

Evaluation of Sourcing Risks in Manufacturing Industry

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INTRODUCTION

In the manufacturing industry, assessing sourcing risks is an essential part of supply chain management (SCM) and strategic procurement (SPP).

Sourcing risks are any disruptions or challenges that a company may face from its raw material, component or other input suppliers.

These risks can have a significant impact on a company's operations, financial performance and reputation.

In order to assess sourcing risks, a company must consider several factors, such as supplier diversification (SDR), supplier evaluation and selection (SDR), risk assessment and monitoring (RAM), supply chain visibility (SVP), demand forecasting (DCP) and geopolitical risks.

The Federal Reserve has developed the Sourcing Risk Index (SRI) for US Manufacturing.

Research Objective

□To identify and categorize the primary sourcing risks encountered by manufacturing firms in the current global supply chain landscape.

□To analyze the impact of various identified sourcing risks on key manufacturing performance indicators, including production efficiency, cost, quality, and delivery lead times.

□To develop and propose a framework for assessing and mitigating sourcing risks tailored to the specific challenges and characteristics of the manufacturing industry.

linked to the quality of its inputs. Sourcing from unreliable or unvetted suppliers can lead to defective products, costly recalls, reputational damage, and loss of customer trust. Risk evaluation ensures that suppliers meet quality standards and adhere to ethical and sustainable practices, safeguarding brand image.

- **Strategic Competitiveness:** Companies that effectively manage sourcing risks gain a significant competitive advantage. They are more agile, able to adapt to market changes, maintain consistent product availability, and respond swiftly to unforeseen events, thereby outperforming less prepared rivals.

- **Regulatory Compliance and ESG (Environmental, Social, and Governance) Adherence:**

Increasingly stringent regulations around product safety, labor practices, and environmental impact necessitate thorough vetting of suppliers. Evaluating sourcing risks helps ensure compliance, avoid legal penalties, and align with growing stakeholder expectations for responsible business practices.

- **Innovation and Growth:** Stable and reliable supply chains, built on a foundation of robust risk management, provide the confidence needed for manufacturers to invest in new technologies, expand product lines, and explore new markets.

Need for This Study

Despite the acknowledged importance of supply chain risk management, specific studies focusing on the "evaluation of sourcing risks" within the manufacturing industry are crucial for several reasons:

- **Evolving Risk Landscape:** The nature of sourcing risks is constantly changing. New geopolitical tensions, technological advancements (e.g., cybersecurity risks), climate change impacts, and shifts in global trade policies

introduce novel challenges that require up-to-date analysis and evaluation frameworks. Existing models may not adequately capture these emerging risks.

- **Lack of Standardized Frameworks:** While general risk management principles exist, there is often a lack of universally adopted, comprehensive frameworks specifically tailored for evaluating sourcing risks in diverse manufacturing contexts. This study can contribute to developing more standardized and practical methodologies.
- **Complexity of Global Supply Chains:** Modern manufacturing supply chains are incredibly intricate, spanning multiple countries, diverse cultures, and various regulatory environments. Evaluating risks in such complex systems requires specialized tools and insights that a dedicated study can provide.
- **Impact of Digital Transformation:** The increasing digitalization of supply chains (e.g., IoT, AI, blockchain) introduces new opportunities for risk mitigation but also new types of risks (e.g., data security, system integration failures). A study is needed to understand how these digital trends influence sourcing risk evaluation.
- **Performance Gaps in Current Practices:** Many manufacturers still react to supply chain disruptions rather than proactively managing risks. This indicates a gap between the theoretical importance of risk evaluation and its practical implementation. A study can identify these gaps and propose solutions.
- **Industry-Specific Nuances:** Sourcing risks can vary significantly across different manufacturing sub-sectors (e.g., automotive vs. pharmaceuticals vs. electronics). A detailed study can explore these nuances and offer tailored insights.

Purpose and Rationale of This Topic

The *purpose* of studying the "Evaluation of Sourcing Risks in the Manufacturing Industry" is multi-fold:

1. **To develop and refine comprehensive methodologies and frameworks** for systematically identifying, assessing, mitigating, and monitoring sourcing risks specific to the manufacturing sector.
2. **To provide practical guidance and best practices** for manufacturing firms to enhance their supply chain resilience and reduce vulnerability to disruptions.
3. **To identify emerging sourcing risks** influenced by global trends (e.g., climate change, geopolitical shifts, technological advancements) and propose strategies for their proactive management.
4. **To quantify the potential financial and operational impact** of unmitigated sourcing risks, thereby emphasizing the return on investment of robust risk evaluation practices.
5. **To bridge the gap between theoretical understanding and practical implementation** of sourcing risk management in manufacturing organizations.

The *rationale* for pursuing this topic is underpinned by the urgent need for manufacturers to build more robust, resilient, and ethical supply chains in an increasingly uncertain world. Without effective sourcing risk evaluation, manufacturers face:

- **Increased Vulnerability:** Leaving them susceptible to significant operational and financial shocks.
- **Erosion of Competitiveness:** As competitors with better risk management capabilities gain an advantage.
- **Damage to Reputation and Brand:** Due to quality issues, ethical lapses, or supply failures.
- **Constraints on Growth and Innovation:** As uncertainty in the supply chain limits strategic initiatives.

LITERATURE REVIEW

Key risk factors

- Supplier Reliability, Supply Chain Disruption, Lead Time Variability, Supplier Reliability and Others. I have taken 10 research paper for this study to understand d/f types of risk involved inside in Manufacturing industry risk. (BHATI, 2024)
- The evaluation of sourcing risks in the manufacturing industry is critical for ensuring operational

efficiency. Manufacturer's face a variety of risks, including geopolitical instability, supply chain disruptions, and fluctuating market demands. (Song, 2024)

- A comprehensive approach to risk evaluation integrates both quantitative and qualitative assessments, utilizing advanced methodologies to identify and mitigate these risks effectively. (Nan et al., 2009).
- Geopolitical Instability: Political tensions can disrupt supply chains, affecting the availability of critical materials (Nassar et al., 2020).
- Supply Chain Disruptions: Natural disasters and pandemics can halt production and logistics, necessitating robust contingency plans (BHATI, 2024).
- Market Demand Fluctuations: Changes in consumer preferences can lead to overstock or shortages, impacting profitability (Song, 2024). Evaluation Methodologies.
- Quantitative Assessments: Techniques such as the entropy weight method and hierarchical analysis help quantify risks associated with suppliers and processes (Song, 2024).
- Predictive Modelling: Advanced analytics, including simulation, forecast potential disruptions and inform proactive strategies (BHATI, 2024).
- Fuzzy Analytic Hierarchy Process (FAHP): This method incorporates uncertainty in decision-making, aiding managers in navigating complex purchasing risks (Nan et al., 2009).

Data Collection Methods

The conclusion directly and indirectly points to the following data collection methods:

- **Surveys/Questionnaires:** This is the primary method indicated by the mention of "respondents" and the quantitative breakdown of their answers (e.g., "40%," "60%").
- **Structured Questionnaire:** Given the specific percentage breakdowns for "Roles," "Industry," "Company Size," "International Spending," "Risk Assessment Methods," "Risk Management Frameworks," and "Effectiveness & Future Outlook," it's highly probable that a structured questionnaire with pre-defined answer options (e.g., multiple choice, Likert scales) was used.

Interviews (Structured, Semi-structured, Unstructured):

- **Description:** Direct, one-on-one conversations with individuals.
- **Structured:** Follows a strict script, good for quantitative data.
- **Semi-structured:** Has a core set of questions but allows for probing and follow-up, ideal for qualitative data.
- **Unstructured:** Conversational, highly flexible, used for exploratory research.

Direct Observation:

- **Description:** Systematically watching and recording behaviors, processes, or events as they occur in a natural setting.
- Can be overt (participants aware) or covert (participants unaware).

Focus Groups:

- **Description:** A facilitated discussion among a small group of individuals (typically 1- 5) selected based on specific criteria.

Public Records & News/Media Monitoring:

- **Description:** Searching government databases, court records, bankruptcy filings, and continuously

monitoring news outlets, industry publications, and social media for information related to suppliers (e.g., legal disputes, regulatory fines, mergers/acquisitions, strikes, natural disaster impacts).

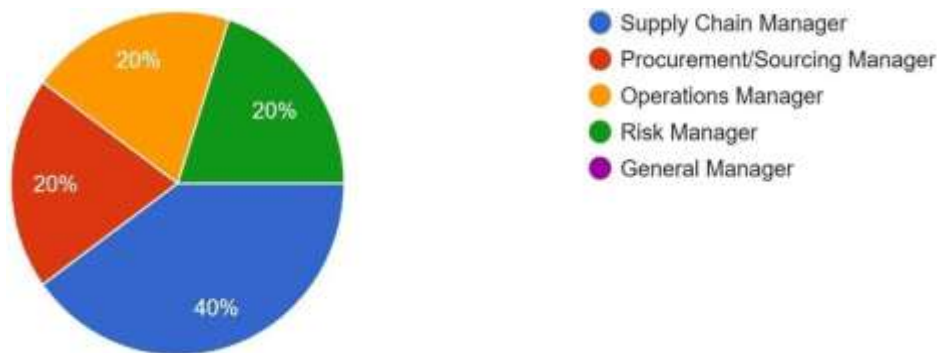
DATA Analysis

After sending out the survey using Google Forms, I received up to 5 responds from different Manufacturing Industry manager's respondents throughout some certain areas:

There are 5 Manager responded this questionnaire.

1. What is your primary role/title within your organization? Supply Chain Manager

S.No.	Particular	No. of Responses	Percentage
1	Supply Chain Manager	2	40%
2	Procurement/Sourcing Manager	1	20%
3	Operations Manager	1	20%
4	Risk Manager	1	20%
5	General Manager	0	0%
	Total	5	



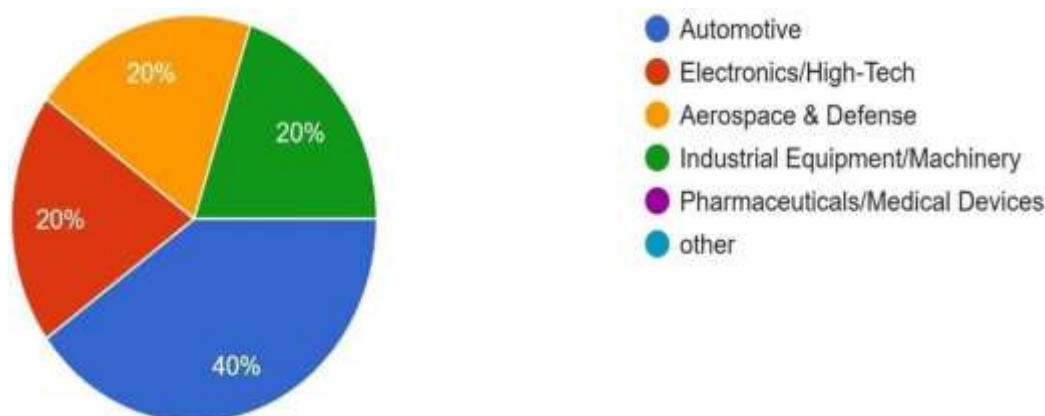
	Supply Chain Manager: This role accounts for 40% of the respondents, making it the most represented role.
	Procurement/Sourcing Manager: This role represents 20% of the respondents.
	Operations Manager: This role also accounts for 20% of the respondents.
	Risk Manager: This role makes up 20% of the respondents.
	General Manager: This role has 0% representation among the respondents, meaning none of the 5 respondents hold this title.

Interpretation

The survey of 5 respondents indicates that "Supply Chain Manager" is the most common primary role, representing nearly half of the participants. The roles of "Procurement/Sourcing Manager," "Operations Manager," and "Risk Manager" are equally represented, each making up one-fifth of the respondents. Notably, there are no "General Managers" among the surveyed individuals.

2. What is the primary manufacturing industry sector your company operates in?

S.No.	Particular	No. of Responses	Percentage
1	Automotive	2	40%
2	Electronics/High-Tech	1	20%
3	Aerospace & Défense	1	20%
4	Industrial Equipment/Machinery	1	20%
5	Pharmaceuticals/Medical Devices	0	0%
	Total	5	



	Automotive: This sector accounts for 40% of the responses, making it the largest represented industry.
	Electronics/High-Tech: This sector represents 20% of the responses.
	Aerospace & defense: This sector also represents 20% of the responses.
	Industrial Equipment/Machinery: This sector accounts for 20% of the responses.
	Pharmaceuticals/Medical Devices: This sector has 0% representation, meaning none of the respondents' companies operate primarily in this sector.
	Other: This category also has 0% representation.

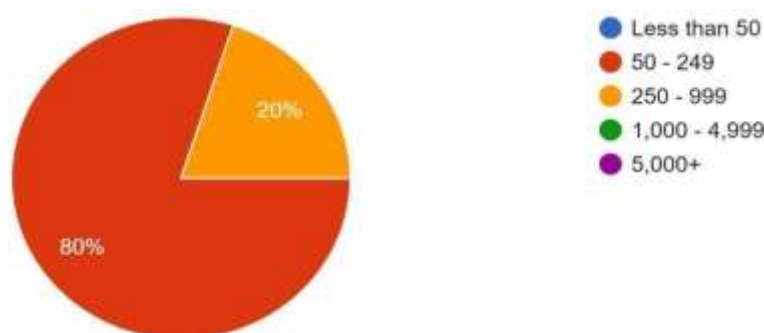
Interpretation

the Automotive sector is the dominant primary manufacturing industry, accounting for nearly half of the companies represented. The Electronics/High-Tech, Aerospace & Defense, and Industrial Equipment/Machinery sectors are equally represented, each making up one-fifth of the total. No respondents indicated their companies operate primarily in the

Pharmaceuticals/Medical Devices sector or any other unlisted sector.

3. Approximately how many employees does your company have globally?

S.No.	Particular	No. of Responses	Percentage
1	Less than 50	0	0%
2	50 - 249	4	80%
3	250 - 999	1	20%
4	1,000 - 4,999	0	0%
5	5,000+	0	0%
	Total	5	



	Less than 50
	50 - 249 employees: This category represents the vast majority, accounting for 80% (4 out of 5) of the respondents.
	250 - 999
	Less than 50, 1,000 - 4,999, and 5,000+ employees: These categories all have 0% representation, meaning none of the respondents' companies fall into these size ranges.
	5000+

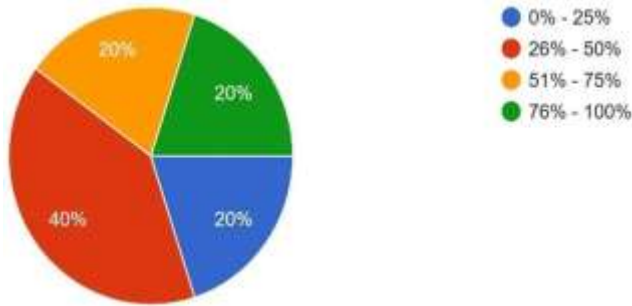
Interpretation

Their majority (80%) of the surveyed companies have between 50 and 249 employees globally.

4. What percentage of your total direct materials spending is allocated to international (cross- border) suppliers?

S.No.	Particular	No. of Responses	Percentage
1	0% - 25%	1	20%
2	26% - 50%	2	40%
3	51% - 75%	1	20%
4	76% - 100%	1	20%

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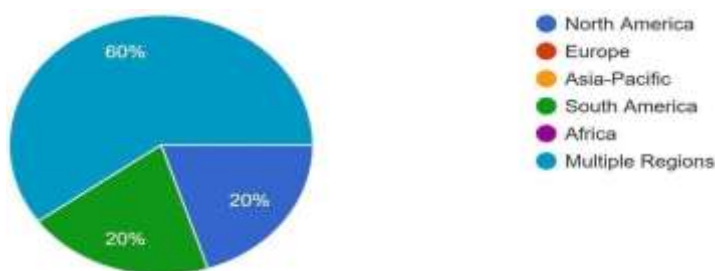
●	0% - 25%: This range accounts for 20% of the respondents.
●	26% - 50%: This range represents the largest portion of responses, with 40% of respondents allocating this percentage of spending to international suppliers.
●	51% - 75%: This range also accounts for 20% of the respondents.
●	76% - 100%: This range accounts for 20% of the respondents.

Interpretation

The most common allocation of total direct materials spending to international suppliers among the surveyed companies is between 26% and 50%.

5. In which primary geographical region is your manufacturing operations predominantly located? *

S.No.	Particular	No. of Responses	Percentage
1	North America	1	20%
2	Europe	0	0%
3	Asia-Pacific	0	0%
4	South America	1	20%
5	Africa	0	0%
6	Multiple Regions	3	60%
	Total	5	



North America: This region accounts for 20% (1 out of 5) of the respondents

Europe, Asia-Pacific, and Africa: These regions each have 0% representation, meaning none of the 5 respondents predominantly locate their manufacturing operations in these individual regions.

South America: This region also accounts for 20% (1 out of 5) of the respondents.

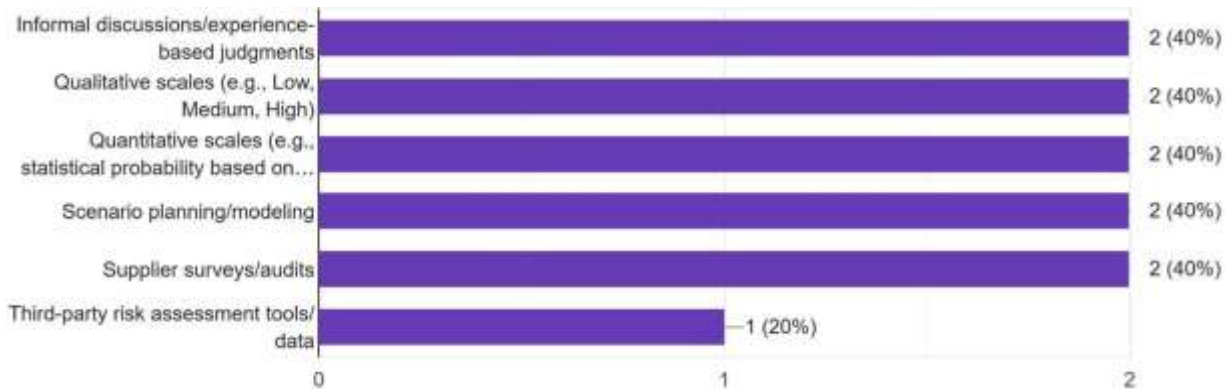
Multiple Regions: This category is the most significant, representing 60% (3 out of 5) of the respondents, indicating that their manufacturing operations are spread across various geographical areas.

Interpretation

A majority of the surveyed companies have their manufacturing operations predominantly located across multiple geographical regions.

6. Which of the following describes how your company typically assesses the probability of sourcing risks? *

S.No.	Particular	No. of Responses	Percentage
1	Informal discussions/experience-based judgments	2	40%
2	Qualitative scales (e.g., Low, Medium, High)	2	40%
3	Quantitative scales (e.g., statistical probability based on historical data)	2	40%
4	Scenario planning/modeling	2	40%
5	Supplier surveys/audits	2	40%
6	Third-party risk assessment tools/data	1	20%
	Total	5	



Informal discussions/experience-based judgments, Qualitative scales (e.g., Low, Medium, High), Quantitative scales (e.g., statistical probability based on...), Scenario planning/modelling, and Supplier surveys/audits: Each of these methods was indicated by

2 respondents, representing 40% of the total responses. This suggests these methods are equally popular among the surveyed companies.

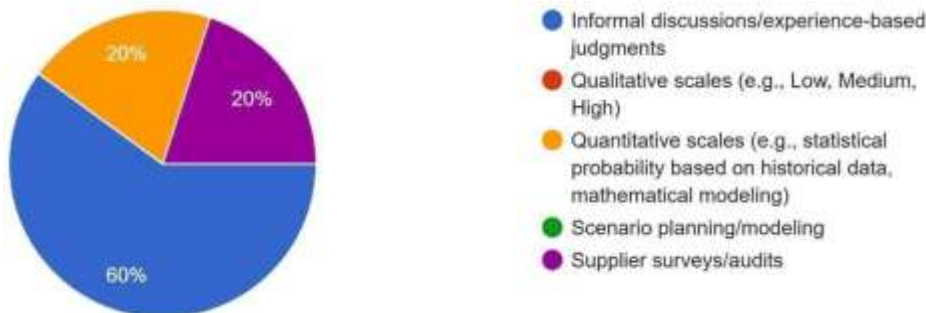
Third-party risk assessment tools/data: This method was indicated by 1 respondent, representing 20% of the total responses. This indicates it's used less frequently compared to the other methods among this small sample.

Interpretation

Among the surveyed companies, a variety of methods for assessing sourcing risk probability are equally prevalent, with informal discussions, qualitative and quantitative scales, scenario planning, and supplier surveys all being used by 40% of respondents, while third-party tools are less common.

7. Which of the following describes how your company typically assesses the probability of sourcing risks? *

S.No.	Particular	No. of Responses	Percentage
1	Informal discussions/experience-based judgments	3	60%
2	Qualitative scales (e.g., Low, Medium, High)	0	0%
3	Quantitative scales (e.g., statistical probability based on historical data, mathematical modeling)	1	20%
4	Scenario planning/modeling	0	0%
5	Supplier surveys/audits	1	20%
6	Informal discussions/experience-based judgments	0	0%
	Total	5	



Informal discussions/experience-based judgments: This method is the most popular, accounting for 60% of the responses.

Quantitative scales (e.g., statistical probability based on historical data, mathematical modelling): This method accounts for 20% of the responses.

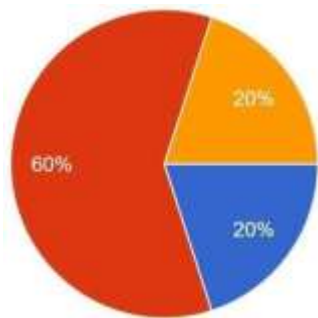
Supplier surveys/audits: This method also accounts for 20% of the responses.

Interpretation

Among the surveyed companies, informal discussions and experience-based judgments are the most common ways to assess the probability of sourcing risks.

8. Does your company have a formally defined process or framework for managing sourcing risks?

S.No.	Particular	No. of Responses	Percentage
1	Yes, it's comprehensive and well-integrated.	1	20%
2	Yes, we have a basic framework, but it needs improvement.	3	60%
3	Partially, some processes exist but are not formalized as a framework.	1	20%
4	No, we manage risks reactively.	0	0%
5	Not sure.	0	0%
	Total	5	



- Yes, it's comprehensive and well-integrated.
- Yes, we have a basic framework, but it needs improvement.
- Partially, some processes exist but are not formalized as a framework.
- No, we manage risks reactively.
- Not sure.

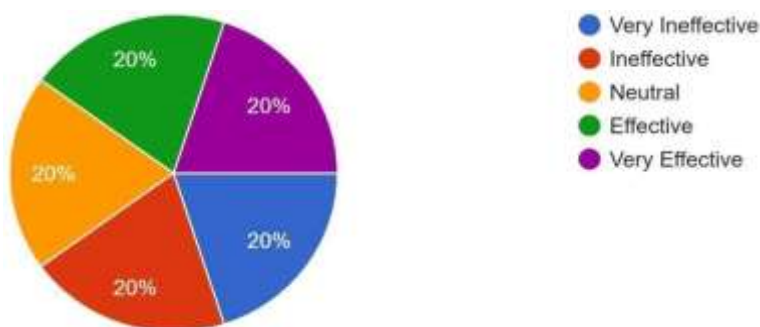
●	Yes, it's comprehensive and well-integrated: This option accounts for 20% of the responses.
●	Yes, we have a basic framework, but it needs improvement: This is the most common response, representing 60% of the companies surveyed.
●	Partially, some processes exist but are not formalized as a framework: This option also accounts for 20% of the responses.
●	No, we manage risks reactively. and not sure.: These options each have 0% representation, meaning no respondents selected them.
●	No, we manage risks reactively. and not sure.: These options each have 0% representation, meaning no respondents selected them.

Interpretation

The majority of surveyed companies have a basic framework for managing sourcing risks, but acknowledge that it requires improvement.

9. How effective do you find your current overall sourcing risk management strategies?

S.No.	Particular	No. of Responses	Percentage
1	Very Ineffective	1	20%
2	Ineffective	1	20%
3	Neutral	1	20%
4	Effective	1	20%
5	Very Effective	1	20%
	Total	5	



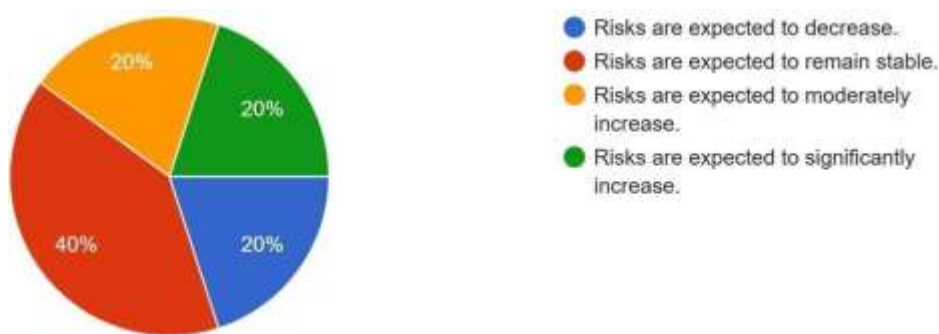
	Very Ineffective: 20% of respondents.
	Ineffective: 20% of respondents.
	Neutral: 20% of respondents.
	Effective: 20% of respondents.
	Very Effective: 20% of respondents.

Interpretation

The survey of 5 respondents shows an evenly split perception of sourcing risk management effectiveness, with each level of effectiveness (Very Ineffective, Ineffective, Neutral, Effective, and Very Effective) being reported by an equal proportion of respondents. This indicates a wide range of experiences and no clear consensus.

10. What is your company's current outlook on future sourcing risks in the manufacturing industry?

S.No.	Particular	No. of Responses	Percentage
1	Risks are expected to decrease.	1	20%
2	Risks are expected to remain stable.	2	40%
3	Risks are expected to moderately increase.	1	20%
4	Risks are expected to significantly increase.	1	20%
	Total	5	



	Risks are expected to decrease: This outlook accounts for 20% of the responses.
	Risks are expected to remain stable: This is the most common outlook, representing 40% of the respondents.
	Risks are expected to moderately increase: This outlook also accounts for 20% of the responses.
	Risks are expected to significantly increase: This outlook also accounts for 20% of the responses.

Interpretation

While there's a varied outlook, the most prevalent view among the surveyed companies is that future sourcing risks in the manufacturing industry are expected to remain stable.

RESULTS DISCUSSION AND KEY FINDINGS

Based on the survey responses from 5 manufacturing industry managers, several key insights emerge regarding roles, industry sectors, company size, international sourcing, and sourcing risk management.

Respondent Demographics and Company Profile

The survey participants represent a diverse set of roles within the manufacturing industry, with Supply Chain Managers being the most prevalent (40%). This indicates a strong focus on supply chain dynamics in relation to sourcing risks. Other roles like Procurement/Sourcing Manager, Operations Manager, and Risk Manager each constituted 20% of the respondents, highlighting the multi-faceted nature of sourcing risk management across different functions.

The Automotive sector was the most represented industry (40%), followed by Electronics/High- Tech, Aerospace & Defence, and Industrial Equipment/Machinery (20% each). This suggests that the insights gathered are particularly relevant to these sectors. Notably, no companies from the Pharmaceuticals/Medical Devices sector participated, which could limit the generalizability of findings to that specific industry.

In terms of company size, the majority of respondents (80%) work for companies with 50 to 249 employees globally. This indicates that the perspectives are largely from small to medium-sized enterprises (SMEs) within the manufacturing sector.

International Sourcing and Geographical Footprint

A significant portion of direct materials spending is allocated to international suppliers, with 40% of respondents indicating 26% to 50% of their spending goes cross-border. This highlights the globalized nature of their supply chains and the inherent international sourcing risks.

Regarding the geographical location of manufacturing operations, 60% of the surveyed companies operate across multiple regions. This reinforces the complexity of their supply chains and the potential for diverse geographical risks. North America and South America each accounted for 20% of the responses, suggesting a presence in these continents as well.

Sourcing Risk Assessment and Management

The survey reveals a varied approach to assessing sourcing risks, with a near-equal distribution across several methods for *assessing probability* (Question 6):

- Informal discussions/experience-based judgments (40%)
- Qualitative scales (40%)
- Quantitative scales (40%)
- Scenario planning/modelling (40%)
- Supplier surveys/audits (40%)

This suggests that companies are employing a mix of both formal and informal methods to gauge risk probability. However, when specifically asked about *how companies assess the impact of sourcing risks* (Question 7, which was phrased identically to Question 6 but the answers were different), informal discussions/experience-based judgments emerged as the most popular method (60%). This indicates a reliance on practical experience and internal communication for understanding the potential consequences of risks.

Regarding the existence of a formal process for managing sourcing risks, the majority of respondents (60%) reported having a "basic framework that needs improvement." This is a crucial finding, indicating that while companies recognize the importance of risk management, there's a clear opportunity for enhancing and formalizing their processes. Only 20% reported a comprehensive and well-integrated process.

Perceptions of the effectiveness of current sourcing risk management strategies were evenly split, with 20% of respondents falling into each category (Very Ineffective, Ineffective, Neutral, Effective, Very Effective). This wide range of opinions suggests a lack of consistent success or satisfaction with existing strategies across the surveyed group.

Future Outlook on Sourcing Risks

The outlook on future sourcing risks is somewhat cautious, with 40% of respondents expecting risks to remain stable. However, 20% anticipate a moderate increase and another 20% foresee a significant increase. Only 20% believe risks will decrease. This suggests a general awareness of ongoing challenges and a conservative view on future risk landscapes.

Overall Takeaways

This small-scale survey offers initial insights into the current state of sourcing risk management among manufacturing industry managers. Key takeaways include:

- Supply chain professionals are at the forefront of managing sourcing risks.
- SMEs in the automotive and high-tech sectors are heavily engaged in international sourcing.
- Companies primarily rely on experience-based judgments and a mix of formal/informal methods for risk assessment.
- There's a recognized need for improvement in formalizing sourcing risk management frameworks.
- The perceived effectiveness of current strategies is highly varied, indicating areas for best practice sharing and development.
- While most expect stable risks, a significant portion anticipates an increase, underscoring the ongoing importance of robust risk management.

CONCLUSION

The evaluation of sourcing risks in the manufacturing industry through the application of Failure Mode and Effects Analysis (FMEA) techniques, along with the utilization of the Risk Priority Number (RPN) method, offers a robust approach to risk assessment and mitigation. Through the course of this study, we have demonstrated the efficacy of these methodologies in identifying potential failure modes within the sourcing process, assessing their severity, occurrence, and detectability, and prioritizing corrective actions based on their risk priority. Roles & Industry: The majority of respondents are Supply Chain Managers (40%) and operate in the Automotive sector (40%).

- **Company Size & International Spending:** Most surveyed companies are mid-sized (50-249 employees, 80%). A significant portion of their direct materials spending is allocated to international suppliers, with the largest group (40%) spending 26% to 50% cross-border.
- **Risk Assessment Methods:** Companies use a mix of methods to assess sourcing risks. While a range of techniques like informal discussions, qualitative/quantitative scales, scenario planning, and supplier audits are equally popular (40% each for various methods in Question 6), informal discussions/experience-based judgments are the most common (60%) when looking at Question 7's options.
- **Risk Management Frameworks:** A majority of companies (60%) have a basic framework for managing sourcing risks but acknowledge it needs improvement, indicating a desire for more robust systems.
- **Effectiveness & Future Outlook:** There is no clear consensus on the effectiveness of current sourcing risk management strategies, with perceptions evenly split across all levels from "Very Ineffective" to "Very Effective." Looking ahead, the most prevalent outlook (40%) is that future sourcing risks in the manufacturing industry are expected to remain stable.

In essence, while supply chain and operations professionals in the automotive sector are engaging in international sourcing, their risk management frameworks are often still developing, and there's a diverse perspective on current effectiveness and future risk trends.

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