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Process Innovation and its Impacts on MSMEs Resilience in Ghana: The Moderating Role of Enterprise Risk Management

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Abstract

Firms' resilience is of key interest to practitioners, owing to the fact that in most developing countries including Ghana, over 60 percent MSMEs do not survive the first five years of business operations. This study looks at how enterprise risk management may influence the impact of process innovation practices of Lean Six Sigma and Quality management Systems on MSMEs' resilience. The study used a quantitative research design, collecting survey data via Google Forms from a sample of 356 MSMEs and analysing it using SPSS software. The results indicated that MSMEs' resilience can be positively impacted by Lean Six Sigma practices. On the other hand, Quality management Systems could negatively affect the resilience of firms. Again, the research illustrates that enterprise risk management practices enhance the impact of process innovation practices on firms' resilience. Specifically, the findings showcase the importance of utilizing process innovation practices and risk management as key principles in obtaining resilient MSMEs. Implications of these findings are important for managers of MSMEs, policy makers and researchers.

Article Info

1. INTRODUCTION

In the realm of business management, resilience of MSMEs is seen as a critical factor continually attracting the attention of business owners and researchers alike (Kumar et al., 2023).The ability of businesses to maintain their resolve and carry on with their operations for years in the face of adversity and difficulties in the business environment is known as resilience (Lv et al., 2018). Therefore, a resilient company is one that can survive business environment constraints and continue to operate for a long time (Gunawan et al., 2023).The absence of the critical element of resilience in business practice according to Rose and Krausmann (2013), has led many businesses to collapse.

According to several reports and existing literature on MSMEs' resilience, 20% of all MSMEs registered during a given season fail within the first two years, and 60% do not survive for more than five years (Amaglo et al., 2019).This finding is supported with evidence from by report by Michaella et al., (2021) for Cenfri, an independent African economic impact agency, on MSMEs in Ghana. Key finding from the report shows that in Ghana, of all MSMEs established in a particular period, only only 40% survived beyond five years as of 2021 and this worrying trend is projected to continue.

This worrying trend has necessitated researches to continually find different approaches or combination of factors that will drive firms to attain stability and generate prosperity (Chitsimran et al., 2020; Gomes de Carvalho et al., 2023).Therefore, the development and application of business approaches that engineer organizations' resilience in the mist of threats within by the business environment has been the clear call.

Process innovation is a management strategy that emphasizes implementing novel approaches, strategies, or procedures into an organization's operations or workflow with the goal of attaining the best possible outcomes (Ali et al., 2017). Process innovation is therefore seen as a crucial factor in creating corporate value, helping companies obtain a competitive edge, and enabling them to adjust to a dynamic environment with its risky circumstances while maintaining resilience. (Andreini et al., 2022; Ibarra et al., 2018; Hadjinicolaou et al., 2022; Ouma & Kilika, 2018).

Process innovation practice like the Lean six sigma according to Chugani et al., (2017), is a set principles that focus on reducing wastes and optimizing efficiency in the production processes. In the practice of Lean Six Sigma, Olanrewaju et al., (2019) and Shou et al., (2020), indicate the need to eliminate non-value-added activities and streamlining operations, leading to increasing efficiency and reducing waste, which ultimately lowers operating costs.

Quality Management Systems in organizational development according to Ravelomanantsoa et al., (2019), seeks to continuously improves quality of outputs through establishing quality procedures and monitoring outputs. Reviewed literature posits that the degree to which businesses incorporate innovative processes into their operations will affect how successful and resilient they are (Chugani et al., 2017; Korber & McNaughton, 2018).

For any strategic move, there will be risks that will contend with its formulation and implementation and hence impede the success of strategic intentions (Sarkar & Osiyevskyy, 2018). Risk in business is viewed as any event or factor that has the potential to incapacitate firms in their quest to attain business objectives, which could emanate from any aspect of the operations (Duong et al., 2023; Xu et al., 2017). Churned out much better results and remained operational over a longtime (Hagigi & Sivakumar, 2009; Kraus et al., 2008). Dynamic capabilities theory (DCT) proves relevant to this research. This theory highlights how businesses can learn, adapt, and innovate in response to shifting environmental conditions. It also suggests that in a dynamic, highly uncertain environment, businesses' ability to choose and modify processes will help them respond appropriately to changes in the business environment, ensuring performance (Ali et al., 2021; Chirumalla, 2021; Mehralian et al., 2023). The ability of businesses to innovate not only in terms of products and technologies but also in terms of organizational processes and business models is a fundamental aspect of this organizational theory, which offers frameworks for comprehending how organizations might prosper in dynamic and uncertain settings (Chirumalla , 2021; Inigo et al., 2017).

Another theory that underpins this research is the Schumpeterian theory of innovation. This theory posits that innovation involves introducing novelty into firms' operations through the introduction of new processes, procedures, or business models that disrupts existing markets, driving economic growth and company resiliency (Chen et al., 2018; Edwards-Schachter, 2018). By introducing innovative solutions that address unmet needs or offer superior value, Martínez Vergara, (2022), postulates that these companies can get a significant markets share and build a strong brand, drawing in customers and generating more income and profits that will eventually translate into resilience. Previous studies have demonstrated that the Schumpeterian hypothesis has a positive impact on the resilience and prosperity of businesses (Neumann, 2021).

Despite the ongoing interest in process innovation practices, there is a lack of empirical research especially in the context of MSMEs in Ghana regarding process innovation and its effect on firms' resilience. Larger corporations are the primary target of the majority of research projects (Araújo et al., 2024; Camacho-Garza et al., 2022). More precisely, no

specific study has yet to examine how Lean Sigma and Quality Management Systems affect MSMEs' resilience in Ghana. As a result, there is a study vacuum in our knowledge of how Lean Six Sigma and Quality Management Systems interact to affect the resilience of businesses. Furthermore, it is unclear how much enterprise risk management (ERM) influences the relationship between Lean Six Sigma and Quality Management Systems process innovation methods and a firm's resilience in the context of Ghana's MSMEs (Buer, 2022; Patyal & Maddulety, 2015). In fact, there is currently little empirical data about the moderating effect of ERM on the relationship between Lean Six Sigma process innovation methods, Quality Management Systems, and company resilience in Ghana. Nonetheless, a number of studies have examined how ERM influences the relationship between strategy development and businesses' financial success (Nkansah et al., 2023). Additionally, there is a dearth of thorough research that examines the combined impact of lean six sigma, quality management systems, and enterprise risk management on a firm's resilience from a theoretical standpoint.

This study's novelty stems from the focus it gives to MSMEs in Ghana and its investigation of the links among the practices of Lean Six Sigma, Quality management Systems and ERM on firm's resilience. A third novelty the paper seeks to bring to the fore is the moderating role of ERM on the relationship between process innovation practices and firm resilience. The paper seeks to reveal the extent by which the relationship between process innovation practices and firm resilience can be influenced by risk management practices, by taking into account ERM as a moderating variable. To contribute to the discussion, the study addresses the following research questions.

a. Do lean six sigma practices influence the resilience of MSMEs?
b. Do Quality management Systems (QMS) influence resilience of MSMEs?
c. Do ERM practices moderate the relationship between Lean six sigma and firms'
d. resilience
e. Do ERM practices moderate the relationship between Quality Management Systems and firms' resilience?

The hypotheses developed in this research is explained as follows:

H1a: There is positive and significant relationship between lean six sigma practice and firm resilience.

H1b: There is a positive and significant relationship between Quality Management System (QMS) practices and firms' resilience.

H2a   ERM moderates the relationship between lean Six Sigma and MSMEs resilience in Ghana

H2b   ERM moderates the relationship between Quality management System and MSMEs resilience in Ghana
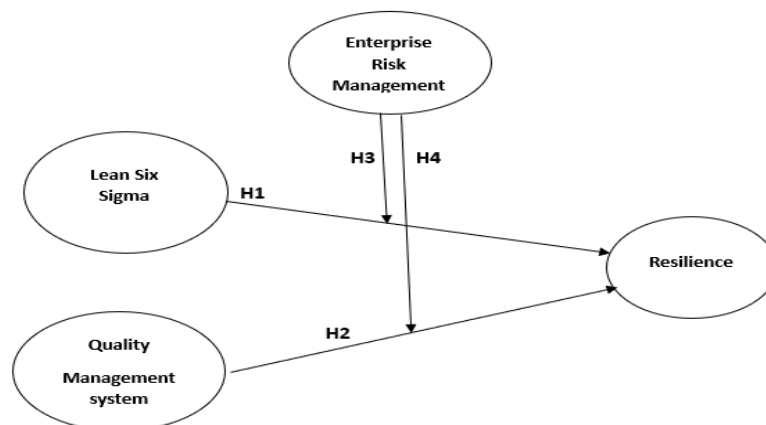

Figure 1. Conceptual Model
Source: Data Processed (2024)

2. METHODS

A descriptive survey design and a quantitative approach based on positivist philosophy were employed in the study (Iyer et al., 2021). The research focused on MSMEs that are legally registered with the registrar's general department and operate within the greater region of Ghana.

The Ghana Enterprise Agency, formerly known as the National Board for Small-Scale Industries (NBSSI), estimates that there are about 2.1 million MSMEs in Ghana, of which 900,000 are listed in their database. MSMEs included in the regional database of the NBSSI were the focus of the study. Using the finite sample size determination formula a total of 385 MSMEs was selected as sample for the study (Donaldson, 2006). A finite sample size method according to Luanglath (2014), therefore is deployed where elements in the population are determined upfront and hence a fixed sample size can be calculated. A simple random sampling technique was used to choose the MSMEs from each stratum. A total of 400 MSMEs were selected, with approximately 25 MSMEs being chosen from each region. This approach was adopted with the objective of enhancing the response rate.

The study's dependent variable is the resilience indicated by a firm's ability to maintain critical operations and services during and after disruptive event. The independent variables consist of Lean Six Sigma (LSS) and Quality Management System (QMS). For each variable, a seven-point Likert scale with four items was used for measurement. Participants were able to indicate how much they agreed or disagreed with the statements that measured the variables using the survey instrument. The NBSSI database was used to obtain the contact information of the chosen MSMEs, and Google Forms was used as the distribution tool to send the questionnaires to the MSMEs' managers via email and the WhatsApp messaging app. Before taking part in the study, the participants were guaranteed the confidentiality of their answers and gave their informed consent, thereby complying with ethical standards.

Data collection took place between July 20, 2024, and August 30, 2024. In order to urge those who did not reply to complete the questionnaire, reminders were issued to them during this time. The survey collected 358 replies in total, yielding an 89.5 percent response rate. Data management and analysis were carried out using the proper tools and techniques. Prior to the analysis, the data was methodically organized, cleaned, and coded. Statistical software like Stata and SPSS (Statistical Package for the Social Sciences) were used to analyse the data. Means and frequencies were among the descriptive statistics used to summarize the data. Inferential statistics, particularly probit regression analysis, are used to assess the study hypotheses and investigate the correlations between variables.

Model Specification

Ordinary Least Square (OLS) regression approaches were used to investigate the relationship between process innovation and MSMEs' resilience, as well as the moderating effect of ERM. The model is typically expressed as:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \varepsilon$$

Firm resilience or any other variable of interest could be the dependent variable, denoted by Y. The independent variables, X1 and X2, could be any variables or factors that are thought to affect the dependent variable. The regression coefficients for the intercept and each independent variable are denoted by the coefficients β_0, β_1, and β_2, respectively. The error term, denoted by ε, captures the variance in the dependent variable that cannot be explained. The empirical model is stated as:

$$FR = \beta 0 + \beta 1LSS + \beta 2QMS + \beta 3(ERM*LSS) + \beta 4 (ERM*QMS) + \beta 5FA + \beta 6FS + \varepsilon$$

Where the dependent variable, FR, stands for the firms' resilience. Lean Six Sigma (LSS) and the Quality Management System (QMS) are the independent variables. The moderating factor ERM's interaction with the independent variables LSS and QMS is represented by the equations (ERM*LSS) and (ERM*QMS). To account for confounding variables, the study controls for business size and firm age. β0 is the intercept term, which is the expected value

of Y when all the independent variables LSS and QMS are zero. It is also known as the constant term. β1-β6 are the coefficients and ε, the error term

3. RESULTS AND DISCUSSION

Demographic information of MSMEs.

In Table 1, the MSMEs' demographic data is displayed. Three important variables are shown in the table: industry sector, years of operation, and enterprise size. With regard to business size, a sizable fraction of MSMEs 39.3% and 43.3% of the sample, respectively-are categorized as small or medium-sized businesses. Micro-sized businesses, which make up 17.4% of the total, are included in the sample. This distribution indicates that MSMEs are fairly and proportionately represented across a range of company sizes.

With respect to the number of years of operation, the vast majority of MSMEs-52.0%-have been in business for five to ten years. According to the survey, 30.1% of the sample consists of businesses that have been in operation for less than five years, while 17.9% are MSMEs that have been in operation for more than ten years. Both new and established small and medium-sized businesses are included in the sample under study, according to the distribution that was found. The industrial sector variable sheds light on how MSMEs are categorized based on their affiliation with the industry. The service industry is well-represented in the sample, making up 73.3% of it. 16.9% of the sample is made up of the manufacturing sector, while 9.8% is made up of the agriculture and agrobusiness sector. This implies that there is a greater concentration of MSMEs in service-oriented businesses. The MSMEs that participated in the study are represented by the demographic information shown in table 1. The findings are more broadly applicable when a diverse and representative sample that spans company size, years of operation, and industrial sector.

Table 1. Demographic Information of MSMEs

		Frequency	%
Enterprise Size	Micro	62	17.4
	Small	140	39.3
	Medium	154	43.3
Years in Operation	<5 years	107	30.1
	5-10 years	185	52
	> 10 years	64	17.9
Industry Sector	Agriculture & Agro-Business	35	9.8
	Manufacturing	60	16.9
	Service	261	73.3

Source: Data Processed (2024)

Table 2. Reliability Analysis

Constructs	Number of Items	Cronbach's Alpha
ERM	4	0.895
LSS	4	0.890
QMS	4	0.780

ERM: Enterprise risk management, LSS: Lean Six Sigma: QMS: Quality Management System
Source: Data Processed (2024)

The results of the reliability analysis indicate that the internal consistency of all constructs is deemed acceptable. The Cronbach's alpha values for the four constructs, namely ERM, LSS and QMS are 0.895, 0.890 and 0.780, respectively. Typically, a Cronbach's alpha coefficient exceeding 0.7 is deemed acceptable for research applications. The results indicate that each construct's fundamental components are highly reliable and consistently evaluate the intended notions. A high level of inter-item correlation within each construct is indicated by the Cronbach's alpha values, guaranteeing a trustworthy assessment of the

relevant constructs. These results boost the assurance of the authenticity of the gathered data and substantiate the appropriateness of these concepts for further analysis in exploring the links among Lean Six sigma, Quality Management System and Resilience of MSMEs

Table 3: Descriptive Statistics

	N	Min	Max	Mean	SD	Skewness		Kurtosis	
						Stat	Std. Err	Stat	Std. Err
FR	356	0.23	1.42	0.70	0.33	0.52	0.13	-0.12	0.26
LSS	356	1.00	7.00	5.37	1.28	-1.77	0.13	1.12	0.26
QMS	356	1.00	7.00	5.47	1.05	-1.09	0.13	0.86	0.26
ERM	356	1.00	7.00	5.53	1.18	-1.95	0.13	0.25	0.26
FA	356	1.00	23.0	7.87	5.02	1.07	0.13	0.32	0.26
F	356	6.78	7.67	7.15	0.25	0.79	0.13	-0.93	0.26

FR: Firm's Resilience, ERM: Enterprise Risk Management, LSS: Lean Six Sigma, QMS: Quality Management System, FA: firm age, F: firm size
Source: Data Processed (2024)

These statistics reveal the central tendency, variance, and distributional characteristics of the variables. The mean value of 0.70 for FR indicates that the sample of MSMEs has an average firm resilience level. The minimum value of 0.23 and the maximum value of 1.42 indicate the range of firm resilience outcomes. The degree to which the FR values deviate from the arithmetic mean is indicated by the magnitude of the standard deviation, which is 0.33. The majority of MSMEs have FR values below average, according to the calculated skewness coefficient of 0.52, which suggests a distribution that is somewhat skewed towards the positive end. With minimal variations in the tails, the distribution is close to a normal distribution, according to the kurtosis value of -0.12.

The variables Lean Six Sigma, Quality Management Systems and Enterprise Risk Management exhibit means that vary between 5.37 and 5.53. In order to become resilient MSMEs, the aforementioned values indicate that the MSMEs in the sample somewhat apply lean six sigma principles and quality management methods. The observed standard deviations, which varied between 1.05 and 1.28, show that the sample's responses were not all the same. For the variables LSS, QMS, and ERM, the observed skewness values of -1.77, -1.09, and -1.95, respectively, show that the distributions are negatively skewed. This suggests that a sizable percentage of MSMEs have expressed greater involvement in implementing these ideas and procedures to create resilient businesses. The data set has kurtosis levels ranging from 0.25 to 1.12. The distributions appear to be slightly leptokurtic based on these data, meaning that their tails are heavier than those of a normal distribution. The arithmetic mean of company Age, one of the variables pertaining to company characteristics, is 7.87, indicating that the average age of the MSMEs in the sample is roughly 8 years. There is a considerable amount of variation in the enterprises' ages, as indicated by the observed standard deviation of 5.02

According to the calculated skewness value of 1.07, the distribution is somewhat skewed to the positive end, suggesting that some MSMEs are older than the norm. The distribution is more closely resembled by a normal distribution, with no significant outliers or extreme values, according to the kurtosis coefficient of 0.32. The sample's MSMEs appear to be of a fairly consistent size, according to the variable Firm Size, which has a mean value of 7.15. A limited range of variability in the size of enterprises within the chosen sample is shown by the small standard deviation value of 0.25. A distribution that is somewhat skewed to the right, suggesting that certain MSMEs are larger, is suggested by the computed skewness coefficient of 0.79. Descriptive statistics often provide a thorough overview of the distributional features, variability, and central tendency measurements of the variables being studied in the study. The findings indicated above help researchers and experts understand the characteristics of the population and the variations in the parameters, which are essential for further analysis and clarification of the study findings.

Regression analysis

Table 4 presents the OLS findings, the diagnostic test and the model fits which showed that the OLS regression model is reliable. The discussion of the findings is done on two levels. The first discussion was done without interaction effects, and the second was done with interaction effects using conditional and unconditional effects. For example, the net effect of the Lean Six Sigma (LSS) is 3.296[(0.596× 5.53)] +(0.633)], where the conditional effect of the interaction of Lean six Sigma and enterprise risk management is 0.596, the unconditional effect of Lean six Sigma is 0.633 and the mean of the moderating variable enterprise risk management is 5.53.

Table 4. Process innovation represented by (Lean six Sigma and Quality management) enterprise risk management and Firm's Resilience

	1	2
Constant	-3.856**	-3.735***
	(0.000)	(0.000)
LSS	0.633***	
	(0.000)	
QMS		-0.145***
		(0.000)
ERM	0.696***	1.681***
	(0.000)	(0.000)
ERM×LSS	0.596***	
	(0.000)	
ERM×QMS		1.381***
		(0.000)
FA	0.016***	0.015***
	(0.000)	(0.000)
F	0.858***	0.599***
	(0.000)	(0.000)
Net Effects	3.296	7.492
Observation	356	356
R²	0.230	0.229
Adjusted R²	0.219	0.219
F-Statistics	20.94***	20.85***

P<0.001, P<0.05, P<0.01 respectively. ERM: Enterprise Risk Management, LSS: Lean Six Sigma, QMS: Quality Management Systems: FA: Firm Age, F: Firm Size
Source: Data Processed (2024)

The following results were established: The regression analysis reveals that the coefficient for Lean Six Sigma is 0.633, which indicates a statistically significant and positive association with firms' resilience (FR) (p-value = 0.000). This observation implies that MSMEs that apply the Lean Six Sigma principles in their business operations are more likely to be more resilient over a long time. The coefficient of quality management system exhibits a statistically significant negative correlation with financial sustainability, as shown by its value of -0.145 and a p-value of 0.000. This suggests that MSMEs that focus on the deployment of quality management principles may not necessarily be resilient over a long time in comparison to those that do not prioritise these principles.

The findings of our study suggest that there exists a favourable correlation between the practice of Lean six Sigma and resilience of an organisation, which is in line with prior scholarly research. According to a research conducted by Juliani and de Oliveira (2020; Klochkov et al. (2019) and Pereira et al. (2019) ,lean six sigma, a process innovation practice is a set principle that focus on minimizing wastes in production and maximizing efficiency in the production processes. In the practice of lean six sigma, Costa et al., (2018) and Näslund, (2008) asserts further that cutting out non-value-added activities streamlines business operations, increasing productivity and cutting waste, which ultimately lowers

operating costs. The enhanced efficiency in operations according to Al-Banna et al. (2023) and Corrales-Estrada et al (2021) helps firms to maintain stability and continuity during disruptions, hence that firms adopt lean six practices can maintain operations in the wake of business challenges and hence exhibit enhanced resilience. Thus, our research provides empirical evidence in favour of the proposition that a positive and statistically significant correlation exists between Lean Six Sigma practice and resilience of firms of MSMEs within the Ghanaian setting, as posited in hypothesis H1a. The finding therefore aligns with the Schumpeterian theory of innovation. This theory emphasizes the role of innovation in driving economic growth and firm's resilience. In the context of this study, Lean Six Sigma is viewed and deployed as innovative practice, minimizing waste in production and ensuring operational is lowered leading to cost savings. This saved cost can according to Chen et al., (2018) and Edwards-Schachter (2018) is channelled into other aspects of operations, ensuring sustained business and therefore the firms resilience (Chen et al., 2018; Edwards-Schachter, 2018).

However, our findings contradict hypothesis 1b, which states that resilience of businesses and quality systems management have a positive and significant association.Indeed, our research contradicts the views of Ispas et al., (2023) and Saihi et al., (2023) when they indicate that implementing a quality management system (QMS) can significantly enhance firms' resilience by standardizing and optimizing processes, leading to more efficient and reliable operations with reduced variability and ensuring consistent quality. This sharp contraction according to Blacklock et al. (2016) can be associated with contextual differences. The contextual factors include factors like the type of industries that data was collected, the period of the collection of data among other factors (Business et al., 2016). The implication is that deploying quality management systems in MSMEs operations may not necessarily generate higher or stronger resilience.

The regression analysis reveals that the coefficient of enterprise risk management is 0.696, which shows a significant and positive correlation with firms' resilience (p-value = 0.000). The implication is that MSMEs that strongly implement enterprise risk management practises are positioned to be more resilient. Moreover, the interplay between enterprise risk management and process innovation practices of LSS and QMS yields significant insights. The correlation between enterprise risk management and Lean Six Sigma yields a favourable result on resilience of MSMEs. This suggests that the presence of enterprise risk management enhances the advantageous outcomes of Lean Six Sigma regarding resilience of MSMEs. The positive impact on resilience can be observed when enterprise risk management and quality management systems interact. This implies that the implementation of enterprise risk management amplifies the favourable effects of quality management systems on the resilience of an organisation.

Our research findings align with earlier studies on the moderating function of enterprise risk management. Different authors have indicated that the adoption of proficient enterprise risk management practices can enhance the favourable effects of process innovation practices on resilience of firms (Eilts, 2020; Yadav et al., 2023).

The implementation of comprehensive risk management practices by MSMEs serves to mitigate potential risks that may be linked with deploying innovation practices, ultimately resulting in improved resilience (Choi et al., 2016). ERM therefore amplifies the outcome of the influence of innovation practices of lean six sigma and quality management systems. Thus, the findings of our research provide evidence in favour of the assertion that moderation effect of enterprise risk management exists in the association between LSS, QMS and resilience of MSMEs. (H2a and H2b). This finding on moderating effect of ERM therefore aligns with the dynamic capability theory which indicates that ERM serves as an innovative approach or a capability of MSMEs managers providing framework for MSMEs leadership to manage risks effectively ensuring that business survives and attains resilience (Macher & Mowery, 2009; Newey & Zahra, 2009; Schwarz et al., 2010).

4. CONCLUSION

This study investigated the connection of process innovation, enterprise risk management, and resilience within the framework of MSMEs in Ghana. The findings of this study make a valuable contribution to the current body of literature by stressing on the importance of various process innovation practices and the moderating influence of enterprise risk management on firms' resilience. The findings show that the implementation of Lean Six Sigma practices have a favourable influence on resilience of MSMEs. This suggests that MSMEs that focus on LSS practices are more inclined to witness stability in all aspects of operations and hence will remain resilient in the wake of challenges. Conversely, it was discovered that firms that prioritize the practices of quality management systems, had an adverse effect on firms 'resilience.

The research additionally emphasises the moderating function of enterprise risk management in the correlation between process innovation practices of LSS and QMS and firms' resilience. The skilful execution of enterprise risk management methodologies within MSMEs aids in the reduction of potential threats that may impact business objectives, ultimately resulting in enhanced resilience. These reveal the importance of integrating risk evaluation, reduction, and supervision initiatives into the operational procedures of MSMEs.

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