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研究課題名（和文）Analysis of Supply Chain Risk Management in the Japanese Automotive and Electronics Industries

研究課題名（英文）Analysis of Supply Chain Risk Management in the Japanese Automotive and Electronics Industries

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研究成果の概要（和文）：私たちは、自動車業界や電子機器業界の日本企業100社以上からデータを収集し分析した結果、調査対象企業におけるサプライチェーンリスクの要因を特定することができた。我々は調査結果を一般化し、日本の自動車及び電子産業におけるリスク管理の特徴を定式化するためのモデル開発を行った。
さらに、2018年にSpringerによって出版された「サプライチェーンリスク管理：先進的なツール、モデル、および開発」と題した本を編集した。それはサプライチェーンリスク管理の分野における最新の研究成果に基づいた3セクション、18章で構成されるものである。

研究成果の学術的意義や社会的意義
私たちは、自動車業界や電子機器業界の日本企業を調査して、サプライチェーン途絶の要因を特定することができた。また、サプライチェーン途絶を軽減するためのリスクマネジメント特性を定式化したモデル開発を行った。

研究成果の概要（英文）：We surveyed and analyzed the data collected from more than 100 Japanese companies in the automobile and electronics industries, and identified factors and drivers for supply chain risks in the studied companies. We generalized the findings and developed a model to formulate the characteristics of the risk management in the Japanese automobile and electronics industry.
I also edited a book entitled “Supply Chain Risk Management: Advanced Tools, Models, and Developments” which was published by Springer in 2018. It includes 18 chapters organized in three sections which address the most recent research findings in the field of supply chain risk management.

研究分野：Supply Chain Management

キーワード：Supply chain management　Risk management

１．研究開始当初の背景

Driving Research Questions: How can we develop appropriate strategies to manage supply chain risks and to mitigate disruptions caused by potential risks? Which risks have more influence on the performance of Japanese companies and their suppliers in automotive and electronic industries? How can we produce detailed scholarly analysis of the actions taken by those companies?

Our answers to these questions may enable a company to get back to its normal operations after a serious disruption such as earthquake or tsunami. Because supply chain disruptions have significant impact on firms business and financial performance. For example, the Grate East Japan Earthquake on March 11, 2011 disrupted both domestic and global supply chains. It caused a significant disruption in supply chain so that many companies and their part suppliers nationwide were unable to deliver products at expected volumes for several months. For example, it took at least three months for Toyota's supply chain to fully recover from the earthquake damage.

Before the Kaken application, with a collaboration with my co-investigator, Prof. Kainuma of Tokyo Metropolitan University, we had started research on this project and collected some data from a small sample of suppliers of only Toyota in automotive industry. We had even presented the findings in two conferences in Japan and the USA. However, we wanted to extend it more in the automobile industry as well as in electronics industry.

２．研究の目的

1) The purpose of this research is the analysis of supply chain risk management practices in the Japanese companies. A primary goal is to identify, evaluate and assess the potential sources of risks, and then to implement appropriate actions in order to mitigate the disruptions caused by supply chain risks such as natural disasters.

2) By focusing on the Japanese automotive and electronic industries, the main objective of the research is to identify the key drivers for supply chain risks in the Japanese companies and their suppliers. Moreover, it is to investigate and analyze their approaches to deal with supply chain risks (including reactive and proactive risk management), and also to investigate their approaches to prevent/mitigate the disruptions caused by potential risks.

Developing an appropriate supply chain risk model enables companies to analyze their risk sources and to formulate a suitable strategy to mitigate the effect of risk in the case of a disruption that could be caused by an internal or external risk. This help companies to return to their normal operations after a disruption in their supply chains.

３．研究の方法

The research was done in three phases. In the first phase, we focused on Japanese automotive industry, and collected the data via a survey from manufacturers and their suppliers in this industry. After collecting the data, we conducted statistical analysis including a cluster analysis. We also analyzed and evaluated their risk management, and their approaches to mitigate the disruptions caused by potential risks. In the second phase, we extended the study to the Japanese electronics industry and performed the same analysis we did for the automobile industry. In the last phase, we summarized the

research findings from the both industries and developed a model to be applicable for firms and suppliers in other industries.

In order to conduct the research, we defined seven hypotheses as follows:

H1: The current Japanese automotive industry is considering supply chain (SC) vulnerabilities.
H2A: All factors that make a supply chain efficient impact on the supply chain risk.
H2B: All factors that make a supply chain more complicated impact on the supply chain risk.
H3A: SC risks that occur internally from an enterprise are more probable to occur than external risks.
H3B: SC risks that occur externally from outside an enterprise are more influential than internal risks.
H4: Damage caused by disaster impacts on all the risks (demands uncertainty, damage of IT system, impact of globalization and supply issues of supplier)
H5: A supply issue of supplier impacts on all the risks (demands uncertainty, damage of IT system, impact of globalization and damage caused by disaster)
H6: The impact of globalization impacts on demands uncertainty and IT system malfunction
H7: Damage of IT system impacts on demands uncertainty.

We classified supply chain risks into three categories using the methodology called Probability-Impact Matrix, as depicted in Figure 1. The horizontal axis represents the probability (the occurrence probability of a supply chain risk) and the vertical axis represents the impact (the impact of a SC risk) and the values from 1 to 5 on these axes represent 5 points Likert scale. Also, the black circles, triangles and quadrilaterals represent the risks that are plotted on Probability-Impact Matrix. The circles plotted in the lightly shaded area on the left bottom can be interpreted as "risks requiring no particular action". Next, the triangles plotted in the white area are constructed as "risks a posteriori" that should be handled immediately upon occurrence. Finally, the quadrilaterals plotted in the thickly shaded area are interpreted as "risks a priori" that should be taken care of before they can occur. Using this methodology, we tried to make clear how the Japanese automotive industry acknowledged SC risks.

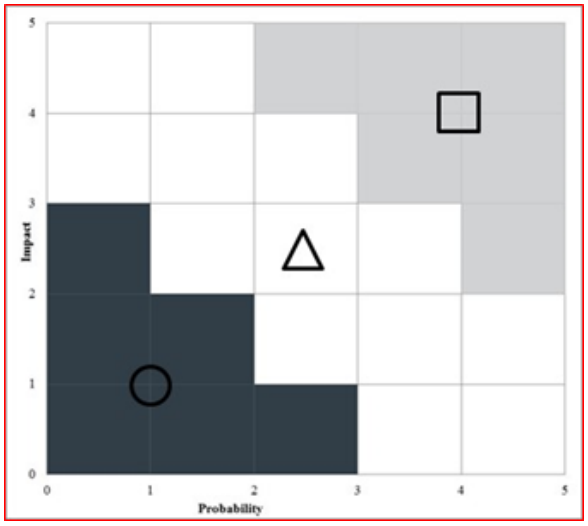

Figure 1 Probability-Impact Matrix

４．研究成果

A main findings of the research is to discover the fact that supply chain vulnerabilities and the impact of supply chain risks are recognized in the Japanese automotive industry, but the level of recognition of the occurrence probability of supply chain risks differ from an enterprise to another. Figure 2 shows the outcome of plotting the 19 risk items onto Probability-Impact Matrix.

Also, some enterprises believe that there is almost no occurrence probability of a supply chain risk, so we assumed that some enterprises placed too much confidence in their supply chains. Therefore, it is necessary for the Japanese automotive industry to be fully aware of supply chain risks and give a clear guideline which risks should be taken care of a priori or a posteriori.

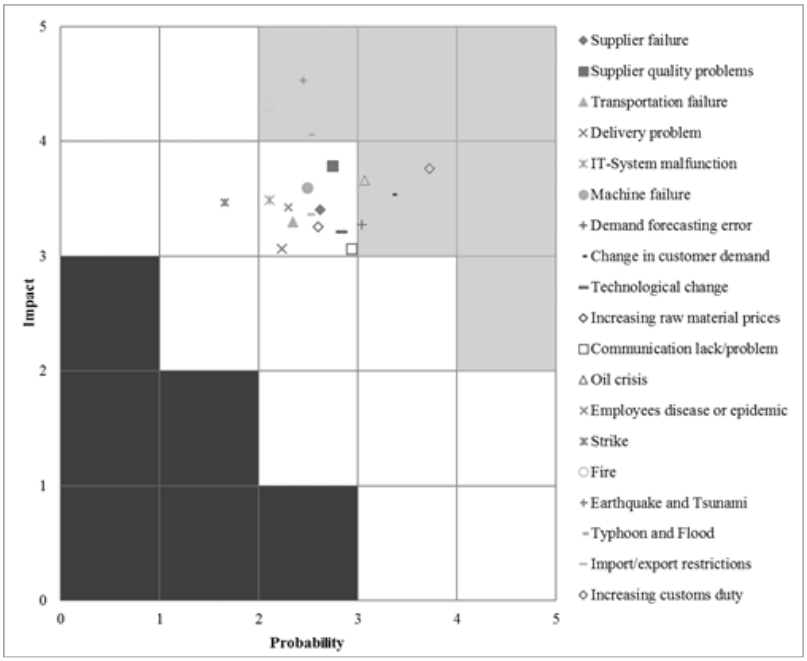

Figure 2 Results: Probability-Impact Matrix

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〔図書〕（計 4 件）

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６．研究組織

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