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A study on Security issues in Supply Chain Management Practices at Manufacturing Industries

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ABSTRACT

Security has been an issue since supply chain begin, where the theft, fraud, smuggling, sabotage, hijacking, piracy, risk of damaged goods were all common security issues in supply chain management especially in manufacturing sector. There are various security issues when raw materials, inventory and finished goods go through a longer and complex supply chain. In material flow, the raw materials, inventory and the finished products can be stolen or faked. Thus, an investigation of security issues concerning SCM can give suppliers, OEMs, intermediaries, customers, and even third-party service providers more guidance on potential security issues concealed in their business and the possible solutions they can use. Therefore, it is essential to investigate and find out all major security issues and relevant solutions within the material flow in supply chain (SC) in order to help companies to deal, to reduce and to prevent those security issues occurring in their supply chains. In the paper relevant supply chain security reason, security programs, security issues and possible solutions are discussed.

1. Introduction

Supply Chain Management has become an unavoidable task for suppliers, manufactures, distributors, or other supply chain partners in order to meet the increasing complexity of their customer requirements in a more efficient way. Hence, some companies have made great efforts into directly managing their supply chain themselves, and others have outsourced to professional third party service providers, which leads to more complex and longer supply chain. Whether a company chooses either to manage their supply chain by their own SCM department or outsource to professional vendors, coordination and collaboration are fundamental to enabling a company to be more responsive and efficient in meeting market or customer requirements. In addition, web-based technology is increasingly being applied to SCM in order to achieve optimum efficiency. However, there are various security issues when raw materials, inventory and finished goods go through a longer and complex supply chain. In material flow, the raw materials, inventory and the finished products can be stolen or faked. In information flow, supply chain information, such as the procurement, billing, order and inventory information could be at great security risk from security attacks due to increased information sharing and information transferring caused by collaborated relationship and usage of web based technology.

More seriously, even a small security problem could cause a significant loss for the supply chain as supply chains become more integrated, and thus security attacks can more easily spread to affect other chain partners than was the case hitherto if proper protection is not in place. Thus, an investigation of security issues concerning SCM can give suppliers, OEMs, intermediaries, customers, and even third party service providers more guidance on potential security issues concealed in their business and the possible solutions they can use. So it is important to investigate various security issues and possible solutions to these issues. Due to the limitation of the paper length, this paper will only report our work on the security issues in materials flow of supply-chain in a typical manufacturing company.

Supply chain security

Supply chain security management can be defined as, “the application of policies, procedures, and technology to protect supply chain assets from theft, damage, or terrorism, and to prevent the introduction of unauthorized contraband, people, or weapons of mass destruction into the supply chain”. The only problem with this definition is that it does not address the origin of the threat or risk. The five sources of supply chain risks provide that. Supply chain security needs to adjust its policies, procedures, and technology to protect the supply chain from all five risk sources.

Supply chain security programs

Several new security programs were launched in the aftermath of the World Trade Centre terrorist attack to protect international cargo flow from being abused for criminal (primarily terrorist) intentions without compromising supply chain efficiency. The U.S. Customs Office launched several programs such as the Customs-Trade Partnership Against Terrorism (C-TPAT), Container Security Initiative (CSI), the 24-hour rule, etc. These security programs address different aspects of supply chain security and target different parts of a transport chain. The link between these security programs is that they involve all parties or stakeholders in supply chain security.

Security Issues Associated with Materials Flow

The security issues associated with material flow have brought increasing attention from various participants along the supply chain. The key security problems and possible resolutions associated with material flows can be summarized as (1) supplier security risks, (2) risks of damaged goods, (3) theft, (4) counterfeiting, (5) food safety and dangerous goods and (6) transportation. Due to the limitation of the paper length, the analysis and evaluation for food safety and dangerous goods will be omitted.

Supplier security risks

Firstly, the security issue associated with suppliers is increasing as the supply chain becomes more complicated today. Suppliers whether or not can deliver required materials on time and in the correct quantity and quality can significantly influence the manufacturing and production process, and influences the flow of materials to the next stage of the supply chain. So, supplying is critical start point for a successful flow of materials.

Thus the six step approach to assessment and prevention of supplier security risks during the material flow process is suggested as follow, which can be called supply chain risk model (SCRM): The first step is to define and identify the potential supplier security risks; the second step is to filing these risks in the company's database; the third step is to screen to detect those defined security risks; the fourth step is to treat these risks; the fifth step is to continually monitor those security risks. Then, these five step procedure will be guide, support, and monitored under the company's incident handling and contingency planning procedure to become more standardized approach to reduce any supplier relate security risks.

It has been found that collaborating, sharing resources, and working toward common goals can help companies not only reduce the problems caused by material flow security, but also address other critical issues such as quality.

Risks of Damaged Goods and Their Solutions

Generally, for the SCM, risks of damaged goods do exist. For instance, electronic goods in the supply chain often face various hazards, and these hazards not only damage these electronic goods, but also have a strong impact on the profitability of the business.

This view can be supported by the research of Magad and Amos's who found that damaged goods represented about 12% of customer service complaints. As a result, improvement in receiving and storage activities can help to minimize damage by utilizing effective handling procedures, equipment and training of employees, various packaging solutions such as use of micro-fluted corrugated cartons The Conference on Web Based Business Management and boxes to minimize the shock hazard, compression hazards and vibration hazard causing damage during the transportation and storage process.

Theft

Theft security problems have always been a major concern with concern to material flow. Principally, cargo theft has become the central concern for material flow security issues within the SCM. This view can be supported by the research finding that 41% of respondents believe cargo security has posed the greatest challenge to supply chain security.

In general, the theft often happens during the transportation or storage process. On the one hand, in order to prevent such theft during the transportation process, investment in technology and in training of staff has been suggested.

On the other hand, advanced technologies and information systems can also play a major role in combating theft. Many firms have used satellite tracking GPS to provide in-transit visibility and thus enable operators to have a real-time visibility of the flow status of their materials. The development of Radio Frequency Identification Device (RFID) could even support fleet managers to enable them to visualize their latest status of materials and to detect any thefts. It is strongly recommend that more attention should be paid to invest in security technology in order to minimize theft during the transportation process. Besides, driver training also needs to be addressed to combat theft security issues during the transportation process.

Counterfeiting

Counterfeiting becomes another increasing security concern for the flow of materials of the supply chain. However, these security issues may only serious affect certain types of supply chains, such as the electronic goods supply chain and high value goods supply chain. Counterfeiting has become an increasing concern along the pharmaceutical supply chain. In general, it can be noticed that both the computer technology and supply chain structure has contributed to the increase of counterfeit material flow. Auto-ID technology, such as bar coding and RFID, can be widely used to execute the track and trace function and to give more visibility in order to secure the material flow. 3D (three-dimensional) code technology can be a good solution for counterfeiting risks. The 3D code is much more difficult to be identified and copied than 2D bar code and even RFID. The 3D code is based on designed secret geometrical information, and this information is saved and stored in a firm's database as a verifying key against counterfeiting.

However, to successfully prevent counterfeit material flow within some supply chains, various parties in the supply chain may still need to think about the use of packaging technologies and compliance with government regulations.

1.2 Statement of the problem

Security has been an issue since supply chain begin, where the theft, fraud, smuggling, sabotage, hijacking, risk of damaged goods were all common security issues in supply chain management especially in manufacturing sector. In Supply Chain, we want to ensure that manufacturers have a competitive advantage in their supply chain optimization for a more secure and successful future. Therefore it is essential to study how to reduce the risk in damaged goods, theft, and goods safety and to ensure the possible solutions for securities issues in supply chain management.

1.3 Objectives of the study

1. To study the security issues in supply chain management of manufacturing industries.
2. To identify the importance of goods safety while transportation and storage.
3. To identify the problem of security issues during theft in transportation and storage.
4. To identify the risk of damaged goods in supply chain management.
5. To study about counterfeiting of goods and to infer supplier security risks in manufacturing industry.
6. To analyze about man power safety in production department in manufacturing.

1.4 Need for the study

Supply chain security refers to enhance the security of supply chain, the transport and logistics system for the world's cargo. It combines traditional practices of supply chain management with the security requirements driven by threats such as terrorism and theft. So as to improve the knowledge about security problems in goods safety, to prevent the problem of counterfeiting of goods and reduce the risk in damaged goods and theft this study is essential.

2. Review of Literature

Sheffi (2001) presents the need for companies to simultaneously operate under heightened security environments and the need to prepare for rapid recovery after terrorist attacks. In addition he establishes seven supply chain design trade-offs that management will face when designing secure supply chains: Repeatability vs. unpredictability , The lowest bidder vs. the known supplier, Centralization vs. dispersion, Managing risk vs. delivering value, Collaboration vs. secrecy, Redundancy vs. efficiency and Government cooperation vs. direct shareholder value.

Christopher & Peck (2004) argue that the challenge is to manage and mitigate supply chain risk by creating more resilient (flexible, agile) supply chains. They establish the four basic principles that support resilient supply chains: resilience should be designed in the processes. There is a need for a high amount of collaboration.

Shujun Zhang & Kevin Hepashi (2010) aimed to investigate and find out all major security issues and relevant solutions within the material flow in supply chain (SC) in order to help companies to deal, to reduce and to prevent those security issues occurring in their supply chains.

Paulson, Kouvelis & Li (2011) stated that supply chain risks have expanded, resulting in a new set of uncertain and unfamiliar incidents that can create chaos and disruptions, posing a number of significant threats to business continuity. A great variety of risks exists, which can have significant effects on the short-term and long-term performances of supply chains.

Sujit Rokka Chhetri & Nafiul Rashid (2016) told that security system for Industry needs to identify risk, implement appropriate safeguards to protect critical infrastructures, detect occurrence of security events, respond to threats, and recover after an attack has happened. The various enabling technologies for Industry, explained their respective security issues, presented security issues in the product lifecycle in terms of enabling components, and highlighted the advances made in securing the enabling components for the product lifecycle of the manufacturing system.

3. Research Methodology

This study undergoes a descriptive type of research in which the survey is carried out for collecting data needed for the work. Since this work is based on fact finding enquiries and is used to find out the present state of the security issues in supply chain of manufacturing industries in Trichy, it is said to be descriptive study. The census survey is been used, it is also known as population survey. The population of manufacturing industries in Thiruverambur is 73. A census survey collects complete information from all participants in the population. The data was gathered by distributing a questionnaire to supervisor and manager who are all working in a manufacturing industry units like warehouse, production department.

3.1 Chi-Square Test

1. Checking relationship between information flows in SCM and managing supplier issues.

Table: 3.1.1

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.50	12	.024
Likelihood Ratio	18.07	12	.113
Linear-by-Linear Association	0.195	1	.659
N of Valid Cases	73		

Calculated value = 23.501
Tabulated value = 21.206
Degrees of freedom = 12
Significance level = 5%

2. Checking relationship between goods damage during transportation and quality issues

Table: 3.1.2

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	57.73	16	.000
Likelihood Ratio	37.85	16	.002
Linear-by-Linear Association	18.24	1	.000
N of Valid Cases	73		

Calculated value = 57.734
Tabulated value = 26.296
Degrees of freedom = 16
Significance level = 5%

3. Checking relationship between Right quality delivery and managing supplier issues.

Table: 3.1.3

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.048	12	.612
Likelihood Ratio	12.088	12	.439
Linear-by-Linear Association	.737	1	.391
N of Valid Cases	73		

Calculated value = 10.048
Tabulated value = 21.206
Degrees of freedom = 12
Significance level = 5%

4. Results

From chi-square test,

1. The calculated value (23.501) is greater than the tabulated value (21.206). So it leads to the rejection of hypothesis and it can concluded that there is significant association between information flow in SCM and managing supplier issues.
2. The calculated value (57.734) is greater than the tabulated value (26.296). So it leads to the rejection of hypothesis and it can concluded that there is significant association between goods damage during transportation and maintaining and quality issues in the organization.
3. The calculated value (10.048) is less than the tabulated value (21.206). So it leads to the acceptance of hypothesis and it can concluded that there is no significant association between right quality delivery and managing supplier issues in the organization.

5. Discussions

From the results most of issues in the transportation maintenance and supplier management in supply chain management so need to improve the transportation security and supplier relationship management.

As a result, improvement in receiving and storage activities can help to minimize damage by utilizing effective handling procedures, equipment and training of employees, various packaging solutions such as use of micro-fluted corrugated cartons and boxes to minimize the shock hazard, compression hazards and vibration hazard causing damage during the transportation and storage process.

6. Conclusion

However, there are various security issues when raw materials, inventory and finished goods go through a longer and complex supply chain. In material flow, the raw materials, inventory and the finished products can be stolen or faked. More seriously, even a small security problem could cause a significant loss for the supply chain as supply chains become more integrated, and thus security attacks can more easily spread to affect other chain partners than was the case hitherto if proper protection is not in place. Thus, an investigation of security issues concerning SCM can give suppliers, OEMs, intermediaries, customers, and even third party service providers more guidance on potential security issues concealed in their business and the possible solutions they can use.

From the results security issues related to transportation and suppliers is major concerned while other issues have least impact in security issues in supply chain management. So the organizations need to focus the issues related to transportation and suppliers relationship should be improve to eliminate the transportation issues sand supplier risk in supply chain management.

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