has a sense of autonomy and he is audacious. He has a capacity for learning and creativity and he is able to adapt. He is a risk taker as he has an emotional intelligence.

	GS	ADAP	PERSEV	OPT	CONF	APP	CREA	USD	INTEL	TUE	RISQ
GS	1										
ADAP	.597	1									
PERSEV	.662	.617	1								
OPT	.630	.570	.592	1							
CONF	.035	.556	.570	.630	1						
APP	.521	.499	.631	.570	.553	1					
CREA	.577	.692	.528	.654	.620	.555	1				
USD	.631	.570	.688	.602	.702	.612	.531	1			
INTEL	.522	.630	.701	.522	.775	.611	.561	.561	1		
TUE	.631	.511	.639	.587	.631	.566	.522	.622	.532	1	
RISQ	.701	.635	.599	.501	.531	.520	.541	.631	.522	6.71	1

**Table 16. Variable correlation matrix**

### 3.2. Discussion

Resilience has developed under the impetus of multidisciplinary approaches. It is a trans disciplinary concept that is based on foundations from various disciplines such as: psychology, sociology, ethology, medicine, entrepreneurship, etc.

The literature that deals with the concept of resilience distinguishes organizational resilience (Psiuk, 2005; Anaut, 2005; Lallau et al., 2018; Academy of Entrepreneurship and Innovation et al., 2020; Reghezza, 2020; Adam, 2022) from that of the individual (Hjemdal et al., 2010; Ariane et al., 2020). Proponents of organizational resilience define it as a process generally in three stages, namely the capacity for absorption, the capacity for renewal and the capacity for appropriation. Individual resilience is seen more as a character trait (Hjemdal et al., 2010; Ariane et al., 2020) or even a skill (Arnaud and Mellet, 2019; Boubakary, 2022).

To explore resilience as a personality trait, we draw on the research of Hjemdal et al. (2010) who, based on a study of 666 university students in Norway, proved that resilience is a quality that defines the personality of the individual. On the other hand, Ariane et al. (2020) studied the resilience of 361 mothers of child victims of sexual assault. The concept has three dimensions, namely stresses management, psychological distress and the feeling of empowerment, and defines resilience as a psychic character.

Far from being a once-and-for-all character trait, resilience is a skill that can be developed. It is on this approach that we have focused our attention in the present work, relying mainly on the studies of Arnaud and Mellet (2019). The authors attribute to resilience a cognitive dimension (i.e. what one understands and what one thinks of the situation) and an emotional or affective dimension (i.e. what one feels and what that one experiences in the situation)...They consider resilience as a skill that develops to give the individual more self-confidence, more adaptability and more determination .

Applied to the field of entrepreneurship, entrepreneurial resilience is one of the key skills that characterize the profile of entrepreneurs (Bernard and Dubard Barbosa, 2016), especially with the onset of the Covid-19 health crisis (Boubakary, 2022). . Assessing one's level of resilience in order to be able to develop it to overcome crises certainly requires a reliable measuring instrument. It is for this reason that the objective of this study was to construct a scale for measuring entrepreneurial resilience.

In the context of this article, we have carried out two steps to ensure the validity of the scales for measuring the resilience of Tunisian entrepreneurs. First, we checked the dimensionality of the scale. Next, we calculated Cronbach's alpha to check the reliability of the dimensions. However, it must be ensured that the data can be factored. For this purpose, we performed the Kaiser-Meyer-Olkin (KMO) test. Its measurement must be acceptable and have a value greater than 0.60, thus reflecting the inter-correlation of the variables. Secondly, we performed Bartlett's sphericity test, which provides the statistical probability (threshold of 5%) that the correlation between the items of the scale is different from zero.



This test must be significant for the data to be factorable. Thus, a principal component factor analysis with orthogonal rotation (Varimax) was conducted. This allowed us to consider the dimensionality of each variable. We followed the psychometric approach, which consists in eliminating from the factorial analysis the items deemed unacceptable, and to proceed iteratively until a stable factorial structure is obtained.

Finally, in order to ensure the internal reliability of the measurement scale thus obtained, we used Cronbach 's alpha, which is an indicator for measuring the reliability of the various items supposed to contribute to measuring a phenomenon. The factor is reliable if Cronbach's alpha  $> 0.6$ .

As part of this research, we validated the different measurement scales relating to the continuous variables of our research, namely, stress management, adaptability, perseverance, positivity, self-confidence, learning, creativity, audacity, emotional intelligence. , sense of autonomy and risk tolerance; assessing the level of resilience of Tunisian entrepreneurs.

Our results contrast with previous research focusing on the resilient entrepreneur in a crisis context (Duchek, 2018; Mignenan, 2021). They lead us to underline that to undertake from the point of the individual is often to prove to oneself that one is the creator of initiatives, approaches, choices, objectives, key decisions. In the light of the mentioned above, entrepreneurship means creating opportunities for self-victory to set a new course in one's professional and often personal life ( Ayala et al. 2021 ). All of these purposes are essential to achieving resilience. Indeed, according to the results of ( Bernard, 2016; Berthaud, 2017; Legault, 2019; Boubakary, 2022 ), undertaking for these resilient entrepreneurs means wanting to give oneself back a place, a role, an aspiration for create their future, to shape their career. To undertake more broadly is to embark on the unknown, in any case to assume a share of the risk by counting on oneself and by giving oneself a very sharp approach to the environment, by appropriating knowledge of a context, relying on personal resources, creating new links with those around you and daring to be yourself.

#### ▪ **Contributions of the study**

To our knowledge, this study is the only one to have proposed a scale for measuring entrepreneurial resilience. From a managerial point of view, this measurement scale should lead entrepreneurs to acquire and develop their resilience in order to prevent crises. It should also make student entrepreneurs aware of the importance of this quality, presented as the key to the success of their future projects. From a methodological point of view, we propose a new instrument to measure the resilience of entrepreneurs facing crises.

#### ▪ **Study limit**

Certainly, the present study contributes to the exploration of resilience and to the discovery of its virtues as a key skill to be developed in a crisis situation; nevertheless, it must be considered with regard to certain limits. First, all the measurement instruments are self-reported and belong to the same questionnaire, which increases the risk of social desirability bias and the influence of covariation between the instruments. Moreover, the sample of this study, composed of Tunisian entrepreneurs, is specific and is not necessarily representative of other populations, which limits the generalization of the results. Future research should explore resilience among entrepreneurs in different countries around the world. According to the research by Ariane et al. (2020), whose objective was to validate the French-Canadian version of the CD-RISC 10 resilience scale with mothers of child victims of sexual assault, it is possible to validate a scale with another population in different contexts, which could confirm the psychometric qualities of the scale. Finally, future research should prove the reliability over time of the entrepreneurial resilience scale in a longitudinal design.

## Conclusion

For long-term success, entrepreneurs need to be resilient, allowing them to overcome adversity and emerge stronger through setbacks and crises. Until recently, little was known about the factors that drive business decisions during a health crisis.

To help fill this research gap, we have proposed a literature review and deduced a theoretical framework for entrepreneurial resilience. We have proposed a measurement scale for this concept validated on the basis of survey data from 152 Tunisian entrepreneurs who have been able to establish their sustainability despite the health crisis that has appeared in Tunisia since March 2019.

The main contribution of our work is to identify resilience as a multidimensional variable and construct a scale to measure this concept.

We find that entrepreneurial resilience is one of the most important soft skills in a crisis, and therefore it must be acquired by every entrepreneur in all regions of the world.

This scale is a measuring instrument that will also be very useful for researchers.

Nevertheless, our work suffers from certain limitations, of which we can mainly cite the limitation related to the generalization of the results. Indeed, the validation of the resilience scale on a sample of Tunisian entrepreneurs does not allow its generalization to all entrepreneurs in the world.

This research thus highlights the importance of continuing research on this topic, and in particular of reconsidering the dynamic capacity of entrepreneurs and the relationship between entrepreneurs in a crisis context and those operating in a stable ecosystem, and between countries.

It will be interesting to study under what conditions the process of resilience contributes to the success of a business project. In this sense, we must question the role of resilience dynamics in the post-enterprise decision-making process, especially when it comes to developing, transferring or extinguishing new businesses.

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