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SOPHISTICATED TECHNOLOGY INNOVATION CAPABILITY: ENTREPRENEURIAL RESILIENCE ON DISASTER -RESILIENT MSMEs

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Abstract

The level of productivity should be increased and maintained to sustain the success of micro, small and medium enterprises (MSMEs). Furthermore, entrepreneurial resilience requires advanced technological innovation capabilities to avoid continual external disasters. Therefore, this research explores the connection between entrepreneurial resilience, disaster-resilient MSMEs, and new ideas on complex technical innovations to modulate entrepreneurship. Partial Least Squares are used to process 177 MSMEs respondents in Central Java, Indonesia and the findings successfully bridged the gap between entrepreneurial resilience and disaster-resistant MSMEs. The is mediated by sophisticated technology innovation capability. Furthermore, corporate owners and managers are concerned with the ongoing adaptation and creation of complicated technologies concerning sophisticated innovation capabilities. These findings indicate that entrepreneurial resilience contributes to sophisticated technological innovation capability. The findings also show that entrepreneurial resilience contributes to disaster-resilient MSMEs and demonstrate the importance of understanding how entrepreneurs survive during conditions of uncertainty. This theoretical conclusion gives rise to a new competitive resource advantage theory perspective in which sophisticated technology's inventive capacities might be strengthened when entrepreneurial resilience is stronger. The entrepreneurial resilience can improve when corporate organizations or MSMEs players have advanced technical resource capabilities.

Keywords: Entrepreneurial Resilience, Sophisticated Technology Innovation Capability, Disaster-Resilient MSMEs

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1. INTRODUCTION

Research on business disaster resilience is still concentrated in the large-scale sector. Micro, small, and medium-sized businesses (MSMEs) are thought to lack the capacity and potential to minimize risk and achieve resilience. Therefore, the importance will impact the sustainability of post-disaster growth (Badoc-Gonzales et al., 2021).

Indonesia is one of the countries prone to natural catastrophes, populations become more amenable to increasing resilience when they understand how certain cultural elements might influence the community (AlHinai, 2020). Apart from the cultural element, it is important from an economic point of view to examine the effects of entrepreneurial resilience on disaster-resilient MSMEs. What efforts have been made to bridge the gap in previous findings from the inconsistent relationship between entrepreneurial and disaster resilient MSMEs?

In previous findings, there were many low levels of resilience due to reduced resource skills Bharadwaj, (2000) and the importance of partnerships between companies, government and private organizations (Djalante & Garschagen, 2017). Furthermore, some of these findings impact sustainability efforts and increase excellence. Sustainability and increasing the advantages of MSMEs should be increased from the resources owned by business actors. To remain resilient to disaster, entrepreneurial resilience can be owned in tangible and intangible assets (Djalante & Garschagen, 2017). According to Salvato et al. (2020), family ownership resources can turn threats into entrepreneurial opportunities for long-term business resilience. In addition to family ownership, market orientation and individual resilience impact small retailers retailers (Martinelli & Tagliazucchi, 2019). Therefore, this research will focus on entrepreneurship resilience to improve disaster-resilient MSMEs from resource capabilities.

Entrepreneurial resilience efforts have a positive relationship with increasing disaster resilient. For female entrepreneurs, the characteristics of entrepreneurship, resourcefulness, networking, adaptability and continuity can positively impact the formation of strong MSMEs (Matharu & Juneja, 2021). Entrepreneurial resilience with organizational and individual achievement have a strong, positive relationship that makes small enterprises more resilient (Fatoki, 2018). Individual intellectual capital has a positive relationship with understanding certain capacities that support the resilience of SMEs (Daou et al., 2019). However, the findings of Rahman and Mendy (2019a) stated that entrepreneurial resilience from developing countries' perspectives could not increase disaster resilient MSMEs. Compared to emerging regions, less developed places tend to have better qualitative and quantitative entrepreneurship resilience, which fills the gap left by entrepreneurial initiative (Ignat & Constantin, 2020). This is due to political, economic, legal and technological barriers. Therefore, the gap in this research is bridged through advanced technological innovation capabilities.

The role of sophisticated technological innovation capabilities can be enhanced when entrepreneurs own resources. A heterogeneous market demands that business actors have unique resources that are not easily imitated or are available for sale. According to Hunt and Morgan (1995), the resource is heterogeneous and not mobile.

Therefore, consumer needs are not heterogeneous, and business actors are expected to create sophisticated technological capabilities that cannot be imitated or owned by competitors. Homogeneous means that the resource owner has a comparative advantage over its competitors (Hunt & Arnett, 2003). Sophisticated technology innovation capability is the ability of individual intellectual resources from information and technology assets to develop the technology. Therefore, the mediating role of sophisticated technology innovation capability has the potential to bridge inconsistencies and gaps in the relationship between entrepreneurial resilience and disaster resilient MSMEs. This research is intense to discuss the potential mediating role of sophisticated technological innovation capability. This research is intense to discuss entrepreneurial resilience through the mediation role of sophisticated technological innovation capabilities towards disaster resilient in MSMEs.

Entrepreneurial Resilience

Scientists often use fitness, tenacity, sustainability, or self-efficacy in explaining the factors that shape resilience in some employers and their organizations (Hamedi & Mehdiabadi, 2020). In family businesses, entrepreneurial resilience includes intergenerational learning and development during leadership succession (Zehrer & Leiß, 2019).

Entrepreneurial resilience is key in explaining behavior to overcome discomfort and uncertainty as well as learn from past failures (Hamedi & Mehdiabadi, 2020). It is a new element that strengthens entrepreneurial orientation from time to time (Álvaro-Moya et al., 2022). To build a sustainable business enterprise, resilience is essential (Elia et al., 2021).

Value and confidence indicators and motivation index influence entrepreneurial resilience, which includes personality traits, formal and informal partnerships, and human capital (Hamedi & Mehdiabadi, 2020). Previous research on the importance of entrepreneurial resilience in an organization has been carried out by Haloub et al. (2022), Hartmann et al. (2022), and Wang et al. (2021). According to Pascucci et al. (2022), innovation, education, and sustainability are the most crucial determinants for delivering superior entrepreneurial resilience.

Sophisticated Technology Innovation Capability

High technology capability (Agustia et al., 2022) and innovation (Kiani et al., 2019), as well as the intensity of technology (Leo et al., 2022; Zawislak et al., 2018), will result in good company performance to realize a long-term and sustainable orientation (Kiani et al., 2019; Agustia et al., 2022). It is more critical for technological invention to focus on value-added activities than on boosting business profits to standardize manufacturing processes, reduce costs, and improve business operations (Agustia et al., 2022). The success of direct, indirect, and long-term service is greatly affected by capability and service innovation (Kiani et al., 2019).

The improvement of the ability to innovate Kiani et al. (2019) and the intensity of technology Leo et al. (2022) in an organization, including a company, will support the success of the service in the short-term and long-term perspectives (Kiani et al., 2019), particularly in terms of

understanding client wants and available technological solutions (Zawislak et al., 2018; Kiani et al., 2019; Leo et al., 2022). The ability to understand innovation at the enterprise level is a key element in the dynamics of innovation (Leo et al., 2022).

A previous research on technological and relational capabilities and performance demonstrated the importance of SME managers understanding the role these strategic qualities play in sustaining a robust competitive position (Salisu & Abu Bakar, 2020). Relational skills seek to enhance effective working connections and gain new abilities to maintain a competitive edge globally (Rahman & Mendy, 2019b; Salisu & Abu Bakar, 2020).

Disaster-Resilient MSMEs

Disasters such as hurricanes, earthquakes, and cyberattacks can create communication network disruptions, which can have severe economic and societal repercussions (Mauthe et al., 2016). Some challenges are lack of regulations to control disaster-resistant development and regulatory arrangements, insufficient city council capacity, lack of funds, lack of quality human resources, as well as corruption and unlawful activities (Malalgoda et al., 2014).

The concept of disaster resilience has remained constant regardless of the field of investigation. It has a wealth of information on organizational theory, strategy, and operations management (Bhamra et al., 2011). These include applying a particular technology or phase of the disaster management cycle and the adoption side (Vermiglio et al., 2022).

A crucial shift in disaster management and development practice with theory from preserving vulnerable and affected communities to promoting them to learn will assist outside actors. Local communities transform impacted areas into landscapes rather than die to exploit (Imperiale & Vanclay, 2020). Characteristics of resilient communities that are disaster-resistant include having a shared vision, consensus on the risks to be faced, risk management approaches, specific actions to be taken and targets to be achieved, the underlying causes of vulnerability and other factors beyond control (Twigg, 2007, 2013). Communities, including business entities, take a long-term perspective to focus on the results and impacts of disaster risk reduction (Twigg, 2013), and for SMEs, disasters have a detrimental effect on business. These disastrous occurrences could endanger labour, product markets, finance, logistics, and business recovery (Marife & Sonny, 2015).

Operational and structural resilience in construction is the two major categories that should be considered carefully. Structural elements are more concerned with strategies such as redundancy and component variety, while operational aspects focus on the resilience control function for end-to-end and multi-level mechanisms. The critical research focuses on identifying when one strategy should be used over another and how the operational resilience approach interacts with organizations and people (Mauthe et al., 2016). The government's disaster risk reduction and management framework have not been adequately merged into local and sectoral frameworks, including a research in the Philippines. As a result, Filipino MSMEs are highly susceptible to shocks and have poor adaptation, with limited access to various coping mechanisms (Marife & Sonny, 2015).

A survey of MSMEs in Malaysia was

carried out in 2016 to determine the types of catastrophes and their effects. The survey was also utilized to determine Malaysia's issues, including the types of disasters and their effects. The results suggest how difficult it is to overcome or, at the very least, mitigate the consequences of natural disasters on businesses (Auzzir et al., 2018). MSMEs engage in creating disaster preparedness plans and post-disaster recovery measures when developing adaptive ability. These actions are influenced by the individual and collective attitudes of MSMEs. (Ingirige et al., 2008; Auzzir et al., 2018; Branicki et al., 2018; Rahman & Mendy, 2019b).

2. EXPERIMENTAL

This research aims to uncover the inconsistency in the relationship between

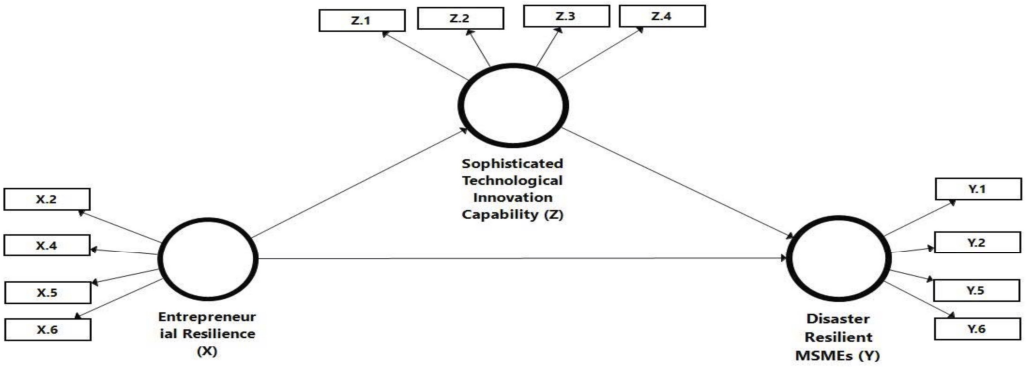

Figure 1. Conceptual Model

Table 1. Characteristic Respondents

No.		Characteristics	Total	%
1	Sex	Male	93	52,5%
		Female	84	47,5%
		Total	**177**	**100%**
2	Education	Senior High School	79	44,6%
		Bachelor Degree	57	32,2%
		Master Degree	24	13,6%
		Doctoral Degree	8	4,5%
		Others	9	5,1%
		Total	**177**	**100%**
3	Long established a businiess	< 5 years	97	54,8%
		> 5-10 years	74	41,8%
		> 10-15 years	6	3,4%
		Total	**177**	**100%**
4	Average Income /month	> 15-20 years	4	2,3%
		< 5.000.000	127	71,8%
		> 5.000.000 – 10.000.000	34	19,2%
		> Rp 10.000.000 – Rp 15.000.000	8	4,5%
		> Rp 15.000.000 – Rp 20.000.000	4	2,3%
		Total	**177**	**100%**

entrepreneurial resilience and technologically advanced innovation capabilities. Meanwhile, questionnaires and interviews will obtain data from 177 micro-business sectors. From February through December 2021 to January 2022, questionnaires were distributed to entrepreneurs in Java for four months. The outcomes of advanced technological innovation capabilities in disaster-resistant MSMEs are shown below.

The dataset (177 samples) is appropriate for PLS-SEM research methodologies (Ali et al., 2018; Kock & Hadaya, 2018).

Variable Measurement

Parameter evaluation items are based on prior research and altered to match the objectives, and a five-point Likert scale is used for the rating. Table 2 shows the research variables and associated measurement indicators.

Data Analysis

The SEM-PLS approach might be practical with complex models and small sample quantities. Additionally, it allows for simultaneous testing of the mediating effect, and the research instrument (outer model) and structural model were investigated on the SEM-PLS in two stages (inner model).

3. RESULTS

Convergent Validity

For variable reliability testing, Cronbach's alpha coefficient was adopted to estimate the reliability of each core variable

Table 2. Operational Variables

Variable Name	Item	Dimension/Indicator	Sources
Entrepreneurial Resilience (X)	4 items	- Social Connection - Innovation/Creativity - Comfort Uncertainty/Failure - Able to adapt to change - Can Stay focused under pressure of change	(Branicki et al., 2018; Fatoki, 2018)
Sophisticated Technological Innovation Capability (Z)	4 items	- Informational Sophistication - Functional Sophistication - IT-Resources (human asset, technology asset, relationship asset) - Human IT-Resources (knowledge assets, customer orientation, synergy)	(Ross & Goodhue, 1995; Bharadwaj, 2000)(Ghobakhloo & Hong, 2014) Author Contribution
Disaster Resilient MSMEs (Y)	4 items	- Cross-skills training and training for human resources - Designing and running facilities - Managing information and data to make sure that all information and data about MSMEs are properly preserved - Getting a business license to provide one's business legal standing	(Utami et al., 2021)

in the model fit. The results showed that all coefficients were higher than the stated value of 0.7, ranging from 0.825 to 0.831 (Bagozzi & Yi, 1988; Fornell & Larcker, 1981). In addition, to confirm the dependability of the variables, all obtained values ranged from 0.8834 to 0.888, greater than 0.7, indicating that the construct is reliable.

The Composite Reliability (CR) value is more significant > 0.7, as evaluated by the construct reliability index (CRI) of 0.70, according to the test results in Table 3 (Hair et al., 2010). The results show that the data is reliable, with entrepreneurial resilience (X) of 0.884, disaster-resilient MSMEs (Y) of 0.886, and sophisticated technological innovation capability (Z) of 0.888. Entrepreneurial strength (0.660), disaster-resilient MSMEs (0.655), and high-tech innovation capability (AVE) are the average measures of extracted variance (AVE) (0.665). The instrument's validity has been established because all AVE criteria are greater than 0.50.

The influence of entrepreneurial resilience R square of 53.9% is shown in Table 3, namely entrepreneurial resilience explains sophisticated technological innovation capability. The remaining 46.1% was explained by other variables that were not investigated. The influence of R square entrepreneurial resilience and technical innovation competence on disaster-resilient MSMEs (Y) is 62.7%, while unevaluated variables accounted for 37.3% of the remaining answer.

Discriminant Validity

Based on the Table 4, the MSMEs disaster resilience (0.812) has a higher correlation than the entrepreneurial resilience variable

Table 3. Convergent validity, Crossbanch's alpha and AVE

Construct	Indicator	STD. Loading	Crossbanch's Alpha	Status
Entepreneurial Resilience (X)	X.2	0.803		Valid
AVE = 0.660	X.4	0.780	0.827	Valid
CR = 0.884	X.5	0.845		Valid
	X.6	0.730		Valid
Disaster Resilient MSMEs (Y)	Y.1	0.815		Valid
AVE = 0.655	Y.2	0.815	0.825	Valid
CR = 0.886	Y.5	0.845		Valid
	Y.6	0.854		Valid
Sophisticated Technological Innovation Capability (Z)	Z.1	0.806		Valid
AVE = 0.665	Z.2	0.883	0.831	Valid
CR = 0.888	Z.3	0.882		Valid
	Z.4	0.746		Valid
R-square (R^2) – DRM			**0.627**	
R-squared (R^2)– STIC			**0.539**	
Adusted R Square DRM			**0.623**	
Adjusted R Square – STIC			**0.537**	

Source: data processed, 2022

Table 4. Discriminant Validity

Variable	DRM (Y)	ER (X)	STIC (Z)
Disaster Resilient MSMEs (Y)	**0.812**		
Entrepreneurial Resilience (X)	0.709	**0.810**	
Sophisticated Technological Innovation Capability (Z)	0.760	0.734	**0.816**

Source: data processed, 2022

(0.709) and the sophisticated technology innovation capability (0.760). It is also higher than the entrepreneurial resilience (0.810) and (0.709), sophisticated, and technology innovation capability (0.734) variables. The variable sophisticated technology innovation capability (0.816) has a higher correlation than entrepreneurial resilience (0.734) and disaster resilient MSMEs (0.760). As a result, the model can be assumed to have acceptable discriminant validity.

Hypothesis Testing

The direct influence between research variables is justified by the confirmatory factor above. Entrepreneurial resilience considerably affects Sophisticated Technological Innovation Capability (0.734) more than disaster-resilient MSMEs (0.329). Meanwhile, disaster-resilient MSMEs have a sophisticated technological innovation capability of 0.627, which is a critical aspect of enhancing entrepreneurial resilience. The model's evaluation can be approved with a loading factor of 0.7, while the importance value of 0.6 and the AVE of 0.50 are still adequate (Hair, 2014).

These findings indicate that entrepreneurial resilience contributes to sophisticated technological innovation capability. Therefore, in an uncertain and complex environment, such as during a disaster, it is needed in a sustainable innovation process to achieve sustainability through the constant fulfillment of environmental, economic, and social requirements (Hair et al., 2010). The result is in line with the findings of (Ross & Goodhue, 1995; Hair, 2014; Branicki et al., 2018), where sophisticated technological innovation capability is a very risky process and is full of uncertainties, including the feasibility of the technology. However, entrepreneurial resilience, which includes

Table 5. Hypothesis Testing

Hypothesis	Direct & Indirect Effect	Original Sample	Standard Deviation	T-Value	P - Values
H1	ER (X) →STIC (Z)	0.734	0.050	14.580	**0.000**
H2	STIC (Z)→DRM (Y)	0.518	0.083	6.216	**0.000**
H3	ER (X)→DRM (Y)	0.329	0.075	4.358	**0.000**
H4 (Me)	ER (X)→STIC (Z)→DRM (Y)	0.381	0.068	5.636	**0.000**

Source: data processed, 2022
Me = Mediation effect; ER = Entrepreneurial Resilience; STIC = Sophisticated Technological Innovation capability; DRM = Disater Resilent MSMEs

Variable Name	Item	Dimension/Indicator	Sources
Entrepreneurial Resilience (X)	4 items	- Social Connection - Innovation/Creativity - Comfort Uncertainty/Failure - Able to adapt to change - Can Stay focused under pressure of change	(Branicki et al., 2018; Fatoki, 2018)
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Figure 2. Full Structural Model of Entrepreneurial Resilience

social connection, innovation/creativity, comfort uncertainty/failure, ability to adapt to change, and staying focused under change pressure, strongly supports the sophisticated technological innovation capability. Continuous innovation is concerned with the capacity to deal with risk and uncertainty to prevent, survive and recover from disruptions.

The findings also show that entrepreneurial resilience contributes to disaster-resilient MSMEs and demonstrate the importance of understanding how entrepreneurs survive during conditions of uncertainty. Fatoki (2018) showed that weak resilience drives entrepreneurial decision-making, often accompanied by unclear or incomplete available misinformation, hence, entrepreneurs should continue to follow various changes to adapt their goals and strategies. This is supported by (Malalgoda et al., 2014; Auzzir et al., 2018; Hamedi & Mehdiabadi, 2020). It found that entrepreneurial resilience showed the ability to survive and quickly overcome adversity, which is an important personal characteristic in times of disaster. However, the findings of other empirical research related to entrepreneurial resilience against disaster-resilient MSMEs are not convincing because the micro (individual) and macro (organizational) aspects are always related and cannot be separated.

Sophisticated technological innovation capability contributes to disaster-resilient MSMEs and improves the entrepreneurial value creation process by using socio-technical drivers to support the acquisition, processing, distribution, and consumption of digital information (Ross & Goodhue, 1995; Branicki et al., 2018). Furthermore, it drives the digital transformation process to bring about monumental changes in the way entrepreneurs operate businesses. New ventures and processes are developed and implemented by digitally equipped companies to accelerate the digital transformation of MSMEs, where the entrepreneur's direct initiative stems from social network.

4. LIMITATION AND SUGGESTION

Regarding the limitation, this research does not focus on similar industries because the data were obtained from several multisectoral respondents. Many agenda items need to be considered, and as a result, further research should focus on

homogeneous business-type objects. It tends to be more measurable in determining the level of agility of creative business actors. Other antecedent variables that can potentially increase disaster-resilient MSMEs, such as financial value agility, brand attitude, innovation, and knowledge quality resonance, are also recommended. These research need to further relate the dominant service logic from a value co-creation perspective, and future entrepreneurs are expected to become resource integrators, producing unique, special, experiential, contextual and meaningful creations.

5. CONCLUSIONS

Entrepreneurship's endurance depends on the competitive advantage gained through technological asset innovation sophistication. Tangible resources in the form of sophisticated technical infrastructure form the determinants of innovative processes. In contrast, intangible resources in premise eight are obtained from the role of knowledge management to recognize, understand, create, select, apply, and modify strategy, according to (Hunt & Arnett, 2003). This theoretical conclusion gives rise to a new competitive resource advantage theory perspective in which sophisticated technology's inventive capacities might be strengthened when entrepreneurial resilience is stronger. The entrepreneurial resilience can improve when corporate organizations or MSMEs players have advanced technical resource capabilities. This high technology is diverse and challenging to obtain because of imprecise and expensive consumer and company data. Therefore, different resources are required for sophisticated technological innovation and are difficult to discover, obtain, or unavailable for purchase on the market at various degrees. Heterogeneity of resources can exist for an extended period due to their immobile character. Each firm has its own set of resources because of the varied character of the industry. Immovable denotes that resources are challenging to locate, sell, or unavailable on the market. The heterogeneity can endure for a long time due to resource immobility. The capacity for technical innovation and the sophistication of the interaction between entrepreneurial toughness is directly proportional to the potential for disaster-resistant MSMEs. Therefore, this research aims to develop advanced technological innovation capabilities for achieving a long-term competitive advantage.

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Álvaro-Moya, A., Gil López, Á., & San

ИНОВАЦИОНА СПОСОБНОСТ СОФИСТИЦИРАНЕ ТЕХНОЛОГИЈЕ: ПРЕДУЗЕТНИЧКА ПРИЛАГОДЉИВОСТ НА ММСП ОТПОРНА НА КАТАСТРОФЕ

Roymon Panjaitan, Muhammad Hasan, Resista Vilkana

Извод

Ниво продуктивности треба повећати и одржавати како би се одржао успех микро, малих и средњих предузећа (ММСП). Штавише, предузетничка прилагодљивост захтева напредне технолошке иновацијске способности да би се избегле сталне екстерне катастрофе. Стога, ово истраживање истражује везу између предузетничке прилагодљивости, ММСП отпорних на катастрофе и нових идеја о сложеним техничким иновацијама за модулацију предузетништва. Метода најмањих квадрата је коришћена за обраду 177 ММСП испитаних у централној Јави, Индонезија, а резултати су успешно премостили јаз између предузетничке прилагодљивости и ММСП отпорних на катастрофе. То је посредовано софистицираним технолошким иновацијама. Штавише, власници предузећа и менаџери су забринути за текућу адаптацију и стварање компликованих технологија које се тичу софистицираних иновацијских способности. Ови резултати указују на то да предузетничка прилагодљивост доприноси софистицираним технолошким иновацијама. Резултати такође показују да предузетничка прилагодљивост доприноси ММСП отпорним на катастрофе и показују важност разумевања начина на који предузетници преживљавају у условима неизвесности. Овај теоријски закључак доводи до нове перспективе теорије конкурентцке предности ресурса у којој се инвентивни капацитети софистициране технологије могу ојачати када је предузетничка прилагодљивост јача. Предузетничка прилагодљивост се може побољшати када корпорације или ММСП имају напредне техничке ресурсе.

Кључне речи: предузетничка прилагодљивост, иновациона способност софистициране технологије, ММСП отпорна на катастрофе

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