



EFFECT OF RISK MANAGEMENT MODELING ON MANUFACTURING PRODUCTIVITIES IN NIGERIA (A STUDY OF DANGOTE CEMENT FACTORY, IBESE PLANT IN YEWA SENATORIAL DISTRICT, OGUN STATE)

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ABSTRACT

The study examined the effect of Risk Management Modeling on manufacturing productivity in Nigeria. The study employed descriptive research design, the population were staff of Dangote cement factory Ibesse in Ogun west senatorial district, and these were chosen in other to have access to larger and more diverse population, societal impact and for regulatory environment purpose, where primary data were collected from the named factory and secondary data from other sources. The enabling objectives were to examine the effect of operational risk management on manufacturing productivity in Nigeria, to examine the impact of financial risk management on manufacturing productivity in Nigeria and lastly to assess the impact of environmental risk management on manufacturing productivity in Nigeria. purposive random sampling technique was embraced and sample size of 80 respondents was captured with the aid of structured questionnaires, using survey method, only production staff and Administrative workers was sampled. Data were analyzed with the aid of SPSS statistical tool. The results show that the predictors employed in the study shows significant impact on manufacturing productivity, and the study recommend that the stakeholders should embark on usage of risk management techniques to reduce the extent of production wastage, optimize productivity which will possibly increase profitability of manufacturing company so as to have positive effect on Nigeria economy.

Keywords: *Risk Management, Productivity, Operational Risk, Financial Risk, Environmental Risk*

INTRODUCTION

Nigeria's manufacturing sector relies heavily on imported raw materials and equipment, which are subject to supply disruptions, delays, and price fluctuations. The volatile nature of the manufacturing sector is also

influenced by the country's economic conditions. These variables include changes in oil prices, interest rates, currency exchange rates, and political unrest. Risk management is the process of identifying, assessing, and mitigating risks to an organization's assets and profits, such as unanticipated costs, legal obligations, technological issues, and natural catastrophes. Risk management refers to the integrated process of identifying specific risk areas, developing a comprehensive plan, implementing the plan, and conducting regular evaluations. Epetimehin (2016). Effective risk management modeling enables businesses to anticipate and respond to market and economic risks, allowing them to adjust production plans, inventory levels, and pricing strategies as needed. Manufacturing companies in Nigeria are especially vulnerable to a variety of risks that could jeopardize their operations, profitability, and long-term viability. Rather than attempting to completely eliminate risk, risk management seeks to identify the risks that can be reduced and implement mitigation strategies. Epetimehin (2022).

Productivity is an important component of manufacturing performance because it has a direct impact on the company's long-term viability, profitability, and competition. Productivity, on the other hand, is a fairly good predictor of production efficiency. According to Beckman (1973, as cited in Ateke & Amanagala, 2020), productivity is more closely related to production and output concerns than to financial resources. Productivity in manufacturing refers to the efficiency with which a company converts its inputs (labor, materials, and capital) into outputs (completed goods or services). Productivity can be measured at the individual, departmental, and organizational levels. It is commonly expressed as the output-to-input ratio. When productivity increases, manufacturers can produce more with the same or fewer resources, lowering unit costs and increasing profitability. Because of the high potential risks to manufacturing companies' operations, such as equipment failures, supply chain disruptions, and political unrest, there has been an increase in disruptive events, ineffective data processing, inventory management issues, and unfounded concerns about worker safety. Ineffective production process optimization, increased resource waste, and overall operational inefficiency lead to higher costs and lower profitability. The study's goal was to provide solutions to each of the aforementioned issues as a result of these difficulties. The study's primary goal is to determine how risk management modeling influences Nigerian manufacturing output. Other objectives include investigating the impact of operational risk, financial risk, and environmental risk on the productivity

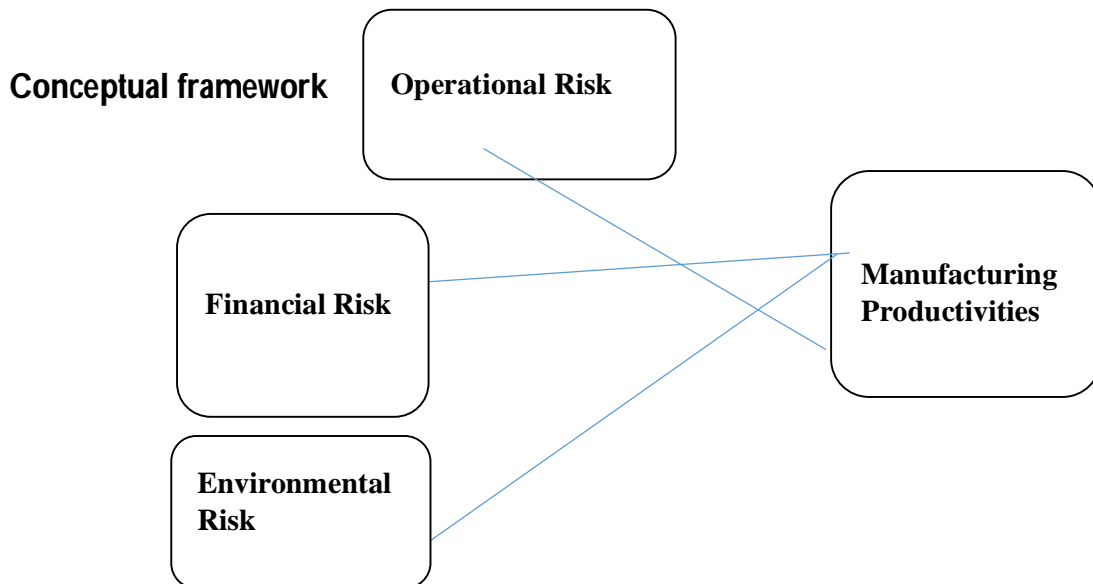
of Nigerian manufacturing companies, all of which affect the country's manufacturing output.

LITERATURE REVIEW

Conceptual Review

Organizations, including manufacturing companies, use risk management as a comprehensive process for identifying, evaluating, mitigating, and tracking various types of risks that may impact their operations, financial performance, and overall objectives. Raji (2018). This entails methodically identifying potential risks, both internal and external, that could impede the organization's goals. These risks can stem from a variety of sources, including operational, financial, regulatory, technological, and environmental concerns. After identifying the risks, the organization determines how likely they are to materialize and what impact they may have on the company. Assessment helps the organization prioritize identified risks based on their likelihood and severity. The organization develops and implements action plans to reduce or mitigate the risks identified as a result of the risk assessment. Some of these strategies include risk avoidance, reduction, sharing, and transfer. The organization keeps a close eye on the identified risks, evaluating the effectiveness of mitigation strategies and making necessary adjustments.

Scholarly research and exploration have shown that increasing productivity is a surefire way to stimulate economic growth and raise living standards in any country. Ademaso (2015). Developing and implementing effective productivity plans has helped to rescue many economies from the global economic downturn and steer them towards growth. Manufacturing is a component of the larger industrial sector. The primary function of the manufacturing sector is to convert raw materials into intermediate and finished consumer goods. Manufacturing is both an engine for economic growth and the foundation for technological advancement (Ullah et al., 2020; Lawal et al., 2017). A strong manufacturing sector is thought to accelerate economic growth because it increases product availability, boosts employment and income, improves efficiency, and strengthens the balance of payments (Paulo et al., 2017).



Operational risk: refers to the risk of loss caused by inadequate or failed internal processes, people, and systems, as well as external events. It is an essential component of an organization's overall risk management strategy. Breakdowns or malfunctions in production equipment, machinery, or automated systems that cause disruptions to the manufacturing process. Inefficient or outdated production processes that result in quality issues, waste, or decreased output. Employees make mistakes during production, maintenance, or other operational activities. A lack of proper training, supervision, or safety protocols contributes to human error. Disruption or failure of the company's information technology systems, such as enterprise resource planning (ERP), inventory management software, or data networks. Cyber security breaches or data losses affecting manufacturing operations, disruptions to the supply of components, raw materials, or logistics services that cause the manufacturing supply chain to malfunction.

Financial risk: refers to the possibility of financial loss or uncertainty that a business, such as a manufacturing company, may face as a result of changing financial circumstances. Changes in raw material prices or currency exchange rates may have an impact on their profitability; losses may occur as a result of market conditions such as swings in commodity prices, interest rates, or exchange rates. The possibility that clients, vendors, or other counterparties with whom the company conducts financial transactions will default or fail to make payments. The possibility that the company will not have enough cash on hand or liquid assets to cover

immediate expenses such as supplier payments, payroll, and debt servicing. The risk related to the company's ability to obtain capital on favorable terms, refinance debt, or secure funding. The risk of loss or poor performance on the company's investments, which could include real estate, financial instruments, or other asset classes.

Environmental risk: refers to the possibility of negative environmental consequences resulting from a manufacturing company's operations and activities. the possibility of receiving fines, penalties, or other legal or regulatory consequences for violating environmental laws and regulations, such as those governing emissions, waste disposal, and resource use. The company's manufacturing operations have the potential to pollute the environment through air emissions, water discharges, or soil contamination. This could result in liabilities, environmental remediation costs, or cleanup expenses. Climate change-related events, rising sea levels, altered temperature and precipitation patterns, and extreme weather could all disrupt manufacturing processes, supply chains, and infrastructure. These hazards may have an impact on the business's capacity to run, produce goods, and ensure business continuity.

Productivity: is a measure of the productivity and efficiency with which employees or a manufacturing company convert raw materials, labor, capital, and energy into finished goods or services. Productivities of Labor calculate the output (units produced, revenue, or value added) per unit of labor input (hours worked, number of employees), indicating the workforce's efficacy and efficiency in converting their time and effort into valuable output. Capital productivity refers to the output per unit of capital input, which includes facilities, machinery, and equipment. Process productivity measures how efficiently certain manufacturing procedures or activities are carried out.

Theoretical Review

The Environmental Uncertainty Theory

Paul Lawrence and Jay Lorsch published the Environmental Uncertainty Theory in 1967. It assumed that there was a single, comprehensive set of management principles that could be applied to all types of organizations. The theory emphasizes how organizations constantly interact with their external environment, which may include social trends, technology, competition, and laws. Organizations also do not exist in a vacuum. According to the theory, for an organization to remain competitive and

effective, its internal structures, procedures, and management techniques must be tailored to the level of complexity and uncertainty in its external environment. The theory helps to explain why companies in the same industry may choose to implement different organizational structures and management strategies in response to the specific environmental uncertainties and challenges they face. Nigeria's manufacturing sector faces a variety of environmental uncertainties, including supply chain disruptions, political instability, economic fluctuations, and infrastructure challenges. As a result, customized risk management strategies are required.

The Organization Characteristics Theory

Joan Woodward's Organization Characteristics Theory, published in 1958, was developed in response to the growing realization that traditional management theories based on general management principles were insufficient to account for the various organizational practices and structures observed in various organizations. According to Woodward's research, an organization's structure, procedures, and management techniques are all heavily influenced by the technology it employs, particularly its manufacturing technology. The theory opposed classical management theories' one-size-fits-all approach and advocated for contingency-based approaches, in which the best organizational structure and management techniques are determined by the organization's unique characteristics, such as size, complexity, and technology. The theory explains why companies in the same industry may choose to implement different organizational structures and management philosophies in response to their business's unique characteristics, such as size, complexity, and production technology. In order to ensure organizational effectiveness and efficiency, the theory emphasizes the importance of matching the organization's structure, procedures, and management techniques to its unique characteristics.

Empirical Review

Olayinka, M.U., Adebayo, O.I. (2019). The impact of enterprise risk management on operational efficiency in a Nigerian manufacturing firm was investigated using a cross-sectional survey approach, a quantitative research design. Researchers used a structured questionnaire to collect information from respondents. The study's sample was chosen through a purposive sampling technique. The target market consisted of manufacturing firms listed on the Nigerian stock exchange. The study's

sample included 150 companies in total. The study discovered a strong and positive relationship between Nigerian manufacturing companies' operational efficiency and ERM implementation. It has been discovered that certain ERM procedures, such as risk identification, assessment, response, and monitoring, enhance operational effectiveness. The researchers discovered that organizational factors, such as risk management capabilities and management support, have a significant impact on the success of ERM implementations. The study recommends that Nigerian manufacturing companies implement a comprehensive ERM framework to improve their overall performance and operational efficiency. The researchers advise businesses to invest in developing a risk-aware culture, learning risk management skills, and incorporating ERM into their strategic decision-making processes.

The study "Risk Management Practices and Financial Performance of Manufacturing Companies in Nigeria" was conducted by Adekunle, S.A., and Awotunde, J.A. (2017). The researcher employed a cross-sectional survey method, which is a quantitative research design. Additionally, a structured questionnaire was used to collect information from respondents. The sample for the study was drawn using a simple random sampling procedure. The target market consisted of manufacturing firms listed on the Nigerian stock exchange. The study's sample included one hundred and twenty companies. The financial performance of Nigerian manufacturing firms was found to be positively and significantly correlated with the implementation of risk management practices. Financial metrics like profitability, liquidity, and solvency have been shown to benefit from specific risk management practices like risk identification, assessment, mitigation, and monitoring. According to the study, Nigerian manufacturing companies should implement a comprehensive risk management system to improve their financial performance. The researchers advise businesses to invest in improving their risk management capabilities, such as hiring experts in the field and training employees in risk management.

Gap of the Study

There is a significant gap in research on the relationship between risk management technologies and manufacturing productivity in Nigeria. Despite the fact that studies such as those by Adebayo, O.I., and Olayinka, M.U. (20019) and Adekunle, S.A., and Awotunde, J.A. (2017) provide useful insights into the broad interactions, there is a lack of research that

investigates the precise mechanisms and transmission channels through which risk management tools directly impact manufacturing productivity in Nigeria. The investigation into how variations in operational risk, financial risk, and environmental risk correspond to specific outcomes for Nigerian manufacturing companies is more thorough. For example, there is no empirical data on how variations in environmental and operational risk influence investment decisions made by manufacturing companies operating in Nigeria. This gap in the literature must be addressed so that manufacturers and regulatory bodies can make informed decisions. Gaining a better understanding of how risk management tools affect Nigerian manufacturing productivity will be extremely beneficial for Nigerian manufacturing firms' growth and productivity optimization.

METHODOLOGY

In order to gain access to a larger and more diverse population, as well as to examine the impact on society and the regulatory environment, the researchers used a descriptive research design. Primary data were gathered from the specified factory, while secondary data were gathered from other sources. The population consisted of the staff of the Dangote cement factory located in Ibese, Ogun West Senatorial District. Only production and administrative staff were included in the study, and 80 respondents were selected for the sample size using a survey method and a structured questionnaire. Purposive sampling techniques were used in this case. With the use of the statistical program SPSS, data were examined. The validity of the questionnaires was determined through pre-testing, and they met reliability standards.

Model Specification: The following model, which is an adaptation of one that has been widely used in earlier studies like (Adebayo, O.I and Olayinka M.U (2019), expressed the relationship between the dependent variable and the explanatory variables.

$$MP = f (OR, FR, ER)$$

The above functional relationship is translated into an equation as follows:

$$MP = \beta_0 + \beta_1OR + \beta_2FR + \beta_3ER + \mu$$

Where:

MP = Manufacturing Productivity

ORM = Operational Risk Management

FRM = Financial Risk Management

ERM = Environmental Risk Management

β_0 = intercept or constant
 $\beta_1, \beta_2, \& \beta_3$ = coefficients of the explanatory variables or factor sensitivities
 A priori expectations: $\beta_0, \beta_1, \beta_2, \& \beta_3 \neq 0$
 μ = the error term

RESULTS AND DISCUSSIONS

Table 1 showing analysis of the student's age

AGE		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-25 years	4	5.0	5.0	5.0
	26-30 years	39	48.8	48.8	53.8
	31-35 years	26	32.5	32.5	86.3
	36-40 years	4	5.0	5.0	91.3
	41-45 years	3	3.8	3.8	95.0
	46-50 years	3	3.8	3.8	98.8
	50 and above	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

Source: field survey July, 2024

The workers in the 20–25 age group make up 5% of the total, followed by those in the 26–30 age group at 48.8%, those in the 31–35 year group at 32.5%, those in the 36–40 year group at 5.0%, those in the 41–45 year group at 3.8%, those in the 46–50 year group at 3.8%, and those in the 50 and above at 1.3%. This table illustrates the workers in different age groups.

Table 2 showing analysis of the workers' Gender

GENDER		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	62	77.5	77.5	77.5
	Female	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

Source: field survey July, 2024

According to the above table, 77.5% of the study population's workers were men and 22.5% of the population's workers were women.

Table 3 showing; Analysis of Academic Qualification

ACADEMIC QUALIFICATION

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid WAEC	4	5.0	5.0	5.0
ND/NCE	48	60.0	60.0	65.0
HND/B.Sc	23	28.8	28.8	93.8
Masters/PhD	5	6.3	6.3	100.0
Total	80	100.0	100.0	

Source: field survey July, 2024

According to the above table, during the study period, 5.0% of the workers held SSCE certificates, 60.0% belonged to the ND/NCE category, 28.8% to the Bsc/HND category, and 6.3% to the Masters/PhD category.

POSITION HELD

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Junior	40	50.0	50.0	50.0
Senior	32	40.0	40.0	90.0
Director	8	10.0	10.0	100.0
Total	80	100.0	100.0	

Source: field survey July, 2024

According to the above table, during the study period, 10.0% of the workers were directors, 40.0% were senior workers, and 50.0% of the workers were junior workers.

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	629.839	3	209.946	42.262	.000 ^b
Residual	377.548	76	4.968		
Total	1007.387	79			

- a. Dependent Variable: MANUFACTURING PRODUCTIVITY,
- b. Independent variable ,operation risk, financial risk ,environmental risk

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.791 ^a	.625	.610	2.22884

Source: field survey July, 2024

First Assumption of Goodness of Fit: The above table's R2 is 0.625. This suggests that operational, financial, and environmental risk accounts for approximately 62.5% of the variation in manufacturing productivity. The R2 value provides additional information about the model's strength; the closer the value is to one, the better the outcome (Tabachnick and Fidell, 2007). The adjusted R2 indicates that the model can explain approximately 61.0.2% of the systematic variation in manufacturing productivity when the degree of freedom is taken into account.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.561	.701		-.801	.426
	OPERATIONAL RISK MANAGEMENT	.438	.120	.363	3.653	.000
	FINANCIAL RISK MANAGEMENT	.347	.121	.302	2.867	.005
	ENVIROMENTAL RISK MANAGEMENT	.277	.119	.233	2.323	.023

Field Survey July, 2024

a. Dependent Variable: MANUFACTURING PRODUCTIVITY

Coefficient of the variables: The constant's value of -0.561 indicates that when all other variables are held constant, Manufacturing productivity will drop by 561. The coefficient of operational risk management is 0.438, which means that every unit increase in operational risk management results in a 0.438 increase in manufacturing productivity. Financial risk management has a coefficient of 0.347, which means that every unit increase in financial risk management results in a 0.347 increase in manufacturing productivity. Finally, the coefficient of 0.277 for

environmental risk management indicates that every unit increase in environmental risk management results in a 0.277 increase in manufacturing productivity.

T-test: In any study, the bulk of the predictors ought to be individually significant. A helpful method for determining important correlations between variables is the t-test. If the t-value is less than five percent (0.05), the alternative hypothesis can be accepted and the null hypothesis can be rejected. If not, we act in the other way. Manufacturing productivity is significantly impacted by the study's predictors. Each predictor has a probability value of 0.00, 0.005, and 0.023, according to the model, indicating a significant impact on manufacturing productivity. These findings imply that the productivity of Nigerian manufacturing is significantly impacted by operational, financial, and environmental risk management. This will surely affect the profitability and sales performance of manufacturing businesses, as well as encourage the expansion of manufacturing in Nigeria and the creation of jobs.

Finding, Conclusion And Recommendations

The study's predictors had a significant impact on manufacturing productivity, as demonstrated by the study's results. As a result, the study recommends that stakeholders use risk management techniques to minimize production waste and maximize productivity, both of which will boost manufacturing companies' profitability and benefit Nigeria's economy.

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APENDIX

Effective operational risk management can improved production processes, reduced downtime, and better quality control, leading to increased productivity and product quality.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	38	47.5	47.5
	Agree	26	32.5	80.0
	Undecided	1	1.3	81.3
	Dsiagree	9	11.3	92.5
	Strongly Disagree	6	7.5	100.0
	Total	80	100.0	100.0

Effective operational risk management enables manufacturing firms to comply with relevant health, safety, and environmental regulations, avoiding potential fines and legal liabilities.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	12	15.0	15.0
	Agree	48	60.0	75.0
	Undecided	6	7.5	82.5
	Dsiagree	10	12.5	95.0
	Strongly Disagree	4	5.0	100.0
	Total	80	100.0	100.0

A strong operational risk management culture and framework can enhance the overall resilience of manufacturing organizations, allowing them to withstand and recover from unexpected events or crises, such as equipment breakdowns, supply chain disruptions,

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	36	45.0	45.0
	Agree	7	8.8	53.8
	Undecided	9	11.3	65.0
	Dsiagree	14	17.5	82.5
	Strongly Disagree	14	17.5	100.0
	Total	80	100.0	100.0

Effective financial risk management can help manufacturing companies in Nigeria better navigate economic uncertainties, such as currency fluctuations, interest rate changes, and market volatility, enhancing their overall financial resilience.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	42	52.5	52.5
	Agree	10	12.5	65.0
	Undecided	7	8.8	73.8
	Dsiagree	13	16.3	90.0
	Strongly Disagree	8	10.0	100.0
	Total	80	100.0	100.0

Financial risk management practices, such as accounts receivable management and inventory control, can help manufacturing companies optimize their cash flow and working capital, improving their liquidity and financial stability.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	38	47.5	47.5
	Agree	8	10.0	57.5
	Undecided	15	18.8	76.3
	Dsiagree	12	15.0	91.3
	Strongly Disagree	7	8.8	100.0
	Total	80	100.0	100.0

The implementation of comprehensive financial risk management practices can enhance the credibility and transparency of manufacturing companies, increasing investor confidence and potentially improving access to capital markets.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	8	10.0	10.0	10.0
Valid Agree	44	55.0	55.0	65.0
Valid Undecided	11	13.8	13.8	78.8
Valid Dsiagree	9	11.3	11.3	90.0
Valid Strongly Disagree	8	10.0	10.0	100.0
Total	80	100.0	100.0	

Effective environmental risk management ensures that manufacturing companies comply with relevant environmental regulations and standards in Nigeria, avoiding potential fines, legal consequences, and reputational damage.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	5	6.3	6.3	6.3
Valid Agree	48	60.0	60.0	66.3
Valid Undecided	13	16.3	16.3	82.5
Valid Dsiagree	10	12.5	12.5	95.0
Valid Strongly Disagree	4	5.0	5.0	100.0
Total	80	100.0	100.0	

By identifying and mitigating environmental risks, such as inefficient energy and water usage, waste management issues, and raw material losses, manufacturing companies can optimize their operational processes and achieve cost savings, thereby enhancing p

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	41	51.3	51.3	51.3
Valid Agree	10	12.5	12.5	63.8
Valid Undecided	8	10.0	10.0	73.8
Valid Dsiagree	14	17.5	17.5	91.3
Valid Strongly Disagree	7	8.8	8.8	100.0
Total	80	100.0	100.0	

Proactive management of environmental risks, such as natural disasters, pollution incidents, or supply chain disruptions related to environmental factors, can help manufacturing companies avoid costly production delays and downtime.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	37	46.3	46.3	46.3
Agree	14	17.5	17.5	63.8
Undecided	10	12.5	12.5	76.3
Dsiagree	15	18.8	18.8	95.0
Strongly Disagree	4	5.0	5.0	100.0
Total	80	100.0	100.0	

Higher productivity allows manufacturing companies to produce more output with the same or fewer resources, leading to lower unit costs and increased profitability.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	41	51.3	51.3	51.3
Agree	5	6.3	6.3	57.5
Undecided	11	13.8	13.8	71.3
Dsiagree	15	18.8	18.8	90.0
Strongly Disagree	8	10.0	10.0	100.0
Total	80	100.0	100.0	

Improved productivity can also enhance a company's ability to price its products competitively, while maintaining or increasing profit margins.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	39	48.8	48.8	48.8
Agree	18	22.5	22.5	71.3
Undecided	5	6.3	6.3	77.5
Dsiagree	12	15.0	15.0	92.5
Strongly Disagree	6	7.5	7.5	100.0
Total	80	100.0	100.0	

Productivity gains can enable manufacturers to respond more effectively to changes in market demand, as they can scale their production up or down more efficiently.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Agree	37	46.3	46.3	46.3
Valid Agree	10	12.5	12.5	58.8
Valid Undecided	8	10.0	10.0	68.8
Valid Dsiagree	15	18.8	18.8	87.5
Valid Strongly Disagree	10	12.5	12.5	100.0
Valid Total	80	100.0	100.0	