Identification of Risk associated with Supply Chain Management and Mitigation Plan
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ABSTRACT

The supply chain network is changing as a result of the information technology industry's quick expansion, and this increased dependency between organizations. Cost overruns and schedule delays in construction projects are a result of poor Supply Chain Management. This paper investigates the vulnerabilities that construction projects provide to the supply chain. An index system for the project’s supply chain is built by detecting the hazards in the chain. It outlines risk mitigation measures for planning, procurement, manufacturing, transportation, and delivery hazards that are external. Eleven risk variables that could have an impact on the construction Supply Chain were identified from the literature. Following this, a questionnaire survey based on these variables was conducted, and contractors and suppliers in Gujarat provided 25 responses. Additionally, it examines efficient risk-reduction techniques like demand forecasting, supplier diversification, strong logistics networks, and risk monitoring. Organizations may improve the resilience of their supply chains and keep a competitive edge in the fast-paced business world of today by being aware of these risks and putting proactive mitigation plans into place.

Key words: Risk management, Supply Chain management, Construction, Building materials.

1 Introduction

Company leaders have expressed growing worries about the increase in supply chain vulnerabilities. This makes supply chain risk management (SCRM) appealing to academics who want to have an impact on business as a research field. On the other hand, the field is still developing and has rather hazy boundaries at this point, raising concerns about the diversity of academics when it comes to the scope of SCRM, perhaps in relation to how they see the demands of industry. Additionally, given that researchers have a variety of domain specialties, concerns concerning the diversity of research instruments and their suitability considering the perceived needs of business inevitably surface. In order to describe the variety of scope and research methods in the researchers' perceptions of SCRM, this paper conducts a field research study. These results, in our opinion, lay the groundwork for future research partnerships between academics and business.

The following steps make up a typical Risk Management process:
1. In order to facilitate the design of the appropriate risk model approach, context analysis tries to identify the boundaries of the RM processes.
2. It comprises two main phases:
   - Risk Identification
   - Risk Quantification
3. The management of hazards associated with the various risk classifications identified is referred to as risk treatment. The four traditional methods of risk management are risk reduction, risk response, risk externalization, and risk acceptance.
4. Risk control, which includes monitoring and review, communication and consulting.

2 Background of supply chain risk management

The goal of SCM is to maximize efficiency and effectiveness, meet organizational goals, and promote more synergy. It first emerged in the industrial sector (Harland, 1996). Since its introduction, SCM has taken on the traits of an evolving idea, becoming more and more enhanced by cutting-edge tools and methods. According to a key theoretical pillar that asserts the necessity of adding value faster than cost to the process (Lamming, 1996) when introducing a new business practice, this cumulative process concerns the totality of transactions flows among
participants in order to maximize total chain profitability (Ha and Krishnan, 2008). Concerning current supply chain risk management procedures in the construction sectors have been raised by numerous authors. Among them are, who highlights the value of supply chain risk management in the construction industry and demonstrates a few instances of inaccurate risk prediction, and, A CBR-based Decision Support System Framework for Construction Supply Chain Risk Management.

3 Supply Chain Management

Supply Chain Management (SCM) is the process of planning, implementing, and controlling the flow of goods, services, information, and finances across the entire supply chain, from raw material suppliers to end consumers. To ensure the successful and economical production, distribution, and delivery of goods or services to meet client expectations, it entails the coordination and integration of numerous operations, functions, and stakeholders within a network of companies. Key components of supply chain management include planning, sourcing, production, inventory management, logistics and transportation, distribution, information systems, risk management, sustainability, etc.

![Fig 1. Supply chain management model for construction project](Source: Supply Chain Management in Residential Construction Sector)

**Why Supply Chain Management?**

India requires supply chain management (SCM) in the construction industry to address a multitude of challenges and capitalize on opportunities in this vital sector. With rapid urbanization and a burgeoning population, India faces an increasing demand for construction projects, ranging from residential developments to critical infrastructure.

Efficient SCM is required to optimize the flow of resources, labour, and information, resulting in increased project efficiency and cost savings. Delays, budget overruns, and quality difficulties have long plagued India's building industry. SCM can assist in optimizing processes, assuring timely material supply, managing project timeframes, and improving quality control. Furthermore, as environmental concerns gain traction, SCM can help to enable sustainable practices in material sourcing, waste management, and energy efficiency.

**Supply Chain Risk Management**

Loss, importance, and probability are the three key components of risk. A risk's characteristics determine whether it should be accepted, avoided, or mitigated. Risk is defined as the probability of suffering a loss and the magnitude of that loss for the entity or individual. SCR has received a lot of attention lately, and several research have provided the definition of SCR, but they are distinct and depend on various circumstances and scenarios, so their applicability in SCRM is constrained. However, a small number of studies are regarded as the foundation of the SCR literature; the definitions and classification of the SCRs they give are helpful to businesses.

There are still some parallels between the definitions of SCR that have been offered by prior researchers despite the differences in context and study design. Most researchers have divided SCR into internal SCR and external SCR categories. Others classified SCR into three categories: supply chain risk that is internal to the chain, external to the chain, and within to the firm but external to the network. Nine sources for SCRs were suggested in the study by Chopra and Sodhi: interruptions, forecast, delays, intellectual property, systems, receivables, capacity, inventory, and procurement. This classification is more thorough since it explicitly describes internal hazards and includes all operational levels in nine categories.
Factors affecting Supply Chain Management in Residential Construction Sector

There are many benefits to supply chain management for the residential construction industry. However, the list of a few causes indicates challenges with supply chain management adoption in residential projects.

- Failure to communicate project information
- Poor definition of the project's goals
- Ignorance of the project's complexity
- Labour shortages
- Supplier Relationships
- Technology and Automation
- Supply chain visibility
- Lack of partner communication

Supply chain risk identification and classification

The first step in the SCRM process is to identify and categorize different sources of risk or risk drivers in a supply chain. According to March and Shapira (1987), supply chain vulnerability is the potential for significant disruption brought on by supply chain hazards. Supply chain risk is defined as the variation in the distribution of potential supply chain outcomes, their likelihood, and their subjective values. As a result, vulnerability is viewed as a mix of a disturbance and its unfavourable outcome.

Jüttner et al. (2003) claim that environmental, organizational, or supply chain-related variables that have the potential to jeopardize supply chain performance parameters are the causes of risk. Furthermore, it is impossible to forecast these risk variables with accuracy. They divide risk factors into three main groups, including organizational, network, and environmental threats. These risk categories include:

- Political risk
- Market risk
- Economic risk
- Consumer risk
- Supplier risk
- Environmental risk
- Labour risk

Managing Supply Chain Risks

The automobile industry requires effective risk management throughout the supply chain. Due to their complicated business and organizational structure, automotive supply chains are more uncertain than those of other sectors. The various ways and strategies that can be used to manage SCRs have been described in previous studies on SCRM among automotive industries. Proactive and reactive techniques to SCRM are available in the automobile industry, according to Thun et al. A proactive approach is frequently cause-related, which reduces the likelihood of SCRs happening. Reactive strategies are effect-oriented and work to lessen the effect of SCRs. The choice of suppliers that consistently produce high-quality goods on schedule, their development as suppliers, their integration, and their use of preventative measures for geopolitical risks are some proactive approaches.

Application of Supply Chain Management

The implementation of supply chain management principles and methods in the construction industry. It entails the effective management of resources, materials, information, and processes in order to finish construction projects on schedule, within budget, and to the satisfaction of clients. Here are some of the most important applications of CSCM.

- Material Procurement and Management
- Inventory Control
- Supplier Relationship Management
- Transportation
- Project Scheduling
- Resource Allocation
- Quality Control
Limitations of Supply Chain Management

Supply Chain Management (SCM) can be challenging to implement effectively in the context of residential construction due to several limitations and complexities unique to this industry. Some of the limitations of SCM in residential construction include:

- Fragmented Supply Chain
- Project Variability
- Seasonal and Regional Variations
- Customization and Client Preferences
- Complex Permitting and Regulatory Requirements
- Short Project Durations
- Labor-Intensive Nature
- Inventory Management
- Communication and Collaboration Challenges
- Supply Chain Transparency
- Technology Adoption

Mitigation Plan

For keeping operations resilient and reducing interruptions, a solid supply chain risk management mitigation plan is crucial. Companies must first undertake a thorough risk assessment to pinpoint any possible weak spots in their supply chains, which might be caused by everything from natural disasters and geopolitical unrest to economic swings and supplier-specific hazards. Diversification is essential because it might be harmful to rely too heavily on a single provider or location. In order to assure adherence to quality and performance requirements, it is essential to cultivate solid supplier relationships and carry out frequent audits. Technology-driven supply chain visibility, demand forecasting, and inventory control all improve the agility and reactivity required to quickly handle any interruptions.

Contingency preparations, alternate sourcing options, and strong contractual relationships with suppliers are also necessary. Preparedness is ensured by the creation of a detailed business continuity and disaster recovery strategy, scenario planning, and personnel training. Supply chain resilience is further increased by working together with peers in the sector, according to rules, and paying attention to data security and sustainability. With continual examination and adjustment of risk mitigation methods as the business environment changes, continuous development and adaptability are essential. A thorough supply chain risk management strategy should also include risk insurance coverage and effective communication plans to help businesses face difficulties head-on.

4 Conclusion

The operations, reputation, and financial health of construction industry can all be greatly impacted by the intricate web of hazards that supply chain management poses. These dangers include everything from natural disasters and regulatory changes to supplier interruptions and international conflicts. An organized mitigation strategy, however, can support businesses in proactively addressing these issues. Companies can lessen the effects of interruptions by strengthening supply chain visibility, diversifying their sources of supply, and developing strong relationships with their suppliers. Tools for inventory management, risk monitoring, and demand forecasting that are effective offer flexibility and reactivity. Additionally, strong business continuity strategies, alternate sourcing, and contractual agreements all function as important safeguards. Data security measures, regulatory compliance, and collaboration with industry peers all provide layers of protection, while sustainability factors provide long-term risk reduction benefits. A robust supply chain strategy ultimately includes ongoing development, personnel training, and crisis communication plans as essential elements. Organizations may handle supply chain risks with greater confidence and guarantee continued operations by putting these safeguards into place and being flexible.
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