Supply Chain Risk Management: A Case Study of Military Airplane Components

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Abstract

Recently in the competitive and uncertain business environment, organizations face increasing different kinds of supply chain risks. Literature shows that managing supply risks is increasingly challenging, because sources of supply chain risks are various and some of them may be even hardly to assess in terms of the probability and severity. However, supply chain risk management is a relatively new and unexplored area of management researches, so limited amount of studies has been conducted. As such, our first research purpose is to review prior studies, providing a conceptual framework for our study and further investigations. Moreover, most researches are typically focused on the business supply chains. As the military organization is mission-oriented, existing evidence may be not suitable for us to extend works into assessing military supply risks. Therefore, a research gap exists in supply chain risk management and military organization. Our second objective aims to discuss supply risk-related issues in military, particularly focusing on the supply chain of military airplane components. Due to the exploratory nature of the research, a case study method would be an appropriate

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method, providing depth insights into a little known phenomenon. We have two contributions as follows: (1) we review the prior studies and organize the key concepts of supply chain risks and supply chain risk management, providing a research basis for further investigations and (2) we use the case study information to identify the hierarchic formation of risk categories, sources, and their effects in supply chain of military airplane components.

Keywords: supply chain risks, military supply chains, sources, effects, military airplane components
1. INTRODUCTION

In today’s increasingly uncertain and competitive environment, supply chains are exposed to different kinds of risks (Harland et al., 2003) and thus managing supply risks is necessary but challenging for most organizations. Consequently, a great deal of interest has been shown in issues relevant to supply risks and supply chain risk management (Cavinato, 2004; Christopher and Lee, 2004; Hallikas et al., 2002; Harland et al., 2003; Peck, 2005; Zsidisin, 2003a and 2003b; Zsidisin et al., 2004), providing many useful managerial suggestions. But a study on supply chain risks is a relatively new and unexplored research area compared to other management domains (Ojala and Hallikas, 2006; Peck, 2005), this calls for more research efforts in this research area. The first research objective in this paper is to review definitions, categories, sources and their effects of supply chain risks based on the existing findings. This provides a research framework for our study and is beneficial for further researches.

Risks appear not only in business supply chains but also in non-commercial supply chains such as military logistics. The purpose of armed forces is not for profit-making but for mission-achieving; the profit/non-profit organizations, however, may appear different focuses on risk knowledge and management. Thus, to study risk management in military supply chains appear is definitely valuable, as risks in military may cause severe damages on national defense and mitigating risks is a very essential task for armed forces.

However, most existing literature still focuses on the business supply chains; currently there is limited evidence focused on armed forces. For example, in the study by Neumann et al. (2004), the primary focus is for Department of Defense in US to examine risks associated with foreign software suppliers and to determine how to manage these risks. Moreover, some studies use military manufacturing firms as cases to discuss relevant supply chain risk issues (e.g., Peck, 2005; Zsidisin, 2003; Zsidisin et al., 2004). In spite of that, there is a research gap existing between supply chain risks and armed forces. The second purpose of this paper aims to investigate sources and effects of supply chain risks as well as their relationships in supply chain of military airplane components.
To achieve the two research objectives, we therefore use a mixed-method approach: extensive literature review and an in-depth exploratory case study of a supply chain engaged in the support of military airplane components. By doing so, it thereby answers the following research questions: (1) what are definitions of supply risk and supply chain risk; (2) how risks are categorized based on prior researches; (3) what sources of supply risks are in general situations; (4) what effects result from drivers of supply risks; and (5) how to identify the hierarchic levels of risk categories, sources and effects in military supply chain.

This paper is organized in six sections. First, research motivations, purposes and questions are introduced. The next section reviews supply chain risk and their related literatures. Then, we give brief descriptions to our methodology. Fourthly, we present the case background on the maintenance and supply systems of fighter jets. The paper provides the discussion based on the case study data in Section 5, and conclusions and implications for future research and practice in Section 6.

2. THEORETICAL BACKGROUND

2.1 Definitions of supply risk and supply chain risk

According to the definition of risk provided by Mitchell (1995), risk is defined by the two key concepts: probability of loss and significance of loss. In Zsidisin (2003a) research, supply risk has been defined as “the potential occurrence of an incident associated with inbound supply from individual supplier failures or the supply market, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety”, in which two key elements are discussed: probability of loss and effect of outcome. Bogataj and Bogataj (2007) define supply chain risk as “the potential variation of outcomes that influence the decrease of value added at any activity cell in a chain, where the outcome is described by the volume and quality of goods in any location and time in a supply chain flow”. Supply chain risk is indeed defined by a broader way and is evaluated by many perspectives: supply, process, demand, control, and environment. However, in Bogataj and Bogataj (2007) study, the focus of examining risk is the probability of risk and severity of consequence. Here, risk, supply risk and supply chain risk are defined and assessed by the same manner.
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Little evidence provides the formal definitions of supply risk and supply chain risk, mostly; researchers discuss supply risk in terms of managerial characteristics and perceptions. For example, Harland et al. (2003) summarize eleven risk types and Cavinato (2004) identifies five categories of risk. In sum, the definitions of supply risk and supply chain risk depend very much on the scope of vulnerability and the effect regarding to its potential consequence; they also depend on the managerial perceptions of each specific organization.

As for supply chain risk management, Norrman and Jansson (2004) provide definition, “supply chain risk management is to collaborate with partners in a supply chain apply risk management process tools to deal with risks and uncertainties caused by, or impacting on, logistics related activities or resources”. Supply chain risk management is thus about risk management as it executes its strategies with supply chain partners to mitigate effects of outcomes.

After reviewing literature, probability of vulnerability and their potential consequences are clearly key elements when discussing definitions of supply chain risk. However, with different supply chain contexts, the definitions may not be the same focused. In this study we focus on the supply chain of military airplane components; we propose our working definition of supply chain risk as follows, “Supply chain risk is any potential unexpected and unpredictable disruption related to supply chain of military airplane components which, if they were happened, might bring about a seriously damaging or potential loss to the maintenance operations and duty achievement in military.”

2.2 Categories of supply chain risk

Supply chain risk can be divided into different types according to its impact on the organization and business environment (Bogataj and Bogataj, 2007; Cavinato, 2004; Harland et al., 2003; Zsidisin et al., 2004); it can also be organized with respect to the levels of risk sources (Norrman and Jansson, 2004; Peck, 2005). Thus, literature shows risk comes in many different forms. Drawing upon the prior studies, we summarize and combine various authors’ work as follows,

- **Operational risk**: it’s the risk associated with a firm’s ability to deal with
production and/or inventory and/or storage and/or distribution control (Bogataj and Bogataj, 2007; Cavinato, 2004; Harland et al., 2003; Norrman and Jansson, 2004; Peck, 2005; Zsidisin et al., 2004).

- **Financial risk**: it’s the risk which can affect a firm’s flows of cash and settlements of assets (Cavinato, 2004; Harland et al., 2003; Peck, 2005).

- **Supply/demand risk**: it’s the risk of inward/outward flows of goods or resources which affects a firm’s operation function (Bogataj and Bogataj, 2007; Harland et al., 2003).

- **Reputation risk**: it’s the risk of eroding a firm’s value of whole business (Harland et al., 2003; Zsidisin et al., 2004).

- **Information risk**: it’s the risk associated with hardware system and ability to capture, process and use the data (Cavinato, 2004; Norrman and Jansson, 2004).

- **Relationship risk**: it’s the risk of damaging to the appropriate linkage between/among a supplier, the focal firm, and a customer (Cavinato, 2004; Harland et al., 2003; Norrman and Jansson, 2004; Peck, 2005; Zsidisin et al., 2004).

- **Environmental risk**: it’s the external risk such as infrastructure, regulation, legislation, market competition, innovation, and strategy implementation (Bogataj and Bogataj, 2007; Harland et al., 2003; Norrman and Jansson, 2004; Peck, 2005; Zsidisin et al., 2004).

2.3 Sources and outcomes of supply chain risk

Mostly, the sources and categories of risks are discussed in the same manner. Thus, when assessing risk, the manager may identify the sources of supply chain risk in terms of its categories. Additionally, the sources of supply chain risk can be conceptualized a specific factor, vulnerability or event. Zsidisin (2003b) provides a summary of item, market, and supplier risks with the specific instances when such risk is perceived. That is, the sources of supply chain risk may be broadly examined in terms of its types or related to specific incident and damage.
Drawing upon the literature, understanding and evaluating effects of outcomes is an important issue needed to be discussed. Below, we review the various outcomes of risk on the current literature. Based on case studies, Zsidisin (2003a) suggests the two outcomes: inability to meet customer requirements and threats to customer life and safety. Reviewing the various studies, there are six types of loss in Harland et al. (2003) paper: financial, performance, physical, psychological, social, and time. Christopher and Lee (2004) provide some examples of how lack and/or low of supply chain confidence may creates risk; these outcomes are sales, customer service, operations, marketing, and raw material supplier.

Overall, some of the many ways in which risk categories, sources, and outcomes are identified in supply chain context are in a similar fraction. Hence, the researcher may observe and define the risk corresponding to the focus and specific nature of the organization. The most important issue in viewing the supply chain risk, however, is to understand the characteristics of risk, its probability of occurrence, and severity of consequence, which provides execute professionals a basis understanding of managing the risks (Zsidisin, 2003b).

3. METHODOLOGY

3.1 Extensive literature review

Ojala and Hallikas (2006) think supply risk-related research is still a fairly new and research findings are relatively scarce. Thus, an extensive literature review is helpful in developing a framework for understanding the supply risks and supply risk management in military, and is beneficial to further investigations.

3.2 Case study method

There are two reasons for us to use the case study as our second research technique. First, the focus of this research was supply risks and their related issues in military supply chains, but most literature has primarily focused on the business organizations (e.g. Norrman and Jansson, 2004; Zsidisin, 2003a; Zsidisin et al., 2004). That is, not so much evidence provides insights in military supply chains. Besides, as the security issue is important for military organization, the existing evidence focused on armed forces is relatively scarce. Therefore, a case study is
employed as it is a desirable methodological choice that provides depth and insight into a little known phenomenon (Ellram, 1996).

Secondly, a case study methodology is preferred in examining contemporary events and in answering “how” or “why” research questions (Yin, 2003). In this paper, we intended to find out why supply risk management is essential for an organization and what the supply risks and effects are. Additionally, we wanted to show how supply risks are assessed and identified by the hierarchic levels of risk categories, sources and effects in the supply chain of military airplane components. As such, the second research technique used in this paper is the case study.

3.3 Design of case study protocol

The case study research design also needs to pay attention to the reliability and validity. According to Ellram (1996) and Yin (2003), a case study protocol development is a major key to case study reliability. Another objective of the protocol is intended to guide the researcher in carrying out the data collection from a single-case study (Yin, 2003). Consequently, we will develop our case study protocol which is used to increase the research reliability and used as a procedure guideline for our research. After referring to information in Yin (2003) example, reviewing previous researches and considering our research goals, our case study protocol is developed, including the three parts: an overview of the case study, field procedures, and case study questions.

Below there are brief descriptions to field procedures of our study. We first identify the sample selection. There are many kinds of supply chains in military. Here, we only focus on the component supply chain of combat plane. Furthermore, given the security consideration and cooperation willingness, there is only one single case site was selected in this study.

Next, based on previous researches and a review of documents in military, we develop the interview guide and questions prior to formal case interview. Then, the pilot case study, supported by two academic and executive professionals, is conducted to ensure that the research procedure is appropriate and the questions are relevant to the research purposes. Our interview questions include eight
unstructured questions, nine semi-structured questions and nine structured questions; opened questions are beneficial to gather new information and avoid researcher biases (Eisenhardt, 1989).

The third part of field procedures is collecting evidence. No single data source has complete advantage over the others and a good case study will want to use as many sources as possible (Yin, 2003). We therefore use the following sources to ensure that information was gathered from a wider perspective: documents, archival records, interviews and focus groups. The aim of collection data from multiple sources is expected to have convergence effect of evidence and achieve data triangulation, providing a strong advantage on an increase of validity and reliability (Eisenhardt, 1989; Yin, 2003). The interviews were conducted with two senior managers, and the focus group was conducted with a broad level of individuals ranging from two minor managers, one line manager, to ten employees. To view the case from the different perspectives, we visited to case study site in teams. This tactic allows us to achieve the convergence of observations and enhance confidence in the research results from multiple investigators (Eisenhardt, 1989).

4. BACKGROUND ON THE SUPPLY CHAIN OF MILITARY AIRPLANE COMPONENTS

4.1 Introduction to military logistics

In this section, we firstly review literature on definitions of military logistics. Prebilić (2006) provides the definition of military logistics as “a group of different activities that systematically, wholly, and continually support the needs of the defense-military system.” Thus, we can observe two interesting phenomena between military and business supply chains. First, they have different organization objectives: one is to support defense capabilities and the later one is to maximize the firm’s economical profit. Thus, the mission of military organization is the key view for observing and assessing the supply chain risks. Second, the same as the commercial supply chain, there are various sub-systems in military logistics system, which are treated as an independent system or a dependent system. However, each of them may cooperate with each other to achieve the objective or independently
support one specific duty. Here, supply chain risks between business and military supply chains may appear the same characteristics and scopes.

Additionally, according to Prebilič (2006), the term “supply” is used for smaller formations and the term “logistics” represents a much broader meaning. Logistics is, therefore, as a special term that is usually used in military organization rather than business areas. However, Dumond et al. (2001) suggest that logistics system can be recognized as an operational process that is a supply chain on business context. Thus, this paper will ignore the point of view from Prebilič (2006) and alternatively use the term “military supply chain” in the following discussion.

As we noted above, the basic objective of military supply chain is to support national defense capabilities; thus, there are numerous sub-systems involved in military to achieve its mission. Specifically, this paper focuses on the supply chain of military airplane component which scope is to support the maintenance comprehensively. Lee (1997) suggests that the main purpose of the military supply system is to provide any material/component on right time, right place, right quality, and right quantity. These goods and resources flows include raw material, component (repaired or new), machine (repaired or new) etc.. As such, we will not systematically discuss the supply chain of military airplane components without understanding the operations and the processes in the maintenance system. It is because, from a systematic point of view, only cooperation between maintenance system and supply system may lead to high combat forces performance. Next, we will briefly introduce the maintenance system and supply system.

4.2 Maintenance system of combat plane

The maintenance system of combat plane is divided into three levels: organization level (O), intermediate level (I), and depot or producer-supplier level (D) (Lee, 1997; Supply Handbook of Air Command Headquarters, MoND). The each level of this maintenance system has its basic and unique functions that are viewed as follows and the diagram of this system is shown as Figure 1.

- **Organization level (O):** the armed units in this level execute the basic and simple maintenance duty. Its main aim of O-level is to restore the
disruption in the combat war or daily operation. Due to less appropriate technology and facilities, they are authorized to pass some works into the higher level, intermediate level (I).

- **Intermediate level (I):** the units in this level however are responsible for more complicated repairing or examining duty. The first objective of intermediate level is to assist units in O-level to maintain its maintenance amount and accomplish its operational duty. The second purpose is to be a buffer between units of O-level and D-level. The units in I-level support the works from downstream level and; on the other hand, they also enable to transfer the some components/modules to upstream level if they don’t have such maintenance capability and facilities.

- **Depot level (D):** the armed units in this level are to support maintenance and repair policies comprehensively. Compared to other two levels, they have much more authority and responsibility, which are beneficial for improving the maintenance system effectively and efficiently as well as preventing the potential breakdown of the maintenance system. However, if the severity of the broken components/modules is beyond the control, D-level may choose to either send the broken modules back to the supplier or request the new purchase.

![Figure 1 The three levels (O-I-D) in the maintenance system](image-url)
4.3 Supply system of combat plane

After reviewing internal documents, archival records and Supply Handbook of Air Command Headquarter (MoND), the Figure 2 is used to describe the details of supply process in the supply system. There are four key units in this supply chain of military airplane components: operational armed units, evaluation armed units, Combined Logistics Command and foreign suppliers.

Generally, the supply process of material/component can be divided into the two sub-processes regarding to amount of inventory in storage. First, when there is no inventory in military, information flow will pass through from operational units, to evaluation units, and then to Combined Logistics Command. Combined Logistics Command, as a link between foreign suppliers and the armed forces, will follow acquisition policy to place the new procurement. When receiving material/component, the goods will be shipped from Combined Logistics Command back to operational armed units.

The second sub-process depends on the amounts of the existing storage in either evaluation armed units or Combined Logistics Command. When the operational armed units express their demand to higher level of armed units, they will support the downstream demand under the situation with inventory in storage. Or the requested information is instead transited to Combined Logistics Command which will fulfill supply requests when they have inventory in storage.
5. RESULTS AND DISCUSSION

In this study, we use the hierarchy form like Figure 3 to present the finding in a synthesis manner. We must note that we try to present the interview information with this simple hierarchy diagram, but in practice, their relationships and interactions must be more complex beyond the linear relationships as the risk sources are not mutual exclusive. Besides, from senior managers’ and employees’ points, the result findings, however, may not be similar, but we intend to provide a synthesis discussion of the interviewed data. The results and discussions are included into the following sub-sections.

5.1 Operational risk

In this paper, the operation risk is the risk associated with a firm’s ability to deal with production and/or inventory and/or storage and/or distribution control. All the interviewees identify operational risk as a key risk as it influences duty-achievement related to inventory, distribution and storage fields.
Based on the data, the operational risk appears relatively high because of the following five situations. Firstly, as the logistical processes and procedures in military are very complex and time-consuming, there are delay effects on inventory and distribution. Moreover, the informants believe operational risk currently is being amplified by organizational reengineering. Now, the new organization, Combined Logistics Command, exercises control over the whole logistics system, including Army, Navy, and Air Force. Once the requested application is transited into Combined Logistics Command and it thus leads to long cycle time. Thirdly, external sources such as government acquisition regulations and defense budget sometimes cause operational risk. The fourth situation is that the suppliers who support the specific type of combat fighter are very limited. According to Chopra and Sodhi (2004), dependency on a single source of supply increase disruptions, error forecast, and/or damages on receivables. Therefore, such a condition in Air Force indeed produces the higher likelihood of operational risk. Finally, the inappropriate storage facility and local weather conditions are also the key drivers that produce sever impacts on the quality of material/component, which directly or indirectly influences the maintenance performance.
5.2 Supply/demand risk

Supply/demand risk is another risk based on the interview data. Supply/demand risk is the risk of inward/outward flows of goods or resources which affects a firm’s operation function. The informants think that the quality of the repaired component/module, which is executed in the military maintenance system or contracted maintenance companies, is the source of supply/demand risk. Because of poor quality, the supply flow may be disrupted and it results in performance-related consequence. Some employees suggest that limited maintenance capacity is a driver that causes the poor quality, and it is quite damaging to defense duty.

Moreover, the sources of poor quality of goods include not only maintenance systems but also the suppliers. The employees mention that sometimes key component or raw material procured from foreign/local supplier is poor quality. More badly, such a situation has not been found till the component is distributed to the maintenance system, as the poor quality is not identified without qualified maintenance professionals. Another issue from suppliers is that sometimes goods will not be distributed with right quantity and right time. These events increase the likelihood of performance and time losses. Disruptions to material flow can be frequent or infrequent; and damages for the affected duties are ranging from minor to serious.

Overall, just as Bogataj and Bogataj (2007) indicate that the outcomes of supply chain risks come to volume and quality of goods and time in a supply chain flow. We can see here quality management, repairing capacity, and suppliers cause supply/demand risk, poor performance and time loss.

5.3 Information risk

The operational definition of information risk refers the risk associated with hardware system and ability to capture, process and use the data. The key drivers of information risk identified by the managers are information infrastructure and communication channel. According to Zsidisin (2003b), incompatible information
system is an essential reason for managers to perceive high supply risk. Indeed, incompatible information system in military indirectly results in supply/demand risk. For example, the poor quality of some key component/module is identified by qualified maintenance professionals till this component is ready to be used. At this time, the maintenance employees must request another order for the required component, and it results in the delays in duty achievements. One manager believed higher rate of material/component obsolescence could be decreased at the very beginning point of supply process, if there is an appropriate information linkage between the supply and maintenance systems.

The drivers of information risk provided by the employees are information infrastructure and employees’ capability. The respondents mentioned that employees’ capability to transfer timely, accurate and relevant information could cause risks for supply and maintenance systems. Chopra and Sodhi (2004) believe information distortion is the driver of system and forecast risks, thus keeping an eye on information accuracy, visibility, and accessibility is one of few ways that is beneficial to breaking the risk spiral (Christopher and Lee, 2004).

5.4 Environmental risk

Environmental risks are the external risks of environmental influences such as infrastructure, regulation, legislation, market competition, innovation, strategy implementation. All the respondents conclude that currently there are numerous environmental risks: dynamics of political environment and defense policy, limited defense budget, and organizational reengineering.

Compared to other above risks, the environment risks are assumed to cause the most serious impact on the whole military organization, because disruptions at environmental level are likely to be beyond the direct control of supply chain managers and business strategies (Peck, 2005). The political environment and defense policy may directly influence the defense budget plan and indirectly contribute to the need for organizational reengineering. Drawing upon the manuscript of interview data, the environment risk affects the following aspects: operational performance, physical flows, human resource management, time, and even financial performance (e.g. exchange rate in the contracted period). The more
uncertain the defense policy is, the greater the threat that environment risk can cause failure everywhere in the armed forces.

6. SUGGESTIONS AND CONCLUSIONS

The purposes of this study are to provide a summary of prior studies of what definitions, categories, sources and effects related to supply chain risk, and to provide case study information to fulfill a research gap existing between supply chain risks and armed forces. Reviewing literature is beneficial for better understanding supply chain risk issues and providing more organized information for our paper and further studies. Research results based on the case study method reveal a fact that supply chain risk in military is recognized as an important issue needed to be understood and managed. Moreover, by examining existing conditions in maintenance and supply systems, we also find out four risk categories, thirteen causal variables, and their effects in the military supply chain. In practice, relationships and interactions between various supply chain risks must be more complex and are beyond the linear relationship, but to present their relationship briefly, we use the hierarchy form as Figure 3 to summarize our findings.

As mentioned, armed forces are not profit-oriented companies; the main responsibility of military leaders is to fulfill the military targets, which is supported by a good logistics system without any unpredictable disruption and potential loss to the maintenance operation. Thus, traditionally, the trade-off between the risk and the cost of mitigation mostly becomes very easy for decision-makers. When supply threats appear, the priority for military leaders is to mitigate damages immediately without considering cost of risk reduction. Today, because of the decreasingly amount of defense budget, Ministry of National Defense (MoND) starts to pay attentions on the allocation of defense budget and intends to promote efficiency of logistics by supply chain-related approaches. As a result, the research findings not only provide a basis for policy-maker in military to understand the current risks and their effects, but also allow military leaders to think about improvements by risk-related management approaches.

However, Chopra and Sodhi (2004) suggest that when applying risk management into the business supply chains, managers should keep an eye on
balancing the risk/reward relationship. Thus, lessons from both existing evidence focused on business supply chains and our findings are valuable for military decision-makers not only to understand the supply chain risk-related issues, but also to learn how to leverage risk and rewards. In addition, even though this study considers the research subject of military combat fighter, the research findings also can be used to examine airplane component market as a whole.

The nature of this study is exploratory and preliminary, there are many research problems needed to be improved. One of them is that this study needs more insight information, which is beneficial for generalizing the results into risk management. Either choosing more cases or considering survey is a good way to collect more data. Defense security consideration, however, is a research obstacle when executing military researches. To overcome such a problem, we suggest the mathematical model as another research opportunity. Besides, conducting a longitudinal research to understand this issue from a long-term view is another way to provide further insights.
REFERENCE


供應鏈風險管理：軍機零組件之個案研究

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摘要

在日益競爭與不確定的企業環境下，組織面臨多種不同的風險因素，而且某些風險來源甚至很難用可能性與嚴重性來衡量，因此越顯風險管理的重要與挑戰性。由於供應鏈風險管理是個較新的研究領域，相關的文獻與研究結果較少。因而本研究的第一個目的即是透過文獻研討來發展一個本研究及未來研究所需的研究架構。再者，因為多數文獻仍就著重於企業供應鏈，而非其他非商業組織如軍事單位，所以供應鏈風險管理與軍事組織之間仍有很大的研究發展空間。因此本研究的第二個目標即是以個案研究法來討論國軍供應鏈風險管理的議題，且特別聚焦於軍機零組件之供應鍊。本研究有以下兩個研究貢獻：（1）廣泛性的研究探討補給風險與供應鍊風險的定義、來源及其相關影響與後果，提供後續研究較完整的文獻參考；（2）透過軍機零組件供應鍊個案來了解國軍供應鍊風險管理議題，並以層級結構圖顯示該供應鍊所面臨的風險類別、來源與影響結果。

關鍵字：供應鍊風險、國軍供應鍊、來源、影響後果、軍機零組件

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