

A Study on Risk Management for Export Control on Strategic Trade in Supply Chain Management

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Abstract : In this study, AHP analysis was conducted through a survey that was organized by 9 job categories. The results show that sustainable operation risks have the highest priority level among all criteria with management interest having the highest priority level within sustainable operation risks related attributes. The most important risk attributes among stakeholder risks appeared to be asset security and cargo and conveyance security, with education and training being the most important among regulatory risks. Effective management and response to the risks from export controls on strategic trade require an understanding of supply chain security and compliance programs, effective training programs, investments for development of security systems that meet international standards. In addition, the government needs to focus on developing professionals and providing support for companies with compliance programs, working closely with businesses.

Key Words : AHP(Analytic Hierarchy Process), SCRM(Supply Chain Risk Management), Export Control on Strategic Trade, CP(Compliance Program), SCS(Supply Chain Security)

1. Introduction

In the increasingly globalized world, supply chains are becoming ever more complex and different interests are becoming ever more interconnected along all facets of supply chains. As the stakes are getting higher to protect these interests, governments around the world are adopting Supply Chain Security (SCS) to prevent loss of life and property damages in terrorist attacks and other security vulnerabilities.

In particular, developed countries like the U.S. have increased the enforcements of export controls on strategic items since the terrorist attacks on September 11, 2001. After Resolution 1540 was adopted by the UN Security Council Committee in September, 2004, export control was expanded from simply targeting state sponsors of terrorism and countries that proliferated Weapons of Mass Destruction (WMD) to including individual terrorists and terrorist groups as well as exports, re-exports, transfers, financial support, end users, and intangible transfer of technology (ITT) of strategic items. Each participating country is also requiring enforcements for the newly

adopted export control laws and regulations.

As supply chains become increasingly complex and interconnected, conflicting interests among different groups give rise to terrorist attacks, provocations of war, nuclear proliferation and other risks threatening the international community. The impacts that these threats can have on all facets of international community are getting stronger than ever, potentially creating new trade barriers.

While countries are placing greater emphasis on national security as a result, there seems to be a lack of interest and research on risk management at the business level for export controls on strategic trade for supply chains. As will be shown throughout this study, the importance of understanding export controls and managing related risks will continue to grow for businesses as management, supervisors and team leaders at all levels make decisions faced with uncertainties.

Therefore, the purpose of this study is to identify relevant risks by category and provide helpful recommendations in order to assist with policy making at both business and national levels. In understanding export controls on strategic items, a more holistic approach of

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considering politics, economy, stakeholders, regulations, security and all other related factors will be taken, instead of merely looking at supply and demand of strategic items.

2. Theoretical Backgrounds and Previous Studies

2.1 Theoretical Backgrounds

The term 'strategic item' refers to materials, software and technologies that can be used to develop WMD, conventional weapons and missiles which are used to transport them.¹⁾ These are divided into two categories: 'strategic items' and 'catch-all items'. The former refers to items that are designated and announced as export control items and the latter refers to dual-use items that have a high likelihood of being used for the manufacturing, development, deployment, and storage of WMD and the missiles that can be used to transport them²⁾.

Export Controls of strategic items is designed to restrict the trade of strategic items through export license and other means, thus preventing the use of these items from becoming a threat to international peace and security. Such international nonproliferation systems consist of multiple levels. At the first level are international nonproliferation treaties include the Nuclear Nonproliferation Treaty (NPT), the Biological Weapons Convention (BWC), the Chemical Weapons Convention (CWC), and the Convention on Certain Conventional Weapons (CCW). At the second level, multilateral export control systems on strategic trade include the Nuclear Supply Group (NSG), the Zangger Committee (ZC), the Wassenaar Agreement (WA), the Australia Group (AG), and the Missile Technology Control Regime (MTCR). Finally, there are Resolution #1540 by the UN Security Council, the WMD Proliferation Security Initiative (PSI), and the export control system on strategic trade used by the U.S. government to control American products.

In addition, because a majority of corporations in the developed countries consider export compliance of strategic items to be a corporate social responsibility for achieving international peace and security, they are proactively establishing internal compliance programs as a preventive measure to forestall any tangible or intangible damage, such as financial loss or negative public image that could arise from failure to comply with regulations.

As businesses are increasingly participating in internal compliance programs, voluntary compliance and efficiency of execution from doing so are becoming more commonplace. Because compliance programs provide businesses with more autonomy and are more effective in managing compliance efficiently, the importance of Compliance Programs (CP)³⁾ as an alternative to export licenses issued by each government is growing. Adding to this, adoption of the Catch-All system requiring exporters to verify the end use and end user of the dual-use items further necessitates the need for compliance programs by each of the exporting businesses⁴⁾.

The Supply Chain Security (SCS) is becoming established as a global mega trend, strengthening security measures along the entire supply chain since becoming enforced for national security reasons after the 9/11 attacks. The SCS is designed to systematically eliminate any risk that can be caused by illegal cargo while ensuring safety of people, property and other assets. However, there are negative views on the SCS as opponents claim that building and maintaining the SCS add to the higher costs while creating new trade barriers and distorting the trade relations.

Ensuring supply chain security has emerged as a key factor in protecting national security and achieving national competitiveness in logistics. Moreover, security management systems and certifications for supply chain that can simplify customs clearance procedures on low-risk items and enforce stringent control on high-risk items are becoming more widespread.

1) Korea Strategic Trade Institute (2009), "Compliance Guidance for Strategic Trade", Korea Strategic Trade Institute website publication, p.11

2) Oh, Hyunseok and Yang, Jeongho(2009), "A Study on Export Control on Strategic Trade Status and Vision", Korean Research Institute of International Commerce and Law Publication Vol.42, pp. 311

3) Compliance Program (CP) is a program capable of managing internal compliance, strategic item ruling and making decisions to stop exports on possible violations, independent of sales departments with a purpose of getting export licensing through close collaboration with government agencies.

4) Lee, Haknoh, Choi, Seunghwan, Lee, Gwangmin, Hwang, Yonggun, and Paek, Gwanyong(2011), "A Study of Planning the Strategic Trade Management Paradigm that Meets 1 Trillion Trade Era", Donggook University, Final Report from Ministry of Knowledgeable Economy, pp. 18-22.

2.2 Understanding Previous Studies

While The Korea Strategic Trade Institute (2009) defined strategic items as recognized in the above 2.1 Theoretical backgrounds, Oh, Hyunseok and Yang, Jeongho (2009) viewed that Catch-All items, under which dual-use items and the items that are covered by multilateral export control regimes fall in, were to be added to Strategic Items. Lee, Gihee (2006) saw that strategic items included not only munitions, but also dual-use items that are used in everyday lives for improving quality of life as well.

As for strategic trade control regimes, the Korea Strategic Trade Institute (2009) saw them as a restrictive mechanism as described in the above 2.1 Theoretical backgrounds. Jeon, Bongeun (2005) considered the international nonproliferation regime to be a multi-layered structure.

Lee, Haknoh et al. (2011) emphasize the need for preparation for regulatory and business operational changes as they determine that an increasing number of exports from South Korea will soon become subject to export control for strategic items given the advanced technologies and accumulated knowledge that South Korean exports are based on.

According to the Strategic Item Control Status Report by Lee, Heeyong, et al., the level of compliance and enforcement of export control in South Korea is similar to that of Cuba and China, and as a result, South Korea is likely to face regulatory setbacks including penalties and exports restrictions abroad while experiencing difficulties in adopting advanced technologies from countries concerned about consequences of possible incompliance.

Lee, Seokgi (2006) emphasized the importance of adopting corporation certification standards and discussed the possibility of national and international standardization of customs/customs clearance through the introduction of C-TPAT in the U.S. and AEO in the EU. Lee, Sangjin et al. (2006) recommended a system that obligates exporters to manage compliance.

In regards to Compliance Programs (CP), Lee, Chungbae et al., (2011) suggest that participation in CP presents businesses with new opportunities to build a credible corporate image, Furthermore, Kim, Hyunji (2008) and the Korea Strategic Trade Institute (2009) argue that compliance is within the domain of corporate social responsibility to contribute to sustaining international peace.

Table 1 Summarized Previous Studies by Categories

Categories	Contents
Definition of Strategic Item	<ul style="list-style-type: none"> ○ Korea Strategic Trade Institute: WMD + conventional weapons + transportation tools + software + technologies ○ Oh, Hyunseok, Yang, Jeongho: strategic items + catch-all ○ Lee, Gihee: munitions + dual-use
Control System on Strategic Item	<ul style="list-style-type: none"> ○ Korea Strategic Trade Institute: Export control system on strategic items to prevent applications that can threaten international peace and security ○ Jeon, Bongeun: Multi-layered structure of international nonproliferation regime
Export Control Trends	<ul style="list-style-type: none"> ○ Lee, Haknoh, et al: Trend of continuous expansion, enforcement and emphasis on legal and corporate preparation ○ Lee, Heeyong, et al: Enforcement and compliance programs for export control are yet to be well established in South Korea. Concerns about export constraints and other regulatory challenges ahead
Corporate Certification	<ul style="list-style-type: none"> ○ Lee, Seokgi: Emphasis on the importance of adopting corporate certification system. Introduces the possibility of the standardization of customs clearance procedures ○ Lee, Sangjin and other: Recommends that exporter be responsible for managing end uses and end-users for exports
Compliance Program	<ul style="list-style-type: none"> ○ Lee, Chungbae and other: Emphasis on the importance of participation in compliance programs to trade with firms in the developed countries ○ Kim, Hyunji, Korea Strategic Trade Institute: One of the corporate social responsibilities and calls for a change in perspective to recognize it as a new international order
Supply Chain Security	<ul style="list-style-type: none"> ○ J. Martens: Emphasis on preventive measures and management support based on the perceived effect that security management customs have on supply chain security.

J. Martens (2011) analyzed the perceived effect that security management customs have on supply chain security. His survey, which targeted logistics professionals, revealed that preventive measures are more effective than corrective measures while management support and sufficient access to resources play a greater role than other factors on supply chain security.

In summary, existing research papers on export control for strategic trade tend to only have a theoretical focus, consisting primarily of literary studies and some surveys from those in academics and other related experts. While they have helped emphasize the importance of the field academically, there is still room for studies that produce more practical insights for daily business operations in the real world. Therefore, this paper seeks to supplement previous studies by providing policy implications through taking a more practical approach that takes into account various environmental factors for corporations.

3. Methods

3.1 Selecting Study Methods

This study uses empirical analysis based on Analytic Hierarchy Process (AHP) for survey analytics. Nine classifications were used to categorize the survey respondents in accordance with AEO company classification standards: exporters, importers, customs brokers, airlines, shipping companies, freight forwarders, bonded area operators, bonded carriers, and foreign suppliers. The AHP method allows for evaluation of multiple selections and alternative solutions as well as qualitative analysis. Due to its advantages, the method was used on survey results based on experts' subjective and qualitative views to generate an analysis of the hierarchical structure of risk management of export controls on strategic trade in supply chains. Also, brainstorming, hierarchic design, weight determination, consistency validation, grade measurement and sensitivity analysis were carried out through pairwise comparison between each element in order to give confidence to decision-makers in their choices and outcomes.

3.2 Hierarchy Design

The Analytic Hierarchy Process (AHP) involves three steps that include setting a goal, making criteria and coming up with alternatives to a problem. This study also consists of three hierarchical steps as shown in Fig 1, for analyzing risk management in strategic trade export controls on supply chain. As a first step, the goal was set to evaluating priority levels of corporate risk management for strategic trade export control, among other risk managements for corporate sustainability.

In setting criteria for evaluating effective risk management as a second step, risks were divided into three large categories: sustainable operation risks, for internal risks and stakeholder risks and regulatory risks, for external risks. In the final step, attributes were designed for each criteria set from the second step.

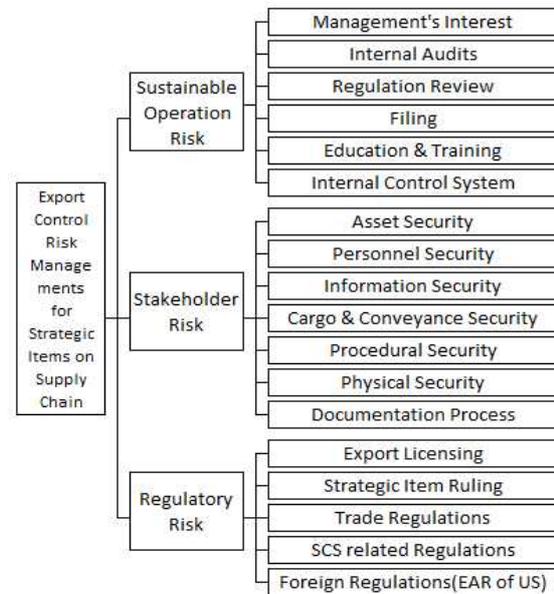


Fig. 1 Risk Management Hierarchy

As a result, 18 assessment attributes were derived based on assessment items of ISO 28000, AEO, and interviews with professionals. Eight categories from security manuals related to ISO 28000 security risk assessments were used to make up the 18 assessment attributes and these are largely divided into two large groups. The first of these is stakeholder risks covering the first attribute through the seventh attribute and includes 1) physical failure threats and risks, 2) operational threats and risks, 3) natural environmental events, 4) factors outside the organization's control, 5) stakeholder threats and risks, 6) design and installation of security equipment, and 7) information and data management and communication. The second group is threats and risks involved in sustainable operations. Sustainable operation risks are then divided into six attributes in accordance with AEO assessment criteria. Attributes for regulatory risks took into account security policies and legal requirements in establishing procedures for security system planning as specified in ISO 28000 security management manuals. The rest of the attributes are based on strategic item ruling, SCS regulations, foreign export control regulations including those of the US and other regulatory references that are specific to supply chain and export controls⁵⁾.

5) Korea Strategic Trade Institute(2010), Guideline to Introduce Security Management System ISO28000 for Supply Chain", Parkyongsa pp.78-79, p.85, p.247-249.

3.3 Survey Design

The survey conducted in this study was designed for Analytic Hierarchy Process (AHP) and included general characteristics of the respondents. For general characteristics, respondents were requested to enter their personal information such as job title, experience, and position within their company. General questions were divided into a total of eight categories, including risk management needs, system management, history of executing risk management within the firm and knowledge on regulations and rulings. The table below summarizes assessment attributes in detail to assist understanding of figures and terminologies.

Table 2 Survey Subject Groups and Number of Samples

Classifications	Company	Population	Number of Total Samples	Survey Response	Valid Samples	Invalid Samples	Remarks
Korea Strategic Trade Institute	Exporters	132	132	23	16	7	CP approved companies
	Importers	18	18	5	4	1	
	Freight Forwarders	6	6	6	4	2	
	Bonded Area Operators	5	5	8	5	3	
	Bonded Carriers	4	4	3	2	1	Member List
Korea Customs Brokers Association	Customs Brokers	1,478	7	7	6	1	Member List
Korea Shipowner Association	Shipping Companies	178	19	19	6	13	
Incheon International Airport	Airlines	91	4	4	2	2	Airlines list
Trade Association	Foreign Suppliers	1,870	5	3	2	1	Foreign supplier list
Total		3,822	220	78	47	31	

- Note 1: Exporters, importers, freight forwarders, bonded area operators, and bonded carriers are based on a list of companies registered for compliance with Korea Strategic Trade Institute as of Dec. 31, 2012.
- Note 2: For customs brokers, companies registered in Korea with Customs Broker Association that are representative of the group were selected as of the end of April, 2013.
- Note 3: For shipping companies, companies registered in Korea with Korea Shipowner Association that are representative of the group were selected as of the end of April, 2013.
- Note 4: For airlines, companies registered in Korea with Incheon International Airport that are representative of the group were selected as of the end of April, 2013.
- Note 5: For foreign suppliers, 5 representative companies in the industry were selected.

The survey was limited to professionals working with export controls on strategic trade instead of those without any exposure to the field. The list of people to survey was collected based on the data of companies registered for CP on the Korea Strategic Trade Institute website. The surveys then were distributed through emails, visits as well as at seminars and trainings held by Korea Strategic Trade Institute. Other surveys for professionals from companies representative of their respective field were also distributed through individual contacts.

Because this study holds significance in that research was done on managers and team leaders with five or more years of experience at manufacturing firms, general trading companies, shipping companies, airlines, customs brokers, freight forwarders and bonded carriers among business professionals who have knowledge and experience with export control in supply chain. First and second round of surveys were conducted from May 16, 2013 to May 23, 2013, for a total of eight days, and additional surveys were conducted for another 12 days from June 3, 2013 to June 14, 2013.

4. Results

4.1 Consistency Validation

In the data used for AHP analysis, consistency in survey responses is essential. Since priorities are used in each step, it was necessary to generate a consistency ratio (CR). The Consistency Ratio was calculated as per Table 3. As consistency ratio decreases, each value of Consistency Index (CI) and CR increases. As a result, CR is only reliable at less than 0.2. (Satty, 1990). Priorities are then derived using the consistency analysis based on 47 valid samples.

Table 3 Average Value of Consistency Index

n	3	4	5	6	7	8	9	10	11	12
R.I.	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48

Note : Consistency Ratio (C.R.=Consistency Ratio)

$$C.R. = \frac{C.I.}{R.I.} = \frac{\lambda_{\max} - n}{n - 1} \times \frac{1}{R.I.}$$

4.2 Priority Analysis by Step

1) Analysis Results on General Survey by Job Category

This part shows the results of survey responses and perceived direct effect that internal, external risks as well as keywords related to the hierarchy questions have on job performance. In order to get a more comprehensive view of the data in each job category, survey was conducted with consideration for invalid samples.

Table 4 below shows opinions of survey respondents on each assessment attribute in risk management for export controls on strategic items in supply chain. The need for risk management has the highest score while document management and in-house training have the lowest score for priority.

Table 4 Analysis Results on General Survey

Classification	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1.Exporters	6.2	5.1	4.8	5.0	5.4	5.0	5.0	5.4
2.Importers	6.0	4.6	4.4	5.2	5.6	4.6	4.8	5.4
3.Customs Brokers	6.6	5.4	5.3	5.6	5.9	5.0	5.9	5.9
4.Shipping Companies	5.5	5.2	4.8	5.8	5.6	4.8	5.3	5.5
5.Airlines	5.5	3.3	3.0	6.5	5.5	5.3	5.3	5.8
6.Freight Forwarders	6.3	5.3	5.2	6.3	6.0	5.7	6.2	6.0
7.Bonded Area Operators	6.4	5.0	4.5	5.6	5.9	4.4	5.5	5.9
8.Bonded Carriers	5.7	4.3	3.7	5.7	5.7	4.0	5.3	5.3
9.Foreign Suppliers	7.0	6.7	6.0	5.7	6.3	5.7	5.7	6.7
Total	6.1	5.1	4.7	5.5	5.7	4.9	5.3	5.6

(A): Risk Management (B): Management Interest (C): Document Management /In-House Training (D): SCS Certification System (E): Information System Management (F): Prior Ruling System (G): Restricting Illegal Activities (H): Need for Training on Foreign Regulations

2) Weight Analysis Results by Three Criteria in Step 1

According to the weight analysis results by each of the three criteria from the first step, sustainable operation showed to have a relatively higher priority than the two others. This shows that professionals prioritize internal risks over external risks.

Table 5 Weight Analysis Results by Three Criteria in Step 1

Classification	Sustainable Operation	Stakeholder	Regulations	Geometric Mean	Weights	Rank
Sustainable Operation	1.000	1.887	2.608	1.701	0.505	1
Stakeholders	0.530	1.000	2.985	1.165	0.346	2
Regulations	0.383	0.335	1.000	0.505	0.150	3
Total				3.371	1.000	

Table 6 shows consistency validation in regards to the weight analysis by criteria from step 1 with RI value of 0.58.

Table 6 Consistency Validation by Assessment Criteria in Step 1

Classification	Sustainable Operation	Stakeholders	Regulations	Sum of Rows	Row N/G Value
Sustainable Operation	0.505	0.652	0.380	1.547	3.066
Stakeholders	0.267	0.346	0.447	1.060	3.066
Regulations	0.193	0.116	0.150	0.459	3.066

$\lambda_{max} = 3.066$
 $CR = 0.057$

$CI = 0.033$

For priorities placed for each criteria in step 1 by job category, shipping companies tend to prioritize sustainable operation risks while airlines prioritize stakeholder risks

more than any other job category. Despite small differences, freight forwarders among all job categories assigned the highest priority on the importance of regulatory risks.

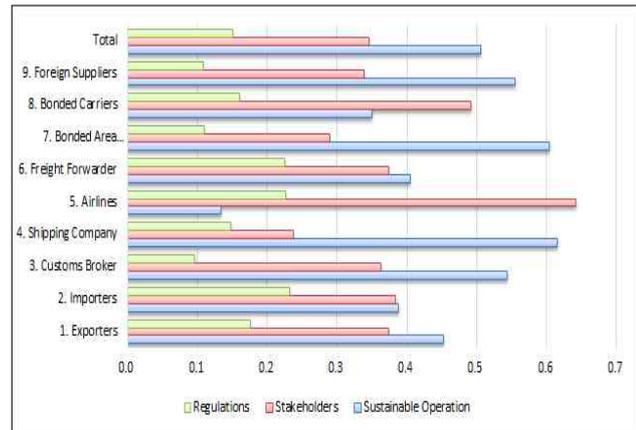


Fig. 2 Analysis Results of Priorities for Each Criterion from Step 1 by Job Category

3) Analysis Results on attributes of internal risk criteria from step 2

As in Table 7, management interest is shown to have the highest importance while internal control risk has the lowest importance of all assessment attributes. The difference in weights between the attributes is significant and the combination of management interest and internal audit, which have the highest and the second highest weight each, is more than half of the total sum of all weights. According to these results, management interest and internal audit alone can help manage internal risks well.

Table 7 Analysis Results by Sustainable Operation Risk Assessment Attributes in Step 2

Classification	Managements' Interest	Internal Audit	Regulation Review	Filing	Education & Training	Internal Control	Geometric Average	Weights	Rank
Managements' Interest	1.000	2.115	2.446	2.065	2.667	3.002	2.099	0.298	1
Internal Audit	0.473	1.000	2.698	1.789	3.420	3.269	1.716	0.243	2
Regulation Review	0.409	0.371	1.000	0.919	3.104	2.464	1.011	0.143	4
Filing	0.484	0.559	1.088	1.000	3.957	4.266	1.306	0.185	3
Education & Training	0.375	0.292	0.322	0.253	1.000	2.002	0.511	0.072	5
Internal Control	0.333	0.306	0.406	0.234	0.499	1.000	0.411	0.058	6
Total							7.054	1.000	

The table 8 shows consistency validation for sustainable operation risk assessment attributes with RI value of 1.24.

Table 8 Consistency Validation by Sustainable Operation Risk Assessment Attributes in Step 2

Classification	Managements' Interest	Internal Audit	Regulation Review	Filing	Education & Training	Internal Control	Sum of Rows	Row N/G Value
Managements' Interest	0.298	0.514	0.350	0.382	0.193	0.175	1.913	6.430
Internal Audit	0.141	0.243	0.387	0.331	0.248	0.191	1.540	6.333
Regulation Review	0.122	0.090	0.143	0.170	0.225	0.144	0.894	6.240
Filing	0.144	0.136	0.156	0.185	0.287	0.249	1.157	6.246
Education & Training	0.112	0.071	0.046	0.047	0.072	0.117	0.465	6.413
Internal Control	0.099	0.074	0.058	0.043	0.036	0.058	0.370	6.339

$\lambda_{max} = 6.333$ $CI = 0.067$
 $CR = 0.054$

Bonded area operators had the highest concentration while the shipping companies had the lowest concentration among all job categories in assigning priority in management interest attribute that carried the highest weight. This is likely due to the fact that shipping companies prioritize regulation reviews over management interest given the size of typical shipping companies and their already well established internal risk management systems(Fig. 3).

4) Consistency Validation by External Risk Assessment Attributes in Step 2

External risks, stakeholder risks and regulatory risks, were analyzed the same way as the sustainable operation risks above. The priority sequences for stakeholder risks are ① Asset Security > ② Cargo and Conveyance Security > ③ Physical Security > ④ Procedural Security > ⑤ Personnel Security > ⑥ Information Security > ⑦ Documentation Process, from the highest to the lowest. Asset security shows a relatively high level of priority compared with other attributes. This is especially so for bonded area operators who gave the weight of 0.372, which was the highest among all jobs categories for asset security.

As for regulatory risks, the priority sequences are as follows: ① Export licensing > ② Strategic Item Ruling > ③ Trade Regulations > ④ SCS Related Regulations > ⑤ Foreign Regulations. One thing that stands out is that export licensing was given the highest priority and the weight is more than twice that of foreign regulations. The sum of weights for export licensing and strategic item ruling is close to 0.5. This is most likely because of the exports and procedures required of the export control for strategic items.

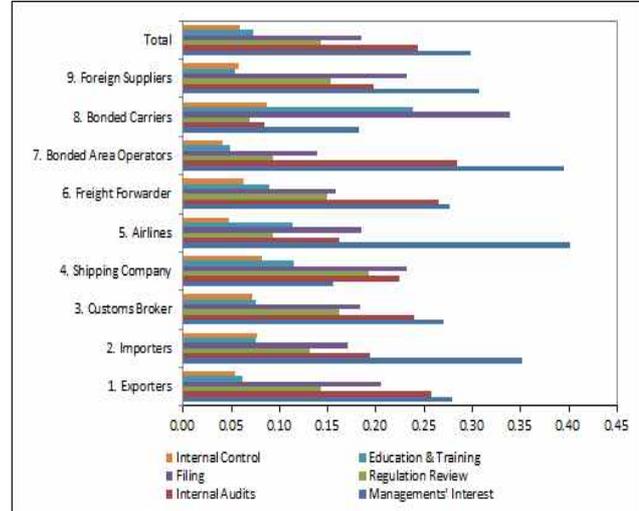


Fig. 3 Analysis Results of Priorities for Each Criterion attribute from Step 2 by Job Category

4.3 Comprehensive Priorities Analysis

Comprehensive analysis on all 18 attributes was generated based on a combination of weight analysis by criteria from step 1 combined with weight analysis by attributes from step 2. This analysis is meaningful in getting a comprehensive understanding of priorities and not just of each criterion or attribute. The values in the comprehensive analysis were calculated by multiplying weight of each criterion in step 1 by weight of each attribute in step 2. The results of the analysis are shown in Table 9.

According to the results of the comprehensive priority analysis, management interest and internal audits were shown to be of the highest and second highest in priority, respectively. These attributes are both part of sustainable operation risks or internal risks and this shows that survey respondents prioritize internal risks over external risks. The third highest in priority was asset security, an attribute for stakeholder risks.

Meanwhile, internal control risks were the 15th highest in priority among sustainable operation risks while information security and documentation process were 12th and 13th each in priority for stakeholder risks. Finally, for regulatory risks, strategic item ruling, SCS related regulations and foreign regulations were 9th, 17th and 18th, respectively.

As the results of the empirical analysis communicate, companies must place highest priority on managing sustainable operation risks through internal control, management interest and filing. For stakeholder risks, companies should place emphasis on asset security, physical security and cargo & conveyance security. Finally, emphasis on SCS related regulations and trade regulations should be placed for regulatory risks.

Table 9 Results of Comprehensive Priority Analysis on Risks

Criteria	No.	Attributes	Total Weight	Total Rank
Sustainable Operation	1	Managements' Interest	0.150	1
	2	Internal Audits	0.123	2
	3	Law Review	0.072	5
	4	Filing	0.093	4
	5	Education & Training	0.037	11
	6	Internal Control	0.029	15
Stakeholders	7	Facility Security	0.095	3
	8	Manpower Complement	0.042	10
	9	Information Security	0.036	12
	10	Transportation Security	0.048	6
	11	Process Security	0.043	8
	12	Physical Security	0.046	7
	13	Documentation Process	0.036	13
Regulations	14	export licensing	0.043	9
	15	Strategic Trade	0.032	14
	16	Trade Regulations	0.028	16
	17	Security Regulations	0.027	17
	18	Foreign Regulations	0.020	18

(A) Exporters (B) Importers (C) Customs Brokers (D) Shipping companies (E) Airlines (F) Freight forwarders (G) Bonded area operators (H) Bonded carriers (I) Foreign suppliers

5. Policy Implications

5.1 Issues and Implications of Export Control on Strategic Trade

Some of the issues on export controls on strategic trade include limited enforcements for export control regulations, administrative inefficiency from absence of independent regulations for export control, inconsistency of controls and wasted manpower and costs as a result, and finally, a lack of awareness, human resources and information for businesses.

In solving the aforementioned issues, countries need to make efforts to establish regulations with guidelines set forth in Resolution 1540 by the UN Security Council and other existing regulations in leading nations on export control issues. Specifically, countries need to amend treaties and tighten regulations to prevent nuclear and missile proliferation while building institutions to oversee. At the national level, countries also need to make extensive efforts to obtain organizations and manpower and establish independent regulations for export control on strategic trade. Corporations need to build internal compliance systems, provide training and change the existing awareness to aspire to international peace and national security.

5.2 Issues and Implications of Compliance Programs

Structural and systematic issues in compliance programs include insufficient interest and awareness by departments, team members, and management, insufficient knowledge and information of customers and products, high costs of building compliance programs as well as absence of experts and experienced practitioners.

In solving the issues relating to compliance programs, there needs to be a change in perspectives, recognizing that voluntary compliance is an inevitable international trade order and is essential in maintaining international peace. Moreover, in complying with catch-all systems, businesses need to understand the importance of managing client databases to store end-uses and end user information to avoid any missing information. Governments need to provide policies to support small and medium businesses by

Table 10 Comprehensive Priority Analysis Results by Job Category

Classifications	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	Total	Rank
Managements' Interest	0.126	0.159	0.122	0.070	0.181	0.125	0.179	0.083	0.139	0.131	1
Internal Audits	0.116	0.088	0.108	0.102	0.073	0.120	0.129	0.038	0.089	0.066	2
Law Review	0.065	0.060	0.073	0.087	0.042	0.067	0.042	0.031	0.069	0.060	5
Filing	0.093	0.077	0.083	0.105	0.083	0.072	0.063	0.153	0.105	0.093	3
Education & Training	0.028	0.034	0.034	0.052	0.051	0.041	0.022	0.108	0.024	0.044	12
Internal Control	0.024	0.035	0.052	0.037	0.021	0.028	0.018	0.039	0.026	0.029	17
Asset Security	0.104	0.081	0.131	0.044	0.059	0.072	0.139	0.037	0.090	0.084	4
Personnel Security	0.045	0.039	0.027	0.066	0.013	0.039	0.039	0.107	0.041	0.046	10
Information Security	0.043	0.034	0.042	0.042	0.019	0.035	0.037	0.014	0.025	0.032	16
Cargo & Conveyance Security	0.050	0.047	0.048	0.072	0.089	0.042	0.027	0.064	0.077	0.057	6
Procedural Security	0.044	0.048	0.034	0.053	0.092	0.071	0.047	0.044	0.036	0.052	8
Physical Security	0.053	0.054	0.039	0.040	0.035	0.038	0.045	0.049	0.056	0.049	9
Documentation Process	0.035	0.070	0.022	0.055	0.036	0.077	0.039	0.057	0.050	0.052	7
Export licensing	0.038	0.040	0.068	0.034	0.033	0.025	0.063	0.044	0.062	0.045	11
Strategic Item Ruling	0.040	0.019	0.031	0.032	0.063	0.013	0.062	0.020	0.017	0.033	14
Trade Regulations	0.040	0.034	0.029	0.034	0.024	0.040	0.018	0.030	0.047	0.033	15
SCS Regulations	0.034	0.041	0.032	0.041	0.034	0.045	0.017	0.034	0.036	0.035	13
Foreign Regulations	0.024	0.040	0.015	0.034	0.021	0.052	0.014	0.047	0.012	0.029	18
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

providing internal export control compliance systems for effective compliance.

Table 11 Issues and Implications of Export Control and Compliance Programs

Classification	Issues	Implications
Export Control	<ul style="list-style-type: none"> ○ Regulatory limitation of informal structures ○ Absence of independent regulations for export control ○ Lack of awareness and information on export control 	<ul style="list-style-type: none"> ○ Establish regulations with guidelines from the UN ○ Establish independent regulations for export control ○ Improve awareness and build internal compliance systems
CP	<ul style="list-style-type: none"> ○ Lack of interests and awareness of managements ○ Lack of information about clients and products ○ High cost of export control compliance programs ○ Insufficient availability of exports and practitioners 	<ul style="list-style-type: none"> ○ Build agreements and change the awareness ○ Build client database ○ Distribute government-led systems ○ Expand training to increase availability of experts and practitioners

5.3 Implications for Supply Chain Security Systems

The supply chain security systems have become a global mega-trend since September 11 attacks, and as a result, ensuring security on supply chain networks would be essential in protecting nation security and obtaining national competitiveness.

In order to ensure security on supply chain networks, foreign and international SCS regulations need to be understood and complied with and importance of the security system throughout the supply chain needs to be recognized. Furthermore, additional investments are needed for technologies and equipment for acquiring SCS as well as for SCS software and container tracking services given the current low level of investments in the SCS industry.

5.4 Implications for Each Risk Management Criteria Attribute in Supply Chain

Several experts have noted that other attributes including internal audits, regulation review, filing, education & training and internal control systems were all affected by management interest within the sustainable operation risk category. Consequently, policies and systems are needed to get managements as well as employees interested and educated on export control issues.

As for stakeholder risks, there are numerous stakeholders within a supply chain and in order to ensure security management throughout all attributes, including asset security, personnel security, cargo & conveyance security, procedural security and documentation process,

companies higher up in the supply chain need to pay continuous attention to, provide training for and manage compliance with companies lower down the supply chain.

Finally, the role of agencies that oversee export control is critical in regulatory risks. Especially, export licensing and strategic item ruling by Korea Strategic Trade Institute and enforcements of trade regulations and SCS by Korea Customs Service and customs officials are important aspects in managing regulatory risks. Education on foreign regulations including EAR and ITAR of the U.S. also needs to be provided.

6. Conclusion

Recognizing the importance of risk assessment for risk management related to export control of strategic items in supply chain, this paper seeks to study risk management practices by businesses and generate analysis of relative priority level for each risk. As South Korea is faced with needs for new regulations and compliance to be on par with international standards, this study also provides suggestions for exporters, logistics companies and government institutions including Korea Strategic Trade Institute for better planning and preparation.

This study shows various methods of risk management and importance of those methods. However, there were a lot of deviations between each job category in all 9 job categories, most likely arising from large differences in experiences and related education specific to each job category. Also, the survey design with internal and external risks and their attributes could not include all possible risks available to all stakeholders. The sample groups for the analysis may not represent the population perfectly and in targeting managers and team leaders, survey responses may not correctly represent the companies of the respondents in regards to export control risk management policies.

There needs to further studies done in this field by academia and the government, building on the research from this study. While academic research is important on the export control topics, there needs to be more research from the perspectives of businesses that manage internal compliance programs.

If export control regulations on strategic trade are violated, the damages and the penalties will be unimaginable. Therefore, understanding and research of the International Nonproliferation Convention, the multilateral export controls on strategic trade and the U.S. export controls should be carried out while managing and

enforcing regulations.

Finally, the fact that export controls on strategic trade is an inevitable trend should be recognized, and it is suggested that small and mid-sized corporations thoroughly manage the risks involved.

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