

Security extension through integration mechanisms in export supply chains: Case study analysis of four Authorized Economic Operators in Indonesia

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Abstract

Security in supply chain requires participation from all supply chain members (Jüttner et al., 2003, Martens et al., 2011, Thun and Hoenig, 2011). The focal firms have vested interests in security along their supply chains and must, therefore, extend their security interests to their chain partners. As firms engaged in importing and exporting commonly outsource their logistics functions to external logistics service providers, supply chains are increasingly complex and the risks to the supply chain security (SCS) are amplified. Thus, SCS extension, or compliance of relevant security standards at every function of the supply chain from the focal firms to their chain partners, is paramount.

The relationship between the focal firms and chain partners involve mechanisms of supply chain integration (SCI) characterized by ownership, contracts, operational interdependence and information sharing (Robinson, 2009). Achieving SCI in export supply chains requires the careful coordination of activities and collaboration among the partners. Many firms are, however, failing in their attempts at SCI (Jayaram and Tan, 2010, Robinson, 2015) and thus risks are posed to SCS. Therefore, this research examines the relationship between SCI and SCS, and how integration mechanisms facilitate security extension from the focal firms to their chain partners.

This research was focused on the Authorized Economic Operator (AEO) program, which is promoted by the World Customs Organization (WCO) with the overarching principle of integration to ensure security in an end-to-end supply chain (WCO, 2012). The implementation of the AEO program in Indonesian export supply chain provided the research context on the export leg from the manufacturers to the ports of export.

Using a multiple case study approach of four newly awarded AEO exporters and their chain partners operating in an Indonesian port environment, the relationship between SCI and SCS was examined. Agency theory underpinned this research to examine efforts of security extension from the AEOs to their chain partners. Data were collected via semi-structured interviews and in situ observations at the Indonesian ports. The data were thematically analyzed to map supply chain structures, and identify integration mechanism practices, security risks, and measures related to security extension. Subsequently, a cross-case analysis was conducted to produce topography of integration mechanisms and security extensions across the case studies.

The results demonstrate that contractual agreements facilitate direct relationships between the AEOs and the chain actors, including extended tier partners. Such agreements allow for a wider span of control and opportunities to implement security standards in the whole chain. The benefits of having wider security extension throughout the chain outweigh the agency costs of control and coordination in the principal-agent relationships between the AEOs and their chain partners.

This research makes significant theoretical and practical contributions. The theoretical model developed to analyze the SCI-SCS relationship reveals that SCI is critical to achieving the required security levels within every segment of the supply chain. Improving the understanding of this relationship at the intersection of SCI-SCS has made a significant contribution to the integration literature, specifically in the context of export supply chains in the Indonesian port environment. The use of agency theory in resolving the conflicts and uncertain outcomes in principal-agent relationships also offers a new perspective on the complexity of multiple-tier relationships. Practically, the research findings will help AEOs, logistics service providers and customs administrations realize the significance of integration mechanisms for extending security standards effectively in export supply chains.

Student declaration

I, Dicky Hadi Pratama, declare that the PhD thesis entitled “Security extension through integration mechanisms in export supply chains: case study analysis of four Authorized Economic Operators in Indonesia” is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Dicky Hadi Pratama

Melbourne, August 2018

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Alhamdu lillahi rabbil 'alamin

"All the praises and thanks be to God who is the Lord of the universes"

This thesis is a result of a journey that was beyond my previous comfort zone. After a twenty year career in business and government, entrance into the academic world was thought to be an impossible challenge. To me and hopefully to my children, this thesis is a testimony to the belief that nothing is impossible with God's will and our perseverance.

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Dedication

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List of abbreviations

AEO	Authorized economic operator
CC	Container consolidator
CCTV	Closed circuit television
CP	Empty container park
CY	Container yard
FCL	Full container load
FF	Freight forwarder
LCL	Less than container Load
SA	Shipping agent
SAFE	Framework of standards to secure and facilitate trade
SCI	Supply chain integration
SCM	Supply chain management
SCRM	Supply chain risk management
SCS	Supply chain security
SL	Shipping line
WCO	World Customs Organization
WH	Warehouse
WTO	World Trade Organization
YO	Yard operator
3PL	Third party logistics service provider

Conferences and Publications

Pratama, DH & Everett, S 2017, 'Supply chain security initiatives: the Authorized Economic Operator and Indonesia's experience', *Journal of International Logistics and Trade*, vol. 15, no. 1, p. 10.

Pratama, DH, Shee, H & Hede, A-M 2016, 'Security in export supply chains: a dare necessity from integration perspective', in *ANZAM 2016 Conference*, Brisbane.

Pratama, DH & Everett, S 2016, 'Authorized Economic Operator: the new global initiative in supply chain security', in *One Belt One Road 2016 Conference*, RMIT University, Melbourne.

Pratama, DH & Shee, H 2017, 'Security extension in export supply chain in Indonesia: an agency theory perspective', in *the 9th International Conference on Logistics and Transport 2017*, Thammasat University, Bangkok.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This research has examined the relationship between supply chain integration (SCI) and supply chain security (SCS) in export supply chains and responds to the need to integrate security measures and standards in supply chains. The context of the research is Indonesia where the AEO program was recently introduced.

Section 1.2 below presents the theoretical background of this study, with a brief review of the literature in the areas of SCS and SCI. Section 1.3 outlines the research question and objectives. Section 1.4 briefly discusses the research design and methodology. Section 1.5 elaborates on the research significances from both theoretical and practical perspectives. Section 1.6 and 1.7 cover ethical procedures and the thesis structure respectively.

1.2 Theoretical background

Supply chain security (SCS) is recognized as an important part of supply chain management (SCM), especially after the tragedy of 9/11 in the United States of America (US) (Bichou et al., 2014, Martens et al., 2011). Since then supply chains have been identified as a potential vehicle to facilitate acts of terrorism (McNicholas, 2008). This risk is amplified in the context of global international trade, with more than 600 million containers used annually and only two percent physically inspected (UNODC, 2013). This represents critical exposure and requires a new approach to SCM (Sheffi, 2001). The magnitude of the risk has compelled authorities, internationally and nationally, to design programs to detect and deter potential threats (Allen, 2007, Altemöller, 2011).

Prior to 9/11, security risks in supply chains included damage to cargo, theft, natural disasters, corruption and piracy. Now terrorism has been added to that list (Closs and McGarrell, 2004, Park et al., 2016, Voss et al., 2009). In this period, managing the

security of supply chains against crime was widely left to the business itself. Governments were only interested in matters related to smuggling for tax evasion, trade of illegal narcotics or counterfeit goods and violations in compliance to environmental regulations (Hintsa and Hameri, 2009). In the post-9/11 era, there is a need for tight security interaction between private and public agencies in international trade. This is a direct result of the increased threat of terrorism which requires intensified security procedures at country borders to counteract terrorist threats, such as the smuggling of weapons of mass destruction, resulting in regulative security requirements for transporters (Urciuoli, 2010, Böhle et al., 2014).

Prominent among SCS programs is the Authorized Economic Operator (AEO) program with its overarching principle to integrate security in supply chains from end-to-end. The approach of the AEO program is to improve SCS without deterring legitimate trade (Mikuriya, 2007, Urciuoli and Ekwall, 2012). It has successfully attracted 168 countries to sign their commitment to the program (WCO, 2014). However, integration in supply chains from end-to-end is easier said than done (Fawcett and Magnan, 2002, Knemeyer and Fawcett, 2015) as supply chains tend to operate in a fragmented manner (Robinson, 2009).

International logistics supply chain is increasingly exposed to security risks (Marlow, 2010). Firms operating in international trade predominantly outsource their logistics functions (Rodrigue, 2012) leading to multiple tiers of business relationships with fragmented responsibility (Jüttner et al., 2003), exposing them to potential global security threats. Analysis of SCS, or the application of policies, procedures, and technologies to protect supply chain assets (e.g., products, facilities, equipment, information, and personnel) (Closs and McGarrell, 2004), has burgeoned since the 9/11 tragedy (Xiangyang and Chandra, 2008). Terrorism has introduced a new element of risk into supply chains (Sheffi, 2001). Before 9/11, security strategies focused on preventing goods from leaving the supply chains (Williams et al., 2008, McNicholas, 2008). Now the focus is on preventing the unauthorized insertion of contraband, people or weapons into cargo containers (Zailani et al., 2015). This change signifies the need to address the risks of terrorism in international supply chains.

Maintaining security in supply chains requires broader coordination and collaboration (Zsidisin and Ellram, 2003). Security initiatives call for procedural improvements that

warrant inter-organizational cooperation (Böhle et al., 2014). From a business perspective, security risks have forced a shift in the security orientations of logistics functions, from within firms to end-to-end supply chains, from a country focus to a global focus, and from traditional theft prevention to anti-terrorism (Closs and McGarrell, 2004). Therefore, coordination between chain members is required to achieve optimal security outcomes.

Coordination and collaboration are fundamental to SCI (Christopher, 2016). While authors may differ in their conceptualization of integration, the notion of integration between actors and their operations is always central to discussions in supply chain management (Alfalla-Luque et al., 2013). A supply chain consists of a sequence of activities that involve multiple partners and a wide variety of operations, with every part of the chain expected to contribute to the success of the chain performance (Ataseven and Nair, 2017). Interconnections between both actors and operations define the efficiency of the whole chain performance (Jayaram and Tan, 2010). Therefore, SCI is a mechanism aimed at optimizing the processes around the flow of goods and information across the entire supply chain. This involves the effective coordination of strategies and collaboration between chain partners (Vanpoucke et al., 2017, Mackelprang et al., 2014).

Previous studies on SCI reveal that key information integration, partner coordination, resource sharing, and organizational relationships are important dimensions for SCI success (Alfalla-Luque et al., 2013). The integration mechanism across firms has been conceptualized as an arc of integration (Frohlich and Westbrook, 2001). Integration with the first tier logistics functions (i.e., narrower arc) is much easier to manage than with the extended tiers (i.e., a wider arc). This concept is appropriate for this research, as the management of cargo movement in supply chains is frequently outsourced and involve multiple external parties making complex chain operations (Jayaram and Tan, 2010).

Many authors emphasize that SCI involves internal and external integration, as well as the inbound and outbound flow of goods and information (Tseng and Liao, 2015, Afshan, 2013, Jayaram et al., 2010, Jayaram and Tan, 2010, Frohlich and Westbrook, 2001). SCI is further viewed as coordinating with chain partners, such as providing access to planning systems, the integration of shared information technologies

(Frohlich and Westbrook, 2001), shared decision-making, and the sharing of skills (Bagchi et al., 2005). In addition, Robinson (2009) characterized SCI as chain ownership, contractual relationships, operational interdependence and information sharing. Despite the fact that coordination and collaboration among partners are prerequisites for SCI, firms are failing in their attempts to integrate internally and externally (Jayaram and Tan, 2010, Robinson, 2015).

Integration enhances the performance of firms (Frohlich and Westbrook, 2001, Özdemir et al., 2014, Danese and Bortolotti, 2014) or supply chains (Bagchi et al., 2005, Vanpoucke et al., 2017, Mackelprang et al., 2014, Alexandru, 2014). An end-to-end approach to SCI, comprising internal integration in supply chain planning involving suppliers and customers, is associated with positive outcomes in relation to cost, quality, delivery, flexibility and efficiency (Danese and Bortolotti, 2014). While full strategic SCI is associated with better performance outcomes (Mackelprang et al., 2014), external integration with suppliers and customers appears more complicated and demands more effort to achieve (Fawcett and Magnan, 2002). In downstream supply chains (i.e., the delivery of goods to customers), the increasing use of 3PLs (Rodrigue, 2012) adds to this complexity.

In SCI, each actor in supply chain contributes to performance (Ataseven and Nair, 2017, Schoenherr and Swink, 2012). Similarly, any security initiative will be ineffective if any one actor in the supply chain does not meet the required security standards (Sheffi, 2001). Individual security strategies of firms operating within the supply chain are not sufficient to address current threats (Williams et al., 2008). Rather, integrated strategies that involve multiple actors and operations are needed. Supply chain risk management (SCRM) highlights the need to collaborate with other chain actors rather than having a confined perspective within a firm (Ho et al., 2015). While SCI is essential to optimize SCS performance (Martens et al., 2011), there is a paucity of research and in-depth evaluation of SCI in supply chains with varying degree of complexities in their structure in relation to actors, functions and context. Investigation of chain structure and the integration mechanism to achieving SCS objectives is new.

Some studies have found positive relationships between SCI and supply chain performance (Ataseven and Nair, 2017, Frohlich and Westbrook, 2001, Alfalla-Luque et al., 2013, Autry et al., 2014); and others have identified the positive influence of internal

integration on external integration (Schoenherr and Swink, 2012). More recent literature has looked at the SCRM (Friday et al., 2018), and SCS (Zailani et al., 2015, Zhao et al., 2013), exploring how these affect firm performance (Autry and Bobbitt, 2008, Peleg-Gillai et al., 2006, Sheffi and Rice Jr, 2005) and security operational performance (Martens et al., 2011, Rice and Caniato, 2003, Sheffi, 2001). Despite the importance of connecting SCS with integration, there is a dearth of literature that links these two important constructs.

Security has garnered little attention in relation to whole-of-chain integration. Nevertheless, a few studies have focused more on investigating security and risk management for supply chain performance. For example, Böhle et al. (2014) conceptually investigated how a current supply chain operations reference (SCOR) model accounts for state-of-the art security and its extension along the chain. Zhao et al. (2013) empirically found a negative relationship of supply delivery risk with SCI (i.e., supplier, internal and customer integration) and performance. Yang and Wei (2013) found an improvement in safety and customs clearance performance through the practice of facility and cargo security, accident prevention and processing, information management, and partner relationship management. Zailani et al. (2015) identified the positive relationship of security compliance of cargo, facilities, human resources and information management with security performance success. Park et al. (2016) found that a supply chain with more security compliance experienced less disruption. Until recently, there has been little discussion about how SCI can help address security risks in a supply chain, specifically the risk of terrorism in the context of export supply chains. This current study fills this gap by explicitly examining the use of integration mechanisms to extend security in the entire export supply chains.

Providing a context for this research, Indonesia recently implemented an international SCS initiative called the Authorized Economic Operator (AEO) program, under the authority of customs administration. The AEO program aims for global implementation of standardized SCS measures with an overarching principle of integration and risk management (WCO, 2012). It addresses security in the end-to-end supply chain by involving players in international trade and covering operations related to the movement of goods in import and export. The national AEO program focuses on players and operations within its national jurisdiction. Indonesia commenced the

program with five AEO exporters accredited for their security standards. The operations of these AEO exporters in moving their goods from their manufactures to the ports of exports are the context of this research.

The AEO exporters are expected to extend security standards to the whole of chains, representing a concept of a 'single intelligence' that directs the behavior of the constituent firms (Robinson, 2015). Different from the term collaboration or coordination, security extension implies an element of power from the AEOs to share security risks and roles with their chain partners. However, this concept is challenged by fragmented supply chains arising from the number of chain partners involved in the movement of cargoes (Robinson, 2009), as well as by the ignorance of terrorism as a security risk in Indonesian supply chains. Moreover, the AEO program is voluntary in nature and not all actors in a particular chain are accredited as AEOs. In an export chain leading from production sites to ports of export in Indonesia, an AEO exporter may employ non-AEO freight forwarders or non-AEO trucking companies in which security standards are not equal. These differences in security status in an export supply chain create gaps that, in turn, challenge the objectives of AEO implementation.

From a practical perspective, the disparity in security levels creates complexity in inter-organizational relationships (Alexandru, 2014). Recently, Yang and Wei (2013) found a positive relationship between security management and security performance in the context of Taiwan. In the Malaysian context, Zailani et al. (2015) found evidence to suggest that security practices collectively affect a firm's security operational performance among service providers. While Yang and Wei (2013) used partner relationships and information exchange as determinants of security management in their study, this current research has taken a step further by considering ownership, contractual relationships, interdependence and information sharing, as SCI mechanisms suggested by Robinson (2009). These integration mechanisms are explored in an attempt to managing the security of cargo, conveyance, premises, personnel and trading partners in an export chain as regulated in the AEO program (WCO, 2006).

To examine the efforts of extending security from the AEOs to their chain partners, agency theory underpins this research, focused on the principal-agent relationship and the problems associated with the ineffective management of inter-organizational

relationships (Richey et al., 2010). The theory sheds light on outcome uncertainty and risk (Eisenhardt, 1989), which is found in the implementation of SCS. The principal-agent relationships between firms result in agency costs for control and coordination, incurred in an effort to establish security extension between the AEOs, as the principals, and their chain partners, as the agents.

1.3 Research question and objectives

Within the context discussed above, this research aimed to study the relationship between supply chain integration mechanisms and security extension in export supply chains. The following research question was formulated:

How does the integration mechanism influence the extension of security standards from focal firms to chain partners in Indonesian export supply chain?

This research question entails the need to identify the elements of SCI and SCS in the AEOs' export supply chains. Therefore, the objective of this research is to explore the supply chain structure and integration mechanisms, and the way both can help extend the security standards to achieve security extension in export supply chains. In other words, the research explores the current structure of AEO-operated supply chains that likely to affect the integration of partners along the chain. While the operational and strategic security standards are inherently embedded into the AEO program, the current chain structure and integration mechanism prohibit the standards to follow through the chain. The study attempts to reveal how the integration mechanisms with varying chain structure can extend the security standards from the focal firms to their chain partners.

Security extension is the compliance of security standards at nodes (e.g., warehouse and container park) and links (e.g., transportation routes) managed by chain partners following the security certification of the focal firms as the AEOs. Security extension, for the purpose of this study, is defined as the elements of security enhanced from the focal firm to effectively share and execute security practices and skills with the chain partners (Böhle et al., 2014). Further, it refers to ensuring security compliance of policies, procedures, and technology to protect supply chain assets (Park et al., 2016). As such, this research identifies and evaluates whether and how the AEOs and their

chain partners address the issues associated with the nexus between security and integration. Following the context, the research is limited to export supply chain leg from exporters to ports of export.

1.4 Methodology and research design

Recognizing the complexity of global supply chains' network and operations (Xiangyang and Chandra, 2008), especially with the extensive participation of 3PLs (Mentzer et al., 2001), a qualitative case study approach was used to develop an in-depth and comprehensive understanding (Zikmund et al., 2012) of the current state of integration and security extension in the AEOs' export supply chains. A case study approach offers a detailed examination of a complex research problem (Simons, 2009) in the relationships between supply chain actors involving multifaceted interests and operations.

Four AEO certified exporters participated in the research. Their chain partners, including firms responsible for warehousing, freight forwarding, trucking, empty container parks, and container yards with different functions in the export chains, were included in the case studies.

The methods of data collection were interviews and observations to gather primary data, and desktop research to obtain secondary data. The AEO export supply chain was considered the unit of analysis in this study. Employing a deductive approach, the data were segregated according to pre-determined themes (Braun and Clarke, 2006). The themes were formulated in the theoretical framework consisting of three constructs: chain structure, integration mechanisms, and security standards. Chain structure consists of actors, functions, and contextual existence. Integration mechanisms consist of ownership, contractual relationships, operational interdependence, and information sharing (Robinson, 2009). Security measures, as regulated in the AEO program, consist of cargo, conveyances, premises, personnel and trading partner security (WCO, 2006).

The data were first used to develop the individual case studies of AEO chains, followed by a cross-case analysis to identify the similarities and differences across these chains.

At this stage, agency theory was used to help analyze the AEO security extension strategies and the influence of integration in achieving that extension.

1.5 Research significance

This study identifies the integration mechanisms used in the implementation of SCS in AEO export supply chains in the context of Indonesian ports. Theoretically, it contributes to the existing body of knowledge on SCI and SCS, and practically it informs authorities and businesses in the area of international trade, supply chains, and logistics.

SCI and SCS are popular themes in SCM literature. SCI has been widely discussed for its contribution to performance improvement (Alfalla-Luque et al., 2013) and SCS is mostly positioned in the discussion of SCRM (Ho et al., 2015, Rao and Goldsby, 2009). The relationship between these two key constructs in supply chains has not been sufficiently explored in the SCM literature. While the SCI literature has focused on the effectiveness and efficiency of the whole operation (Afshan, 2013, Autry et al., 2014, Jayaram and Tan, 2010), much of the security literature has focused on supply chain disruption because of unforeseen events that slow down the logistics flow (Dekker and Stevens, 2007, Grainger, 2007, Hintsa and Hameri, 2009). These studies, however, have overlooked the potential of SCI for improving SCS. Moreover, the structure (e.g. actors, functions) varies from one to another in any supply chain, so as its degree of integration. This study explores the chain structure and examines how the integration mechanisms will help achieving the security standards in the chain. Therefore, this research offers a novelty in using the integration principle to study SCS and the way security can be extended (i.e. security extension) from focal firms (i.e., AEOs) to their chain partners.

The literature review reveals that there is a lack of study on a supply chain security initiative that involves both integration and risk management perspectives. With the awareness that supply chain is a network of inter-connected activities (Davison, 2008, Hodges, 2012), this paper fills the gap where the agency theory is used as the lens to evaluate the extension of security from the AEOs to their chain partners through integration mechanisms. The use of agency theory signifies the originality of this

research connecting SCI and SCS. This current research has therefore addressed an identified gap in the literature by focusing on the SCI-SCS relationship, explicitly the use of integration mechanisms to achieve security. This research is important for business and customs administration. It will help guide export firms to assess their existing security strategies and practices in relation to cargo, conveyances, premises, personnel and trading partners while extending security awareness to their partners. The application of policies, procedures, and technologies can protect supply chain assets (i.e., products, facilities, equipment, information, and personnel) from burglary, damage, or terrorism at any point along the supply chain and should not be seen as a cost burden; the security benefits outweigh the cost investment (Peleg-Gillai et al., 2006). It is important for AEOs and chain partners to understand that relationship management, through coordination and collaboration, is key for SCS success. Inter-organizational collaboration enhances security extension in AEO export supply chains.

1.6 Ethics approval

This study involved interviews, observations and the collection of secondary data that required ethics approval. The Victoria University ethics committee issued approval before the researcher began the data collection process. The researcher followed the university's guidance when addressing potential ethical risks, including appropriately addressing issues of consent and privacy. The case study protocol incorporated ethics procedures, including making participants aware of potential risks during interviews and observations. Once the researcher explained the study objectives and expectations of involvement, participants were asked for their consent to be part of the study. The case study protocol is provided in Appendix 2.

1.7 Thesis structure

This thesis is comprised of eight chapters. Chapter 1 has introduced the research by providing a brief background on the implementation of the AEO program and a gap analysis. The research question was presented, followed by a description of the research design and the significance of the study.

Chapter 2 presents a review of the literature on supply chains, especially in the area of SCS, SCI and SCRM. A systematic literature review was conducted to observe the intersection of SCS and SCI. This chapter also includes a discussion on the development of the theoretical framework, together with a summary of the propositions formulated from the literature review.

Chapter 3 builds on the background and context of the problems signaled in Chapter 1. It covers the development of security initiatives as a response to the global challenge of security risks, discussing the content of the AEO and how it differs from other SCS initiatives. AEO implementation in Indonesia and its rationale are also elaborated.

Chapter 4 presents the methodology, with choices of methods and techniques discussed and justified. The chapter outlines factors influencing the research paradigm and the research design and provides details of the data collection and data analysis.

Chapter 5 reports on the findings from the data collection in four AEO case studies. The results from interviews and observations provide details on the AEO export supply chains and their chain partners. The sequence of presenting the findings follows the theoretical framework, starting with the mapping of chain structures in each chain in which the AEOs are the main actors. This continues with the identification of security measures adopted by each actor involved in the chains and the efforts taken by the AEOs to extend security to their chain partners.

In Chapter 6, the findings from Chapter 5 are discussed using thematic and cross-case analytical techniques. The findings from each AEO are analyzed under the integration and security themes. The results are then compared to evaluate the connection between security and integration. Agency theory analysis is presented together with the key findings.

Discussion is expanded in Chapter 7, with the findings discussed in relation to the literature. Chapter 7 also provides a discussion of the AEOs' export chain risk management strategies as represented in their integration emphasis.

Finally, Chapter 8 summarizes the findings and addresses the research question. The academic and practical implications, as well as the limitations of the current research and suggestions for future research, are also presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter 1 has presented a brief background, the research question, and objectives that guided the selection of literature to be reviewed. This chapter presents a review of literature in the intersections of SCI, SCS, and SCRM, as well as literature related to the risks of terrorism, the AEO program or other SCS initiatives. Literature review in this research serves several purposes i.e. to establish the context of SCI and SCS, to understand the origins and structure of the subject, to rationalize the theoretical significance, to relate the real-world phenomenon and development of knowledge, and to find academic gaps this research can contribute (Hart, 2018).

The literature review led to the development of a theoretical framework and propositions that guide the research. Section 2.2 presents a review of the literature on SCI and supply chain structure to help understand the integration concepts and identification of constructs. It includes discussions on outsourcing logistics services, recognizing that all AEOs employ these services and that they are central to discussions of integration in this study. Integration mechanisms and their operational elements as discussed in previous studies are also presented, given their role in this research. Section 2.3 focuses on security in supply chains. It starts with a broad description of security in general, before narrowing down to a discussion on the development of terrorism and related SCS initiatives and SCRM. Section 2.4 presents a systematic literature review of previous studies that denote intersections of SCI, SCS and SCRM. Section 2.5 observes relevant theories in the literature that led to the use of agency theory. Section 2.6 presents the theoretical framework along with research propositions developed for the research.

2.2 Supply chain structure and integration

Scholars propose different definitions of SCM from a variety of perspectives (Hodges, 2012). Many refer to elements of complexity in the form of the number of participants

(Mentzer et al., 2001), as well as the variety of activities (Christopher, 2016) within the supply chains. Recognizing the importance of coordination and collaboration among supply chain members, this research refers to the following definition by the Council of SCM Professionals (CSCMP) (CSCMP, 2017), which is also frequently referenced by other scholars (Cooper et al., 1997, Mentzer et al., 2001, Larson and Halldorsson, 2004):

SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. (CSCMP, 2017)

Supply chains comprise upstream and downstream activities (Sadler, 2007). The upstream supply chain includes activities relevant to goods production, such as sourcing for raw materials, goods conversion, and transportation. The downstream supply chain activities relate to the flow of goods, including information and funds, from manufacturers to end consumers, and vice versa. The whole of the activities can be seen as an end-to-end movement and storage of materials and goods from the point of origin to the point of consumption (Hodges, 2012). This process involves the transformation and transportation of goods, as well as commercial transactions (Pugliatti, 2011).

This study focused on the downstream export supply chain, covering logistics activities from post-production to the transportation of goods from manufacturers to ports of exportation. The export supply chain is the point of interest in this study and known as the intermediary supply chain process in the maritime logistics (Seo et al., 2015). Other than the transport at sea, maritime logistics includes traditional inland logistics functions such as stripping, stuffing, storage and inventory management.

SCI is central to SCM (Robinson, 2002, Frohlich and Westbrook, 2001, Sadler, 2007, Afshan, 2013, Christopher, 2016), where the inter-relationships among partners enhances the performance of the whole chain (Ataseven and Nair, 2017). This interdependence of partners has made integration central to the study of SCM (Pagell, 2004). Jayaram and Tan (2010) defined SCI as the coordination of business processes

both within and outside the company boundaries. SCI has been recognized for improving firm performance (Frohlich and Westbrook, 2001, Özdemir et al., 2014, Danese and Bortolotti, 2014) and supply chain performance (Bagchi et al., 2005, Vanpoucke et al., 2017, Mackelprang et al., 2014, Alexandru, 2014, DeVass et al., 2018). While most of these studies have considered upstream dyadic relationships (i.e., a buyer-supplier dyad) in SCI studies, this research focuses on coordination and collaboration between focal firms, third party logistics service providers (3PLs), and the intermediaries (e.g., freight forwarders, trucking companies, shipping agents, container yard operators).

A supply chain is viewed as a network of actors and logistics operations in which the actors collaborate for performance improvement (Tseng and Liao, 2015, Afshan, 2013, Jayaram et al., 2010, Jayaram and Tan, 2010, Frohlich and Westbrook, 2001). Sadler (2007) posited that a supply chain represents a group of companies that collaborate to source, produce and deliver goods and services to end customers. This notion underlines the fact that firms must expand their views outward (i.e., external integration) instead of being confined to their internal process (i.e., internal integration). Frohlich and Westbrook (2001) argued that the narrower 'arc of integration' is easier than the wider one, that is, external integration with more extended entities in the chain (e.g., external businesses or 3PLs). Identification of the roles of each actor and its contribution to the chain objectives is key to successful collaboration (Ralston et al., 2015).

As a supply chain is defined as a set of entities (Mentzer et al., 2001), an empirical study in SCM demands a comprehensive understanding of the actors and operations within supply chains (Robinson, 2015). The concept of entities, operations and their interactions is often referred to as supply chain structure in the literature (Ernst and Kamrad, 2000, Netessine and Rudi, 2004, Song and Yao, 2013). The term supply chain structure is frequently found in the literature without introducing its definition. Even though the literature lacks the agreed definition, the term suggests a broad understanding of patterns of players in supply chains. For example, it refers to patterns and interactions between the process of manufacturing, assembly and packing introducing four possible patterns: postponed, flexible, rigid, modularized that illustrates the number of actors in each process (Ernst and Kamrad, 2000). Therefore, in this

research the term supply chain structure indicates the complexity in the chains that includes the elements of players, their functions and how these players interact to achieve their common goals.

Identification of the supply chain structure includes the mapping of the 'nodes' and 'links' (Riahi and Wang, 2015). Nodes are the points where the goods are processed or change hands, such as at manufacturing plants, warehouses, and container yards. Links refer to the paths that connect the nodes, such as trucking lines or transportation routes. Other than suppliers, producers, and consumers, supply chains are inhabited by third party service providers who help move the goods. They can be freight forwarders, trucking companies, warehouse operators or other parties who manage more than one of these functions, known as 3PLs. In the era of globalization of trade and production (Bowersox et al., 2013), the supply chain mapping shows wider structures with the involvement of more 3PLs (Marasco, 2008, Aguezzoul, 2014). These entities further define the supply chain structure, which includes facilities, locations, and their business relationships (Waters and Waters, 2006).

SCI in the context of maritime logistics is less discussed in the literature. Seo et al. (2015) argued that SCI is more difficult to achieve in the maritime logistics and proposed that the term supply chain collaboration better captures the cooperation between the players in this part of global supply chain. Fragmentation is more apparent where emphasis of own profit and objectives dominate, neglecting the whole operations beyond individual organizations. Contentious characteristics and a complex entity engaging a series of operations make SCI more challenging in maritime logistics.

Following a suggestion from Robinson (2015) on the need to identify chain structure in supply chain studies, this research begins with the mapping of the AEOs' export supply chain structures in an effort to understand the state of integration and security implementation in the whole chains. The chain structure consists of the chain actors, functions and their contextual existence (Robinson, 2009).

2.2.1 Outsourcing logistics services

Logistics operations were traditionally performed by manufacturers and under the management of internal organizations (Lieb, 1992, Abdur Razzaque and Chen Sheng,

1998, Marasco, 2008). However, the current business environment demands manufacturers to become more competitive by increasing their focus on manufacturing competency and outsourcing non-core activities to external organizations (Sheffi, 1990, Wang et al., 2017). This trend has been accompanied by a rising tendency of global companies to outsource their logistics activities (Rodrigue, 2012). Many firms consider their supply chains as not their core business and opt to outsource them for reasons of efficient resource management (Hertz and Alfredsson, 2003, Rodrigue, 2012). Cost-saving is one dominant reason to outsource services (Logan, 2000, Li et al., 2012, Wang et al., 2017). Outsourcing is a means to enhance competitive advantage (Fletcher, 2007), because when a firm decides to invest in the use of a 3PL, they expect to gain maximum benefits from the services to improve its SCM (Jayaram and Tan, 2010). The increasing demand in the maritime transport influences demand for inland logistics services, such as distribution, consolidation, warehousing, and cargo handling (Yuen and Thai, 2017).

Despite the abundant discussions on the benefits and challenges that a 3PL offers, there is a palpable inconsistency among scholars in terms of defining 3PL functionalities (Marasco, 2008). In some cases, the term is restricted to outsourcing on transportation and/or warehousing. In other cases, it describes more complex outsourcing that covers the whole logistics process (Van Laarhoven et al., 2000). Addressing this discrepancy, some scholars argued that 3PLs are not companies that only provide, for example, trucking or warehousing services (Berglund et al., 1999, Marasco, 2008). Berglund et al. (1999) asserted that a 3PL must at least perform two functions on behalf of the shipper or manufacturer. Other activities may include inventory management, assembly and installation of products, or even end-to-end SCM. Additionally, the formal contract between a 3PL and the focal firm should include an element of management in a period of at least one year. The existence of a contract and the longer period of cooperation distinguish the role of the 3PL from traditional 'arm's length' service providers that function generally on a transactional basis (Marasco, 2008).

The term 3PL used in this research follows the classification from Berglund et al. (1999), which refers to their multiple roles generally embodied in the function of freight forwarder. However, their relationships with the focal firms may not always involve legal

contracts. The terms chain partners and vendors are used interchangeably in this research encompassing all actors employed by the AEOs in export supply chains regardless their work coverage (e.g., trucking company, yard operator, empty container park operator, as well as freight forwarder).

Further, Marasco (2008) created a classification to depict the stages of the relationship between a 3PL and an employer. These stages consist of three relationship developments. The first is the build-up stage, when service users select 3PLs. This is usually followed by negotiation and contract development. The selection process includes bidding or a tender process in which the users set their requirements and the potential 3PLs submit their offers. The second stage is the execution of what has been agreed upon in the contracts, with operations carried out with coordination and monitoring processes. The last stage is institutionalization, in which potential long-term relationships are built up by broader use of shared knowledge and technologies. The coordination of activities through information exchange using technology characterizes the very concept of an integration mechanism within a supply chain. The integration mechanism is referred to frequently in this research, primarily to evaluate the scale of relationships that have been built up between the AEOs, the 3PLs, and other chain partners.

2.2.2 Supply chain integration dimensions

Frohlich and Westbrook (2001) drew our attention to the growing consensus on the strategic importance of integration between suppliers, manufacturers, and customers. They suggested that the current global business platform necessitates horizontal perspectives to align operations across processes along the supply chain. Frohlich and Westbrook (2001) argued that manufacturers have different strategies to integrate with their stakeholders and propose integration dimensions that include access to planning systems and joint electronic data interchange (EDI) access/networks.

On the same note of integration-performance connection, Danese and Bortolotti (2014) suggested that wider integration results in better firm performance. They argued that an end-to-end integration, involving dimensions of internal integration and supply chain planning, demonstrates positive outcomes in terms of quality, delivery, flexibility and efficiency. Additionally, while supporting the argument that full strategic SCI is

associated with the widest breadth of integration, Mackelprang et al. (2014) also cautioned that unknown moderators may influence the results that include cultural and social aspects, and type of products. Conclusively, these findings show that more integrative activities are associated with better performance, whether within firms or in the supply chains. These studies indicate that chain performance is an outcome of the whole chain, where all chain members contribute and a 'weak link' may harm the entire performance (Schoenherr and Swink, 2012).

Despite the palpable agreement on the connection between integration and performance, external integration appears more complicated and demands more effort to achieve. It requires full cooperation of all supply chain players in their operations (Thai and Jie, 2018). Yuen and Thai (2017) identified five constructs that potentially prevent integration i.e. lack of trust and commitment, resistance to change, incompatibility of operating and strategic goals, lack of resources, and measurement failure.

Moreover, Fawcett and Magnan (2002) argue that while supply chains continue to engage with more companies in an outsourcing environment, the extent of integration does not increase accordingly. The authors found that the majority of companies achieved integration of internal processes within their firm and very few systematically integrated end-to-end. This indicates that end-to-end integration remains fragile. While criticizing that theoretical ideal of integration supporting performance seldom resembles supply chain practice, Fawcett and Magnan (2002) did not explore the mechanisms that connect the external parties with the focal firms. These mechanisms determine the level of connection that may influence the impact of integration to supply chain performance. It is hard to achieve full integration in a network of chains where each member has its own agenda and goals, especially at the point where a focal firm signs off a contract with other external third parties logistics provider. Therefore, companies need to undertake supply chain mapping exercise and enhance knowledge on their second-tier level (Lambert and Cooper, 2000). As more tiers are added, the more vulnerable the chain is to security threats. Supply chain security being at the center of this study, there are security challenges in export supply chain. This has drawn attention because of different observed structure leading to varying degree of

integration. This study fills the gap in that both supply chain structure and integration mechanism impact the security standards in terms of non-compliance.

Scholars vary in their perspectives of the different dimensions of SCI (Alfalla-Luque et al., 2013). Yuen and Thai (2017) summarized the premises where collaboration and coordination occur: information, operational, and relationship integration. Information integration is characterized by the degree of information sharing. Operational integration is joint activities, work processes, and decision-making. Relationship integration refers to the level of trust and commitment between players in the supply chain.

Robinson (2009) classified ownership and contractual arrangements as the main dimensions determining the degree of integration in supply chains. Fragmentation of ownership in chain functions makes integration vulnerable (Peck, 2005) and a lack of contractual arrangements reduces the degree of integration that is possible (Robinson, 2007). Supplier integration, customer integration and cross-functional internal integration mechanisms assist end-to-end integration within supply chains (Vickery et al., 2003). Sahin and Robinson (2002) and Bagchi et al. (2005), however, offered other integration dimensions, including mechanisms to share information with partners, to collaborate through decision-making, and share ideas and culture. These integration elements have been analyzed mostly in relation to supply chain performance. There is paucity of the literature that studies the elements of integration in the connection with security. Therefore, this research offers a novelty in using the integration principle to study SCS and the way security can be extended from focal firms (i.e., AEOs) to their chain partners.

2.3 Supply chain security

Problems in supply chains are complex and intertwined (Bichou et al., 2014, McNicholas, 2008). To better understand the phenomenon of international SCS initiatives, an interdisciplinary knowledge is required (Ashby et al., 2012, Sanders et al., 2013). Some studies on SCS initiatives take the perspective of security per se (Stasinopoulos, 2003, Metaparti, 2010, Lu et al., 2010, Altemöller, 2011, Bichou et al., 2014), some focus on the aspects of policy frameworks (Brooks and Button, 2006b,

Grainger, 2007, Marlow, 2010, Voss and Williams, 2013, Widdowson et al., 2014, Banomyong 2005), while others look at the intersection of issues from more familiar angles in SCM, such as risk management (Ireland, 2009, Sheffi, 2001), efficiency (Hintsa and Hameri, 2009, Urciuoli and Ekwall, 2012, Véronneau and Roy, 2014) and integration (Martens et al., 2011).

As a foundation to further discuss security in supply chains, Williams (2012) raised four fundamental questions while studying security: What is security? Whose security are we talking about? What counts as a security issue? How can security be achieved? Even though these questions are not designed specifically to address security issues in supply chains, they help to guide the flow of thinking in the research of SCS. Accordingly, the discussion in this section is guided by these questions and their relevance to security standards in export supply chains.

Security is a very broad term. Williams (2012) defined security as an “alleviation of threats that can be perceived in the negative term as the absence of threat or in positive term as enabling phenomena to make things possible (p.7).” To anticipate ambiguity in interpreting the term, a clear definition of security is required in this research. In practice, the terms security and safety are often confused, as noted by the researcher during fieldwork. Brooks and Button (2006b) differentiated between these two terms:

Security, however, poses particular problems because, unlike safety where there is no conscious effort to cause harm, there is an inevitable gaming problem with potential perpetrators continually vying to circumvent security regimes. Added to this, security involves uncertainty that, unlike risk, has no real probability associated with it (p.100).

Security, therefore, is uncertain and chain actors are unable to estimate the probable occurrence of any threat. The risk of terrorism in supply chains has increasingly drawn the attention of scholars and practitioners. An unsecured supply chain is vulnerable to disruption and damage may cause harm beyond the supply chain itself (Jain and Grosse, 2009). Scholars have identified terrorism as one of the evident risks that potentially create major disruptions, not only to supply chain activities, but also the

entire related business operations (Ho et al., 2015, Urciuoli and Ekwall, 2012, Trkman and McCormack, 2009).

Urciuoli (2010) discussed SCS in terms of measures, objectives, and threats. The measures are the combination of routines, technologies and managerial strategies. The objective is to enhance the protection of assets and operations from the threat of voluntary attacks. Security threats in supply chains are not only in the form of theft or burglary, but also international terrorism, and other criminal actions like drug smuggling, and human trafficking (Closs and McGarrell, 2004). Among the various explanations of SCS discussed so far, a definition from Closs and McGarrell (2004) appears to be appropriate for this thesis. They defined SCS as:

The application of policies, procedures, and technology to protect supply chain assets (product, facilities, equipment, information, and personnel) from theft, damage, or terrorism, and to prevent the introduction of unauthorized contraband, people, or weapons of mass destruction into the supply chain.

This definition offers a systematic perspective that comprises four elements of SCS management and is applicable to the line of investigation taken in this study of export supply chains. The first element refers to tools to address security threats: “policy, procedures, and technology.” Second, the objective of the application of these tools is “to protect supply chain assets.” Third, the threats are “theft, damage, or terrorism.” Fourth, the ultimate goal is “to prevent the introduction of unauthorized contraband, people, or weapons of mass destruction into the supply chain.”

2.3.1 Security in supply chain management

Security risks in supply chains are not discussed in the literature as much as other risks, such as business, financial, technological and physical risks (Xiangyang and Chandra, 2008). The risk of terrorism is discussed even less, despite the severity of its potential impact (Allen, 2007). Classic challenges of SCM may include operational speed, inventory reduction, demand-supply alignment, resilience and customer service improvement (Hints and Hameri, 2009, Christopher, 2016). Delivery in full and on time (DIFOT) is the focus of any supply chain operations (Sohal and Rahman, 2013).

Security of the logistics in the chain is vital. Since security measures require adequate investment, one argument is that business always expects an acceptable return from expenditure (Véronneau and Roy, 2014). Security is often perceived as a burden (Sheffi, 2001), and further efforts to improve security are likely to interrupt the logistics operations. However, scholars have offered arguments to justify additional expenses in SCS improvement (Hintsa and Hameri, 2009, Martens et al., 2011, Noda, 2004, Sheffi, 2001). Some scholars suggested embedding security measures in supply chain operations as part of the business process. Sheffi (2001) argued that investment in SCS benefits more than the company itself. Other than business operational benefits, corporate involvement in security programs also improves corporate image, creates a closer attachment from the employee (Sheffi, 2001), and opens up new business opportunities (Hintsa and Hameri, 2009). However, it is difficult to quantify the benefits of implementing security programs (Martens et al., 2011).

Not many scholars discussed security as part of SCM. Sheffi (2001) and Hintsa and Hameri (2009) discussed the impact of security measures on the speed of supply chain operations. Sheffi (2001) argued that efforts to improve security should be directed towards tighter collaboration between business partners and the optimal use of information technology, and later supported by Martens et al. (2011) and Banomyong (2005). The issue of alignment between demand information and material supply is also discussed as an element of integration, necessary to achieve greater efficiency in supply chain operations. Actions such as optimum utilization of information technology (IT) and closer collaboration with business partners have been highlighted as key to improving security, as well as simultaneously achieving tighter integration and improved efficiency. Scholars have examined various supply chain collaboration schemes, such as vendor managed inventory, efficient consumer response, just-in-time, and collaborative transport management (Sheffi, 2001). As a prominent scholar in SCS, Sheffi (2001) concluded that the extension of SCS between business partners and government, and the support of IT, play a key role in corporate performance. However, the level of relationships between partners to ensure secured and equal security level along the supply chains is missing in his discussion. The perspective of contractual form that connects chain partners in the context of security extension is a gap to be filled by this research.

2.3.2 Security and supply chain risk management

Discussions on SCS are frequently found in the SCRM literature (Ho et al., 2015, Rao and Goldsby, 2009). However, a review of this literature indicates that there are still knowledge gaps and inconsistencies in current research, particularly in terms of the methodologies used and the types of risks investigated (Ho et al., 2015). First, less than one third of the articles reviewed for this study used qualitative methods focusing on risk identification and SCRM constructs. The literature is dominated by the use of quantitative methods and the application of analytical methods is much more prevalent than empirical methods. Second, the majority of articles discuss supply risks, while very little attention is given to infrastructural risks, like transportation and information. Rice and Spayd (2005) also suggested the need of empirical research in the SCS literature.

This current research fills these gaps by applying the qualitative case study approach and addressing the infrastructural risks in the flow of goods transportation and information. These risks are reflected in the AEO security standards that require sufficient security measures to be implemented in the areas of cargo and conveyance security.

Security and risk are often seen as interchangeable terms and are not seen as distinct. There is some confusion on the use of terms such as risks, uncertainties, vulnerabilities, and sources of risk (Manuj and Mentzer, 2008). While Section 2.3.1 discussed security, this section explores risk and risk management strategies and how these differ from security. There is no clear consensus on the definition of risk in SCRM (Sodhi et al., 2012). Ho et al. (2015) defined risk as the likelihood and impact of unexpected macro or micro level events that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures. So the risk is associated with the probable occurrence of adverse events.

The element of collaboration consistently appears in SCRM discussions (Tang, 2006a, Thun and Hoenig, 2011, Jüttner et al., 2003). Jüttner et al. (2003) offered basic constructs that help identify risks and their management within the complexity of a supply chain. They also highlight the need for collaboration.

Table 2.1 SCRM basic constructs

Risk sources	Risk consequences	Risk drivers	Risk mitigation strategies
i. Environmental - Accidents - Terrorism ii. Organizational - Labour strikes - Production uncertainty iii. Network - Lack of ownership - Chaos - Inertia	i. Cost ii. Quality	i. Efficient vs. effective ii. Globalization of supply chain iii. Focused factories and centralized distribution centers iv. Outsourcing. v. Reduction of supplier base	i. Avoidance ii. Control iii. Cooperation iv. Flexibility

Source: Jüttner et al. (2003)

Table 2.1 shows the suggested risk management strategies, identified according to the source of the risk (e.g., environmental, organizational, and network), the risk consequences (e.g., cost and quality), the risk drivers (e.g., globalization, outsourcing etc.) and possible risk mitigation strategies (e.g., avoidance, control, cooperation and flexibility). Following these constructs, the risks of security identified in the AEOs can be categorized into three groups of sources. The first group is environmental risks. This type of risk refers to the surroundings of the supply chain operations, whether in the form of socio-political actions (e.g., rallies or terrorist attacks) or natural incidents (e.g., extreme weather, earthquakes, flood or fire). The second group relates to organizational risks that are found internally within the chain actors' organizations and may include a wide range of causes, such as labor disputes (e.g., strikes), production problems (e.g., machine failure), or IT-system breakdowns. The third group is network-related risks that derive from issues in the relationships between chain partners. The interaction between and among partners may create potential friction, hampering the smooth flow of the supply chain. These three risk sources are identified in the AEOs. For example, the AEOs work in collaboration with the trucking companies to determine the container routes from warehouse to port. This takes into consideration the environmental risk of road disruptions due to weather or riots, organizational risks of

time uncertainty on container readiness, and network-related risks on the agility of the trucking companies.

As risk is often inevitable (Jüttner et al., 2003), the development of risk mitigation strategies should include the identification of risk drivers, many of which originate from the natural pressure of competition in business. A driver relevant to this research is the increasing trend to outsource, particularly logistics operations such as warehousing, transportation and freight forwarding (Jayaram and Tan, 2010, Hertz and Alfredsson, 2003). Companies are induced to produce and deliver goods in the most cost-efficient manner to improve their operational competitiveness (Svensson, 2002). The AEO export supply chains offer appropriate examples of logistics outsourcing to achieve efficiency. The outsourcing is relatively low risk when the AEO signs a contract with the first-tier outsourced company. However, outsourcing operations become more vulnerable to risk when the first contracted company enters into a subcontract creating second tier and beyond.

Peck et al. (2003) classified risks in supply chains into four category levels (see Table 2.2). These align with the AEOs' security aspects (WCO, 2006). The four levels show that vulnerabilities come in different forms and risk drivers may be found in different interconnected levels. Peck et al. (2003) highlighted a problem in SCRM, with many firms still concentrating only on risks within their organization, despite the many examples of business continuity being influenced by supply chains. The first level of risk relates to the process value stream, which describes the flow of goods and operations between organizations in a supply chain network. This level is represented in the AEOs' cargo and conveyance security, where coordination between stakeholders in the chain is a critical to achieving the smooth flow of goods. This flow not only involves goods and container movement but also information sharing systems that support individual operations. This level relates to the role of links (goods transportation) that connect nodes (individual operations). The second level focuses on asset and infrastructure dependencies (e.g., factories, distribution centers, retail outlets, trucks, trains, vessels, planes, etc.) that characterize the aspects of premises and personnel security. The third level emphasizes the importance of organizational and inter-organizational networks. This resonates with the principles of trading partner security. The final level covers environmental risks, including the risk of terrorism.

Table 2.2 Four levels of risk in supply chains

Level 1: Process/value stream	Supply chain is seen as a linear 'pipeline' flowing through and between organizations in the network. It focuses on the efficient, value-based management of individual workflows of products and information.
Level 2: Assets and infrastructure dependencies	Supply chains as asset and infrastructure dependencies (e.g. factories, distribution centers, retail outlets, trucks, trains, vessels, planes, etc.).
Level 3: Organizations and inter-organizational networks	Supply chains as inter-organizational networks. The central focus is on the organizations that own or manage the assets and infrastructure, through which the products and information flow.
Level 4: The environment	Supply chain as a wider macroeconomic and natural environment. It includes aspects of politics, economic, social, technology, terrorism and nature in the operating and trading environment.

Source: Peck et al. (2003)

From different perspectives, Trkman and McCormack (2009) categorized uncertainty into two groups, endogenous and exogenous, to classify internal and external aspects of risk from inside and outside the supply chain. Endogenous uncertainty includes market and technology turbulence that can affect the relationships between focal firms and suppliers. Under exogenous sources, two groups of risk are discrete events (e.g., terrorist attacks, contagious diseases and workers' strikes), and continuous risks (e.g., inflation rates, consumer price index changes). Terrorism is categorized as a risk affecting the supply chain under the category of external risk from the environment. This is beyond the control of supply chain managers. Tang (2006b) argued that with a robust mitigation strategy, firms can not only maintain smooth operations, they can keep satisfying customers when other firms collapse or fail to recover quickly enough after disruptions. One way to rationalize the security investment is through an understanding of the probability of risks occurring. Interestingly, despite the fact that many firms are aware of the magnitude of the risks and the need for security strategies, the majority of firms fail to justify the investment needed to develop security strategies and only a few decide to take robust action to secure their supply chains (Zsidisin et al., 2004).

Rice and Caniato (2003) proposed a number of assumptions that they believed underlay this phenomenon. First, firms tend not to appreciate risk when accurate risk assessment is absent. Second, firms are not familiar with SCRM. Third, security programs are difficult to justify without proper investment analysis. Insurance becomes an option to mitigate risks (Heckmann et al., 2015). However, only a small number of firms rely on insurance because it is expensive and, in the aftermath of a major disruption, it cannot prevent a firm from losing customers (Rice and Caniato, 2003). To address this issue, Tang (2006a) argued that a security strategy must serve two purposes. First, it should be able to support business continuity during normal conditions. Second, it should allow sustainable operations during and after a disruption. Tang (2006a) focused on supply and demand chain in production and sales, overlooking the logistics of goods movement where the use of third parties is dominant (Rodrigue, 2012). The development of SCS initiatives was also not included in his discussion despite their potential options to support firms' security strategy. In fact, the characters of continuity and sustainability highlighted in the discussion are closely relevant with AEO program and to be revealed in more details in this thesis.

Security at nodes and links is equally important to ensure security for the whole supply chain (Sheffi, 2001). Rice and Caniato (2003) considered security control at nodes to be relatively uncomplicated since this is generally under the authority of a firm. On the other hand, maintaining security at links (i.e., transportation routes) requires more extensive coordination and collaboration (Zsidisin and Ellram, 2003). Scholars (Williams et al., 2008, Closs and McGarrell, 2004, Peck et al., 2003) have discussed specifically the importance of collaboration for addressing security risks. As noted in Chapter 1, Closs and McGarrell (2004) argued that current security risks have forced the shift of security perspectives from within firms to end-to-end supply chains, from a country to a global focus, and from traditional theft prevention to anti-terrorism. A closer relationship with government authorities, as well as other actors, is highlighted as necessary to achieve positive security outcomes.

While companies react differently to risks and not all companies have strategies to mitigate and manage them along the supply chain, Jüttner et al. (2003) proposed the implementation of a cooperation strategy. This strategy constitutes a joint effort between chain actors with three purposes: to improve supply chain visibility and

understanding; to share risk-related information; and to prepare supply chain continuity plans. Jüttner et al. (2003) portrayed the focus of many firms to integrate internally and neglect the importance to integrate externally. Their study supported the claim from Haywood (2002) that external integration is limited to first tier suppliers. The integration level as represented by different tiers of relationship and the impact to security was not discussed. This current research revisited this claim through the AEO case studies by evaluating the existence of multiple tiers in the principle-agent relationships.

Terrorism in Jüttner et al. (2003) was tangentially discussed as an external risk element affecting the business continuity. The offered cooperation strategy addresses general supply chain risks and does not focus on terrorism only. However, the strategies of control and security are closely related to the focus of this research. A control strategy involves the transfer of risks in the form of integration, contracts, and agreement. A security strategy addresses information system security, freight breaches, terrorism, vandalism, crime, and sabotage. The focus of the strategy is the ability to identify an abnormality in a supply chain. This strategy embraces the opportunity to work closely with government and other authorities (Manuj and Mentzer, 2008).

2.3.3 Terrorism and supply chain security

Discussion on SCS has intensified since the tragedy of 9/11, and the SCRM literature has increasingly included terrorism as a threat to security (e.g. Allen, 2007, McNicholas, 2008, Bichou et al., 2014). Prior to the 9/11 tragedy, traditional threats to supply chains mainly concerned theft and loss of cargo (McNicholas, 2008). Terrorism has somewhat dwarfed the traditional risks of theft, smuggling or even piracy (Bichou et al., 2014). The risk of terrorism has brought a new discourse in supply chain research, with the daunting prospect of catastrophe (Allen, 2007, McNicholas, 2008, Bichou et al., 2014). Tan (2011) noted that maritime transport security may refer not only to potential abuse of cargo, but also the possibility of ship hijacks for terrorism purposes. Terrorism has become the biggest concern in supply chain operations, with the potential for explosives to be hidden in containers for the purpose of blowing up ports or creating incidents similar to the hijacking of planes in the 9/11 tragedy (McNicholas, 2008). However, despite the imminent danger of terrorism and the high demand for security programs, this area still lacks academic exploration (Bichou, 2010,

Martens et al., 2011). Terrorism in export supply chains has the potential for catastrophic consequences and this research aimed to explore how security measures can be implemented effectively within this context.

The following are some of the papers discussing terrorism as part of supply chain security. Hintsa and Hameri (2009) analyzed the managerial and practical impacts of US government-led security initiatives on a global consumer goods company, a carrier and a port operator. All participating firms in the research realized the benefits of information transparency, tighter partner relationships, resilient and efficient supply chains, and new business opportunities. Even though relationship between actors emerged in their discussion, details describing the practices representing the relationships are missing. Further, Metaparti (2010) stated that the rhetoric surrounding the 9/11 attack has contributed to the fast acceptance and implementation of US security programs. Many countries immediately agreed to participate in CSI and CTPAT, predicated on political and economic considerations rather than security. Similar situation found in the acclamation of the AEO program when it was first introduced by the WCO (WCO, 2012).

Urciuoli (2010) suggested three areas that may improve security in supply chains: government initiatives, management strategies and operational routines. Several governmental initiatives related to SCS programs, including the AEO program, were analyzed for their functions: prevention, detection, and recovery. The AEO program was considered to have more prevention function rather than detection and recovery functions. They concluded that the AEO and CTPAT are similar in their prevention function and both have minimum guidelines about how these functions could be implemented. Even though their discussion was oriented more toward regulators than operators, Urciuoli and Ekwall (2012) recommended that businesses promote security measures that can also increase efficiency by incorporating security orientations into SCM. Their study findings indicate that goods owners and logistics service providers have significantly more security awareness compared to carriers.

2.3.4 Supply chain security and policy perspectives

Urciuoli and Ekwall (2012) alerted policy-makers to the importance of improving security in supply chains. In the context of policy frameworks, many scholars agree that

current regulatory programs necessitate further improvements, with a focus on closer partnerships between government and private entities (Voss and Williams, 2013, Widdowson et al., 2014, Marlow, 2010, Grainger, 2007, Brooks and Button, 2006a, Banomyong 2005). Such partnerships can mitigate the threat of terrorism more effectively. However, supply chains are often complex, with diverse stakeholders and sometimes conflicting objectives (Banomyong 2005). This is the context in which the World Customs Organization (WCO) introduced the AEO initiative. Bichou et al. (2014) argued that the imminent threat of terrorism calls for further research to design better security without deterring legitimate trade. Many researchers agree that AEO serves as an instrument to both secure and facilitate international trade (Altemöller, 2011, Zhang and Preece, 2011, Urciuoli and Ekwall, 2012, Mikuriya, 2007).

Kaufman (2007) argued that international trade is vulnerable to many issues, and security remains a major distraction. The AEO program instigators envisage global implementation, with the smooth and secure cross-border flow of goods and all actors enjoying the facilitation of minimum barrier procedures. From a business perspective, Fletcher (2007) studied the experience of IBM, arguing that security improves the competitiveness of a company by attaching a value differentiator to its supply chain. In his study, conducted with MIT and Stanford University, Fletcher (2007, p. 62) stated that security in supply chains provides “increased efficiency, improved asset visibility, enhanced supply chain resiliency, and better inventory management and customer relations.” On a basic level, the benefit of AEO implementation is that it doesn't interrupt business operations. However, the AEO program should offer value-adding to encourage business participation and justify the investment. Zhang and Preece (2011) asserted that, in most cases, government-business relationships are more rhetoric rather than action, but they were convinced that the AEO program represented an effective partnership program between government and the private sector. The AEO is designed to benefit both sides with a mutual contribution to security and logistics facilitation.

Grainger (2007) analyzed a cross-border environment in which multiple security institutions and regulations were involved in the governance of international borders. In the same vein, Marlow (2010) studied the legal ramifications in the shipping industry when ships, insurance, crews, and the goods carried belonged to different legal

systems. Marlow suggested that modern supply chains consist of three flows: goods, information and funds. This adds to the complexity of developing security policy since each flow has their own stakeholders but intersecting operations. Further, Grainger (2007) observed that uncoordinated official controls, overlapping supervision, a lack of uniformity in regulations, and the use of paper documents are the main problems that need to be addressed. At this junction, the AEO program has the potential to support reconciliation between government and business (Grainger, 2007, Marlow, 2010).

2.4 The relationship between security and integration in supply chains

Previous studies in SCRM have indicated a lack of in-depth discussion specifically focused on the relationship between security and integration (Friday et al., 2018, Ho et al., 2015, Tang and Musa, 2011, Rao and Goldsby, 2009). To locate previous studies that have explored security in supply chains and how SCI is likely to help in meeting the security of the export supply chain, a systematic literature review was undertaken based on steps taken by Friday et al. (2018). Figure 2.1 shows the process of data searching in this systematic literature review.

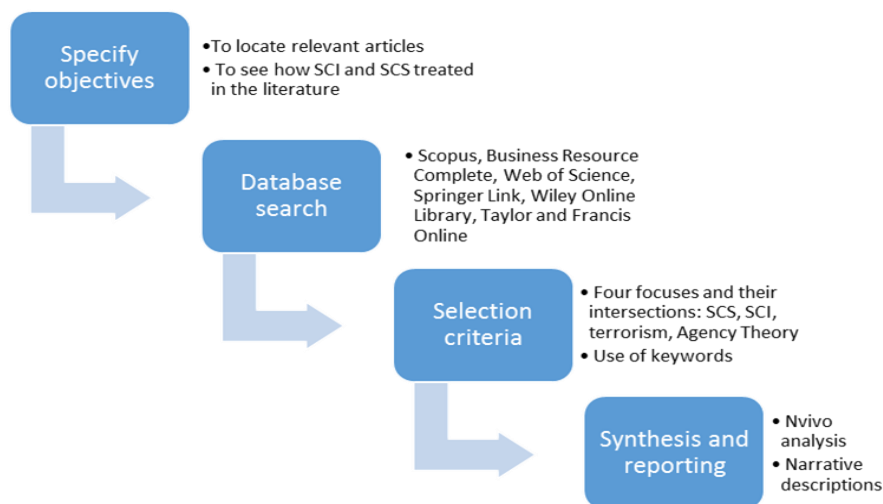


Figure 2.1 Systematic literature review process

The process included developing the objectives of the literature review, locating sources of data, determining selection and appraisal criteria, synthesizing, and reporting. The review also intended to identify the use of agency theory and to learn more about relevant methodologies. Journal databases, such as Scopus, Business Resource Complete, Web of Science, Springer Link, Wiley Online Library, Taylor and Francis Online, were used. Selection criteria were developed based on the four focuses of this research: SCS, SCI, terrorism, and agency theory. The search was limited to articles within the subject areas of business and management. When available, subject branches such as SCM, logistics, and transportation were selected. The researcher used a computer-assisted qualitative data analysis software (i.e.,

Nvivo) to help identify and categorize the criteria in the synthesizing process. Articles identified as stemming from other areas such as military, investment, and IT were excluded. Discussions of security in the area of risks other than terrorism, such as financial, information, and production risk, were also excluded.

The data search was conducted several times with different sets of keywords narrowed down from general SCI and SCS to a combination of SCI and SCS topics that discussed terrorism and involved the use of agency theory. This method allowed an observation on the current state of the literature related to those focus areas. Table 2.3 presents the results of the data search, which points to several conclusions.

Table 2.3 Data search results

Databases	Keywords				
	"Supply chain" AND integration	"Supply chain" AND security	"Supply chain" AND integration AND security	"Supply chain" AND integration AND security AND terrorism	"Supply chain" AND integration AND security AND terrorism AND agency theory
Taylor and Francis Online	9,863	4,427	3,334	204	74
Relevant articles found: Bichou, Szyliowicz & Zamparini 2014; Gutierrez & Hintsu 2006; Jain & Grosse 2009; Tukamuhabwa et al. 2015; Urciuoli & Hintsu 2017					
Wiley Online Library	5,324	2,488	1,827	115	65
Relevant articles found: (Kleindorfer and Saad, 2005, Meixell and Norbis, 2012)					
Springer link	2,858	1,281	736	34	0
Relevant articles found: (Bichou, 2004, Gould et al., 2010, Noda, 2004, Shan and Zhuang, 2014, Czinkota et al., 2010, Urciuoli, 2010, DuHadway et al., 2017, Ekwall and Torstensson, 2011, Helmick, 2008, Moore, 2015, Munoz and Welsh, 2006, Sodhi and Lee, 2007)					
Emerald insight	14,707	7,479	5,497	298	130
Relevant articles found: (Autry and Bobbitt, 2008, Chang and Wu, 2015, Manuj and Mentzer, 2008, Peck, 2005, Richey et al., 2010, Böhle et al., 2014, Dong-Wook et al., 2018, Hohenstein et al., 2015, Rao and Goldsby, 2009, Lembito, 2013, Sameer et al., 2014, Seu and Booi, 2008)					
Web of Science	3,497	485	37	0	0
Relevant articles found: (Cigolini et al., 2016, Hameri and Hintsu, 2009, Longo, 2010, Martens et al., 2011, Park et al., 2016, Smith et al., 2007)					
Business Source Complete	2,480	584	58	0	0
Relevant articles found: (Paquette and Moffat, 2005, Keng and Yuhong, 2004, Sabbaghi and Vaidyanathan, 2008)					
Scopus	1,857	360	36	3	0
Relevant articles found: (Böhle et al., 2014, Nagurney and Qiang, 2012)					

First, they clearly demonstrate that SCI has attracted more attention from scholars compared to SCS. Second, a small portion of studies in SCI involves security in their discussions and vice versa. From that small portion, many of these articles discuss

both SCI and SCS but do not focus on their inter-relationships. Third, fewer articles discuss issues of terrorism and last, none of them indicate the use of agency theory. The researcher then scanned the titles and abstracts from articles that indicated a relationship between SCI and SCS. From this process, many articles were found to be irrelevant. For example, the focus of some articles was on IT (Paquette and Moffat, 2005, Venkatachary et al., 2017), port security (Pallis, 2017), and military and humanitarian supply chains (Kaneberg, 2017).

Each database in the scanning process produced a number of articles that discussed security and integration in supply chains and included terrorism as a security risk. Duplications were excluded. None of these, however, showed a security-integration connection as the focus of study or involved agency theory. Some have been referred to already in the previous sections in terms of helping us understand SCS and SCI, such as the works of Bichou et al. (2014), Bichou (2004), Urciuoli (2010), Manuj and Mentzer (2008), Peck (2005). In addition, a trace-back method using the references in the articles derived from the data search led to several relevant articles. Table 2.4 summarizes the data, presenting the different focus areas, methods, and findings of these articles, particularly as they relate to this research.

Table 2.4 Previous studies connecting security and integration

Authors	Integration focus	Security focus	Methods	Findings
Rice and Caniato (2003)	Internal	Internal	Qualitative observation	Importance of internal integration between functions.
Banomyong (2005)	Maritime supply chains	Implementation of international security program	Conceptual	Security as driver for trade facilitation.
Kleindorfer and Saad (2005)	End-to-end	General	Quantitative	Trust, information, and profitability are conditions of SCS.
Autry and Bobbitt (2008)	Internal	General security orientation	Qualitative interviews/ Exploratory	Firm's security orientation affects financial, customer, and continuity outcomes.
Xiangyang and Chandra (2008)	End-to-end-integration	General security	Quantitative modeling	Taxonomy of SCS management.
Gould et al. (2010)	Conceptual/Not specific	Conceptual/Not specific	Literature review	Security studies should include chain member relationships.
Martens et al. (2011)	Internal and external	Terrorism	Quantitative/RBV theory	Internal and external integration positively related to security effectiveness.
Böhle et al. (2014)	End-to-end integration	Not specific	Systematic literature review	SCOR model potentially supports integration of security in supply chains.
Zhao et al. (2013)	Internal, supplier, and customer integration	Supply delivery risk and demand variability risks	Quantitative approach with structural equation modeling	Supply delivery risk negatively influences supplier, internal, and customer integration.
Park et al. (2016)	Not specific	Implementation of security programs	Survey	Extent of security measures influences security outcome.
Friday et al. (2018)	Collaborative risk management	General	Systematic literature review	No security study with holistic integration perspectives.

From these selected articles several assumptions can be made. First, the focus of integration has been studied from the perspective of internal firm integration (Rice and

Caniato, 2003, Autry and Bobbitt, 2008), a combination of internal and external (Martens et al., 2011, Zhao et al., 2013, Friday et al., 2018), and the need for end-to-end integration (Kleindorfer and Saad, 2005, Xiangyang and Chandra, 2008, Böhle et al., 2014).

Taking the perspective of internal firm integration, Rice and Caniato (2003) and Autry and Bobbitt (2008) represent the less utilized approach of empirical qualitative methods compared to the other selected articles. Rice and Caniato (2003) studied a response from supply chain communities to the risk of terrorism and concluded that integration of security and logistics operations was growing and showed potential. Their observations show that some firms improved their security and supply chain performance by merging security and logistics into one organization. Others created a security task force, whether internally or externally, to work with logistics teams to address security risks in logistics operations. These approaches show the importance of integration between functions within organizations. Autry and Bobbitt (2008) indicated similar findings from their interviews with 31 logistics and supply chain managers. Their data were content analyzed, resulting in the identification of critical themes on multiple approaches in the mitigation of SCS and risk management. The findings highlight the importance of integrating security measures into business process (e.g., inventory management and transportation).

Despite the importance of integration between functions in logistics process, these authors did not cover the fact that relationships between firms and their 3PLs vary in their tiers and contracts. Recognizing that the AEOs have different approaches in outsourcing their logistics needs, inviting 3PLs poses a varying degree of structure and integration challenges in export supply chain. This current research explored how the structure and integration mechanisms impact the security extension.

Looking at both internal and external integration, Zhao et al. (2013) argued that the increasing use of outsourcing, together with the globalization of supply chains and shorter product life-cycles, has resulted in more risks in business. Their study found that risks have a negative impact on integration. However, the focus of risks and integration in Zhao et al.'s study differs from this current research, and terrorism was only a part of the risks discussed. In a recent study, Friday et al. (2018) insisted on the importance of an inter-firm collaborative approach to share and mitigate risks. The

authors identified six collaborative risk management strategies: risk information sharing, procedure standardization, joint decision-making, risk and benefit sharing, and collaborative performance systems.

From the perspective of end-to-end integration, Böhle et al. (2014) assessed the use of a supply chain operations reference (SCOR) model to support security integration and, in turn, improve performance. The authors argued that a security-added SCOR model offers three benefits: 1) supports security integration by overcoming barriers and bridging gaps among chain partners; 2) facilitates identification of end-to-end security risks; and 3) assists implementation and dissemination of security initiatives. Kleindorfer and Saad (2005) added to this argument by suggesting that continuous coordination, cooperation, and collaboration are required for risk avoidance, reduction, and mitigation. Contractual relationships and incentive schemes, they argued, were practical ways to achieve this.

Similar with this current research, Böhle et al. (2014) discussed SCS from the perspectives of integration using the SCOR model representing the entire supply chain process. Both studies agreed that security should be integrated in the end-to-end supply chains. The impediment of measuring security performance was also considered as a limitation, either in the studies as well as in practice. Even though the discussion touched on similar aspects of security and integration in supply chains, the focus and coverage were different. The coverage in Böhle et al. (2014) included the entire process from sourcing raw materials, production and delivery to consumers. The entire supply chain activities were discussed neglecting internal and external aspects of the operations. The security measures were not focused to the relationships with the other players in the supply chains where security is more fragile. Integration aspects were discussed as a solution without detailing the aspects of integration relevant to support security. The current research complimented the study in the interconnection of SCS and SCI by filling these gaps.

Relevant to this context, Xiangyang and Chandra (2008) proposed a four-element taxonomy of security management: constraints, requirement, instruments, and management. Constraints are the causes of security problems, which consist of components such as assets, vulnerability and threat. Requirement refers to the demands placed on security performance and service, characterized by measures,

security compliance, and business goals. The instrument is selected according to needs and the specific constraints. The instrument can be in the form of general technology, mechanisms, service, and/or policy. The last element is management, which comprises tools, standards and business processes.

The second assumption shown in Table 2.4 is that, generally, the risk of terrorism is discussed together with other external or environmental risks such as theft, natural disasters, piracy, and riots. An exception here is the work of Martens et al. (2011), which focuses on the risk of terrorism and explores the effectiveness of SCRM by employing the perspectives of resource-based view (RBV) theory and the concept of SCI. These authors identified a number of factors that influence a firm's decision to implement a security program, including investor perspectives, social/government regulation, or the opinion of their supply chain partners. They argued that security at links is more difficult to manage than at nodes, and suggested that internal and external integration positively related to security effectiveness. External integration, however, requires more investment and is more challenging to realize. The mechanism to achieve higher integration was insufficiently discussed.

Martens et al. (2011) aimed to explore the relationship between security management practices and the perceived effectiveness of supply chain security. SCI was discussed as one of four major elements that influence security performance together with motivation, resources, and training and measurement. The study did not offer details on the SCS-SCI relationship that include the security measures. Therefore, this current research expands the discussion by focusing on the use of integration mechanisms in context of supply chain of varying structure to extend SCS from the focal firms to their chain partners. The thesis has used agency theory to illuminate more on contractual relationship that was often neglected in previous SCI-SCS studies.

The third assumption shown in Table 2.4 is that not many studies have focused on security programs in relation to integration, except for Banomyong (2005) and Park et al. (2016). Even though Integration was peripheral in their discussions, Park et al. (2016) surveyed the implementation of security initiatives, such as C-TPAT and CSI as part of corporate SCRM strategies. Their findings indicate that security is achieved according to the extent to which security practice is adopted; the more resources allocated, the higher the security level achieved. From the perspective of contingency

theory, the authors argued that risk taking propensity influences risk mitigating decisions that leads to a reduction of supply chain disruptions. In a different context, Banomyong (2005) identified five contributing parties involved in the development of port and trade security initiatives: government (typically represented by customs authorities), traders, ports, service providers, and insurance. Even though they may have conflicting interests and objectives, SCS is a result of collective efforts from which all parties enjoy the benefits. While his study focused on port and trade security in maritime SCM, this research explores the inland export supply chain leading to the ports of loading.

This systematic literature review reiterates the need to include integration in pursuing security objectives in supply chains. The growing global supply chain networks highlight the importance of integration as a way to manage SCS (Xiangyang and Chandra, 2008). Supply chains comprise various interconnected stakeholders who maintain unique relationships with other chain members, play different roles in the entire chain, and manage different security schemes (Arway, 2013).

At the same time, the literature review substantiated the argument that there is a knowledge gap in terms of connecting the two important constructs of integration and security in supply chains. Even though all the above studies mentioned the importance of integrating security measures, none of them provided a comprehensive empirical connection between the efforts to secure the supply chains and the channels of integration between the actors in those supply chains.

Further, the concept of security extension raised by Böhle et al. (2014) was modified in this research. Böhle et al. (2014) used the term as the continuity of security between the entire supply chain processes as represented in the SCOR model. This research focused on the use of integration mechanisms from the focal firms to their chain partners to extend their security interests when the goods change hands during transportation from factories to ports of export. Different from Böhle et al. (2014), the term extension in this research implies a level of power from the principal to agents in the perspectives of Agency Theory. This research fills the significant gap in that structure and integration may impact security objectives in the whole supply chain. The context of the risk of terrorism and the application of agency theory offers a new perspective on the connection between security and integration. The context of the

AEO program and Indonesia also adds a new dimension to the literature on supply chains.

2.5 Relevant theories and justifications for agency theory

The use of agency theory in this research is not without a challenge. Eisenhardt (1989) warned that the theory has a wide application in the studies of economics, finance, and political science. A school of scholars relate the theory specifically to capital market, whereas other applied the theory to areas extraneous to capital market. This triggers questions on the appropriateness of its application in supply chains. Perrow (1986) criticized the agency theory as being one-sided focusing on the principle and neglecting the interests of the agents. Therefore, further discussions on how agency theory has been used in supply chains literature, how it is used in this research, as well as other relevant theories are required.

Stock (1997) explained that logistics research is largely influenced by economics and partially by behavioral studies. The economic perspective is mostly directed towards cost minimization and profit maximization. On the other hand, the behavioral approach helps understand psychological and sociological aspects in the supply chain environment (Mentzer and Kahn, 1995, Donohue and Siemsen, 2011). Studies in logistics and supply chains often employ theories from other disciplines (Carter et al., 2015).

In the context of research in SCI, outsourcing and the inter-relationships between actors and operations, the supply chain literature includes recurrent discussions on RBV (Liu and Lyons, 2011, Barney, 1991), transaction cost economics (TCE) (Stank et al., 2001, Williamson, 2008), a combination of TCE and RBV (Jayaram and Tan, 2010, Zacharia et al., 2011, Williamson, 2008, Lai, 2004, Carter and Rogers, 2008), network theory (Zacharia et al., 2011, Peck, 2005), stakeholder theory (Co and Barro, 2009, Carter and Liane Easton, 2011), and agency theory (Logan, 2000, Manatsa and McLaren, 2008, Simatupang and Sridharan, 2002, Whipple and Roh, 2010, Zsidisin and Ellram, 2003). Not only in SCI, these theories dominate the literature in SCM (Gligor et al., 2018).

This research focuses on the relationships between exporters and their 3PLs under the context of AEO implementation. These relationships are characterized by outsourcing concept where the exporters maintain a degree of power to control their partners. The researcher acknowledges that these theories have the potential to underpin supply chain and logistics management research. However, agency theory appears to be the most appropriate for illuminating the issues of this research. For example, the RBV theory offers a view on the existence of 3PLs and their different roles (Lai, 2004, Liu and Lyons, 2011) that elucidate the different characters of the AEOs' export supply chain structures. RBV theory may help explain the decision of each AEO to outsource their logistics functions. Similarly, TCE theory could guide this research to look at outsourcing issues from different angles related to cost-effective performance presented by 3PLs (Zacharia et al., 2011). The TCE approach indicates that the barriers to effective relationships potentially come from uncertainty and the opportunistic behavior of 3PLs (Jayaram and Tan, 2010). However, neither RBV nor TCE theories can specifically explain the logic of potential gaps in security extension from the AEOs to their chain partners.

Stakeholder theory widely covers all parties that may influence a decision regardless the relationship between a firm and the stakeholders e.g. regulators, communities, employee (Miles, 2012). Thus, it is not relevant with the focus of the research that concentrates on the relationship between the AEOs and their chain partners only. Similarly, network theory, general system theory, and channel theory offer an understanding that supply chains are composed of interconnect elements to build its wholeness (Bolumole et al., 2007). However, the AEOs, as the focal firms, play a determinant factor in the supply chains and the extent of their visibility towards the chain partners contributes to the quality of the whole supply chains. This visibility is relevant to potential deterioration of the AEOs control that may be subject to physical distance, cultural distance, and closeness centrality (Carter et al., 2015). Therefore, these theories lack a perspective on the hierarchy of the focal firms and their subordinates, and they do not allow for the examination of focal firm efforts to influence other chain members.

Other than the above theories, this research also acknowledges theories related to risk and security, such as Normal Accident theory, High Reliability theory, and Situational

Crime Prevention theory (Clarke, 1980). Speier et al. (2011) integrated these theories in his endeavor to develop a framework for supply chain risk mitigation strategies. As he elaborated, Normal Accident theory assumes that accident is “normal” to happen in complex and interconnecting systems. Human error and management fault should be more accountable for an accident, rather than attributing them on technical or mechanical reasons. In contrary, High-Reliability theory argues that accident can be prevented. To supplement these two perspectives, Situational Crime Prevention proposes insights on intentional acts of disruption. Clarke (1995) further argues that crime is the result of a combination of motivated offenders, vulnerable targets and the lack of effective security.

These risk and security theories may form foundational perspectives in identifying and understanding the risks under research and help explain the potential security gaps between the AEOs and their chain partners. The process of risks evaluation at every chain member in the case studies may also find these theories useful to help suggest effective security measures. However, this research focuses on the integration mechanisms of the AEOs that influence the security extension to their chain partners. Agency theory is relevant in that the issue of opportunism, goal conflicts, and information asymmetry (Eisenhardt, 1989) associated with principal-agent relationships that endanger the supply chain security. Therefore, while recognizing their virtue, these theories do not constitute the main theoretical foundation for this research.

Agency theory finds its root in economics during the 1970s (Stock, 1997). The theory is appropriate to address issues on the relationship between actors with potential conflicting purposes in a collaboration (Eisenhardt, 1989). The focus is on the relationship between a principal, a firm that delegates part of its work, to other firms, as agents, under contractual agreements (Jensen and Meckling, 1976, Shook et al., 2009). Stock (1997) explained that even though contracts exist to regulate their relationships, the parties may not behave in accordance to the interests of each other. This is where potential conflict may arise and a more appropriate strategy to manage this relationship is necessary. Agency theory helps identify methods to ensure beneficial relationships between principals and agents through behavior control.

Under this principal-agent relationship, the principal uses strategies to ensure that agents follow direction, especially in the absence of direct supervision. This strategy is

referred to as agency cost. Jensen and Meckling (1976) defined agency cost as any cost that might be sustained in a collaborative relationship. This cost is not incurred by the principal only, but is also sustained by the agent. The agency costs comprise the principal's cost of monitoring, the expenditure incurred by the agent, and residual loss (Jensen and Meckling, 1976). The theory was considered appropriate for this research as collaborative relationships between the AEOs and their chain partners create conflicts of interest. This research sought to identify and evaluate the approach of the AEOs, as the principals, to effectively extend their security concerns to their chain partners, as the agents. In the study of logistics, agency theory is used in the areas of organizational relationships, strategic partnerships, as well as other SCM issues such as risk sharing and the identification of SCI costs and benefits (Stock, 1997).

Fayezi et al. (2012) advocated the use of agency theory to diagnose and manage supply chain relationships where behavioral uncertainties are evident. They suggested that agency theory is useful in three contexts. First, when there is substantial goal conflict between principals and agents (e.g., AEOs and chain partners). Second, when there is sufficient outcome uncertainty to trigger the risk (e.g., security outcomes). Third, when the evaluation of behaviors is difficult (e.g., complex contractual relationship tiers in AEOs) (Fayezi et al., 2012). These three situations occur in the relationship between AEOs and their chain partners. Moreover, agency theory is useful in the areas of mutual information, risk and reward sharing (Cooper et al., 1997, Lee and Whang, 2000), integrated relations and processes (Clements and Wilson, 2009), goal congruence across the chain (La Londe and Masters, 1994), and establishment and maintenance of long-term business relationships (Cousins, 2001). All these areas are represented in the relationships between AEOs and their chain partners, confirming the applicability of agency theory to this research.

A problem that was repeatedly conveyed by the participants in the research interviews and often emerges in the supply chain literature relates to the different objectives of chain members, which disturbs interconnection and affects the whole chain performance (Stock, 1997). In the principal-agent relationship, prominent challenges include the misrepresentation of ability (adverse selection) and lack of effort (moral hazard) on the agent side that erodes the principal's objectives (Fayezi et al., 2012). While a contract is a metaphor for the relationship between principal and agent in

agency theory (Eisenhardt, 1989), an actual contract that regulates this relationship is central to this research. The existence of a contract and its content is highly influential in forming the relationship. Therefore, contracts constitute essential elements in the analysis of agency costs borne by the AEOs.

In the specific area of logistics, where outsourcing is commonly found, Logan (2000) studied the reasons for so many failed outsourcing relationships in transportation. Instead of blaming the agents for failing to meet the principal's expectations, the study suggested the need to evaluate not only agents' behavior, but also the principal's strategy in managing their partners. Secondly, agency theory was recommended to help develop an appropriate contract to manage mutually beneficial relationships. Logan (2000) recommended the use of agency theory to help explain problems when principals and agents have different goals, and when the principal uses restrictions to control its agents. The chain partners in supply chains play a role with their resources and accountability. They contribute as a profit or a cost center that forms an agency. Therefore, an agent strives to maximize its gain (Carter et al., 2015).

Agency theory was applied by Byrne and Power (2014) to study unequal distribution of information and power, and the nature of interactions between firms in the supply chain. The agency-related factors were revealed as the cause of inter-relationship issues between firms. Additionally, Simatupang and Sridharan (2002) posited that agency theory is not only applicable to observe the relationship between chain actors, it is also germane for cooperation within a firm where internal divisions are autonomous. Lack of trust is also considered influential in impeding collaborative efforts. The different domains of responsibilities and absence of understanding of the whole chain process may endanger the smooth operations of the entire chain. Furthermore, a quantitative research study using agency theory conducted by Zsidisin and Ellram (2003) revealed that there is a significant relationship between supply risk sources and how they are managed. As proposed in agency theory, two ways to address risks are through either a behavior-based contract or an outcome-based contract. Their findings show that behavior-based control is preferred as it offers more sustainability through an improved relationship between parties. This improvement also includes enhanced information sharing, monitoring progress, and a closer relationship.

Li et al. (2015) expanded the study from Zsidisin and Ellram (2003) and used agency theory in their study on joint supply chain risk management. Agency theory is chosen since it underpins the interface between a focal firm and its chain partners. The theory explains the common principal-agent problems such as opportunism, differences in goals and risks, and information asymmetry. These problems are found to hinder effectiveness in the mitigation of supply chain risks.

Soosay and Hyland (2015) argued that many collaboration theories in SCM literature, including agency theory, tend to have more focus on the focal firms' perspectives. As a network of firms, collaboration in supply chains is a result of all players that requires a dyadic or multi-firm perspective. This research did not attempt to contend this argument realizing the AEOs as the focus. However, the discussions include the perspectives of the chain partners to support the efforts of the AEOs to extend security through the integration mechanisms.

2.6 Theoretical framework and propositions

The theoretical framework addresses the research question by developing the relationship among the study variables being tested in a research context (Maxwell, 2005, Ravitch and Riggan, 2016). The framework serves three purposes. First, it identifies who and what is to be included in the study. Second, it describes the relationship between the elements based on logic, theory and findings. And finally, it allows the researcher to develop general constructs (Miles et al., 1994, Baxter and Jack, 2008). In this research, the framework was developed to identify and review the elements of integration and the way these help achieve extension of security standards in export supply chains. It adopted a modification of the chain constructs proposed by Robinson (2009). This modification took into account aspects in the chain constructs that were relevant for analyzing security in the context of integration. Guided by the research question, the theoretical framework (Figure 2.2) combines elements of SCI and SCS as discussed in previous sections.

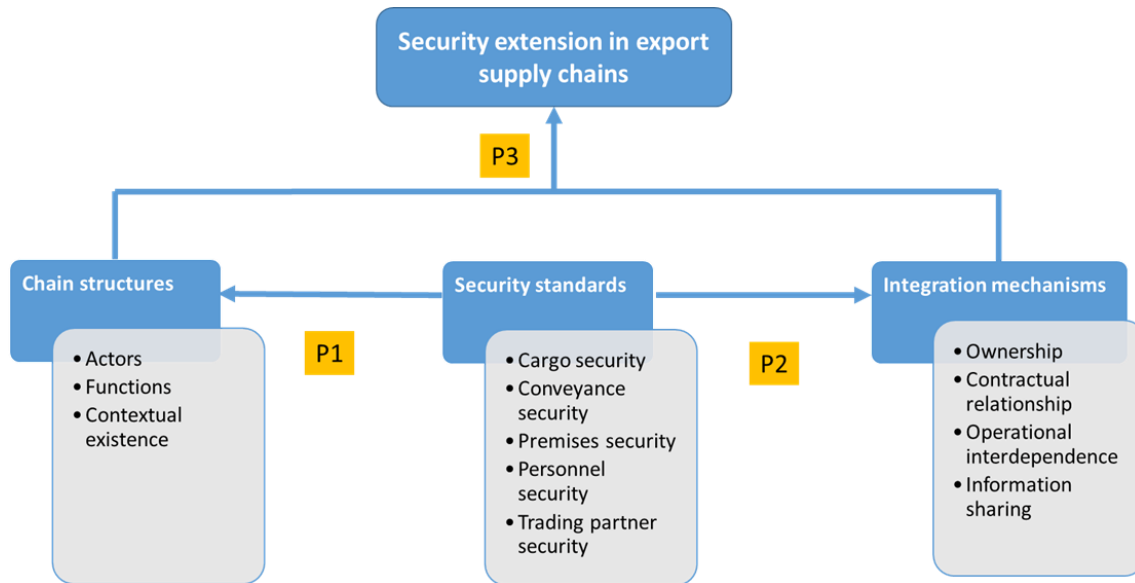


Figure 2.2 Theoretical framework

Figure 2.2 presents the components of the theoretical framework. The first component is the chain structure, characterized by individual actors in the chains, their functions, and contextual existence. Actors are the firms involved in the chain operations including the exporters as the focal firms and their chain partners. Functions refer to the roles and activities of actors in the movement of cargo from the exporters' premises to ports of export (e.g., freight forwarders, trucking companies, shipping agents, empty container park operator). A single actor or many actors might handle one function or more functions in a chain. Contextual existence refers to an actor's specific activity in a sequential flow of cargo and how it contributes to the whole processes in an export supply chain. The contextual existence of an actor may be different from one chain structure to another even though it represents the same function. For example, a freight forwarder is commonly perceived to have more than one role in supply chains (Berglund et al., 1999) such as preparing export documentation, organizing transportation or recruiting trucking companies (See Table 3.2). However, some freight forwarders may, for example, only handle a single function such as delivery of documents. Hence, one freight forwarder may have a more significant relationship in one supply chain than another. Contextual existence can also refer to contribution level of an actor in a supply chain. For example, a single actor handling just one function contributes to the supply chain more significantly compared to multiple actors handling

the same function. The number of trucking companies serving an export supply chain is an example of this situation.

The next component is security standards, characterized by security aspects related to cargo, conveyance, premises, information, personnel and trading partners (WCO, 2006). These standards are explained further in Chapter 3. The third component involves integration mechanisms in export supply chain to extend security standards, characterized by ownership, contractual relationships, operational interdependence, and information sharing. While ownership and contractual relationships are self-explanatory, for the purpose of data collection and analysis, defining the mechanisms of operational interdependence and information sharing requires greater specificity. This research used the integration dimensions from previous studies to identify operational activities characterizing operational interdependence and information sharing. These are shown in Table 2.5.

Table 2.5 Definitions of operational interdependence and information sharing

Operational interdependence	Information sharing
Access to planning systems (Frohlich and Westbrook, 2001)	Joint EDI access/networks (Frohlich and Westbrook, 2001)
Organizational relationship linkage (Lee, 2000)	Information sharing and decision-making coordination (Sahin and Robinson, 2002).
Collaboration and shared decision-making with network partners (Bagchi et al., 2005)	Information integration (Lee, 2000)
Operational and strategic collaboration (Bagchi et al., 2005)	Information sharing and communication across the SC (Bagchi et al., 2005)
Sharing of skills, ideas and institutional culture and organization (Bagchi et al., 2005)	Integration using information technologies (Frohlich and Westbrook, 2001)
	Sharing data from traditional planning and control systems (Bowersox and Daugherty, 1995)

The above three groups of variables (chain structures, security standards, integration mechanisms) are inter-connected to influence the security extension along the chains. This research examines security extension in the whole export chain represented by implementation of relevant security standards by every actor involved in the movement of export cargo from the AEOs to port of export. The security extension is achieved by the AEOs in their efforts to extend security standards to their chain partners through

the integration mechanisms. In the perspective of agency theory and the concept of single intelligence (Robinson, 2015), the AEOs exercise their power as the principals extending their certified security standards to their agents. This research did not measure security level as the result of SCI, instead it proposed different levels of security extension.

Following the development of the theoretical framework, three propositions were formulated to focus and delimit the scope of research (Baxter and Jack, 2008, Yin, 2014). The logic of the theoretical framework and the rationale for the development of propositions are discussed in the following sections.

2.6.1 Proposition P1: The relationship between supply chain structure and security standards

The AEO program is designed to promote security in the areas of cargo, conveyances, personnel, premises, and trading partners. However, the fragmented nature of supply chains and the extensive use of 3PLs and chain partners in the AEO export supply chains challenge the AEO objectives. Recognizing the voluntary nature of the AEO program (WCO, 2012) and considering that many supply chains operate in a disintegrated manner (Robinson, 2002), security breaches are likely.

Robinson (2015) suggested investigating the chain structure, architecture and dynamics to understand the influence of partner collaboration and the coordination of logistics activities on chain performance and efficiency. In this research, chain structure identification was expanded to include an analysis of the influence of the chain structure on the extension of security standards across the AEOs' export supply chains. Chain structures involve actors in the chains, their functions, and contextual existence. The structure of the chain varies when actors from transport, warehouses, and container yards join the chain. The variation of chain actors, their functions and contextual existence may affect the level of security standards in the export supply chain. The more complex the structure, the harder is the challenge to achieve effective extension of security standards from the AEOs to their chain partners. Therefore, the following proposition was formulated.

Proposition P1: Supply chain structure, comprising of actors, functions and their contextual existence, affects the extension of security standards in export supply chains.

2.6.2 Proposition P2: The relationship between security standards and integration mechanisms

The theoretical framework adopts the concept of SCI mechanisms that is characterized by elements of ownership and contractual relationship as suggested by Robinson (2009), and the elements of operational interdependence and information sharing from Alfalla-Luque et al. (2013). The concept of ownership traces back to the tradition of logistics facilities and operations being owned and managed internally by an organization (Abdur Razzaque and Chen Sheng, 1998). In the AEO context, the organization is the AEO acting as the focal firm, which may own its logistics functions, such as warehousing, freight forwarding, trucking, and even a seaport. With the increasing trend of outsourcing logistics functions (Sheffi, 1990, Rodrigue, 2012), and in the absence of sole ownership, connections between focal firms and these functions can be in the form of transactional relationships, cooperative understandings, or long-term contracts (Ellram, 1991). Contractual relationships are formal and legal relationships characterized by a contract regulating the interactions and expectations of all parties (Marasco, 2008). Compared to other forms of connection, contractual relationships signify a level of integration (Robinson, 2007, Robinson, 2015).

Operational interdependence and information sharing are critical in a principal-agent relationship. A successful dyadic principal-agent relationship must be built on coordination and collaboration (Banchuen et al., 2017). This research adopted the integration dimensions and variables presented by Alfalla-Luque et al. (2013) to translate the concepts of operational interdependence and information sharing from Robinson (2009) into more practical classifications. Under the themes of operational interdependence and information sharing, activities are classified into sub-themes of measures considered to contribute to SCI as summarized by Alfalla-Luque et al. (2013). As shown in Table 2.5 above, this research adopted integrative measures from Frohlich and Westbrook (2001) on access to planning systems and joint EDI access. Integration elements from Lee (2000) included organizational relationship linkages and information integration. From Bagchi et al. (2005), three elements of operational

interdependence were adopted: collaboration and shared decision-making with network partners; operational and strategic collaboration; and sharing of skills, ideas and institutional culture and organization.

In the AEO export supply chains, security is potentially at risk due to the complexity of chains, the fragmented nature of chain operations, and the newness of the AEO program, which creates significant disparities in security levels between the chain actors. The outcome of a supply chain is dependent on the performance of each and all chain members (Schoenherr and Swink, 2012). Thus, to achieve the security objectives for the whole chain, the AEOs must extend their security standards to their chain partners. The researcher argues that efforts to extend security standards from the AEOs to their chain partners can be optimized by utilizing integration mechanisms. This gives rise to the following proposition:

Proposition P2: Extension of security standards from focal firms to chain partners can be facilitated by integration mechanisms.

2.6.3 Proposition P3: The relationship between chain structure, integration mechanisms and extension of security standards

Section 2.4 presented a discussion of previous studies that investigated, to some extent, the relationship between SCI and SCS, and revealed the importance of merging the two constructs in the management of supply chains. Some firms improve their security and performance by merging security measures into their logistics operations (Rice and Caniato, 2003). This emphasizes the importance of integrating security and business processes (Autry and Bobbitt, 2008). The increasing outsourcing of logistics services also increases security risks (Zhao et al., 2013). This reinforces the need for collaborative approaches to share and mitigate the risks along the chain (Friday et al., 2018). While the general arguments from the literature highlight the importance of integration in the context of firm or supply chain performance, this research explores further the impact of the use of integration mechanisms to extend security standards. The security extension in the export supply chain is achieved when the focal firms successfully extend their security standards to chain partners. Integration mechanisms are potential avenues to support the efforts of security extension in consideration of the complexity of the chain structures. This leads to the following propositions.

Proposition P3: Overall security extension is dependent on the effectiveness of the interactions between security standards, chain structures and the integration mechanisms.

2.7 Chapter summary

This chapter presented a literature review on the topics of SCI, SCS, SCRM, as well as agency theory, particularly in relation to supply chains. Based on this review, the theoretical framework was designed, in a sequential order, to understand the AEO export supply chain structures, identify existing security measures and standards, and evaluate operating integration mechanisms and their connection to efforts to extend security to the whole chain. Three propositions were formulated to further guide the research. Having reviewed the literature relevant to the research, Chapter 3 elaborates on the background and context of the study signaled in Chapter 1, the AEO program and export supply chain.

CHAPTER 3

THE AEO PROGRAM AND EXPORT SUPPLY CHAIN: THE RESEARCH CONTEXT

3.1 Introduction

The implementation of the AEO program has been briefly introduced as important to this research. Recognizing its central role in this study, it is necessary to have a comprehensive understanding of the AEO initiative and its implementation in Indonesia. This chapter presents a further discussion on how the AEO program provided context, helped build the theoretical framework, created a debate on SCS, and became the case study for this research.

To underline the magnitude of the AEO, Section 3.2 provides comparisons with other similar security initiatives in supply chains. This highlights their differences and similarities and, most importantly, how the AEO stands out among other security programs in supply chains. Section 3.3 describes the World Customs Organization (WCO), as the international organization from which the AEO evolved, the SAFE framework, as the umbrella initiative that embodies the AEO program, and the AEO program in more detail, including the responsibilities of each party to achieve the AEO objectives. Section 3.4 discusses AEO development and challenges. Section 3.5 overviews typical export procedures and actors that are frequently referred in further discussions. Finally, section 3.6 presents the implementation of the AEO program in Indonesia.

3.2 Security programs in supply chains: precedents and challenges

In a national context, the United States of America (US) has played a central role in promoting SCS programs. Immediately after the 9/11 tragedy, the country launched a number of supply chain related security initiatives, such as the Container Security Initiative (CSI), Customs-Trade Partnership Against Terrorism (CTPAT) and Maritime Transportation Security Act (MTSA) (Altemöller, 2011). Other developed countries with

high security risks also commenced ensuring that goods entering their land were safe and secure by moving the span of control from traditional in-country to extensive off-border control (Nguyen, 2012).

Under the CTPAT, the US Customs and Border Protection (CBP) examines companies exporting to the US and ensures they accomplish and maintain sufficient security measures. In return, their cargoes are deemed to contain less risk and enjoy less interference from customs at ports of destinations in the US (US Customs and Border Protection, 2004). The CSI seeks cooperation from partner countries to allow the US CBP to conduct risk analysis and execute examinations on US bound containerized cargoes at ports of export (USCBP, 2011). With an approach to expanding control beyond borders, these initiatives are among 33 programs enlisted in the US' "Strategy to Enhance International SCS" issued by the Department of Homeland Security (US Department of Homeland Security, 2007).

In the international context, the United Nations' associated bodies, the United Nations' Office for Drugs and Crime (UNODC) and the International Maritime Organization (IMO), introduced the Container Control Programme (CCP) and International Ship and Port Security (ISPS) consecutively. These two are examples of security initiatives established with an expectation that all countries will participate to enhance control at certain nodes in supply chains. Even though primarily designed to combat the smuggling of drugs, the CCP covers the risk of international organized crimes, including terrorism. By organizing a task force composed of related law enforcement bodies and with the support of intelligence exchange systems, the CCP aims to intercept and control anomalies at international ports (UNODC, 2013). The ISPS, on the other hand, focuses on the security of ships and port facilities and regulates minimum security standards to prevent and detect security threats. This initiative has been in force since 2004 and provides prescriptions for governments, shipping companies, and related port authorities to identify security risks and prepare measures to overcome potential security incidents at port facilities and on ships (IMO, 2016).

The above four examples of security initiatives (i.e., CTPAT, CSI, CCP, ISPS) are global in coverage and involve significant participation, both in terms of the number of countries and types of patrons in the chains. Since its introduction in 2001, the CTPAT has been growing significantly, covering more than 11,400 business entities that

represent all functions in the US import chains. This includes importers, carriers, customs brokers, terminal operators, as well as exporters and manufacturers abroad who serve as their trade partners (US Customs and Border Protection, 2004). The CSI currently includes 58 participating international ports, covering 80% of the entire containerized cargoes shipped to the US (USCBP, 2011). With the significant influence of the United Nations, the CCP and ISPS have also attracted substantial participation globally. The CCP is now operating in 36 countries with more than 50 port control units contributing to the increasing detection and confiscation of illicit drugs (UNODC, 2017). While the CTPAT, CSI and CCP are voluntary initiatives, the ISPS is mandatory for country signatories to the Safety of Life at Seas (SOLAS) Convention (IMO, 2016).

Despite some extensive coverage, these programs lack certain international SCS aspects that would make them more globally accepted and operational, connecting all patrons in a borderless environment. Considering that supply chains in international trade connect countries through the flow of goods, documents, and funds, it is necessary to have a security initiative that is accepted by all patrons in the chains, including their partners in the country of destination. This sense of broader international interest is missing in the US' CTPAT and CSI (Altemöller, 2011). Different from CTPAT where institutional pressures are strong for firms to participate (Ritchie and Melnyk, 2012), the AEO program in Indonesia is fully voluntary.

In conclusion, while the programs developed by international organizations are more globally accepted, their coverage is limited to particular nodes and orientation in supply chains. The ISPS only focuses on security at ports, and the CCP exclusively focuses on control without offering facilitation to balance the tighter control. The common perception that security programs incur additional costs and time may aggravate the already complex procedures in supply chains (Grainger, 2007).

3.3 WCO's SAFE Framework and AEO

The WCO was established on 26 January 1953 in Brussels, Belgium. Initially created by a study group of thirteen European countries, it has grown to include 180 countries (WCO, 2017). Responding to the increasing global security challenge, the WCO commenced the development of a security program in 2002, and introduced the

framework of Standards to Secure and Facilitate Global Trade (the SAFE framework) in 2005 (Mikuriya, 2007). This framework is built upon principles of strong cooperation between customs administrations as well as the tight partnership between customs and private sectors. The framework involves a concept of key players contributing to security in supply chains: the AEOs. With members managing more than 98% of world trade (WCO, 2017), the WCO has played a vital role in developing programs that are adaptive to shared interests in international trade. Indonesia is one of the WCO's 168 member countries that endorsed the SAFE framework once it was introduced in a leaders' conference in 2005 (WCO, 2014). The signature of endorsement indicates that the program will be introduced in their countries. This commitment has generated optimism that the AEO may induce a promising future of globally-secured supply chains in which patrons are not burdened by different overlapping programs.

An AEO is defined as:

A party involved in the international movement of goods in whatever function that has been approved by or on behalf of a national Customs administration as complying with WCO or equivalent SCS standards. AEOs may include manufacturers, importers, exporters, brokers, carriers, consolidators, intermediaries, ports, airports, terminal operators, integrated operators, warehouses, distributors and freight forwarders. (WCO, 2012)

The AEO program offers a balanced approach towards control and facilitation. A chain actor is certified as an AEO by customs after meeting a set of specific requirements, including the firm's compliance record, financial viability, information accessibility, and security on cargo, conveyance, premises, personnel, and trading partners (WCO, 2014). Upon certification, the AEOs are privileged with benefits from customs that are not given to non-AEO companies. The benefits may be varied between countries and may include less inspection, fewer documents and direct assistance from customs.

When national oriented programs do not represent the interests of other countries, and international initiatives are more fragmented in their focus and objective, the implementation of security measures in a supply chain is challenging. Against this backdrop, the WCO's SAFE framework that promotes the AEO program offers a holistic approach (WCO, 2012). Integrated orientation and a balanced character of

control and facilitation make the AEO more acceptable for stakeholders in supply chains. The SAFE framework seeks to establish standards of SCS with an end-to-end approach supported by two pillars of strong partnerships: customs-to-customs and customs-to-business.

For the first pillar, the WCO SAFE framework (WCO, 2012) prioritizes integrated SCM above ten other standards that include risk management systems, employee integrity, and outbound security inspections. The second pillar is mainly about the establishment of the AEO program and outlines the requirements for customs and businesses. An AEO guideline (WCO, 2006) elaborates thirteen standards to qualify an AEO. These standards relate to aspects of business performance, information exchange, security compliance, and incident recovery. However, for the purposes of this research, the aspects of business performance and incident recovery are excluded as they are not relevant to the focus on integration and security. As shown in Table 3.1 below, business performance covers the first five requirements in the AEO guidelines, and incident recovery is incorporated into the last two conditions.

Table 3.1 AEO conditions and requirements

Requirements	Research focus
A. Compliance with customs requirements	NO
B. Management of commercial records	NO
C. Financial solvency	NO
D. Consultation, cooperation, communication	NO
E. Education, training, awareness	NO
F. Information exchange, access, confidentiality	YES
G. Cargo security (sealing, third party)	YES
H. Conveyance security	YES
I. Premises security	YES
J. Personnel security	YES
K. Trading partner security	YES
L. Crisis management and incident recovery	NO
M. Measurement, analysis, improvement	NO

Source: Modified from WCO (2006)

The aspects of information exchange are included in the focus of this research because they relate to security and integration in supply chains. These aspects include information access and confidentiality that potentially lead to risks in information security. A breach of information access and unauthorized alteration of information can enormously affect security in supply chains (Jouini et al., 2014). The AEO guidelines specify conditions and requirements for both AEOs and customs related to their information management. The guidelines regulate limited access to sensitive information, implementation of electronic data exchange, and development of information security procedures. These procedures may include the use of firewalls and passwords to protect against unauthorized access.

In terms of physical security, customs must verify aspects of business operations, covering cargo, conveyances, premises, and personnel. Cargo security comprises the integrity, access and control procedures of the cargo. Cargo packaging, the use of seals, container quality, controlled access to cargo storage, and documentation procedures are examples of AEO standards under this category. Conveyance security regulates that transport conveyances are effectively secured and maintained. This standard requires quality vehicles to be used in all modes of cargo transportation, security control during transportation, and the employment of trained personnel. Premises security covers gate entry systems, peripheral and perimeter security, access control (particularly to loading docks), cargo storage, and information systems. Personnel security requires AEOs to screen the background of their employees, implement identification procedures, and have procedures in place to identify record and deal with unauthorized persons.

In the perspectives of integration, cargo and conveyance security are not limited to AEOs but must include other chain members involved in the flow of cargo, as well as their conveyances. The security of cargo when under the other party's control is also regulated in this category. The elements of premises and personnel security are also relevant to integration, especially when cargo handling and movement involve other chain members. Therefore, the element of trading partner security becomes important to assure the AEOs extend their security standards to their chain partners. When not all actors in the chains are AEOs, differences in security status may hamper security

performance across the whole of the chains. Trading partner security is a factor that contributes to the integration of SCS.

It is necessary to clarify the meaning of the term trade partner since there is no precise definition of this term in the AEO implementation guidelines (WCO, 2006). The online Collins dictionary defines “trading partner” as “a *person, organization, or country with whom somebody customarily does business*” (Collins, 2017). The AEO guidelines use two similar terms in different contexts: Trading partner and business partner. First, the term trading partner is used in an AEO requirement:

Customs shall establish AEO requirements and mechanisms whereby the security of the global supply chain can be bolstered through the commitment of trading partners to voluntarily increase their security measures, as may be more fully set forth in supplemental national criteria. (WCO, 2006)

In this requirement, the AEO is required to:

- a. if necessary, when entering into negotiated contractual arrangements with a trading partner, encourage the other contracting party to assess and enhance its SCS and, to the extent practical for its business model, include such language in those contractual arrangements.*
- b. review relevant commercial information relating to the other contracting party before entering into contractual relations. (WCO, 2006)*

The second term, “business partner” is used as an entity under the seventh AEO requirement, cargo security. This requires AEOs to:

- b. ensure that it and/or its business partners in the supply chain with sealing responsibilities have written procedures in place to properly seal and maintain the integrity of the shipment or transport conveyance while in its custody;*
- c. ensure that it and/or its business partners employ the use of seals that meet or exceed the then-existing ISO Standard. (WCO, 2006)*

Both terms, trading partner and business partner, in the above context, are analogous to the functions of chain actors, like freight forwarders, warehouse operators and other

logistic service providers. For that reason, in this research context, the terms are used to refer to an AEO's chain partners. From the whole of chain perspective, each chain member contributes to the integrity of the chain (Robinson, 2009). With that understanding, this research discusses the participation of chain partners in export chain security, especially when they do not have the AEO status.

3.4 AEO development and challenges

The WCO argues that the AEO program mutually benefits government and business (WCO, 2012). For customs, it enhances the risk management system and provides an avenue for coordinated border control management. For business, together with uniformity and predictability, it offers faster clearance at borders. In turn, it contributes to economic development and security protection. Thus, the program has successfully attracted 168 out of 180 member countries, albeit not compulsory (WCO, 2014). The AEO program has also gained support in many international forums. The Asia-Pacific Economic Cooperation (APEC) emphasized the importance of AEOs in their trade security strategy and 17 out of 21 member countries have operational AEO programs (APEC, 2016). Likewise, the Association of Southeast Asian Nations (ASEAN) promotes the AEO program and develops cooperation mechanisms, recognizing the differences in implementation stages among its members (ASEAN, 2016). In addition, the World Trade Organization (WTO) members agreed to adopt the Trade Facilitation Agreement that carries an element of SCS for trade actors involved in international trade. The spirit of this agreement is similar to that of the AEO program as it recognizes that businesses with certified security should be treated differently and enjoy more facilitation (WTO, 2014). This development has brought stronger leverage for the implementation of the AEO program.

With this increasing trend toward implementation, the AEO program has attracted more business participation. As an example, Widdowson et al. (2014) summarised a study commissioned by the Australian Trade and Transport Industry that identified the need for Australia to implement a scheme of SCS in its international trade. It underlined the potential of the AEO program to influence Australia's competitiveness in the global market. Through focus groups, surveys, and interviews, the industry reflected their concerns about their exports related to additional potential delays and costs due to the

lack of acknowledged security status. Therefore, the industry suggested the introduction of an internationally accepted security scheme in supply chains. They also proposed possible incentives to implementing such schemes, including reduced intervention, simplified procedures, priority treatment, reduced fees and mutual recognition. It is interesting to consider further the development of opinions related to SCS in Australia. Even though Australia committed to implementing the SAFE framework in 2005, the Australian Customs and Border Protection Service (ACBPS) decided not to introduce the AEO program because of existing high security standards and the minimal benefits of AEO implementation (Australian Customs and Border Protection Service, 2012). This decision was based on two surveys conducted by the ACBPS among its business stakeholders in 2008 and 2011. Interestingly this direction changed with the announcement of a plan to implement the Trusted Trader Program, which is similar to the AEO initiative (Australian Customs and Border Protection Service, 2013). This development may constitute an example of the need for governments to consider international security schemes in their related supply chain policy planning.

The attractiveness of a SCS program influences its success (Altemöller, 2011) and country participation in the AEO program is increasing (WCO, 2016). However, AEO implementation is not without its challenges. The latest report revealed only 69 out of the 168 countries that signed the commitment have implemented the program (WCO, 2016). It indicates that further efforts are required to enhance the implementation of the program.

The AEO program is not compulsory and the regulations are not detailed. Supply chain patrons targeted to become AEOs also vary. Some countries implement the AEO program on imports, while others on exports (WCO, 2016). For example, EU countries, Singapore and Canada, accommodate all types of chain actors in both exports and imports in their AEO programs. Other countries, such as New Zealand, Colombia, and Mexico only certify exporters as AEOs (WCO, 2016). Moreover, even though a government may open the program to all, this does not guarantee that all actors in a particular chain are AEOs. This means that an AEO exporter may employ non-AEO freight forwarders, or an AEO freight forwarder may employ non-AEO trucking companies, and so on. When AEO and non-AEO actors have unequal levels of security

standards, threats can occur anywhere in the chain and fragmented security measures may affect the security performance of the whole supply chain. The voluntary character of the program challenges the uniformity of AEO security standards as goods change hands along the supply chains.

3.5 An overview of typical actors and procedures in export

A summary of generic actors and their functions in export supply chains is presented in Table 3.2, adopted from various sources (Morash and Clinton, 1997, Voortman, 2004, Wood et al., 2012, Bergami, 2013).

Table 3.2 Roles of chain actors

Chain actor	Generic functions
Seller/producer/exporter	Record sales, issue invoice, create export documents, arrange transport and insurance (depending on terms of delivery).
Buyer/importer	Substantiate purchase, obtain proof of cargo, arrange for transport (terms of delivery/Incoterms), receive import documents, lodge import clearance, settle invoice.
Carriers	The term carrier encompasses anyone involved in the transportation of goods, like forwarders, brokers, transport operators, shipping companies or airlines.
Freight forwarders	Purchase transport services, consolidate smaller shipments, documentation support.
	Daily pickup and distribution, global intermodal shipping, local staff, documentation, consolidation.
Transport brokers	Arrange transportation, source transport.
Internal transportation manager	Monitor and track transportation rates, select the best mode, choose specific carriers, decide routing and scheduling of trips, pay carriers, audit freight bills, handle loss and damage claims, manage service providers, analyse transport data.
	Freight consolidation, carriers' rates and charges, carrier selection, documentation, tracing and expediting, loss and damage claims, demurrage and detention, hazardous materials.
Warehouse	Function of movement, storage function, information transfer function. Activities in warehouse: receiving, placing, replenishment, quality check, packing, stocktaking. Warehouse ownership: own, lease or combination of both.

For the purpose of this research, the roles of chain actors are elaborated on below in a discussion of the two main groups: exporters and intermediaries.

Exporters

In a firm, export activities typically comprise the works of different divisions, such as sales, export, and shipping. More broadly, they may involve other departments such as manufacture and accounting. For the purpose of this research, a security focus also involves other departments, such as general affairs divisions that are generally responsible for issues related to premises and personnel security.

According to Reuvid and Sherlock (2011), export activities include a series of operations as depicted in Figure 3.1.

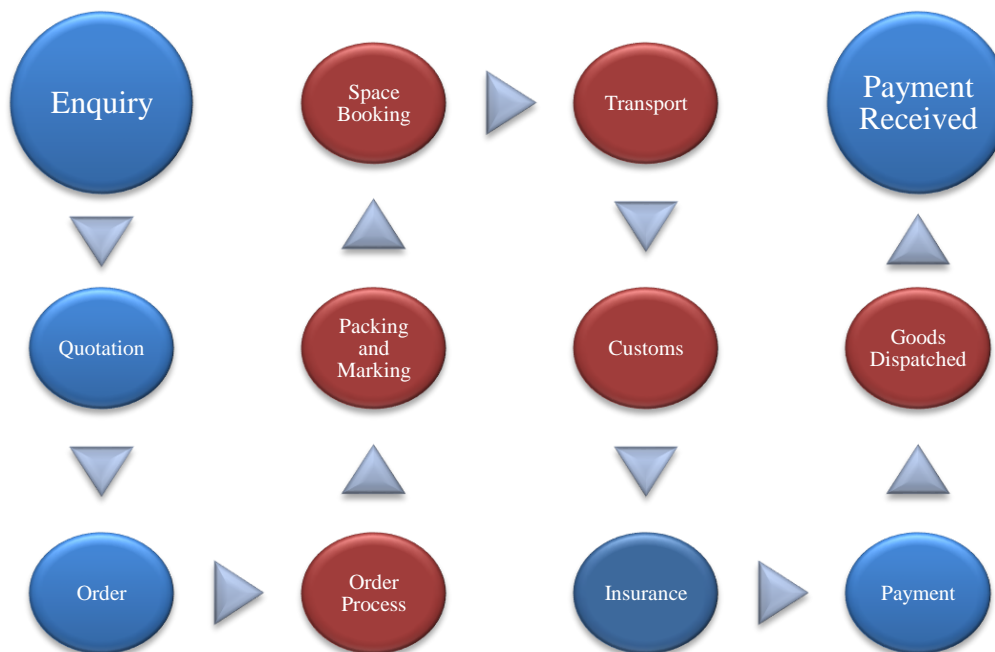


Figure 3.1 Sequence of export

Source: Modified from Reuvid and Sherlock (2011)

The role of exporters in this research is limited to activities related to the fulfilment of orders from customers. This focuses on the process of transporting the goods from exporters to ports of exportation in the country. These activities are represented by the

red circles in Figure 3.1. The organization of these functions is unique to each firm and varies enormously. A firm may handle all these activities internally, another may outsource all or some of these processes.

The exporters' roles and responsibilities are also determined by the choice of delivery terms. This relates to International Commercial terms (known as Incoterms) published by the International Chamber of Commerce. The Incoterms 2010 consist of eleven terms under four groups: Group E (departure), F (main carriage unpaid), C (main carriage paid), and D (arrival). Among these terms, ex-works (Group E), free on board (Group F), and cost insurance freight (Group C) are the most commonly used (Reuvid and Sherlock, 2011) and are found in the case studies in this thesis. In Ex-works (EXW), the buyer arranges the goods shipment from the supplier's premises to the final destination. Free on board (FOB) regulates that the seller arranges all shipment until the goods arrive at the port of export and the buyer arranges all other stages beyond. While in Cost Insurance Freight (CIF), the seller arranges the carriage of the goods up to the destination, including the insurance. Figure 3.2 below illustrates the exporters' responsibilities in the stages of export.

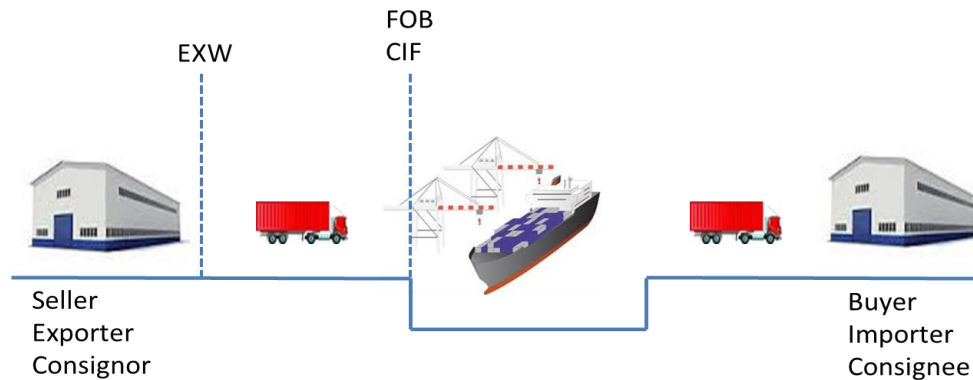


Figure 3.2 Incoterms: EXW, FOB, CIF

Source: Modified from Reuvid and Sherlock (2011)

Intermediaries

Freight forwarders, sometimes also referred to as non-vessel operating common carriers (NVOCC), act as intermediaries between the shippers and the carriers (Wood

et al., 2012). Most exporters use their services and many freight forwarders provide other shipping services, commonly characterized as third party logistics service providers (3PL). Reuvid and Sherlock (2011) listed five general services provided by intermediaries. First, providing specialist advice related to transport and customs' procedures in international trade; second, completing exports and transport documentation; third, customs clearance; fourth, transport booking; and fifth, grouping of goods into one container of different exporters (Less than container load/LCL) when an exporter does not produce one full container (Full container load/FCL). Many of these functions can now be carried out online, such as cargo tracking, requesting vessel schedules, and space booking (Wood et al., 2012).

3.6 The implementation of AEO program in Indonesia

Indonesia was among the first signatory countries to adopt the SAFE framework, which incorporated the AEO program in 2005. A deliberate development of AEO implementation started in 2012 and continued with a pilot program in December 2013, involving nine selected exporters (DGCE, 2013). In March 2015, five of these exporters were awarded AEO status (Ministry of Finance, 2015). This lengthy period of policy development indicates the complexity of adopting a SCS program within a policy framework. This process involves dimensions like international relations, economic benefits, and policy orientation. In Indonesia the situation was complicated further by the fact that the implementation of a security initiative was relatively new.

The current emphasis on SCI in Indonesian logistics policies (Coordinating Ministry for Economic Affairs, 2012) signifies the magnitude of inter-related issues that Indonesia is facing. These issues include expensive logistics costs (Bahagia, 2013) and increasing logistics business (Antara, 2014). Consequently, it is important to consider the country's logistics performance in relation to the AEO implementation and how this can contribute to further improvement. The Logistic Performance Index (LPI) of the World Bank is a widely used measure. Indonesia's LPI has been fluctuating from the highest of 43 in 2007 to the lowest of 75 in 2010. In 2016, Indonesia ranks 63, compared to 53 in 2014 and 59 in 2012. Among its neighbouring countries, in 2016 Indonesia was below Malaysia (32) and Thailand (45) but above Vietnam (64) and the Philippines (71) on the other (Arvis et al., 2016).

Six elements are used to measure LPI: customs, infrastructure, international shipment, logistics quality and competence, tracking and tracing, and timeliness. Security, however, is not included in the list. An AEO program is expected to help improve customs clearance processes, better integrate operations in supply chains, and create more secure and reliable tracking systems. This would result in reliable supply chains improving the LPI and is in line with the Indonesian government's current emphasis on the importance of logistics systems, where the concept of SCI is envisaged (Bahagia, 2013), to support national economic development.

In terms of security, a case of depleted uranium smuggling test from Jakarta to the US in 2003 (Skinner, 2005) ascertains the presence of a weak link in Indonesia's export supply chains. While there is no further explanation on how this incident happened, it indicates the vulnerability of freight breaches and heightens security risks. The risk of the tampering of containers widens the risk perimeter such as trespassing and identity manipulation.

Security, however, is not new to customs administrations. Traditionally, it has been a part of the functions that customs typically carry out in controlling the movement of goods at their borders. The security role is represented in one of customs' major tasks, as frequently touted by the WCO: trade facilitation, industrial assistance, community protection and revenue collection (Mikuriya, 2007). Indonesian customs has these functions included in its mission statement (DGCE, 2016). It is a fundamental duty of customs to secure the nation and its people from the unlawful traffic of goods such as firearms and illicit drugs.

Terrorism, as a new security threat, was included in the 2006 amendment of Indonesian customs law. Despite the elevated attention on security and terrorism, including its recognition in the legal system and the emergence of several bodies focusing on terrorism concerns, Indonesian customs has long employed risk management principles in the deterrence and detection of modern risks such as terrorism. This approach directs the efficient use of limited resources to address the calculated risks without hindering the efficiency of lawful trade. The implementation of the AEO program represents a new level of partnership between customs and business that covers the interests of both. The program helps customs in managing the

risks of compliance in security, while at the same time the AEOs enjoy less interference from customs.

3.7 Chapter summary

This chapter outlined the evolution of the AEO program, its development, and prospective benefits. It also discussed export procedures, the typical actors and their roles, and illustrated Indonesia's logistics and security issues, making AEO implementation in Indonesia a valuable context for this research. The next chapter discusses the research design and methodology of this study. Methods and techniques of data collection and analysis are elaborated on and justified in order to address the research question.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This chapter describes the research paradigm underlying this study and provides details of the research design. The research question were central in determining the research paradigm, methodological approaches, methods of data collection and data analysis techniques. This chapter is arranged according to these elements. Section 4.2 presents justifications for the research design. Section 4.3 introduces the research design focused on a qualitative case study approach and outlines the use of case study method, its types and purposes. Section 4.4 explains the context, population, and sampling. The data collection methods of interviews and observations are discussed in Section 4.5. Section 4.6 describes the methods and techniques of data analysis. The last section covers the efforts undertaken in this research to assure the quality of the research.

4.2 Justifications for qualitative research design

From the outset, the research problems in this study have induced the use of a constructivist approach, which poses that social phenomena are accomplished by social actors (Bryman and Bell, 2015). Under the constructivist paradigm, Lincoln and Guba (2000) classified the ontology of relativism where reality is localized to its corresponding context and when there is no single truth explaining a phenomenon (Crotty, 1998). This philosophical orientation led to the development of an inductive framework to study the connection between SCI and SCS and how actors and events are inter-influenced (Saunders, 2011). This approach also advocates the use of qualitative methods (Golicic and Davis, 2012) to enable a further understanding of "complex behaviours, needs, systems and cultures" (Ritchie and Spencer, 2002). This complexity is also found in supply chains (Mentzer et al., 2001).

The research was guided by an interpretivist epistemological orientation, with the expectation of a substantial degree of involvement from the researcher in the data

analysis process (Bryman and Bell, 2015). The researcher's practical and professional experience in shipping industry and international trade influenced data interpretation and approaches. Selection of the appropriate methodology must involve consideration of the research question and the objectives a research wants to achieve (Mertens, 2015, Bryman and Bell, 2015, Patton, 2002). Considerations should also be given to the "current state of knowledge" and "the nature of the variables involved" (Smith and Dainty, 1991). This suggests that if there is not much discussion about the topics in the literature, then a qualitative design is more suitable because it allows greater exploration and understandings of a phenomenon. This approach allows the researcher's knowledge and experience to influence the interpretation of data from interviews and observations. The researcher's background as a customs officer for twenty years makes him familiar with international supply chain industry. Together with a master degree in international laws and a bachelor degree in English literature, this approach allows quick understanding of the context and further enrichment of the research.

Considering that research in supply chains is still emerging (Burgess et al., 2006), and that there is limited research focused on the intersection of SCI and SCS in the export supply chain context, a qualitative case study methodology (Baxter and Jack, 2008, Stake, 2010, Yin, 2014) was employed in this research. Following Barratt et al. (2011), the qualitative case study in this research is defined "as an empirical research that primarily uses contextually rich data from bounded real-world settings to investigate a focused phenomenon."

This research used the qualitative design with a non-rigid linear sequence from problem formulation to conclusion (Creswell, 2013). The five components in the research represent reciprocal relations of goals, theoretical framework, research question, methods, and validity (Maxwell, 2005). The choice of methodology also took the historical factor into account, which considers previous studies in the disciplines (Buchanan and Bryman, 2007).

Recognizing that a positivist paradigm is dominant in SCM research (Burgess et al., 2006, Arzu Akyuz and Erman Erkan, 2010) and interpretivism is not popular in supply chain studies (Burgess et al., 2006), there is a need to trade off the two general choices of quantitative and qualitative approaches to reflect the complexity of problems

in supply chains (Näslund, 2002, Golicic et al., 2005). Thus, this research contributes to the discipline of SCM that demands a more qualitative approach.

4.3 Design framework: qualitative case study

Stake (2010) and Yin (2014) are prominent advocates of case study methods. The philosophical orientation of this research is in line with the approach adopted by both Stake and Yin on a constructivist paradigm (Baxter and Jack, 2008). Yin (2014) suggested the use of a case study design when the research falls under several conditions. First, the research aims to have an in-depth explanation to answer the "how" question. Second, the researcher does not intend to modify the behavior of the research participants. Third, the context of the research has a significant influence on the study. These conditions were found to be well suited in this research. First, the qualitative approach was expected to explain "how" the AEOs extend their SCS through the adoption of integration mechanisms along the export supply chains. Second, the AEOs and their chain partners are independent in this research. Third, AEO program implementation in Indonesia provides a context in which security initiatives are relatively new in the export supply chain environment and fragmented chain management is likely to occur.

A distinction can be made between the different types of case studies based on their objectives and characters (Baxter and Jack, 2008, Stake, 2010, Yin, 2014). The case study in this research has three purposes. First, according to Yin's typology (Yin, 2014), this research can be classified as descriptive because the research is used to describe a phenomenon of AEO program implementation in a new environment, creating a challenging context. Second, it is also exploratory because it involves exploration of different environments in which the connection between integration and security in supply chains is not yet clear. Third, Stake (2010) might suggest this research is instrumental as it attempts to refine the SCI concept within the context of security in export supply chains. These research purposes are represented in the research stages, as shown in Figure 4.1.

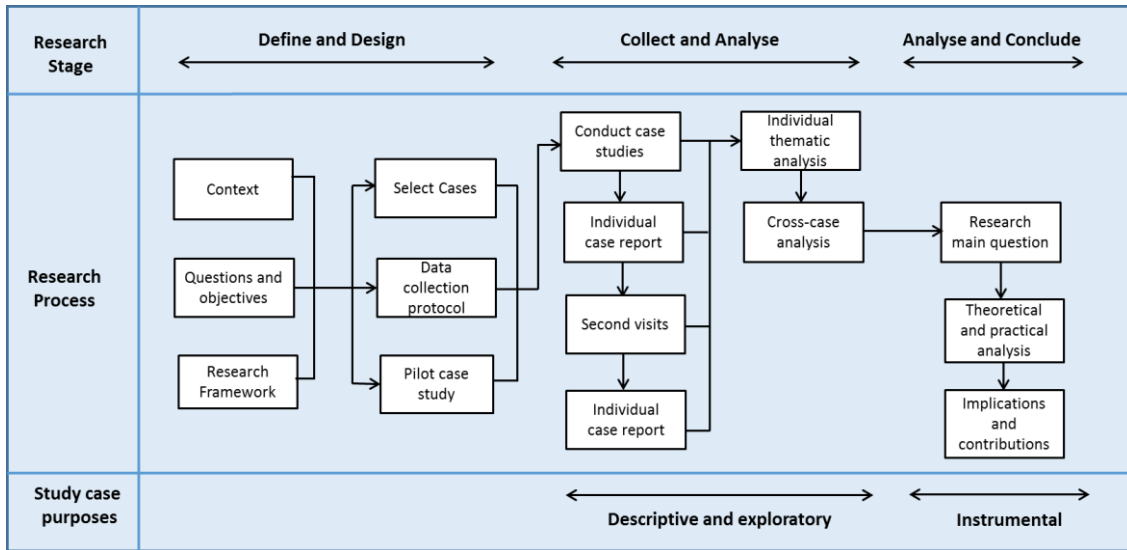


Figure 4.1 Multiple-case study procedure

Source: Modified from Yin (2014)

As Figure 4.1 shows, a case study protocol was developed and a pilot case study conducted in preparation for the data collection phase. The protocol guided the fieldwork during interviews and observations and ensured uniform steps and procedures were followed with all participants. It included an opening introduction to the study, to provide some context for participants, expectations from their involvement in the research, as well as ethical considerations. The pilot study provided the researcher with an opportunity to test the interview questions and observation targets, allowing for any necessary modifications to be made to the questions for the interviews with the AEOs.

The research used a multiple-case study approach with four AEOs studied as separate cases. Figure 4.1 shows that in the second research stage, the process of data collection, analysis and report writing was conducted individually for each AEO to understand the chain structure, integration mechanisms, and security measures. The data was then thematically analysed within each setting, before then undertaking cross-case analysis to understand the similarities and differences between the cases. The themes followed the theoretical framework that guided the search of elements of integration mechanisms and security measures. At this stage, the research achieved the descriptive and exploratory purposes of the case study.

The findings from the individual thematic analysis addressed the research proposition, elaborating the map of the AEOs' chain structures, identify security risks and measures, as well as integration mechanisms. These findings provided a context for the analysis, addressing the research question. At this stage, a discussion on the connection between integration mechanisms and security extension aimed to achieve the instrumental purpose of the case study.

4.4 Population and sampling

The selection of research participants was based on a criterion sampling technique to identify participants who have experienced the phenomenon under research (Collingridge and Gantt, 2008). At the time of undertaking this research, the AEO program had just been launched in Indonesia with five exporters certified as AEOs. These five AEOs, along with their chain partners, were the research population used for this research. Because of the limited numbers of approved AEOs available, the research targeted the whole population, there was no scope for sampling. The participants were middle and lower level managers, supervisors, and administrative staff. In the AEOs, most of them came from export division with different areas of responsibilities. Their operational areas represent the flow of goods for export that include warehousing and transportation. In the AEOs' chain partners, the managers were from marketing division who handled their clients. The operational staff varied from trucking dispatchers, document control, and container quality control. Even though the organizational structure in the AEOs and their chain partners were different, the divisions participating in the research were similar. The variation of the participants in their functions allowed broad understanding of the connections of each function and the flow of the operations.

This representation of different organizational staff levels improved research validity (Bryman and Bell, 2015). Each export supply chain was considered the unit of analysis, although the respondents come from their respective functional areas within the chain. Four AEOs agreed to participate in the research together with their respective chain partners. The level of participation, however differed from one participating AEO to others. Three of them were very supportive, involving almost all chain partners in the interviews and observations. These AEOs helped organize the participation of their

chain partners. Group discussions were held to allow a thorough investigation of processes involving parties representing all functions in the chains. This method allowed the collection of very rich data via interviews and discussions. One AEO agreed to be interviewed only, but did not wish to participate in the observation phase. At this AEO, the interviews were taken with two managers - one from export and one from security division. This AEO refused to introduce their chain partners. Access to their chain partners was gained without their involvement, resulting in limited data collection. This variation of participation is reflected in the case study reports presented in Chapter 5.

4.5 Data collection

This research used interviews and observations as a means of data collection. Additionally, data were also collected from secondary sources such as company websites, business reports, and government documents. The researcher accessed publicly available documents related to the study interests. Prior to interviews, general information about the AEOs and their chain partners was found through the internet. This information related to business size, variation of products, manufacture locations, and export destinations. This initial knowledge about the research participants helped in the design and direction of the interviews and observations, or was used as a stimulus to probe new inquiries (Patton, 2002), or to cross-check information from other sources. Other documents obtained during fieldwork included export declarations, surveyor inspections, logistics checklists, hand-over documents, delivery orders, and security reports. The secondary data and the combination of data collection techniques enabled triangulation to improve the reliability and validity of the findings (Stake, 2010).

The data collection involved different divisions in the AEOs' organizations. The main sources of information were managers and staff from export and import divisions. Other divisions supported the data collection process through the provision of information relevant to their domains. For example, IT divisions provided data related to information security, general affairs divisions provided information on personnel and premises security, and productions divisions gave details of scheduling and packaging.

4.5.1 Interviews

Interview is commonly used in case study research (Yin, 2014). In qualitative research, interviews that are unstructured, open-ended and informal (Schwandt, 1997) offer a relaxed atmosphere between the researcher and participants. Such interviews develop more like conversations, without a rigid structure of questions, and while directed to a consistent line of inquiry, they are fluid. This format is referred to as semi-structured (Barriball and While, 1994). The questions were open-ended allowing broad flexibility to reveal new issues beyond the questions and allowed participants to use their own words while responding freely to inquiries. The researcher did not limit the interviewees' responses and provide substantial space for answers.

The semi-structured interview was chosen for this study as it also allowed the researcher to go back and forth in the questions, responding to participants' answers (Bryman and Bell, 2015). It encouraged further exploration of perceptions and opinions from AEOs related to policy and its implementation. This technique enabled the exploration of information that can be more complex and sensitive. Patton (2002) classified this interview type as "the general interview guide approach". This interview type, as applied in this study, involved a set of questions prepared before the interview. The same list of questions was used for all participants even though the sequence varied, and sub-questions evolved differently between interviews. The researcher had the freedom to follow up responses to clarify issues needing greater attention. The interview questions were not in the form of rigid sentences, but bullet points guiding areas of interest to allow the researcher to ask the same questions in different ways to suit the unique characters of different respondents. A focus group discussion was also held in a case study to follow the request of the participants. This method of data collection generates collective views at the same time regarding their shared experience. The method is useful to produce a comprehensive understanding of participants' experiences (Gill et al., 2008).

Interview questions are attached in Appendix 4. As suggested in the approach of semi-structured interview, the questions were more of a set of guidance rather than direct questions. The questions were designed in relations to the themes in the theoretical framework. They were explorative in their character aimed to help the researcher to understand the chain structures, integration mechanisms and security measures. The

elements of integration and security followed the theoretical framework and used as the themes in the thematic analysis. At the end of the interviews, the questions asked for the participants' opinions on their integration and security level, the connection between integration and security, development of security before and after the AEO implementation.

The interviews were conducted in Indonesian language. The results from the pilot case study supported this approach. Three interviews were transcribed verbatim in Indonesian. The others were summarized in English for more efficiency without risking the research objectives. The researcher's bachelor degree in English literature and work experience as an English-Indonesian translator assured the accuracy of the translation. A consultation with fellow Indonesian researchers was also taken to avoid bias. The summaries of the interviews were sent to the participants for their review and agreement. The participants' English proficiency was deemed sufficient to understand and approve the summaries.

4.5.2 Direct observation

Direct observations were conducted to provide a more comprehensive understanding of the chain operations, including cargo handling and conveyance from one location to another until the cargo arrived at ports of exportation. Observational evidence is often useful to understand the topic under investigation (Yin, 2014). It provides a comparison of information collected from interviews or archival documents and serves as confirmation that the previous information is accurate.

Smith and Dainty (1991) categorized this technique into several types: researcher as an employee, research as the explicit role, interrupted involvement, and observation alone. This research used different techniques to adjust to the field context and participants' characters. After interviews with the managerial team, the researcher followed up with "explicit role" observation by moving around in areas of interest and interacting with employees working in different locations. An "interrupted involvement" technique was applied when the researcher stayed for an extended period of time observing material handling and movement in export operations and conducted sporadic interviews with employees involved in the process.

It is necessary to state at this stage that even though supply chains include the flow of goods, information, and funds (Marlow 2010), this research focused only on the flow of goods and information. The flow of goods involves the movement of goods that include other chain actors. The flow of information is related to, for example, production planning, movement of cargo, communication with third-party service providers, tracking of goods movement, and the creation and submission of export documents. It also covers other information shared between chain members on issues or incidents in their operations.

4.6 Data analysis: thematic and cross case analysis

Following recommendations from Yin (2014), this study adopted a set of strategies for data analysis: first, relying on theoretical propositions; second, working data from the "ground up"; third, developing a case description; and fourth, examining plausible rival explanations. The first strategy guided the data analysis process to support or reject the propositions formulated in the theoretical framework. Hence, the analysis techniques were directed to explore the elements of integration mechanisms and the extent of security that can be achieved in the export supply chains under study. The second strategy temporarily abandoned the theoretical approach and explored the interview data by identifying a pattern of similarities and differences. This strategy aimed at developing the export chain structures in which the AEOs work with their chain partners. The third strategy used the theoretical framework to identify security and integration elements. The fourth strategy categorized findings that might challenge the results from the other strategies. The findings might contradict the theories, deviate from general views or out of the elements designed in the theoretical framework. These findings enrich the discussions with potential alternative outcomes from the propositions. At the same time, they might strengthen the conclusions. Guided by these four strategies, this research utilized thematic analysis and cross-case analysis techniques.

In comparison to thematic and cross-case analysis, content analysis emerged as an option for its ability to test theoretical issues by extracting words into categories related to the content (Elo and Kyngäs, 2008). Similar to the other methods, the aim is to produce concepts describing the phenomenon under study. Therefore, as qualitative

data analysis methods, content analysis and thematic analysis are commonly and often interchangeably used (Vaismoradi et al., 2013). However, Vaismoradi et al. (2013) explained that studies with constructivist philosophical background tend to lean on thematic analysis. Content analysis is more on quantifying data rather than qualifying it, even though themes can also be found in the data through content analysis. Content analysis is also more general representing different strategies to analyze text, while thematic analysis focuses on patterns.

Thematic analysis was used to identify similarities and differences in the integration and security aspects of the AEOs and their chain partners. Thematic analysis is a foundational method for qualitative analysis and defined as a method to identify, analyze, and report patterns (themes) in the data (Braun and Clarke, 2006). It serves the purpose of organizing and describing the data in detail. One attraction of thematic analysis applicable to this research is its flexibility, much celebrated in qualitative approaches. The researcher had the flexibility in approaching the themes that have been determined following the theoretical framework, prior to data collection and analysis. The extreme flexibility of thematic analysis, however, may lead to inconsistent methods and unclear results. Therefore it is necessary to follow customary guidance, while at the same time taking advantage of its flexibility. For that reason, this research followed the suggested phases offered by Braun and Clarke (2006), as summarized in Table 4.1 below.

Table 4.1 Thematic analysis process

Braun and Clarke's suggested phases	Application in this research
Familiarization with the data	Transcribing/summarizing data, understanding responses, identifying opinions, revisiting data.
Generating initial codes	Identifying integration aspects and security measures in each AEO.
Searching for themes	Finding similarities and differences between AEOs in their integration and security measures.
Reviewing themes	Checking if the themes work in the coded extracts and the entire data set, generating a thematic 'map' of the analysis.
Defining themes	Continue to refine themes and identify their different details in each AEO.
Producing the report	Review findings and compare them with research question, propositions and literature.

Source: Adapted from Braun and Clarke (2006)

To support the thematic analysis, multiple data analysis techniques proposed by Yin (2014) were employed in this study. These techniques are not meant to be applied exclusively. Instead, a combination of their use helped the researcher to make the most of the data to address the research question. The first is a pattern matching technique. This compares the findings with propositions, which were developed in this study through the literature review before data collection. The propositions in this research were derived from multiple sources of empirical knowledge and theoretical references. They proposed the relationship between the elements of security and integration mechanisms in supply chains. This technique seeks for any potential justifications, as well as indictments. It does not offer absolute precision. It can be either less or more than the predicted propositions.

The second technique is explanation building. As a more complex technique of pattern matching, this technique aims to analyze case study data by building an explanation about the case. Yin (2014) argued that "to explain a phenomenon is to stipulate a presumed set of causal links about it, or how or why something happened." This argument implies the use of propositions in a multiple case study. The technique

suggests studying and relating the findings to compare and revise the same propositions repeatedly in each case study.

To evaluate the impact of the AEO program on integration and security in export chains, the research has benefited from time series analysis techniques involving an interval visit to the AEOs to collect a second round of data. Using this technique, the researcher visited the participants two times with a gap of approximately fourteen months. Time series analysis is intended to establish the relationship between the observed phenomenon and the propositions. The first visit helped to understand the implementation of the AEO program in participants' export chains and their integration mechanisms. The background of their participation in implementing the AEO policy and their efforts to obtain AEO certification were also explored. During the first visit, participants could not provide any information on the impact of the policy due to its early implementation. The second visit, therefore, aimed to address this gap. After two years of AEO implementation, the researcher expected to see the impact of the AEO program on their chain operations, especially those related to security and integration.

The results of the thematic analysis were cross-case analysed between the multiple case studies. This process compares findings across cases and produces stronger arguments than those drawn from a single case study (Yin, 2014). Each case is first analyzed individually before it is compared to others. Applying the previous techniques of pattern matching, the findings from individual cases are categorized to reproduce the data in a meaningful fashion (Miles et al., 1994). The categories are the elements of integration mechanisms and security measures as developed in the theoretical framework. The categorization process follows the technique used in Pagell and Wu (2009), where elements of integration and security found in individual AEO cases were "cut" and "pasted" to form a meaningful construct. Figure 4.2 below summarizes the sequence of the methodological approaches of the research, with the research question and objectives influencing the approach significantly.

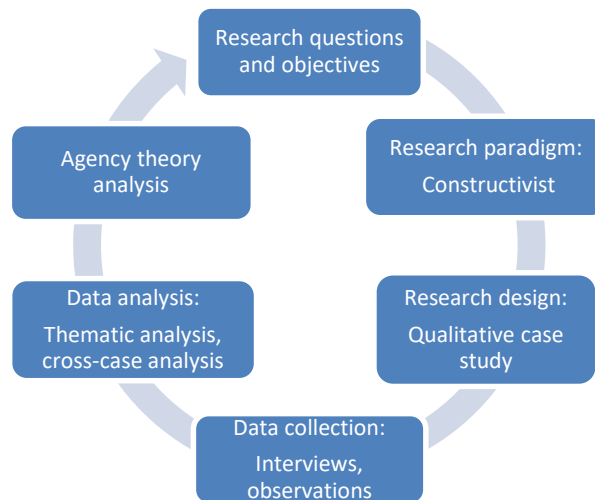


Figure 4.2 Methodological approach

4.7 Quality of the qualitative research

Yin (2014) suggested four logical tests to produce quality research: construct validity, internal validity, external validity, and reliability. These are summarized in Table 4.2. This study sought to ensure the quality of the research by observing these validity tests.

Table 4.2 Case study validity tests

Tests	Case Study Tactics	Phase of research
Construct validity	<ul style="list-style-type: none"> - Use multiple sources of evidence. - Establish a chain of evidence. - Have key informants review draft case study report. 	Data collection
Internal validity	<ul style="list-style-type: none"> - Do pattern matching. - Do explanation building. - Address rival explanations. - Use logic models. 	Data analysis
External validity	<ul style="list-style-type: none"> - Use replication logic in multiple-case studies. 	Research design
Reliability	<ul style="list-style-type: none"> - Use case study protocol. - Develop case study database. 	Data collection

Source: Yin (2014)

Construct validity refers to measures for ensuring the relevance of data collection processes and the concept being studied (Yin, 2014). This is related to the development of the theoretical framework and the research question that build the research design. Within this design, procedures and techniques are developed to guide data collection from multiple sources of evidence (i.e., interviews, observations, and other secondary data). In this study, these different sources of data established a chain of evidence that supported validity. The combination of data collection techniques enabled triangulation, which improved the reliability and validity of the findings (Stake, 2010). The transcripts or summaries of the interviews were also reviewed and approved by the participants to increase validity.

An internal validity test guided the research to establish a causal relationship between integration mechanisms and efforts to extend security in the AEOs' chains. An external validity test implies generalizability of findings. However, generalization is a delicate matter in qualitative research (Polit and Beck, 2010). Generalizations can be made more easily from quantitative research than in qualitative research, with most studies in the latter category specifically not aiming to generalize (Collingridge and Gantt, 2008, Gomm et al., 2000). Firestone (1993) introduced a concept of transferability instead of generalization, with "case-to-case transfer" more relevant for qualitative studies than "sample-to-population". However, one strength of case study is that it offers a "theoretical generalization" that compares theories with the actual phenomenon (Tsang, 2014). Instead of aiming to produce a generalizable result, this research sought to provide a rich and contextualized understanding of the phenomenon under research, as pursued by the majority of qualitative studies (Polit and Beck, 2010). The reliability test signifies the quality of methods and protocols in data collection.

4.8 Chapter summary

This chapter has outlined the approaches and methods employed in this research. The methodological options and justifications for the choices taken were presented. The objectives of the study and the research question demanded a comprehensive understanding and a detailed analysis, which the qualitative case study approach could address. The researcher endeavoured to ensure the quality of the analysis by observing triangulation of data collection techniques and sources. The next chapter will

report on the case studies and present a discussion of the selected data collection methods used.

CHAPTER 5

CASE STUDIES

5.1 Introduction

This chapter reports on the data collection process as formulated in the theoretical framework to identify integration and security aspects in the case studies. The integration aspects include the chain structure and integration mechanisms. The security aspects cover the security of cargo, conveyances, premises, personnel and trading partners, as stipulated in the WCO guidelines.

As indicated previously, four out of five AEOs selected agreed to participate in the research. As a part of the ethical procedures, names of persons and firms participating in this research are not disclosed, as requested by a number of participants. To provide uniform treatment and to avoid confusion, the AEO exporters, as the focal firms in the chains under study, are identified as AEO-1, AEO-2, AEO-3 and AEO-4. Three AEOs were very keen to engage and fully support the research. These are AEO-1, AEO-2, and AEO-3. Another AEO participated but provided limited access and information (i.e., AEO-4). The level of participation is reflected in the case study reports and discussions. Follow-up visits were conducted with AEO-1 and AEO-2 after a one-year interval to provide data for time series analysis on the impact of the AEO program on integration and security.

This chapter commences with a report on the pilot case study, followed by individual case study reports on each AEO. Section headings in each case study report are arranged according to the protocol designed during data collection. They represent elements of chain structure, integration mechanisms and security standards as planned in the theoretical framework. The early sections present a map of the AEO export chains that include actors, functions and their contextual existence. The discussions include identification of integrating mechanisms as characterized by elements of ownership and contractual arrangements. The latter sections present security elements. The sequence of the case study reports in this chapter and their code

numbering is based on the sequence of the visit schedule. The visits were arranged according to availability and the consent of participants.

5.2 Pilot case study

5.2.1 Introduction

Before beginning data collection with the AEOs, several pilot case studies were carried out. These pilot case studies provided valuable opportunities for the researcher to test the interview questions and to learn more about the actual operations to be observed in the field. After the pilot studies, adjustments on the data collection plan were made to capture real situations and to address the research objectives more effectively. The pilot case study process followed the recommendations of Yin (2014) for achieving a reliable qualitative case study. A case study protocol was developed consisting of guides to conduct the interviews and observations during the fieldwork. Interview questions and objects of observation were attached to the protocol.

The sequence of interviews and observations vary between cases. Information gathered from different methods supplemented, as well as confirmed, the information from different sources and methods. For example, observations on the export activities justified the information collected during interviews on export procedures. Observations in the pilot case studies cover similar areas in the actual case studies. They include warehousing process, loading goods to containers, sealing containers, selection of empty containers, security procedures at the gates on trucks entering and leaving the premises, locations of CCTV cameras and monitors.

All the elements in the protocol were exercised in the pilot study. This process allowed an evaluation of the protocol prior to its use with the actual case studies. The pilot case study involved three firms. The names of the firms are coded to maintain anonymity as requested by participants. The first firm is a multi-national company producing food and dairy products for both domestic and international markets. It imports food ingredients and exports confectionary and other types of snacks. Its export related activities are the focus of this research. The first firm is henceforth coded as Pilot-1.

The second and third firms are providers of logistics services working with many exporters, including Pilot-1. The second firm, Pilot-2, is a warehouse operator that owns, manages, stores and distributes import, export, as well as domestic cargoes. The third firm, Pilot-3, is a cargo consolidator that consolidates export cargoes with more than one ownership into one container. As indicated in Chapter 3, in international trade this service is known as LCL (Bergami, 2013).

The firms participating in the pilot case study were chosen as they had similar characteristics to the AEOs and their chain partners, especially in their functions in export supply chains. Pilot-1 is located in outer Jakarta, while Pilot-2 and Pilot-3 are near to Tanjung Priok port, where many logistics providers with similar functionalities are situated. This geographical proximity added to the similarities of the pilots with the actual research population. The researcher therefore expected to see comparable situations that would help in the evaluation of the case study protocol. The content and procedures of interviews and observations are represented in the following sections under headings that will be replicated in the discussion of the AEOs.

5.2.2 Chain structure and integration mechanisms

Pilot cases were investigated for their chain structures and integrating mechanisms. Under investigation were their chain partners, relationships with those partners, and business processes, with specific reference to integration and security measures. Typical actors and functions in export chains were revealed through this analysis. The principal actors are manufacturers who also act as exporters, freight forwarders, warehouse operators, trucking companies, and shipping agents. Pilot-1 provided detailed information on their flows and operations in export supply chains. In general, this starts with receiving orders from the buyer, material procurement from suppliers, production planning, and shipment schedules. The research, however, concentrated on export shipments, especially the flow of cargoes from exporters to the port of export.

Pilot-1 does not own any logistics functions in its export supply chains, except for a warehouse. It subcontracts most of these functions to different firms. A major 3PL takes care of most of its export activities. Pilot-1 operates two warehouses; a third party manages one of them. The contracts between Pilot-1 and the chain partners are regulated through a general agreement. Detailed operations are exercised following

separate guidelines or accepted standard practices, including security related measures such as container inspections and seal attachments.

Regular meetings are held to evaluate past operations and to prepare future shipments. Electronic communication through email is their main communication media. Information is also shared with other systems but mainly for internal purposes only. Some data are retrieved from this system and shared to external parties through email. These means of communication and daily operations are part of operational interdependence and their integrating mechanisms, together with the elements of ownership and contractual relationships between chain actors.

Pilot-2 and Pilot-3 provided valuable information on their position as chain partners of AEO exporters. They not only work with Pilot-1, but with many other customers. Some AEOs were mentioned as having used their services. Pilot-2 explained their roles in managing the warehouse. A contract usually exists to secure agreements that describe general responsibilities between warehouse operators and their clients. In contrast, it is unusual for Pilot-3, being a cargo consolidator, to have contracts with their customers. A cargo consolidator commonly has many different customers with various volume and frequency requirements. They welcome infrequent small clients, as well as regular large clients. However, Pilot-3 claimed that the AEOs use their services infrequently since they mostly export in large quantities and use full container loads.

Reflecting on the discussion in Chapter 3 about intermediaries and their function as typical actors in export chains (Reuvid and Sherlock, 2011), the pilot cases suggested that the arrangement of these functions is unique to each supply chain. An intermediary, which often refers to the service of a freight forwarder, may manage all export logistics operations or delegate the functions to other firms. Pilot-1, Pilot-2, and Pilot-3 provided information on their roles, as well as those of other actors and their respective positions in export chains. This includes freight forwarders, trucking companies, warehouse operators, empty container parks, container yard operators, and cargo consolidators. Using information extracted from the pilot cases and the literature, Table 5.1 provides a summary of the general roles of each actor in exports chains. These roles are specific to the delivery of goods from exporters to ports and indicate the collaborative relationships between actors.

Table 5.1 General roles of actors in export chains

Actor	Roles
Exporter	<ul style="list-style-type: none"> - Issue export plan - Issue shipping instructions - Determine shipping lines
Warehouse (WH)	<ul style="list-style-type: none"> - Inventory - Prepare goods
Freight orwarder (FF)	<ul style="list-style-type: none"> - Create export documents - Book space to shipping agent - Send order to trucking company
Shipping agent (SA)	<ul style="list-style-type: none"> - Confirm booking - Issue delivery order (D/O)
Empty container park (CP)	<ul style="list-style-type: none"> - Provide requested container - Record container and seal number
Trucking ompany (TC)	<ul style="list-style-type: none"> - Collect empty container and D/O - Collect cargoes from exporter/warehouse - Deliver container and export docs to Port
Port	<ul style="list-style-type: none"> - Confirm container arrival - Inform vessel departure

5.2.3 Security measures

As these pilot cases did not have AEO status, the researcher expected to learn about standard and common security practices throughout the export chains and be able to relate these to the security standards introduced in the AEO guidelines. The three pilots agreed that there is a lack of security awareness, especially related to terrorism and security updates in international trade. The export and import manager in Pilot-1 was aware of the many security initiatives introduced by the US. Their frequent business interests with companies in the US had kept them updated, and he claimed that many security practices in Pilot-1 had followed international requirements. During observations, the researcher noted Pilot-1's security practices, which included the use of seals, closed-circuit television (CCTV), authorized access, and cargo handovers.

None of the pilot cases reported any security incident related to the illicit insertion of goods. All of them believed that the current state of security measures was adequate. However, theft remained a typical risk. Pilot-1 complained about the loss of goods in their containers, which generally happened in the destination ports overseas.

Despite their claims, significant differences in security levels between these pilots were noticed. Pilot-1 was very strict in premises security, while access to premises was not tightly controlled at Pilot-2 and Pilot-3. Warehouses and consolidators showed more risks with a large number of staff involved in the process of loading and unloading cargo from and into containers. Pilot-3, as a cargo consolidator, was exposed to more significant risk since their staff was mostly outsourced from a third party and security screening of these people was inadequate.

5.2.4 The implications of pilot case findings

The pilot case studies served the purpose of helping the researcher to understand the field, its export practices and the actors involved. The information gathered about export chain structures and security measures was crucial. A comparison of what had been understood and learned from the literature, with what was learned on the field, played a significant role in improving the researcher's knowledge.

Moreover, other benefits and lessons learned emanated from the pilot case studies that informed the data collection processes when working with the AEOs. First, it was essential to meet the right person for interviews. Participants with proper knowledge and adequate authority allow for more effective information gathering. They are typically employees at the managerial level in the area of export, import or supply chain divisions. Second, sharpening questions to concentrate on shipment, rather than on the whole process of export, was important. Third, activities that characterized integration mechanisms needed to be identified. This helped the researcher to cue the questions on the existence of these activities in the AEOs' export chains. Fourth, the prepared questions proved relevant to the export chain operations and their related security measures. The researcher learned a potential gap in security measures and awareness between the pilots and anticipate similar situation in the AEOs' environment.

Moreover, an evaluation of these pilot cases helped determine the suitability of the case study protocol. The pilot not only tested the content of the interview questions and observations, it also served to improve the planned procedures and the information provided to participants, such as the background to the research, participants' rights and contribution, and ethical considerations. After the pilot study, these aspects were

modified to improve procedures and it was determined that a more relaxed and informal atmosphere was preferable so that participants felt comfortable in conveying and discussing relevant information.

The researcher also tested the language to be used in interviews. Managers in Pilot-1 responded with some limitations when English was used. They acted in a more formal manner and admitted that being interviewed in Indonesian would be preferable. Participants from Pilot-2 and Pilot-3 had very limited English language proficiency. For these reasons, only Indonesian was used throughout the interviews with the AEOs. The pilot study also gave an estimate of the time needed for interviews and observations. This information was necessary when potential participants from the AEOs were approached in the actual interview stage and an effective schedule could be created with sufficient time to explore all elements in the protocol.

The pilot cases, however, were not AEO certified entities. Even though the security measures are similar, they do not follow the AEO standards. The absence of security standards in the pilot cases did not allow them to benchmark their security measures. Therefore, the researcher could not review the gap between the findings and standards as planned in the case study protocol. To overcome this weakness, the researcher conducted comparative exercises between the findings in the pilot cases with the AEO standards.

5.3 CASE STUDY: AEO-1

5.3.1 Introduction

The first AEO, termed AEO-1 henceforth, is an electronics company with a global presence and reputation. Initially established in 1958 in its country of origin, AEO-1 has grown to become a giant multi-national company (MNC) with 83,000 employees and 119 subsidiaries worldwide. AEO-1 came to Indonesia in 1990 to create a production base for exports, especially to the Southeast Asian market as well as to Australia, Europe, and the Middle East. Employing around 4,500 people across 22 offices around Indonesia, AEO-1 plays a significant role in the national economy. This led to them to

receiving consecutive Indonesian government awards in 2006, 2007 and 2009, known as 'Primaniayarta', for their outstanding export performance.¹

AEO-1's factories are located in Bekasi and Tangerang, satellite cities adjacent to Jakarta, the Indonesian capital. The Tangerang factory produces refrigerators and is not AEO accredited. The factory in Bekasi, which produces televisions, audio and video appliances, and computer monitors, is AEO certified. Therefore data collection was only conducted in the Bekasi factory.

The interviews and observations took place during November and December 2015. An interval visit was conducted in January 2017 as part of the time series analysis. Interviews were conducted with several departments in AEO-1 and its chain partners. Table 5.2 summarises the processes and methods of data collection used in AEO-1.

Table 5.2 Data collection in AEO-1

Participating chain functions	Interviewees	Methods of data collection	Place / Date	Duration / recording code
AEO-1 SCM department	One manager Two staff	Interview and observation	Factory 1, Cikarang / 20/11/2015	Full day / AEO-1#1
AEO-1 Export and import department	One manager Two staff	Interview and observation	Factory 1, Cikarang / 03/12/2015	Full day / AEO-1#3
Warehouse (WH-1)	One Manager	Interview and observation	Factory 1, Cikarang / 03/12/2015	Full day / AEO-1#2
Freight Forwarder (FF-1)	One group head One trucking supervisor	Interview	FF-1's office, Cikarang / 03/12/2015	Two hours / AEO-1#4
Warehouse/Freight forwarder (WH-2 /FF-2)	One unit leader production and logistics (AEO-1) One supervisor (warehouse)	Interview and observation	Factory 1, Cikarang / 04/12/2015	Full day / AEO-1#5 AEO-1#6

¹ This information is taken from the AEO-1's website, accessed in April 2016. As part of the ethics agreement and for reasons of confidentiality, the name of this website has not been revealed.

	operator/freight forwarder)			
Trucking company (TC-1)	One supervisor	Interview and observation	TC-1's garage, Cikarang / 04/12/2015	Three hours / AEO-1#7
Trucking company (TC-2)	One manager	Interview and observation	TC-2 Office, Kelapa Gading, Jakarta / 07/12/2015	Two hours / AEO-1#8
Trucking company (TC-3)	One sales and marketing manager One operation supervisor One customer service staff	Interview and observation	TC-3 Office, Marunda, Jakarta / 07/12/2015	Three hours / AEO-1#9
Shipping agent (SA)	One director One customer service manager One staff One manager (FF)	Interview	SA's office, Jakarta / 10/12/2015	Two hours / AEO-1#10
Empty container park (CP)	One Manager One surveyor staff One manager (FF)	Interview and observation	Marunda, Jakarta / 10/12/2015	Three hours / AEO-1#11
AEO-1 SCM department	One manager	Interview	Factory 1, Cikarang / 09/01/2017	One hour / AEO-1#12

Managers and staff represented in AEO-1 came from manufacturing, export and import, and logistics departments. The main contact and source of information from AEO-1 was the export and import manager, who also helped to arrange and schedule interviews and observations with representatives from different divisions in AEO-1 and with firms constituting their chain partners. The interviews in AEO-1 were conducted across three different times to accommodate staff schedules. Each interview lasted around two hours and was followed by observations in and around AEO-1's work areas.

Interviews and observations with the chain partners were undertaken after the meetings with AEO-1. This process involved two 3PLs functioning as FFs for AEO-1.

These FFs were responsible for different export chains relevant to the type of goods. The first FF was in charge of finished products, while the second was responsible for spare parts. They both led different export chains with similar structures but completely different actors. The actors included warehouse operators (WH), trucking companies (TC), shipping agents (SA), and empty container park operators (CP). Interviewees from these functions ranged from managers to field staff in charge of operations related to AEO-1's exports.

5.3.2 AEO experience

As a reputable international production base with a high volume and frequency of export and import, AEO-1 has been enjoying a privileged status with Indonesian customs as a priority lane importer. This status was awarded to AEO-1 as an importer with high-level compliance and allows it to enjoy privileges such as minimum interference from customs (no physical inspection) and periodical payment of duties and taxes.

Being a priority lane importer, AEO-1 was invited to participate in the AEO pilot project with nine other exporters. AEO-1 was one of the five exporters who met AEO requirements and was successfully certified. Even though some of its export destinations are countries where AEO implemented, AEO-1's interest in becoming an AEO was not due to market requests. Instead, it was triggered by its high compliance levels from the perspective of customs regulations.

Security initiatives in supply chains are not new to AEO-1. The firm has been familiar with the CTPAT program since 2003 and was regarded CTPAT compliant after a thorough audit by US customs. Some security measures are believed to exceed standards as regulated in the AEO guidelines. AEO-1 expects to have greater privileges accorded to them in customs export procedures, but at the same time, it also realizes that export does not require complex procedures compared to import.

During an interval interview, a staff member at AEO-1 stated that AEO certification did not have a significant impact on their export supply chain operations, especially in terms of integrative activities. Flow of operations and the role of actors remain the same. However, internal and external security has been improved. Internally, initiatives

related to security programs have been adopted by higher level management. For example, the export and import department took the initiative to install speed gates in AEO-1's premises. These gates record the entry and exit of people and block the entry of people without authorized identification. Externally, security awareness among chain partners has increased with the 3PLs include security concerns in trucking vendor selection. The result of this has been a reduction in missing goods incidents during transportation from factory to port. AEO-1 also claimed that its stakeholders appreciate its AEO status and the additional security that comes with it. However, AEO-1 still expects to receive more facilitation from customs and will continue to encourage its chain partners to apply for AEO accreditation.

5.3.3 Mapping the supply chain

5.3.3.1 Functional structure

AEO-1's exports are divided into two types: finished products and service parts. Finished product exports are considerably larger in volume and frequency. Export plans and forecasts for finished products are prepared well in advance and the probability of a deviation from those plans is low. The two types of export constitute different chain structures and involve different actors. They, however, present similar functions and flow of goods, as illustrated in Figure 5.1.

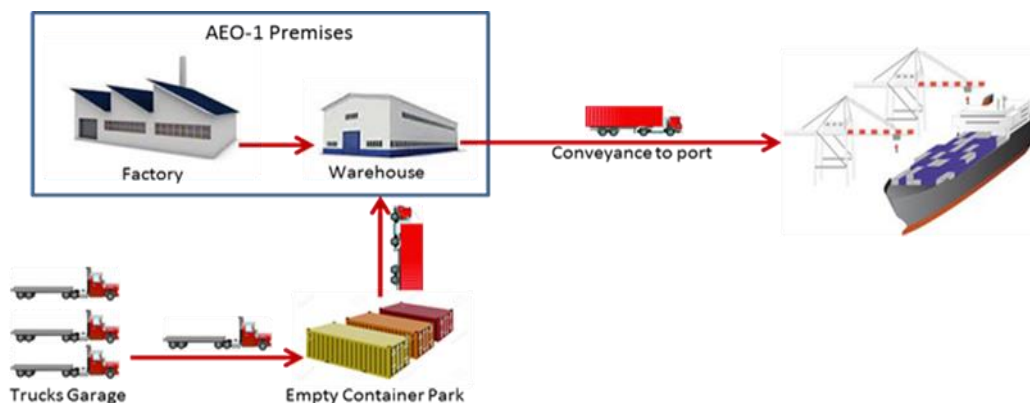


Figure 5.1 AEO-1's export chain

AEO-1 is an example of a firm that uses 3PLs for almost all of its supply chains and logistics operations in its export and import. The 3PLs are the FFs who manage most other functions in its export chains. AEO-1 uses FF-1 for finished products and FF-2 for service parts. As the only direct partner of AEO-1, FF-1 manages warehousing, documentation and communication with other functions in the chains. In general, the role of AEO-1 in the chain concludes after production and delivery of the goods to the warehouse. Even though the warehouses and all their facilities are owned by and located inside the premises of AEO-1, their management is the complete responsibility of FF-1 and FF-2. From this point, the flow of goods from warehouse to port is under the control and responsibility of the FFs. In relation to the flow of information and documents, AEO-1 only makes direct contact with FFs. However, AEO-1 maintains its power to observe and evaluate the smoothness of the cargo flow in their export supply chains.

FF-1 and FF-2 have different allocated warehouses with different type of goods. All employees in the warehouses are under the FFs' management. They use facilities provided by AEO-1, including computers and warehouse management systems. Facilities including racking systems, storage management, and lifting equipment are similar to those used in all of AEO-1's international subsidiaries. They are developed at headquarters with features that allow AEO-1 to access and monitor the activities and performance of its subsidiaries.

FFs start functioning from the warehouse that receive goods from production and store them in dedicated areas waiting for loading. In the warehouse, FFs is responsible for packaging, stock keeping, managing outgoing goods, administration of export documents, taking photos, wrapping, and loading to containers. Documents created at this stage include customs export declarations and attachments.

Providing total logistic solutions to AEO-1, FF-1 communicates with shipping agents and TCs to transport shipments from factory to port and to book vessels. FF-1 manages several TCs to service AEO-1's export of finished products. However, only one trucking company (TC-1) who works based on a contract made with FF-1. TC-1 has a dedicated fleet of 60 trucks just for AEO-1's exports, and it is significantly bigger than the other TCs. The decision about which TC to use is determined at each shipment. While TC-1 takes priority, FF-1 must consider sharing orders with other

smaller TCs to maintain operational relationships. The role of the TC is to collect an empty container at a designated empty container park, drive to the factory, load the goods into the container and finally transport the container to port.

As part of its role, the TC chooses which empty container to use. A special staff member other than the driver or co-driver of the truck takes on this role. This function is usually referred to as “courier.” The courier is responsible for selecting a container that complies with AEO-1 standards, otherwise AEO-1 will reject the container and the TC is held responsible for extra charges. TC-1 assigns a courier per shipment and regards this function as very important. The container selection process is not simple. The problem starts with unclear standards about container quality. Grade ‘A’ is a commonly used term for good quality containers. However, there is no agreed definition of this grade, or any specifications except that the container must be free of rubbish, holes, smells, rust or dents. There is no detail, for example, on the extent of the rust or the strength of the odor.

The choice of empty container parks is determined by the shipping lines used. In many cases, shipping agents also own empty container parks, which may serve a number of different shipping lines. Once the shipping line is selected, the location of the empty container park and port follows.

5.3.3.2 Corporate ownership in the chain

AEO-1 exemplifies a typical full logistics service user. The company does not directly connect with other partners in the chain except its FFs. These FFs are then tasked with handling all chain operations or contracting other vendors. Shipping agents and TCs are the FFs’ dyadic partners. Shipping agents and TCs are in contact with subsequent logistic functions (i.e., empty container parks and ports). AEO-1 even chooses to contract the same FFs to manage and operate its warehouses.

Except for warehousing, AEO-1 has no ownership of other functions. AEO-1 concludes contracts with FFs and the FFs manage the contracts with the TCs. This is illustrated in Figure 5.2. The blue shapes indicate ownership and implied direct control. Red indicates no ownership, with control under the FF. The FF is illustrated in grey to

highlight its central role and its place as the only actor under AEO-1's direct control. The FF extends AEO-1's control to the other actors in the chain.

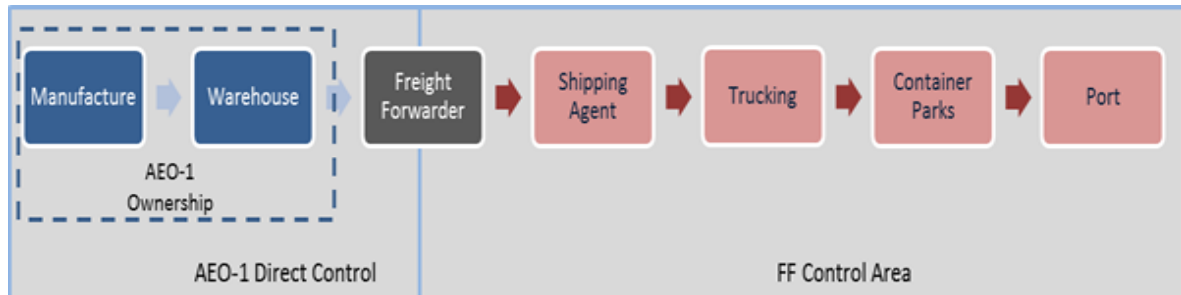


Figure 5.2 Ownership and span of control in AEO-1 chains

5.3.3.3 Contractual relationships

The hierarchy of contractual relationships is illustrated in Figure 5.3. At the first tier, AEO-1's international headquarters determines the use of shipping lines (SL) for all of its subsidiaries around the world, including AEO-1. The shipping line determines which shipping agents (SA) to use and subsequently the empty container parks (CP). This relationship is beyond AEO-1's direct involvement and hence forms tier 2.

Shipping agents work representing the shipping lines in certain geographical areas and communicate shipping operations to their clients. The unique part in AEO-1's chain operation is the direct bulk bidding by AEO-1's headquarters for shipping line services. As a result, the shipping agent is not in direct competition with other shipping agents. It is the shipping lines who are competing to provide better services and rates. AEO-1 headquarters conduct periodic auctions to review and prioritize rates and quality services. Given the significantly high volume and frequency of shipments, the organization can expect to attract the best rates and quality service from shipping lines. Subsidiaries are then advised which shipping lines to use. AEO-1 uses a system that automatically determines the shipping line that is most relevant to specific export countries, but they do not have the authority to choose the shipping line, merely provide feedback to headquarters about the performance of these shipping lines and shipping agents.

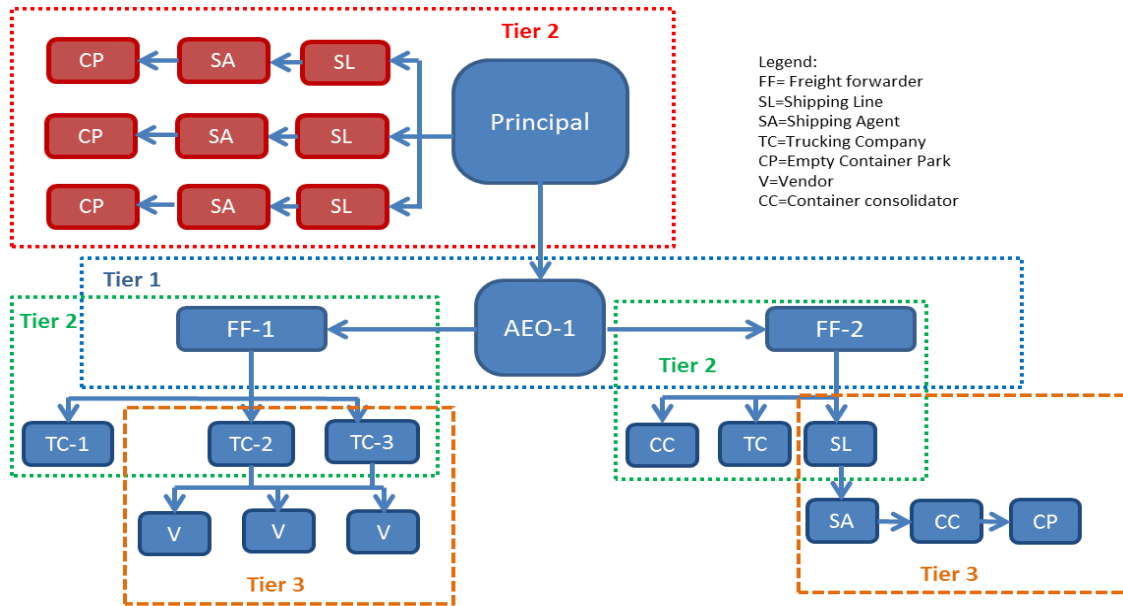


Figure 5.3 Contractual relationships in AEO-1 chains

The contracts between headquarters and the shipping lines contain agreed shipping rates and work estimates for a specified tenure. AEO-1 finds such contracts useful to guarantee the most efficient rate and to reduce the need for further negotiation. However, bulk bidding by AEO-1's headquarters is only carried out for the export of finished products, as service part exports involve much lower quantities and frequency, therefore reducing the benefits of bulk bidding. For the export of service parts, therefore, FF-2 is given the authority to choose shipping lines. Most of the time, FF-2 uses LCLs for its exports. As a consequence, cargo consolidators replace the position of empty container parks in the chain structure.

In tier 1, contractual relationships occur between AEO-1 and FFs. Both FFs have been working with AEO-1 for more than ten years and come from the same country of origin as AEO-1. Both have family relationships in their top management with members of AEO-1. Adding to this close relationship is the fact that some employees in FF-1 are also former employees of AEO-1. Despite this close connection, FF-1 and FF-2 are also in competition to win orders from AEO-1 through bidding processes. Every three years AEO-1 invites tenders for FF functions. The preference is to have an FF that can offer a total logistics solution, which is rare in the market, specifically among those with experience in the electronics industry. Should the need arise, it would be difficult to

change FFs since FF-1 and FF-2 have managed a large portion of the export chains almost from the time AEO-1 started to export. FF-1 and FF-2 have also successfully maintained expected levels of satisfaction in their chain management performance. Their key performance indicators are regularly evaluated by AEO-1 and results have provided no reason to consider replacing either by another FF. However, tenders are floated to check what is offered in the market and to evaluate whether FF-1 and FF-2's rates and performance standards are still competitive.

Lower in the hierarchy, another tier 2 is inhabited by FFs and their subsequent partners. At this point, the structures between FF-1 and FF-2 are different as a result of the global bidding by AEO-1's headquarters. FF-1 works with the pre-determined shipping agents and shipping lines, while FF-2 connects with shipping lines and shipping agents directly, without the involvement of AEO-1's headquarters. Another difference relates to the character of service part exports, which are lower in size and frequency meaning that LCL export often occurs. Hence, cargo consolidators mediate between the warehouse and port.

Even though FF-1 has several TCs in its list to service AEO-1's export chains, only one leading TC is tied to a contract (i.e., TC-1). The contract not only governs the agreed rates and order estimations, but also oversees more detailed agreement, such as the number of dedicated trucks, the maximum age of the trucks and the responsibilities of each party. Other than the contract, guidelines and work instructions regulate standard procedures and expected performance, constituting elements for evaluation. These standards relate to a variety of issues, including drivers' uniforms, their involvement in loading and unloading processes, the length of time a truck can stay in the warehouse, lead-time for transportation from factory to port, and other operational matters.

Tier 3 represents smaller scale relationships, in which a contract is less likely to exist. For example, in contrast to TC-1, which owns the whole fleet and resources, some small TCs outsource to other vendors to provide trucks for AEO-1. This sub-relationship is allowed by AEO-1 and/or FF-1, provided that all operational requirements are fulfilled. Under FF-2, the empty container parks, cargo consolidators and shipping agents have different patterns of relationships relating to the use of shipping lines chosen by FF-2.

5.3.4 Security measures and extension to chain partners

5.3.4.1 Cargo security

AEO-1 has a stringent set of rules on cargo handling, as summarized in Table 5.3. This includes packaging, wrapping, lifting, and stuffing in the container. Electronic equipment is sensitive to humidity and vibration, so every shipment is considered fragile and requires careful handling. The guidelines around container handling provide an example of AEO-1's vigilance in ensuring cargo security. A container must conform to all standards, with holes, dents, or odours deemed unacceptable. A single minuscule leak can result in major damage if water penetrates the packaging. To overcome potential leakage problems, AEO-1 has special water spray devices installed at every loading dock within its warehouse. Water sprays are useful for checking for holes in containers. Without this device, the common checking practice is to go inside the container and see whether any light comes through. However, the risk of water leakage persists if the container's surface is extremely worn and thin.

Table 5.3 Cargo security measures in AEO-1 chains

Chain actors	Cargo security
AEO-1	Issue security procedures for cargo Issue packaging standards to be followed by warehouse Use of standard seals from shipping line Seal affixation procedures Control on trucks' identity when they enter premises
FF	Extend AEO-1 security standards
Warehouse	Packaging: plastic wrap, palleting, etc. CCTV at loading bays Water sprayer systems to ensure leak-free container Secure warehouse with limited access Drivers and co-drivers are not allowed to access warehouse Compare cargo and documents before loading Control on cargo storage and inventory Photos during loading
Shipping agent	Forward request on container quality to empty container park
Empty container park	Providing quality container as requested Record and distribute seals to TCs
TC	Select and collect quality container Ensure quality container free of rubbish, odour, dents, rust, holes, leaks and foreign materials
Port	Compare truck and container identity with documents

Multiple parties check container quality for dents, odour, and rust. The first responsible party is the TC, when collecting empty containers. AEO-1 always includes the container quality requirement in every shipping instruction. The shipping agent follows this up by issuing a delivery order (D/O) to the empty container park, which provides containers that meet the quality requirement. The TC has to take responsibility if the AEO finds out the containers were not up to standard. These measures were originally intended to assure quality. With the AEO implementation, the process includes security check to assure that the above elements do not carry security risks. The containers must be free from foreign materials.

Before stuffing at the warehouse, AEO-1 applies a plastic cover to the inside of the container. For more fragile shipments, bubbled plastic is used instead. This protects the goods against vibrations and any undetected water leaks. During this plastic covering process, warehouse staff ensures no foreign material remains inside the container. This is an additional cargo security measure over and above the standard packaging and palleting processes for electronic appliances.

In addition to the above, the use of seals on containers is standard practice to secure containerized cargo. The shipping agent provides these seals. When the truck comes and collects an empty container, the truck driver collects one seal per container. Some shipping agents provide seals at their offices. If this is the case, the courier usually collects the seals at the same time as the delivery order, which is needed to collect empty containers from the empty container park. The shipping agents charge a fee for seals ranging from Rp.75,000 to Rp.100,000 per seal (AUD \$7.5 - \$10).

5.3.4.2 Conveyance security

To ensure conveyance security of its cargo, AEO-1 relies heavily on the performance of the TCs. Table 5.4 summarizes the role of each actor related to conveyance security in AEO-1's export chain. AEO-1 does not require trucks to have a global positioning system (GPS) to monitor truck movement. Ports and shipping lines provide online information that can show cargo location and movement. AEO-1 believes that the current TCs have sufficient measures to manage and control in-time transportation.

Table 5.4 Conveyance security measures in AEO-1 chains

Chain actors	Conveyance security
AEO-1	Require and check maximum age limit for trucks
FF	Control delivery time Reporting system
WH	Packaging in container
SA	Not relevant
CP	Not relevant
TC	Control on route and transport time Accident reporting system
Port	Provide online container arrival information

TC-1, as the lead TC, demonstrates various activities related to conveyance security. This includes time-control delivery, driver recruitment processes, and using quality trucks with high standard maintenance facilities. TC-1 also has traceability technology, although its use is not currently part of the agreement with AEO-1. Instead of using a GPS, TC-1 has a set of determined routes along with the time estimates of commuting on these routes. Trucks are not expected to deviate or travel longer than the estimated time. TC-1's staff are posted at certain points to control these mechanisms, usually at warehouses and ports. A recovery team is prepared and remains on standby to address any non-conformity.

In this export chain, AEO-1 ensures the use of seals and applies multiple controls at several points, such as at the time of departure of containers from the warehouse and at the arrival of containers at the port. The process of container conveyance demonstrates that a single shipment is the responsibility of multiple parties. Each party comes with their own documentation as evidence that it has carried out its role appropriately. These documents are then approved or signed off by representatives from their dyadic partners. This activity marks a handover of responsibility with confirmation of safety and security in this transfer process. It starts from the collection of empty containers between the TC and empty container park. The empty container park records the condition of a collected container in a handover form, which is then signed by a courier from the TC. This document is referred to if damage is found until

the container arrives at the destination country. This handover activity continues from the TC to the warehouse (AEO-1 and FFs), and from the TC to the port, with different documents relevant to the operations. The warehouse issues documents related to the amount and type of goods to be transported. The TC processes these documents at the port as part of the export clearance process. The port finally inspects the container condition. Different ports at Tanjung Priok have different systems, but the aim is the same, which is to ensure that container details conform with the documents.

5.3.4.3 Premises security

Security at AEO-1's premises is conspicuous. Entry to the premises is scrutinized with checks of identity (ID) cards and x-ray scans of bags. Staff must wear their ID and enter through a single gate. Visitors must obtain a guest ID card to be worn whenever and wherever they are inside the premises. A high fence surrounds the premises, security posters and banners are found in corners and open spaces, a walking path is clearly identified, safety clothes and equipment are well used, and CCTV cameras can be seen around the premises.

CCTV cameras are placed at every loading bay in the warehouse. These cameras record stuffing activities when goods are loaded into containers. This measure was a requirement of the CTPAT program and is unique among the AEOs under study. Container stuffing is the last operational phase in the chain and the most vulnerable to unauthorized access and insertion of illegal material inside the container. Consequently, access to goods is restricted to authorized personnel until the container is opened at the importing country.

A particular measure that is not commonly found at AEOs is a mobile phone application to authorize entry into the computer system. When a staff member logs into a computer, an authorization password is sent to their mobile phone to enable login. This password changes every ten minutes.

In general, AEO-1 provides evidence of security and safety standard measures in its premises. Security standards at FFs' premises show a similar level. Even though the FFs are not involved in goods flow, security is relevant to document flow in the chain. The FFs' offices are located adjacent to AEO-1's location and show a similar level of

security standards. Their operations in the warehouse automatically follow AEO-1's security standards. However, such standards are not always evident in other chain partners' premises.

Security measures start to weaken at the TC and empty container park premises. For example, no fences surround the garages, identity checks for visitors are not applied, and CCTV cameras are not found. TC-1's garage is bona fide and located in a business area. In contrast, TC-2's garage is located in a village on the outskirts of an industrial area near AEO-1. The office is a modified container and trucks are parked on open land.

Table 5.5 provides a summary of measures related to premises security in AEO-1.

Table 5.5 Premises security measures in AEO-1 chains

Chain actors	Premises security
AEO-1	Secure premises (fences, gates, access, identity) Limited access CCTV
FF	Secure premises
WH	Limited access CCTV
SA	Not relevant
CP	No tight security measures
TC	No tight security measures

5.3.4.4 Personnel security

A common practice in recruitment processes is a police check, which is a formal reference check to verify that a person does not have a criminal record. AEO-1 and all firms in the chains have this practice in place for all permanent full-time employees. This requirement is not stringent to casual workers, including drivers, co-drivers, couriers and casual labours who load and unload goods, especially at consolidation warehouses. The number of casual workers in the observed supply chains is

considerable. Their roles are equally vital in the chains to avoid any potential abuse of access to a legitimate shipment.

All TCs have a similar recruitment process to consolidation warehouse for drivers, co-drivers, and couriers. They rely on recommendations from existing drivers when recruiting new ones. TCs do not conduct open recruitment since existing drivers always recommend enough potential drivers. These drivers might be relatives or friends who generally come from the same areas outside Jakarta. This process is believed to offer more security since the recommending driver can provide references related to their skills, record, and character. The same process occurs for couriers. In this chain, a courier's most vital role is selecting the container to meet AEO-1's requirements. Couriers must ensure that the container selected by the empty container park is free from holes, dirt, dents, rust, and smells. This process makes the courier the first party to ensure that there is no unauthorized material inside the container. Since these casual workers play sensitive roles that are vulnerable to abuse, maintaining a good relationship with them is of ultimate necessity. The table below provides a summary of the personnel security measures in each function in AEO-1.

Table 5.6 Personnel security measures in AEO-1 chains

Chain actors	Personnel security
AEO-1	Recruitment involves security consideration Identification at work Security procedures for unauthorized persons
FF	Security consideration
WH	Identification at work
SA	Security consideration
CP	Security consideration
TC	Security consideration Casual workers with high turnover

5.3.4.5 Trading partner security

AEO-1 only has a contractual agreement with the FFs. The contracts regulate general aspects of rights and responsibilities in their business relations. Regarding security, the contract generally states that FFs are to observe the security and safety of shipments in accordance with AEO-1's standards. Detailed guidance on security and safety exists as separate living documents that are regularly adjusted to changing requirements and environment. The guidance is in the form of standard operational procedures, which are attached to different operations in the chains.

Table 5.7 lists the roles of each function in the chain in terms of security. At the warehouse, this includes the use of identity and packaging procedures. In transportation, security measures involve the use of dedicated routes, uniforms for drivers, and emergency contacts in case of deviation. This guidance must be followed by FFs and is included as part of security evaluation. FFs disseminate this guidance to other firms in the chains, especially TCs, which are directly involved in the physical handling of goods. These parties have a regular monthly meeting to evaluate issues that may have occurred and discuss possible solutions, as well developing measures to prevent them from happening again. Concerns on trade partner security are mostly related to the physical movement of goods.

Table 5.7 Trade partner security at AEO-1 chains

Chain actors	Trade partner security
AEO-1	Security details are included in guidance and standard operational procedures (SOP)
FF	Extend SOPs to TCs and shipping agents
WH	Follow procedures on packaging, loading, and sealing
SA	Follow agreements in contracts
CP	Follow AEO-1's guidance in container quality
TC	Follow procedures on truck quality and age, drivers' uniform and identification, parking area, etc.

5.3.5 Integration mechanisms

From the aspect of information sharing, AEO-1 utilizes an internal information exchange system that helps relay operational information to every functional division. For example, marketing, finance, production, export, and import divisions have a closed group system in which access to specific information is only available to members of these divisions. They can, however, view generic details in other areas of relevance. For example, the export division can view information on production plans and production needs to obtain marketing results, and finance requires invoices from the export division. All systems require ID and password authorization, which then determines the employee's area and level of access. Externally, the 3PLs have limited access to this system, only being authorized to see information that helps them carry out their operations. However, only FF-1 and FF-2 can access this system for warehousing activities and document making.

Other firms in the chains use email, phone, and facsimiles as traditional channels of communication. These channels are used to place orders, book vessels, schedule trucking, complete orders, control deliveries and share other pertinent information. The information flow starts from AEO-1 sending emails to the FF notifying them of a shipment order. The FF follows this up with communication with the shipping agent to book a space. The FF contacts a TC to schedule empty container collection, stuffing and delivery to the port. Subsequently, the shipping agent contacts the empty container park to prepare empty containers, or a cargo consolidator, to book a space in a container. Then the TC assigns a courier to choose the empty containers. These activities represent the export routine conducted for every shipment.

Information on their operational plan is generated from AEO-1's internal system and is regularly distributed to relevant chain actors through email. This information originates from AEO-1's production plan and export schedule. AEO-1 sends this information periodically to the FFs as its immediate partners. The FFs share this information with their chain networks. This practice is important for regular planning and preparation of resources, and allows each actor in the chain to estimate their business opportunities and performance.

In terms of operational interdependence, AEO-1 refers to their delivery terms in their exports, which in most cases are FOB or CNF (see explanation in 3.5). The use of these terms makes AEO-1 the legal owner of the goods until the shipment is on board a vessel. Accordingly, AEO-1 has the deciding power in relation to operations in its supply chains, over and above other firms in the same chain. However, sometimes decisions need to be made with consideration of other actors, creating what is known as an integration mechanism. For example, when damage is found in a container, multiple parties are involved in deciding whether the container can be used or must be rejected. Or when an emergency occurs that requires joint action, such as flooding or a demonstration that disturbs the travel schedule of a container, AEO-1 needs to discuss a solution with the other parties.

AEO-1's outsourcing of their warehouse management to FFs also constitutes an integration mechanism. The warehouses are inside AEO-1 premises and all facilities, including computers, software management systems, and equipment are owned by AEO-1, but managed and operated by the FFs.

Duplications in operations can be seen in these chains. One prominent example is the repeated use of similar forms as handover documents between actors. A case that repeatedly occurs is when damage is found in a container, with the TCs and empty container parks both responsible for this issue. To avoid such responsibility, each party issues their own forms, which are verified by their chain partners during handover to cover their interests. This practice constitutes a duplication that is contrary to the integration objectives.

While AEO-1 employs a high standard of security measures, other actors in the chains do not show equal security levels. Security measures erode with the flow of goods downstream, with a disparity in security levels across partner premises. The findings show an absence of robust value sharing from AEO-1 to its chain partners.

5.3.6 AEO-1 summary

Under the perspective of integration, AEO-1 is an example of a firm using total logistics service providers. It chooses to contract out all functions in the export chain to 3PLs rather than directly managing them. This choice reflects its span of direct control, which

terminates at its FFs. The control function is then taken over by the FFs to all other functions in the export supply chain. AEO-1 agrees that security and integration are very important and supports the assumption that integration enhances security in supply chains. AEO-1 applies strict standards of security in its cargo movement and expects other actors in the chains to adhere to the standards as prescribed.

5.4 CASE STUDY: AEO-2

5.4.1 Introduction

AEO-2 is one of the leading automobile manufacturers in Indonesia. The company has three plants around Jakarta. They are located in Sunter, Karawang-1, and Karawang-2. The plants in Sunter and Karawang-1 have become production bases for the international market. The Sunter plant produces completely-knocked-down cars and engines, while the Karawang plants assemble completely-built-up (CBU) cars.

AEO-2 produces different types of cars and exports to many countries including ASEAN countries, the Middle East, Argentina, South Africa, and Brazil.² It competes not only with other international automobile brands, but also internally with other subsidiaries of the same brand from different countries. These subsidiaries compete to win orders from their principal. AEO-2's main internal competitors are Indian and Thai subsidiaries. AEO-2 staff believe that a superior supply chain plays a significant role in maintaining the competitiveness of their exports. Consequently, they have expectations that the new AEO status will bring advantages and help deliver a swift and secure export chain.

The data collection process in AEO-2 occurred between November 2015 and January 2016, with an interval visit in February 2017. This process included interviews and

² This information is taken from the AEO-2's national and international websites, accessed in April 2016. As part of the ethics agreement and for reasons of confidentiality, the names of the websites are not revealed.

observations in several different locations, such as their headquarters, warehouses, and assembly plants in Karawang. Table 5.8 provides details of this process.

Table 5.8 Data collection in AEO-2

Participating chain functions	Interviewees	Methods of data collection	Place/ Date	Duration / recording code
AEO-2 export import department	One assistant manager	Interview	Jakarta / 26/11/2015	One hour / AEO-2#1
AEO-2 export import department	Two manager/Asst. mgr One supervisor One staff	Interview	AEO-2 Office / 17/12/2015	One hour / AEO-2#2
AEO-2 export import department	One manager One supervisor One staff Five managers/Staff (vendors)	AEO-1 presentation, Focus group discussion	AEO-2 Office / 11/01/2016	Two hours / AEO-2#3
AEO-2 warehouse	One supervisor One staff	Presentation, Interview, Observation	AEO-2 Warehouse, Sunter, Jakarta / 12/01/2016	Two hours / AEO-2#4_1
Trucking company (TC-1)	Two supervisors	Presentation, Interview		One hour AEO-2#4_2
Container yard (CY)	One supervisor One staff	Presentation, Interview, Observation	CY-1, Cakung, Jakarta / 12/01/2016	Full day / AEO-2#5
Trucking company (TC-2)	One supervisor	Presentation, Interview, Observation		
Trucking company (TC-3)	One supervisor (TC-3) One supervisor (CY-1) One staff (AEO-2)	Presentation, Interview, Observation	CY-1, Cakung, Jakarta / 13/01/2016	Three hours / AEO-2#6
AEO-2 vehicle yard	One supervisor Three staff	Interview, Observation	AEO-2 VY, Karawang plant / 14/01/2016	Full day / AEO-2#7_1 AEO-2#7_2
CBU yard operator	One manager One supervisor	Presentation, Interview,	Indonesia car terminal,	Five hours / AEO-2#8

	(AEO-2) One staff (AEO-2)	Observation	Tanjung Priok, Jakarta / 15/01/2016	
AEO-2 export import department	One manager One	Interview	Jakarta / 06/02/2017	One hour / AEO-2#9

Each visit took a full day, given the size and complexity of their sites and operations. During the second visit to its headquarters, a focus group discussion (FGD) was held with representatives from almost all functions in the export chains. These were FFs, TCs, car carrier operators, port yard managers, and empty container park operators. The researcher presented the objectives of the study and the expectations of the participants at the beginning of the discussion. This was followed by a presentation from AEO-2 on the general process of export and import, as well as the role of each chain partner. Two managers from the export and import department attended the discussion, conveying their appreciation and support for the research. At the end of the discussion, meetings with the chain partners were scheduled and conducted individually at their respective sites, such as a temporary container yard (CY), a car terminal, a TC and a yard operator (YO).

This process was preceded by email communication to request their agreement to participate and to arrange visit schedules. The fieldwork in AEO-2 was then concluded with a meeting to validate the summary of the interviews and observations, and to provide an avenue for further information or feedback. The main contact in AEO-2 was a supervisor from the export and import department in charge of export and import logistics, including conducting periodic bidding. This position was ideal as the key information source in AEO-2. Two employees from this department assisted during visits and field observations in the chain partners' sites.

5.4.2 AEO experience

As is the case with other AEO pioneers, AEO-2's participation in the program was initiated because of its reputation as an importer and active engagement in policy development at customs. It joined the AEO pilot project and successfully certified without substantial adjustments in its operations or facilities, despite having no prior

experience applying an international security initiative. As a multi-national company, AEO-2 was aware of the AEO initiative in other countries like Japan and Thailand and welcomed its introduction in Indonesia.

The interval interview in AEO-2 showed that AEO implementation has expanded, with two of AEO-2's chain partners receiving AEO certifications. AEO-2 claimed that the AEO program is in line with its design on SCS and integration. Thus being an AEO supports and accelerates its programs to enhance its IT systems for integrating internal and external parties in import and export. AEO-2 also added AEO status as a preferred condition in their latest bidding process for import and export vendors. As a full supporter of the AEO program and highly compliant in export standards, AEO-2 expects to see further developments in the program.

5.4.3 Mapping the supply chain

The researcher observed two types of export chains in AEO-2: CBU cars and components (i.e., parts of the car). The export of CBU cars and components follow different export chain structures, with unique roles played by various partners within the chains. The CBU chain is less complicated than the component chain in terms of the number of actors and operations involved. The component export chains involve 16 actors as partners of AEO-2 and include more complex processes. Recognizing these differences, discussions in the following sections are divided between CBU and components export chains.

5.4.3.1 Functional structure

5.4.3.1.1 CBU export chain

Figure 5.4 illustrates the simplicity of the CBU export chain, involving a small number of actors and the requirements of special CBU handling. The inclusion of FF functions inside AEO-2 contributes to this simpler chain structure. AEO-2 still employs a customs broker to function as a courier service in handling manual export clearances from government agencies. All other common FF functions are directly managed by AEO-2,

such as the issue of export declarations, shipment bookings, and other communication with the rest of the links (e.g., the shipping agent, car carrier, and port operator).

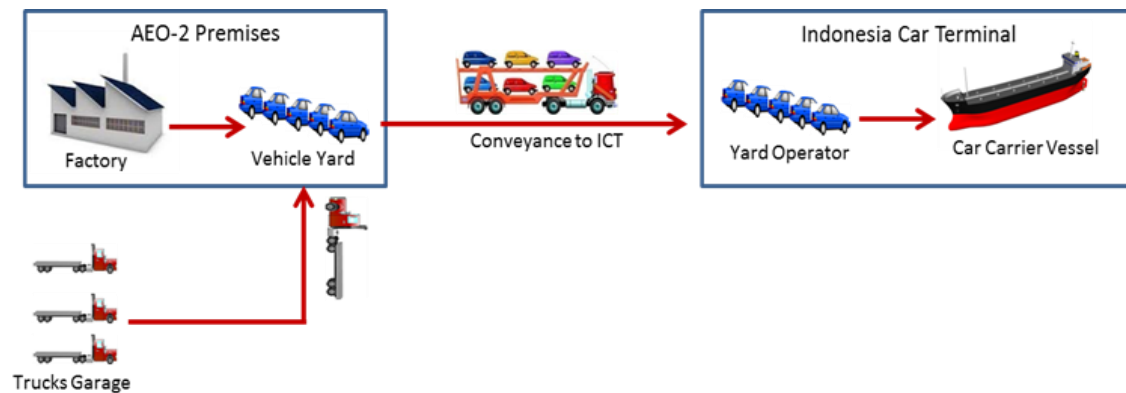


Figure 5.4 AEO-2's CBU export chain

Below are highlights of unique functions and their operations that are distinct from generic export chain structures:

Vehicle yard operator

In terms of goods flow, the characteristics of CBU cargo require the use of CBU vehicle yards (VYs) that function like the warehouse, and car carrier trucks instead of ordinary container trucks. As well as the use of special car carrier vessels, this type of cargo requires a dedicated vehicle port and the service of a car terminal port operator as an additional actor in the chain.

The vehicle yard is located right next to the assembly line, and is owned and fully managed by AEO-2. Again this is similar to a warehouse location, which is usually adjacent to the factory. CBU cars are driven from the factory to the vehicle yard to await shipment. Before entry into the vehicle yard, a pre-delivery inspection (PDI) is carried out, involving 12 points of examination covering the interior, exterior and the engine of each car. Not only does this process ensure the quality of each car, it also involves security and safety aspects. A PDI is the final inspection conducted by AEO-2 before the CBU cars leave its premises. During the assembly process, control is repeatedly carried out at different stages. After the PDI, the subsequent chain partners still perform inspections but in a more random and simpler manner.

Cars are driven to dedicated bays in the yard and grouped in accordance to their shipment. The maximum stay in the vehicle yard is seven days. Meeting this maximum stay target requires a high level of cooperation between all manufacturing processes and support from the IT system, with careful planning across different divisions in AEO-2. Once the cars arrive in the vehicle yard, AEO-2 must have made communication with all other chain actors, so that they can anticipate their individual work requirements. At this stage, the shipping agent has issued a D/O and scheduled the vessel loading time.

Truck car carrier

As a unique aspect in the CBU chain, the use of truck car carriers to transport cars from the vehicle yard to port has some implications. A truck car carrier can carry six to eight cars. Operating a car carrier requires special skills and knowledge, not only in driving but also in handling the cargo. For this reason, a co-driver always accompanies a driver. Every type of car to be transported has different handling procedures according to the car's weight and dimensions, which determine locking and lashing points and procedures. The drivers must observe these procedures to address potentially severe safety risks. Drivers and co-drivers are also responsible for loading the cars from the vehicle yard onto the carrier and unloading them at the port. These complicated requirements and the high investment involved, limit the number of vendors taking on this function. In contrast to the other functions, which necessitate multiple vendors, AEO-2 only uses one vendor to supply the car carrier services.

Port yard operator

Another prominent difference in the CBU chain is the use of a dedicated port for car import and export (i.e., the Indonesia car terminal (ICT)). Owned by a government company, the ICT is the only car terminal in Indonesia and therefore operates without competition. The ICT's operations are distinct from those of container ports. Unlike container ports that handle the movement of containers internally, car handling and movement inside the ICT is performed by other firms. These firms are yard operators. Only one yard operator works for AEO-2 and this company also works for other car manufacturers. AEO-2's yard operator handles 60% of work in the ICT. AEO-2 is also the biggest client in the ICT, occupying 50% of ICT's space and operations.

The yard operator employs sub-vendors who supply drivers with the responsibility for moving cars inside the ICT. The yard operator is responsible for handing over the process with direct operational partners: the car carriers and vessel operators. The yard operator starts its operations when the car carrier arrives at the ICT. The car carrier's driver unloads cars to the receiving bays and hands the cars over to yard operator's drivers, who then park the cars at designated bays pertinent to their shipment time. The waiting time for cars in the ICT is a maximum of seven days, with additional costs applied for extra time. During this time, the yard operator randomly checks the condition of the cars. At loading time, the yard operator's drivers move the cars on board the vessels. This marks the end of the yard operator's functions.

5.4.3.1.2 Component export chain

Figure 5.5 illustrates the flow of export and the functions involved in the process. This chain starts with AEO-2's warehouse preparing the shipment to be collected by TC-1. TC-1 only transports the container from the warehouse to a temporary container yard. AEO-2 employs four TCs in this role and two container yards in the chains. TC-1 operates in this section and participated in this research.

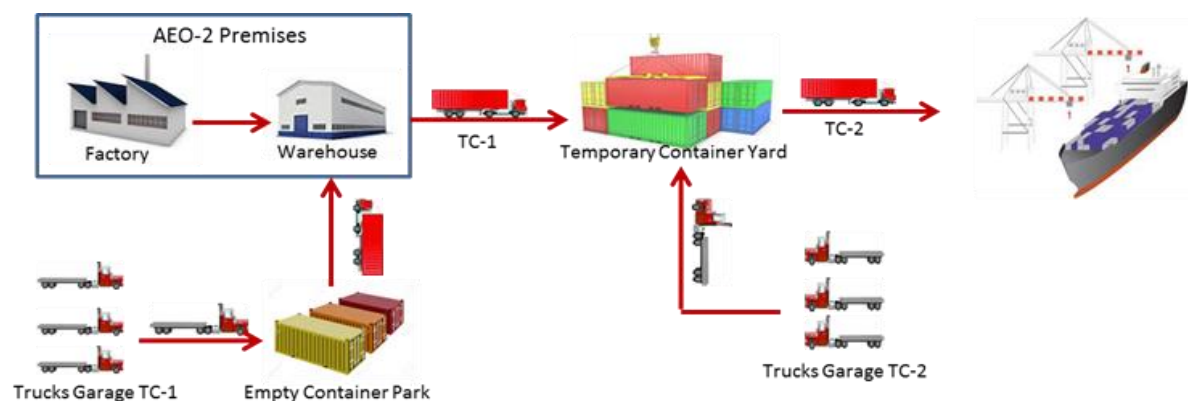


Figure 5.5 AEO-2's component export chain

TC-1's operations are common to other TCs, including collecting empty container, stuffing at the warehouse and transporting to the container yard. The difference is that the container yard is the final destination instead of the port. The container yard functions as a temporary place for containers waiting for their shipment time at ports.

The reasons for this are the time gap between production and loading to a vessel and the capacity of AEO-2's warehouse.

AEO-2 prefers to have different firms functioning in different roles, despite the capability of some firms to perform multiple functions. In consequence, other TCs transport containers from the container yards to ports. At this end, FFs are also used to process customs clearance. Shipping agents and ports commonly function as in other export chains. Thus in this chain, it is the temporary container yard that is unique.

Temporary container yard

This specific node exists after AEO-2 decided that cargo must be confirmed before the export document is created. The cargo is confirmed when AEO-2 completes the stuffing and attaches the seal to a container. After this point, no further change is allowed. The container then has to be removed from the warehouse to allow space for other cargo. This confirmation process allows AEO-2 to create accurate export documents, and avoid document alteration that may result in failure to deliver the cargo on time. Therefore, an extra node in the form of a temporary container yard is needed in the chain. Despite the additional node and the extra investment, the temporary container yard provides a solution to meeting the rigid timeframe between cargo preparation and vessel closing time. By stacking their ready containers at this point, AEO-2 can manage both its delivery and inventory more effectively.

5.4.3.2 Corporate ownership in the chain

Figure 5.6 and Figure 5.7 illustrate the span of AEO-2's ownership in its export chains. In both component and CBU chains, AEO-2 only owns the warehouse and vehicle yard, which have similar functions in storing the cargo before collection for shipment. Similarly, the warehouse and vehicle yard are inside AEO-2's premises adjacent to the factories. The other functions, represented as red boxes in the figures below, are outsourced to vendors. Some functions, such as FF, TC, empty container park, and container yard, have multiple vendors. Other functions that require more specific skills are served by a single vendor, such as the car carrier and yard operator.



Figure 5.6 Ownership and span of control in AEO-2 CBU chain

The car carrier and yard operators have special corporate relationships with AEO-2, which does not intend to replace them. AEO-2 believes that these functions demand experienced vendors to fulfil unique operations and satisfy AEO-2’s standards. Both of these vendors have business relations with AEO-2 and its principal. The car carrier company used to be in the same parent company with AEO-2, when AEO-2 once covered domestic sales. They are now separated, as AEO-2 focuses only on production and export. A sister company manages domestic sales. Comparably, the yard operator is only handled by one company that is related to AEO-2’s principal. Most of AEO-2’s subsidiaries worldwide use the same company for this function. Even though AEO-2 concludes contracts with these particular vendors, there is no bidding for these functions.

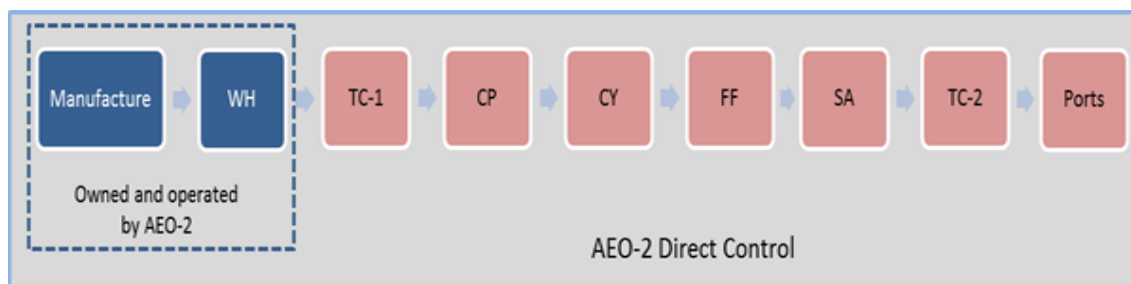


Figure 5.7 Ownership and span of control in AEO-2 component chain

AEO-2’s chains show different types of relationships with its chain partners regarding ownership and contracts. The figures show that outsourcing (represented by the red boxes) is more dominant than ownership (represented by the blue boxes). However, the extension of direct control from AEO-2 to all chain functions is not limited by

ownership. A robust and competitive vendor selection process is evident, highlighting AEO-2's contractual relationships, as discussed below.

5.4.3.3 Contractual relationships

Contracts between AEO-2 and its vendors typically contain the rights and obligations of the parties. Operational procedures and guidance are regulated in separate documents. These documents are referenced in their performance evaluation. The structure of contractual relationships in AEO-2 is divided into three tiers (see Figure 5.8). The first tier 2 is between AEO-2's headquarters and shipping lines, followed by their subsequent functions: shipping agents and empty container parks. Similar to AEO-1, and apparently a common practice for multi-national companies, AEO-2 does not choose shipping lines. Instead, it is the regional office overseeing the Asia-Pacific subsidiaries that conducts the bidding for shipping lines. This is for reasons of efficiency and a centralized tender process applies to both CBU and component exports.

The shipping lines delegate the shipping arrangement to the shipping agents located in different countries. The shipping agent, empty container park and ports are determined as relevant to the shipping line being used. Therefore, these links are not optional but pre-arranged for AEO-2 by its regional office. In consequence, shipping agents and empty container parks do not report directly to AEO-2. They are in the same hierarchical line to report to shipping lines. On the other hand, ports are more independent, without a binding relationship with AEO-2.

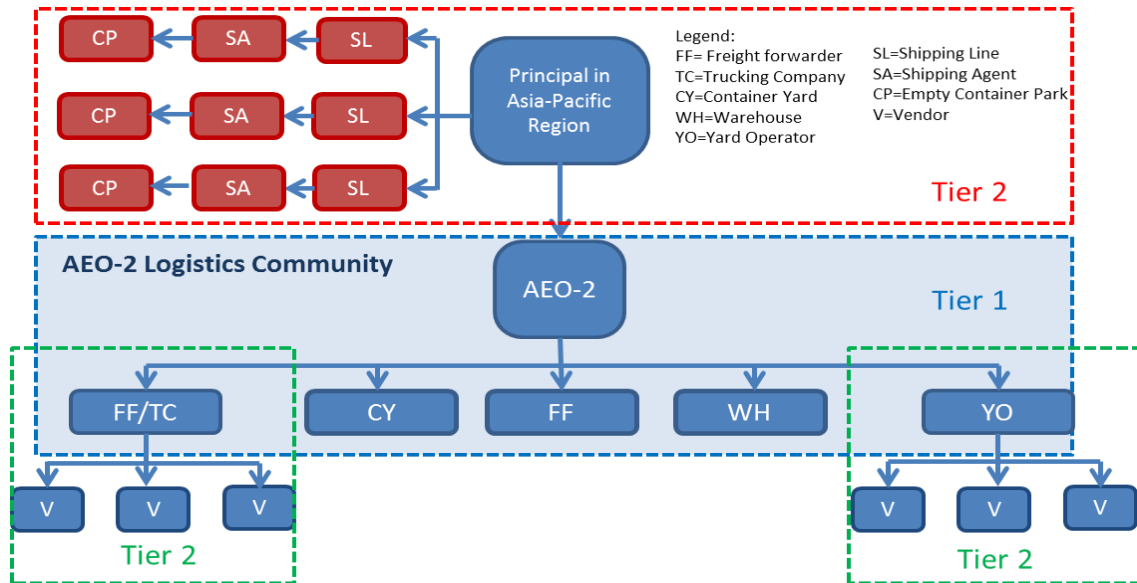


Figure 5.8 Contractual relationships in AEO-2 chains

In tier 1, AEO-2 has developed a careful and structured system to recruit its vendors that represents AEO-2's span of direct control in its chains. The number of vendors and their multifaceted activities has made the chain unique in its operations. The vendors in AEO-2 include FFs, TCs, container yards, shipping agents and yard operators. AEO-2 has multiple firms performing each function, except for the car carrier operator and the yard operator, with a single firm carrying out each of the tasks. However, even though the car carrier operator is responsible for the operation and management of the car carriers, the trucks belong to a number of sub-vendors. Given the high investment needed to own a car carrier, this arrangement is more beneficial. The function of the FF is also very different in the two AEO chains. While in AEO-1, the FF is an individual firm with broad responsibilities, in AEO-2 the FF is an embedded function taken on by the TC, whose responsibility is more like that of a courier. For this reason, the FF and TC are presented in the same box in Figure 5.8. The total number of vendors in the AEO-2 export chain is 16, excluding shipping agents. Internal bidding is conducted every two years, with current, previous, and new vendors welcome to apply. Therefore competition is intense. All the above vendors were contracted as a result of tender processes conducted by the export and import division in AEO-2.

Other than the above functions, other firms need to be included in this study since they play critical roles in the security of the chains. These are driver vendors who supply the

drivers to move the cars in the vehicle yards and in the port yard. These are separate firms, included in lower tier 2 (see Figure 5.8), that are recruited by a different process of bidding. The vendors who work in the vehicle yard are determined through a bidding process organized by the general affairs division of AEO-2. The port yard operator separately recruits vendors to work at the ICT. These vendors are chain actors over whom AEO-2 has no direct control.

5.4.4 Security measures and extension to chain partners

5.4.4.1 Cargo security

While security measures for containerized cargo are typical, CBU cars undergo extra security measures involving multiple inspections by almost all actors in the chain. Unlike containerized cargo, where authorized access to the goods ceases once the container is sealed, CBU cars are openly accessible during the whole process and in transport. Obviously, this presents higher security risks.

In the CBU export chain, cargo security commences from the PDI in the vehicle yard. The main objective is to ensure the quality of the cars. The objects of inspection include defective finishes in the vehicle interior, exterior, engine, electrics, and mechanisms. At the same time, this process addresses security risks by identifying the possible presence of foreign objects. Other cargo security measures conducted by each actor are outlined in the table and discussion below.

Table 5.9 Cargo security measures in AEO-2 chains

Chain Actors	Cargo Security
AEO-2	Global procedures for locking cars on car carriers Multiple checks from truck arrival, loading and leaving premises
FF	Not relevant
WH/CY	Pre-delivery inspection (PDI) for all cars CCTV at PDI points Secure warehouse with limited access Drivers and co-drivers are not allowed to access warehouse Compare cargo and documents before loading Control on cargo storage and inventory
SA	Not relevant
CP	Providing quality container as requested Record and distribute seals to TCs
TC	Select and collect quality container Ensure quality container free of rubbish, odour, dents, rust, holes, leaks
Port	Compare truck and container identity with document

5.4.4.2 Cargo conveyance security

AEO-2 conveys requirements and guidance for TCs during the tender process. Current vendors have the benefit of knowledge and experience in following them, while new applicants have the opportunity to assess their capabilities in adhering to the set guidelines and standards. These requirements relate to security, including quality certification, container standards, tracking systems such as GPS, and locking procedures for CBU cars.

A TC manager said that using tracking systems such as GPS technology is not new, and many TCs already apply this technology for their own purposes to monitor their trucks. However, only a few of the TCs' clients ask for GPS tracking, as it is considered too expensive and they prefer manual tracking at specific checking points. AEO-2 prefers to use GPS tracking to enhance the visibility of their cargo conveyance, particularly given the value of their cargo. The TCs share their GPS monitoring system with AEO-2, which can be accessed over the internet. Internally, AEO-2 also uses other mechanisms to impose control over cargo conveyance through an IT system shared between the nodes in the chain. Each node inputs confirmation of cargo arrival and departure into the system, notifying the connecting internal nodes such as factory,

PDI and vehicle yard. The IT system is discussed further in Section 5.4.5, relating to integration mechanisms.

Other measures that distinguish AEO-2 from other AEOs are truck certifications and locking procedures for car carriers. Trucks and car carriers must be no older than ten years and must undergo AEO-2 certification every six months. Being an automotive manufacturer, AEO-2 provides this certification to examine truck performance, security and safety. Inspection includes the quality of the engine and tyres, and the level of emissions. After passing this examination, a sticker is attached to the windshield. Without this sticker, trucks will be denied entry by security guards at the gates of AEO-2 premises, including warehouses and vehicle yards.

CBU cars demand special handling in their conveyance, using locking procedures to secure the cars to the top of carriers. Procedures also differ between types of cars, with lashing and locking points related to their size and weight. AEO-2 issues a locking procedure every time a new car model is introduced. AEO-2's principal develops all these standards in uniformity with all of its subsidiaries. One shipment may contain hundreds of cars with a limited timeframe between port and vessel berthing time. A short time gap between production and shipment requires accurate scheduling. Table 5.10 highlights the measures discussed above.

Table 5.10 Conveyance security measures in AEO-2 chains

Chain actors	Conveyance security
AEO-2	Limit 10 years of age for trucks Truck inspection and certification
FF	Control delivery time Reporting system
WH	IT system monitoring progress and movement
SA	Not relevant
CP	Not relevant
TC	GPS to control route and transport time Accident reporting system Driving school for new drivers
Port	Real-time information on arrival and progress

5.4.4.3 Premises security

Security measures in AEO-2 premises include identification tags, luggage inspection, safety wear, high fences, and CCTV. Photography and video-recording are strictly prohibited, especially in the warehouse and assembly lines. Stickers must be attached to cover lenses of mobile phones or other electronic devices. AEO-2 has developed specific pathways earmarked for pedestrians, machinery, and vehicles, which must be carefully observed by employees and guests.

In CBU chains, the flow of goods involves fewer nodes: the vehicle yard and the ICT. The vehicle yard belongs to AEO-2 and is located in the same premises as their factory at Karawang. Security measures at vehicle yard are implemented to the same standard as AEO-2's other premises. A single gate is used for entry and exit adjacent to a security office. Visible identification must be worn at all times by employees, guests or vendors. Clearly identified pathways are also evident in the vehicle yard. Bays, where cars are parked waiting for transport, are noticeably marked with different colours. Employees working in different divisions can be identified by their different uniforms. Drivers responsible for the movement of cars from pre-delivery points to the vehicle yard wear all white with hats and face protectors. Car carrier drivers wear khaki

uniforms and white plastic helmets. Others must wear illuminated safety vests. Security cameras are also found throughout the premises.

The ICT is located in the port area and owned by a government company that also owns and manages the port. Therefore, port security measures are also implemented in the ICT. High fences, limited access, routine patrols, and CCTV characterize the existence of security measures at ICT premises. The yard operator's office is located in a building inside the ICT. The building is a four-storey parking building for cars waiting for shipment. Security in the yard operator premises is the responsibility of the ICT.

The flow of component cargo involves more premises than CBU cargo, consisting of empty container parks, temporary container yards, and ports. Empty container parks have different security standards. For example, one empty container park might have strict access control while others are more lenient. Identification is not uniformly implemented and CCTV cameras are not always present. On the other hand, security in container yards is more evident. Observation in one container yard indicated a single gate for entry and exit so that people and vehicles entering and leaving the premises are under the scrutiny of security guards. CCTV cameras are located at four points covering the entry and exit gate and container stacking areas. Fences are two meters high, surrounding the premises. Security guards actively respond to vehicles entering and exiting the premises. Documents are also used to approve the movement of vehicles and containers inside the premises. For example, a truck driver who needs to unload a container at the container yard must obtain approval from the guards at the entrance gate. This approval allows a stacker on the yard to unload and stack the container to a designated point as shown in the approval. This system also applies to TCs when they collect containers at the container yard to be transported to port. Approval from security is predominantly used to ensure the regimented flow of goods with adequate security. Table 5.11 provides a summary of premises security measures in each node.

Table 5.11 Premises security measures at AEO-2 chains

Chain actors	Premises security measures
AEO-2	Secure premises (fences, gates, access, identity) CCTV Corporate global security and safety values and practices
FF	Secured premises
WH/VY	Same internal AEO-2 measures
CY	Secured premises (fences, gates, access, identity) CCTV
SA	Not relevant
CP	Different CP show different security levels
TC	No tight security measures

5.4.4.4 Personnel security

AEO-2 is committed to well-established global values and a culture developed in its country of origin. Its employees demonstrate aspects of safety and security in their daily work and it is part of their culture to be observant and remain vigilant. A simple example is the use of recognized gestures to ensure that is safe to cross a lane in a warehouse or vehicle yard. The use of fingers to point at objects is also included in guidance from AEO-2's principal. The display of these practices during observations shows the success of AEO-2 in instilling company culture and values into its employees. These values and the safety culture are also disseminated to its chain partners in the form of standards and guidance. For example, drivers at vehicle yards and ports are seen performing similar gestures to those used by AEO-2 employees.

Regarding employee recruitment, AEO-2's chain partners show different processes. TCs and car carrier operators rely on kinship in recruiting drivers and co-drivers, with current drivers recommending new drivers. TCs and car carrier operators also provide training not only on driving knowledge and skills but also related to safety and security aspects. For example, one TC has involved a driving school in screening applicants in the process of recruitment. In a different practice, a yard operator in the ICT outsources its driver recruitment to a local vendor and maintains evaluation and development

programs for them. In general, a security police check for new recruits is a common practice in all nodes in the chain.

5.4.4.5 Trading partner security

The pattern of contractual relationships in AEO-2's export chains reflects a wide span of control in its chains. AEO-2 is in direct communication with almost all functions and evaluates their performance. This approach enables AEO-2 to extend its security standards to all vendors effectively. AEO-2 conveys the security guidelines and requirements from the time of tender, and vendors must perform to meet expectations. Additionally, AEO-2 runs a development program for their vendors and has made this more effective by establishing a logistics community with all vendors as members.

Even though maintaining security standards is a requirement, the disparity of standards between AEO-2 and its partners is noticeable. For example, the vehicle yard that is owned and operated by AEO-2 displays higher security levels than those of the vendor's container yard. A lowering in security standards is more apparent in tier 2 of AEO-2's chain (see Figure 5.8). This pattern is typically found in actors beyond AEO-2's direct contractual relationships. Container parks, for example, do not share the same values or levels of security awareness as AEO-2. It appears that security measures are more apparent at locations where vendors have direct involvement in the flow of cargo.

5.4.5 Integration mechanisms

AEO-2 displays a number of activities that act as integration mechanisms. AEO-2 knows all actors in its chains and the company possesses a good knowledge of their individual chain operations. AEO-2 has common operations, with different vendors sharing the same premises in performing their different functions. AEO-2 has three staff members (including a supervisor) posted in the ICT, working together with yard operators handling car movements at the port. Car carrier operators and trucking companies also have their employees posted at the vehicle yard and container yard respectively. As this is a common practice for transporting companies, drivers and co-drivers (if applicable) concentrate on the movement of their vehicles and cargoes, while their colleagues (usually called as couriers) manage documents and administration.

These couriers are posted at the vehicle yard or container yard when the trucks arrive. They prepare the necessary documents so immediate operations can be carried out without interruption. They are also the immediate contacts for the container yard and vehicle yard in case of delay or deviation.

Having direct control of almost all functions in the chains means that AEO-2 must maintain effective communication with all chain partners. In terms of information sharing, AEO-2 uses email as its primary channel to communicate with its chain partners. AEO-2 has an advanced internal information system but not for external operations. Some functions, such as ports and TCs, offer online information that can be utilized to update the progress of work in the chains. The ports broadcast on their websites containers' time of arrival and their position at ports. The TCs also offer AEO-2 GPS access.

AEO-2 creates long-term and short-term work plans. During the process of a tender, work estimates are provided to participants from a summary of the last two year term and can be used by AEO-2's chain partners as a workload forecast. AEO-2 issues a more detailed work plan every month containing information such as goods descriptions, relevant importing countries, vessel names, and dates of departure. AEO-2 also informs its partners of the names of vendors in charge of every function in the chain so that all actors are informed about their partners' workload. AEO-2 determines the workload distribution according to the vendors' work performance. This way, the vendors can immediately evaluate their performance.

AEO-2 activities reveal elements of culture and value sharing as part of its integration mechanisms. In addition to individual relationships with its vendors, AEO-2 has created the logistics community as an effective way of conveying messages, sharing values, and conducting development programs. All vendors who participated in this research agreed that they benefit from the logistics community and that it has contributed significantly to their logistics skills, as well as provided a better understanding of AEO-2's values and standards.

5.4.6 AEO-2 summary

AEO-2 pays detailed attention to every operation in its chain and maintains direct supervision over all actors. It does not own all the functions, but conducts careful and competitive bidding processes, allowing the company to specify its values and culture within tender requirements. AEO-2 not only directs its partners to meet their security standards, but also actively engages with actors in the chain to encourage improvements in their performance. This is evident in the establishment of the logistics community for all logistics partners operating in AEO-2.

All participants in AEO-2 agree that integration helps support security. Security is stringent in all AEO-2 premises. At different levels, chain partners implement security measures, especially when they handle AEO-2 cargoes. AEO-2's values and culture are effectively conveyed to its partners, including its commitment to security and safety awareness.

5.5 CASE STUDY: AEO-3

5.5.1 Introduction

AEO-3 is a producer of pulp and paper products. It was established in 1976 under a foreign direct investment from Taiwan. Currently, it has 16,500 employees and runs three mills at Perawang, Tangerang, and Serang. The company's products vary from paper pulp, tissues, boxes, industrial paper, and other paper-based products. Each mill has its own specialties based on the type of machines they operate. The three mills have been exporting more than they sell in the domestic market. Exports to Asian countries account for 67% of its exports, and the rest covers the US, Europe, the Middle East, Africa and Australia. AEO-3 produces its own brands and other brands based on customer requests.

Only two of the three mills, Perawang and Serang, are AEO certified. Tangerang mill suffered from a flood and was excluded from the AEO application process, although AEO-3 plans to include it and more of its affiliates in future AEO applications. This case

study focused on Perawang mill and Serang mill. AEO-3's headquarters are located at Tangerang Mill, where the entry interview with management was conducted. A supply chain manager explained general operations across the three mills. More detailed observations and interviews with chain partners were conducted in Serang mill. Information related to Perawang mill was also conveyed, and most of their operations and characteristics are similar to those of the other two mills.

The three mills used to have a separate marketing system, with each mill managing their own products. In early 2016, AEO-3 adopted a business model that centralized the management of marketing and production. Each mill, however, produces and sells its products as per instructions from headquarters. Buyers can be companies with an affiliation to AEO-3 or completely separate entities. This centralization also involved the creation of an internal FF function, responsible for managing export and import operations for all three mills. This FF is a separate company, distinct from the three mills, but founded and owned by AEO-3's parent company.

Two visits were made for interviews and observations at AEO-3's sites. The first was on December 2015 at the Tangerang headquarters for an interview with the AEO coordinator in AEO-3 and his staff. This meeting was an entry meeting to introduce the organization to the research. The process involved in the AEO application and the export procedures in AEO-3 were discussed in-depth during the two-hour meeting. More detailed questions were addressed during the site visit in January 2016 at the Serang mill. The site visit took a full day with observations of their manufacturing, warehouse, and truck yard, all located in the same vicinity. The site visit was led by an export and import manager who was also the main AEO-3 contact for this research. Table 5.12 below presents a summary of the data collection process in AEO-3.

Table 5.12 Data collection in AEO-3

Participating chain functions	Interviewees	Methods of data collection	Place / Date	Duration / recording code
AEO-3 Tangerang	One manager Two staff	Interview	AEO-3 HQ, Serpong, Tangerang / 14/12/2015	Two hours / AEO-3#1
AEO-3 Serang AEO-3 Freight forwarder AEO-3 Trucking company	One manager Three supervisors	Presentation, interview, observation	AEO-3 Serang Mill, West Java / 22/01/2016	Full day / AEO-3#2 AEO-3#3
AEO-3 Warehouse	Two managers	Interview, observation	AEO-3 Serang Mill, West Java / 22/01/2016	One hour / AEO-3#4

5.5.2 AEO experience

AEO-3 was in the same group with the other AEO pioneers in Indonesia when they participated in the pilot project. Even though it was not its first exposure to the AEO initiative, SCS is still a relatively new concept for AEO-3, with only a vague understanding and awareness of its objectives and benefits. After more than a year of certification, their operations remain the same and an evaluation of AEO implementation has never been carried out.

5.5.3 Mapping the supply chain

5.5.3.1 Functional structure

The three mills in AEO-3 have different chain structures relevant to their different geographical environments. AEO-3 prioritizes the use of its own ports in Perawang and Serang. The Tangerang mill utilizes public ports at Tanjung Priok. The Perawang mill is located by the river and directly exports to Asian destinations using its own port, which is located in the same premises, as shown in Figure 5.9.

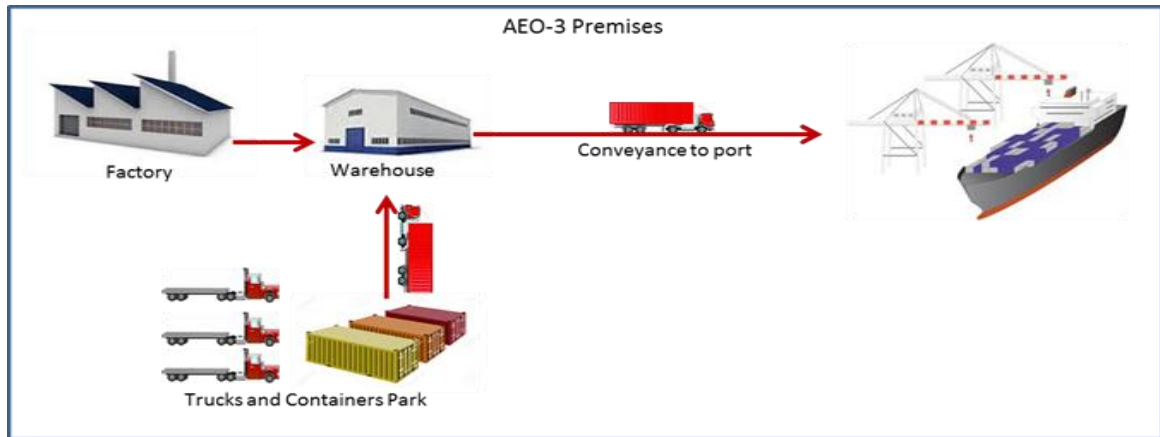


Figure 5.9 AEO-3's export chain in Perawang Mill

The mills in Tangerang and Serang have a choice between the Tanjung Priok port and Merak port. Whenever possible, the Serang mill uses its own port at Merak, located 44 kilometers away, rather than the Tanjung Priok port at a distance of 90 kilometers (see Figure 5.10). However, Tanjung Priok port services more of AEO-3's exports since more vessels operate from there.



Figure 5.10 AEO-3's port locations

While the port in Perawang is only used by AEO-3, the one in Merak is open for public use. A number of big manufacturers around Merak utilize this port for their imports,

exports and domestic freight. However, only two liners make calls to this port, which limits its coverage. The use of their own port reduces the number of actors in AEO-3's export chains. Figure 5.11 illustrates the flow of goods in the Serang mill export chain.

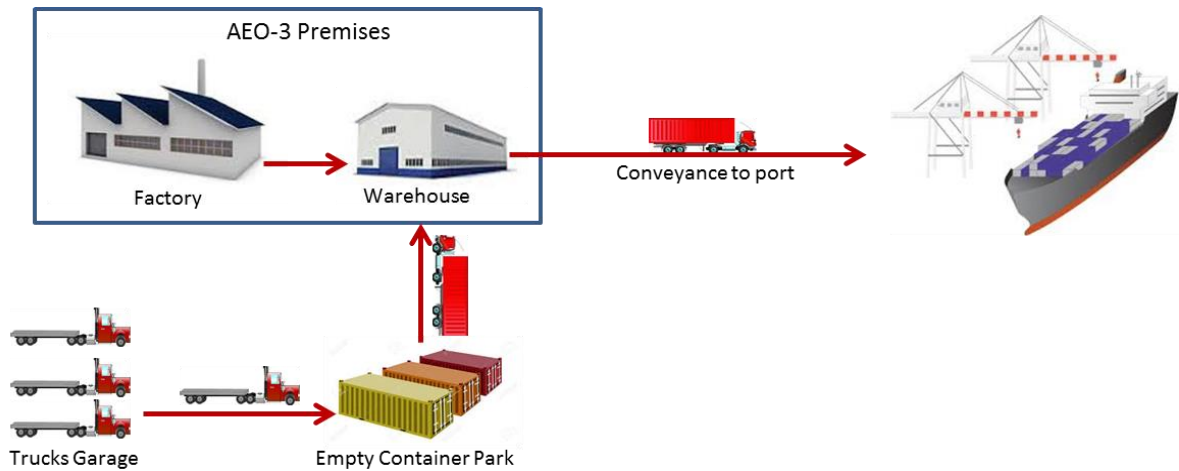


Figure 5.11 AEO-3's export chain in Serang mill

In addition, the three mills enjoy simple structures, partly due to AEO-3's ownership of the FF, which was established due to the size of the organization's exports and imports. This FF has a unique position. It is internal since it sits within the same parent company and works under the hierarchy of the same organization. Similar to multinational AEOs, this FF determines the shipping lines to be used by all mills under AEO-3's parent company. A representative from the FF is posted in every mill and embedded in the structure of the mill's organization. This representative leads a team in charge of export and import, with these team members being employees of the mill. AEO-3 also owns an empty container park near Perawang mill and while this does not directly relate to AEO-3's operations, its existence adds value to the integration of management and control.

In this chain, the warehouse is located on the premises (see Figure 5.11), owned and fully managed by AEO-3. All products are stored in the warehouse before stuffing for shipment. The warehouse has thirteen loading bays, and all are used to store import, export, and domestic products, with clear separation of their location and shipment schedules or production dates. AEO-3 operates a robotic warehouse in addition to its manual ones. In the robotic warehouse, a network of conveyor belts distributes and

stores the goods in their dedicated bays. Even though this is effective in reducing storage errors, it has limitations in terms of non-adjustable speeds, limited weights and dimensions, and higher electricity costs. Therefore, the robotic warehouse is used more frequently for fast moving goods with continuous orders, and traditional warehouses are preferable in day-to-day operations.

AEO-3 owns the majority of functions, namely the FF, ports and warehouse, and only has TCs and shipping lines as its chain partners. This results in a simpler chain structure. Most operations are handled directly by AEO-3. The FF determines the use of shipping lines and TCs. While shipping lines are determined globally by the FF for all AEO-3 subsidiaries, TCs are selected locally

The FF inside AEO-3 has responsibility for management, communication and evaluation of all functions in the chains. It issues customs declarations and produces all supporting documents, such as invoices and packing lists. As every mill has its own distinct FF team, the export operation is separated and individually carried out. A division inside AEO-3 manages the FF function. In Serang mill, the FF team consists of ten AEO-3 employees led by a representative from the FF. This team is in charge of booking space with shipping agents and placing orders with TCs. While the system already locks in the choice of shipping lines, as result of the centralized tender, the FF team must choose a TC for every shipment out of 11 employed TCs. Aiming at a balanced order distribution to all TCs, the FF team considers each TC's performance by quantifying their punctuality, responsiveness, and compliance with AEO-3 requirements. AEO-3 has developed a data system summarizing those values and ranking the TCs to enable the FF team to determine immediately the right TC for every shipment.

5.5.3.2 Corporate ownership

AEO-3 exemplifies the broadest extension in ownership of different functions in its export chains compared to the other AEOs. AEO-3 is the only case study AEO with ownership of trucks and empty container parks, even though it still uses other vendors to service its operational needs, especially when it exports through Tanjung Priok port. AEO-3's mill in Perawang owns all of these on the same premises, while AEO-3 in Serang owns a port in Merak.

Figure 5.12 shows that ownership in AEO-3 is divided into two groups. First, AEO-3 directly owns and manages a warehouse and FF. Second, AEO-3's parent company owns TCs, empty container parks, and a seaport that serve other companies in the group, as well as outside the group. AEO-3's parent company determines the shipping agent. The parent company is a holding company that owns a group of companies, of which AEO-3 is one. These different forms of ownership reflect a pattern of control between AEO-3 and its chain partners. Being under its ownership and management, the warehouse and FF work with the same values and regulations. AEO-3's holding company has a bigger role in controlling the performance of other chain functions under its ownership or contractual arrangements. However, AEO-3 must maintain direct control of external TCs and empty container parks when they are employed.



Figure 5.12 Ownership and span of control in AEO-3 chains

5.5.3.3 Contractual relationships

AEO-3 only has external relationships with shipping lines and TCs, as illustrated in Figure 5.13. Shipping lines are determined by the FF through a global tender. With the movement of 1,200 containers per month, AEO-3 has bargaining power to obtain competitive rates from shipping lines and cost is the main determining factor in their choice. However, speed and quality may be considered in certain situations when required by customers. The contracts with shipping lines can be yearly, quarterly or monthly; the length is determined by volume and price. For example, the yearly contract is based on high volume of use. This term is preferable in order to secure space and price for at least a year. However, prices may fluctuate, such as for fuel, and if the price drops the agreed contract cost, which may be higher than the market price, cannot be adjusted. This also applies, of course, when the fuel price rises. To

overcome inevitable price fluctuations, AEO-3 signs monthly contracts with some shipping lines when forecasts indicate that supply exceeds demand. Nevertheless, shipping lines are determined in advance, generally based on destinations. This system applies to all mills under AEO-3's parent company. Deviation occurs if a customer selects a different shipping line. So while volume has been forecast during a tender process, it is not guaranteed that the volume can be achieved, but this deviation is not considered a breach of the contract. The contract regulates rates and expiry dates.

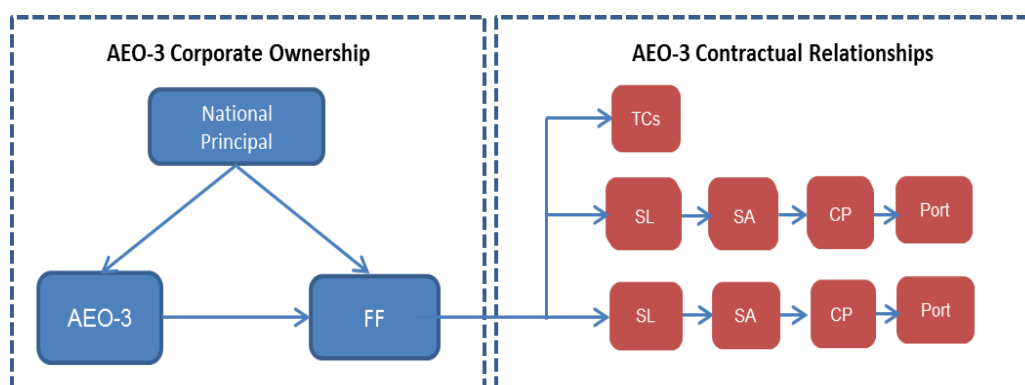


Figure 5.13 Contractual relationships in AEO-3 chains

AEO-3 also has locked-in contracts with TCs regarding price. The tender process is conducted every two years. However the last bidding process did not provide enough competition since the number of TCs was lower than AEO-3's demand. Business with the current TCs began when the need for trucking exceeded availability. When production was high and TCs were scarce, AEO-3 embraced available local TCs to service its transportation demands. Currently, production is decreasing and AEO-3 is planning to call for a new tender and reduce the number of TCs. With a smaller number of TCs and a higher amount of orders for each TC, it is expected that the quality of performance will rise and more efficient rates secured. The AEO-3 group actually owns a TC but the trucks are mostly used for domestic transport. However, the possibility of using its own fleet for export has been discussed, with the potential to expand ownership in the export chain structure.

5.5.4 Security measures and extension to chain partners

5.5.4.1 Cargo security

Table 5.13 lists the cargo security measures implemented by each actor involved in AEO-3's export chains. The characteristics of paper products in its exports influence these security measures along the chains. Paper products are sensitive to water and odor, which makes packaging very important. Water damages the paper products and odor contaminates the scent of, for example, tissue paper. AEO-3 always states their container preferences in their communications with shipping lines and empty container parks. AEO-3 demands grade 'A' containers with similar vague definition found in AEO-1 case. AEO-3 also conducts multiple checks on container security starting from pick-up at the empty container park, followed by entry to the premises and at the time of loading in the warehouse. However, there is a gap between demand and supply for grade 'A' containers and the TCs often fail to provide the required quality containers. For these reasons, AEO-3 plans to get involved directly with empty container parks to have priority for quality containers, especially when exports increase or when dealing with customers with high demand.

Table 5.13 Cargo security measures in AEO-3 chains

Chain actor	Cargo security
AEO-3	Require quality container
FF	Not relevant
WH	Check on loading Drivers and co-drivers are not allowed to access warehouse Compare cargo and documents before loading Control on cargo storage and inventory
SA	Not relevant
CP	Providing quality container as requested Record and distribute seals to TCs
TC	Select and collect quality container Ensure quality container free from rubbish, odor, dents, rust, holes, leaks
Port	Compare truck and container identity with documents

5.5.4.2 Conveyance security

With its current level of ownership in the chain, AEO-3 has a wide span of control in all operations. Table 5.14 provides a summary of conveyance security measures for each actor in the chain. TCs are highly involved in ensuring that trucks, drivers, and cargo comply with required standards. For example, trucks must be less than 15 years old. The container standard is initially inspected at the empty container park, but AEO-3 ensures compliance when containers arrive at the mill. Security inspection includes the trucks and drivers and is conducted at the time of gate entry. The identifications of drivers and trucks are checked and containers are inspected before queuing at the warehouse for loading. Packaging and loading processes are conducted by AEO-3 while drivers are not allowed in the warehouse. The cargo is verified against the export documents before loading. As part of this procedure, photos are taken at several steps during loading (i.e., when the container is empty, half full, loaded and sealed). These photos are kept for three years. Handover between AEO-3 in the warehouse and the TCs is signified by the signing of a release document and transfer of export documents to the TCs for further clearance at the port.

Table 5.14 Conveyance security measures in AEO-3 chains

Chain actors	Conveyance security
AEO-3	Multiple checks from truck arrival, loading and leaving premises Require quality trucks
FF	Not relevant
WH	Seal procedure
SA	Not relevant
CP	Not relevant
TC	Control delivery time
Port	Internet information on arrival and progress

AEO-3 does not require GPS tracking for trucks and it is not involved in controlling the movement from warehouse to port. Considering the value of the cargo is lower than the truck itself, it is believed that TCs will be more concerned about truck security and any route deviations than AEO-3. AEO-3 controls the arrival of cargo at ports through

online systems provided by those ports. To ensure smooth flow in the chains, AEO-3 has formed a team that consists of staff from divisions such as marketing, production, export-import, and warehousing. This team works together and is effective in solving problems that demand consideration from each division involved. There is also a plan to start including GPS tracking in the next bidding requirements, so that members of this team can monitor the movement of cargo more effectively.

5.5.4.3 Premises security

Table 5.15 provides a summary of premises security measures in AEO-3's export chains. In AEO-3, these measures include clear identification for all patrons, a single gate for entry and exit, and perimeter fences. Guests coming to the premises must leave photo identification at security. The same procedure is applied to trucks coming to load at the warehouse. However, security teams are not provided with information on truck loading schedules, as evident in AEO-2, but the warehouse staff maintain a system that informs queuing time for trucks on the premises. This is related to waiting time. TCs can claim for compensation from AEO-3 if the time exceeds the agreed waiting period. The FF ensures that orders to the TCs are transferred when the cargo is ready so penalties for queuing can be avoided. The maximum waiting time is eight hours.

Table 5.15 Premises security measures in AEO-3 chains

Chain actors	Premises security
AEO-3	General measures: fences, gates, access, identity CCTV
FF	Not relevant
WH	Same as AEO-3
SA	Not relevant
CP	No tight security measures
TC	No tight security measures

Since most of the other actors are part of AEO-3 or owned by AEO-3's parent company, their measures are at the same standard and managed with similar systems. However, this only applies to functions located on the same premises, such as FF and

the warehouse. Other functions, like empty container parks and TCs, despite being under the same ownership, show relatively relaxed security measures. Having locations separated from the factory and the exclusion of the empty container parks and TCs from the flow of goods, were said to be the reasons for these more relaxed security measures.

5.5.4.4 Personnel security

In terms of security, a police check is a required part of AEO-3's recruitment process. However, AEO-3 is not involved in, and does not control, employee recruitment processes at its chain partners. AEO-3 is only concerned to ensure that drivers entering its premises come from the correct TCs. Security guards at AEO-3 check the documentation and personal identification of drivers when they arrive. Representatives from the TCs are also posted in AEO-3 premises to support operations, especially in the administration of documents. These representatives ensure that drivers match those identified on the schedules.

As in other AEOs, it is common in TCs to rely on recommendations from current drivers to recruit new drivers. The same system occurs for co-drivers. In these chains, most drivers are also casual workers and they tend not to work for long periods at the same company. This situation requires more security control from AEO-3.

5.5.4.5 Trading partner security

As most of the functions in the chains are under its ownership, AEO-3 only conveys its standards and requirements to TCs and shipping lines. Even though contracts between these actors do not detail security concerns, operational standards with shipping lines are clearly specified and agreed during bidding. AEO-3 also conducts shipping line awards for best performance. These awards are not given to TCs. However, trucks entering AEO-3's premises, including drivers and co-drivers, must follow AEO-3 regulations and values. This includes, for example, abiding by speed limits, not resting in car parks, and ensuring the availability of fire extinguishers in trucks. Even though AEO-3 staff admitted that they had not extended security concerns effectively to chain

partners, they claimed that the above measures have contributed to current security levels. AEO-3 intends to put more emphasis on security with its TCs and shipping lines.

5.5.5 Integration mechanisms

An internal communication system supports integration between functions in AEO-3. The system allows each division to update their work progress and see updates from other divisions. They also have regular weekly meetings to discuss issues, evaluate previous performance and plan future operations. For example, warehouse staff analyze occupancy rates and communicate this information to the marketing division. This process is chaired and supervised by the mill head. Such coordination may lead to a significant price adjustment to lower inventory level in the warehouse.

Moreover, a production plan is issued weekly and disseminated to each division through weekly meetings and a shared information system. However, the system is only shared with related divisions and with restricted access. As an additional security measure, any memory stick used inside the mills must be registered with security guards. There is no shared communication system with external firms since email is still the only means used to convey information.

AEO-3 considers to use a cargo tracking system to increase visibility. However, information from the ports related to container entry and location is currently accessible via the ports' websites and is deemed reliable enough to control cargo movement. The shipping lines provide similar services, showing the movement of cargo from the time of entry to ports, arrival at transit ports, destinations, and demurrage.

The TC's representatives assigned to support trucking operations are posted at AEO-3's premises to ensure operational integration in AEO-3 chains and smooth processes at warehouse entry and exit points.

5.5.6 AEO-3 summary

AEO-3 is an example of almost complete integration in terms of ownership, owning virtually all the functions in its chains. Being under one ownership, all actors in the chains share the same values and quality standards. However, internal integration has its own challenges. Also, AEO-3 still needs to resource its logistic functions from

vendors because the capacity of its trucks and empty container parks is not sufficient. Therefore, AEO-3 still has to cooperate with vendors and to extend its security standards.

AEO-3 supports the assumption that the more integrated the chain, the more security it will offer. From their experience, it is important to share their values with chain partners, so they abide by requirements when in charge of AEO-3's cargo. For example, the TCs respect AEO-3's safety and security standards in terms of cargo conveyance, even though security treatment in their own premises may not be in line with AEO standards.

5.6 CASE STUDY: AEO-4

5.6.1 Introduction

AEO-4 is a multinational company established in 1933. Historically, the Dutch who governed the country during that period made the investment. Currently, it has global production bases to supply a wide international market. More than 6,000 employees work in eight factories located around Jakarta and Surabaya. AEO-4 has a wide range of products, from home and personal care to food and ice cream. Many of its brands are very popular, both in Indonesia and worldwide. Even though most of its products are for the domestic market, AEO-4 exports to countries as determined by the principal. Japan, Korea and Pakistan are some of the countries that import from AEO-4.³

AEO-4's participation in the research was limited, as seen in Table 5.16. Two interviews were conducted with two AEO-4 managers. The first was an export and import manager from the Jakarta headquarters, who was also the AEO national coordinator in AEO-4. The second interview was with a regional security manager who was in charge of security for all AEO-4 premises and operations in the eastern part of

³ This information is taken from AEO-4's national and international websites, accessed in April 2016. As part of the ethics agreement and for reasons of confidentiality, the names of these websites are not revealed.

Indonesia. He reported to a national security officer who supervised two local officers for eastern and western Indonesia. The security manager provided new and in-depth information on security practices. From these interviews, actors in AEO-4's export chains were identified.

Table 5.16 Data collection in AEO-4

Participating chain functions	Interviewees	Methods of data collection	Place / Date	Duration / recording code
AEO-4 HQ	One manager	Interview	Jakarta / 26/11/2015	One hour / AEO-4#1
Freight forwarder	2 customer coordinators	Interview	Surabaya / 10/12/2015	One hour AEO-4#2
Trucking company (TC)	1 marketing manager	Interview, observation	Cakung, Jakarta / 17/12/2015	One hour / AEO-4#2_2
AEO-4 Surabaya Factory	1 security manager	Interview, observation	Rungkut Factory, Surabaya / 24/12/2015	Two hours / AEO-4#3
Freight forwarder (FF) and trucking company (TC)	1 manager 1 export Staff 1 document supervisor	Interview, observation	Tanjung Perak, Surabaya / 31/12/2015	Two hours / AEO-4#4

The researcher also visited and interviewed AEO-4's chain partners: an FF and a TC. The FF regularly handles AEO-4 waste exports from Surabaya to Osaka, Japan. The TC was involved in AEO-4 food exports. The research focused on the available information, with triangulation of data performed to assure the validity of the information from AEO-4.

5.6.2 AEO experience

Recognizing its size and reputation, it was not difficult for AEO-4 to gain security certification from customs. Similar to other AEO pioneers, AEO-4 was invited to participate in the piloting project when Indonesian customs initially developed the program. AEO-4's principal was familiar with the AEO initiative long before the introduction of the scheme in Indonesia. Moreover, AEO-4's international headquarters

are located in the Netherlands, a country that has been very active in promoting the AEO program worldwide. This background has made AEO-4 a very active participant in AEO program development in Indonesia.

AEO-4's principal has developed a security evaluation system for each of its subsidiaries and created a ranking of security risks. Recently, the principal reduced the security risk level in AEO-4. While this may not be relevant to AEO certification, this ranking improvement relates to the fact that the number of security incidents has decreased profoundly in AEO-4. AEO-4 has also experienced some changes in its approach to security. With a higher level of security awareness, AEO-4 management has developed security education for all employees in every division. Each division was asked to discuss security risks that are unique to their line of work. Then, with guidance from security officers, they developed a risk management system to mitigate and address these risks. This initiative provided staff with an understanding that security is not only about such issues as theft, but covers risks such as data loss or breaches in IT, the leaking of marketing information, or failures in production. More importantly, this has prompted an understanding that security is not merely the responsibility of the security division, but of all employees regardless of their level and divisions.

AEO-4 interviewees were knowledgeable about security measures and had been actively participating in customs forums related to AEO and other compliance events. They believed that AEO-4 already had the necessary security measures in place before AEO implementation. Even though terrorism was not included among the identified risks, the security measures were sufficient to deter risks related to terrorism. However, AEO certification has improved security awareness within the organization's high-level management and positively influenced security improvement programs in the company. The greater challenge has been extending security awareness to AEO-4's partners, whose security concerns, capacity and preparedness vary widely.

As indicated above, even before its involvement in the AEO program, AEO-4 had already implemented a robust security system. AEO-4's security management system follows guidance developed by the police and addresses the security of people and premises. This includes access control, employee background checks and other aspects that are discussed in the sections below.

5.6.3 Mapping the supply chain

AEO-4 has different 3PL employment strategies in its import, export and domestic chains. Each chain has a unique structure, and some may employ multiple structures related to the number of partners operating in the chains. This research only focuses on export chain operations at the AEO-4 factory in Surabaya, where AEO certification has been awarded.

5.6.3.1 Functional structure

This chain involves the general export functions of warehouse, FF, shipping agent, TCs, empty container parks, and ports. The FF plays a central role in managing and controlling all chain operations, both in terms of documents and goods. Figure 5.14 and Figure 5.15 show the flow of goods in two of AEO-4's export chains. At the Surabaya factory, AEO-4 has three warehouses for export purposes. One is located inside the factory premises, the other two are outside the premises and also function as distribution centres.

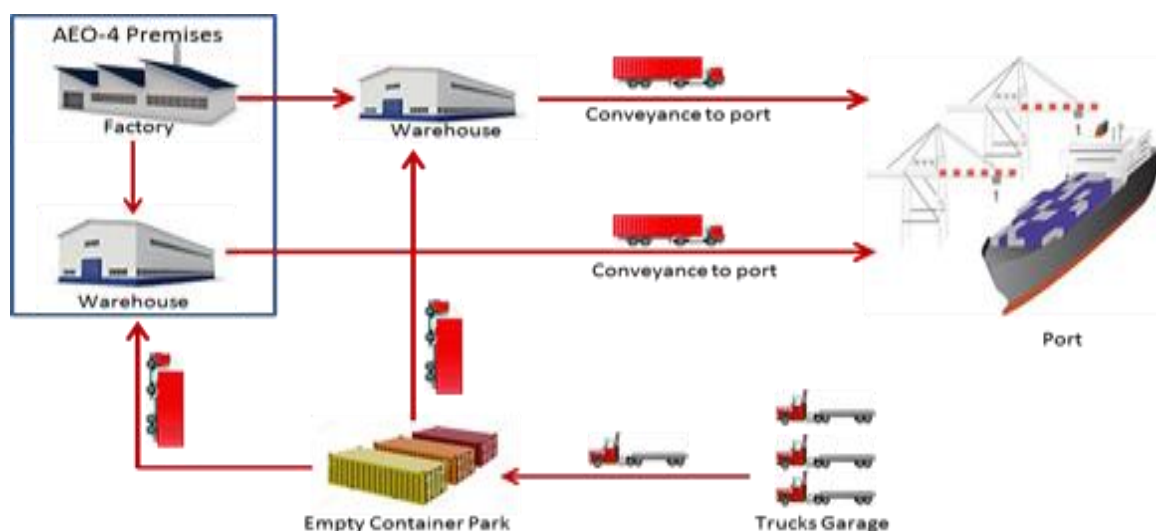


Figure 5.14 AEO-4's consumer goods export chain

The functional structure illustrated in Figure 5.15 is an export chain of chemical waste from Surabaya to Osaka, Japan. The waste is a by-product of a chemical manufacturer supplying chemical material to AEO-4. Product ownership and chain management belongs to AEO-4, which then exports the waste to a company in Osaka, Japan. This chain indicates AEO-4's strong preference to have 3PLs that offer total supply chain solutions.

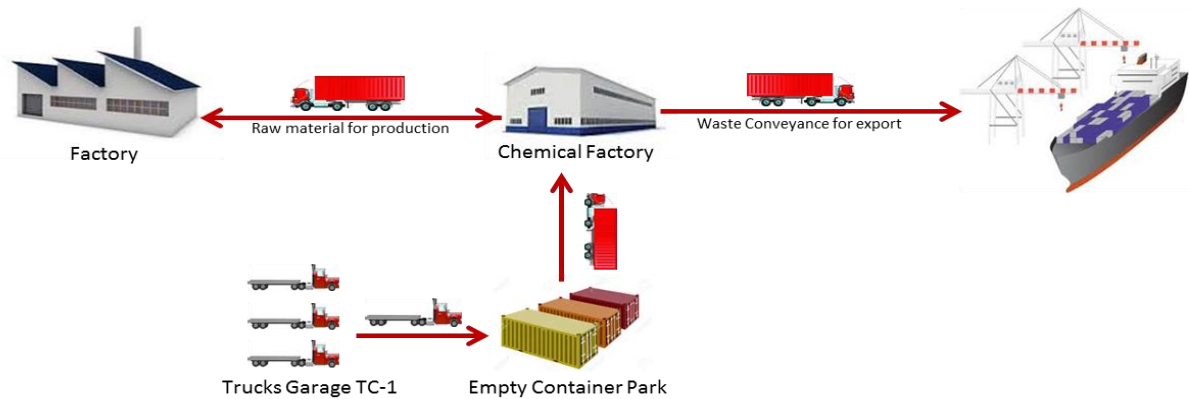


Figure 5.15 AEO-4's chemical waste export chain

AEO-4 ceases its direct involvement in the chains after sending export plans to the FF. These generally contain shipping instructions together with mandatory documents such as invoices, packing lists, and customs export declarations. AEO-4 determines the shipping lines and the FF follows up with collection of the D/O from a shipping agent. A TC then collects an empty container. For the waste export, the truck loads the material at the chemical manufacturer and finally transports it to the designated port. It should be noted that in this particular product, AEO-4 is not involved in the physical movement of goods. The product is loaded from AEO-suppliers and transported directly to the port without any activities involved in AEO-4's premises. This chain structure is unique in this research and also depicts common behaviour in chain operations where an exporter may not have direct physical involvement in chain operations.

5.6.3.2 Corporate ownership

AEO-4 does not own all functions in its chains, only the warehouse. It also rents other warehouses to serve its inventories with numerous product varieties. AEO-4's ownership and span of control are represented in Figure 5.16 below. It should be noted that AEO-4 employs multiple vendors for the same functions.



Figure 5.16 Ownership and span of control in AEO-4 chains

5.6.3.3 Contractual relationships

AEO-4 conveyed a strong preference to outsource its non-core businesses. Therefore, 3PLs with a capacity to cover various logistics functions are selected. The 3PLs operating in AEO-4 chains are varied, from those with international backgrounds to local firms, many of which have had long relationships with AEO-4. The FF participating in this research had been working for AEO-4 since 1968. Even though there is no ownership, the long relationship of the two companies may have influenced their interactions. In contrast with the other FFs, AEO-4 does not conduct a tender bidding process with this particular FF function in its waste export chain. However a contract that regulates their business exists and is evaluated periodically. The FFs have subsequent contractual relationships with their own vendors, such as TCs. The highlight in this chain is the use of the FF as a total logistics solution for most of AEO-4's chains.

5.6.4 Security measures and extension to chain partners

5.6.4.1 Cargo security

As highlighted in Table 5.17 below, AEO-4 requires the use of quality containers and ensures their FFs comply by conducting multiple checks. Other than the empty container park and FF who are responsible for providing grade 'A' containers, AEO-4 inspects containers and trucks at entry, during loading and at the time of exit from its premises. All vehicles are subject to inspection during entry and exit. As part of this process, security guards conduct preliminary and cursory inspections during the entry and exit of vehicles to identify any non-compliance in terms of container quality requirements. Security guards follow specific procedures aimed at identifying potential security risks associated with containers and trucks, including checking walls, doors, floors, and seals. Following AEO implementation, inspections now include ensuring that no unauthorized elements are found inside containers before loading.

Table 5.17 Cargo security measures at AEO-4 chains

Chain actors	Cargo security
AEO-4	Multiple checks on cargo and seals during entrance, loading, and exit from premises Control procedures on truck and driver identity when entering premises
FF	Not relevant
WH	Packaging standards CCTV at loading docks Secure warehouse with limited access Drivers and co-drivers are not allowed to access warehouse Compare cargo and documents before loading Control on cargo storage and inventory Photos during loading
SA	Not relevant
CP	Providing quality container as requested Record and distribute seals to TCs
TC	Select and collect quality container
Port	Compare truck and container identity with document

AEO-4 maintains a seal security system, with staff recording container seal numbers into the system during security and warehouse checks. The seal number provides an operational reference for multiple checks by security guards, and staff at warehouses, empty container parks, TCs and ports. This is one of the reasons why security officers at AEO-4 are required to have basic computer literacy.

When trucks load or unload cargo at the warehouse, their drivers and co-drivers undergo inspection checks. Security guards check their identity against documents and make sure that the same drivers or co-drivers drive the vehicles in and out of the premises. For this purpose, AEO-4 maintains a system that records all drivers' data from their TCs. This file also contains data on blacklisted drivers from TCs to ensure against unlawful access and maintain conveyance and cargo security.

5.6.4.2 Conveyance security

As a consequence of having three warehouses in different locations, AEO-4 established three routes for cargo transportation from warehouses to ports of export at Tanjung Perak, Surabaya. TCs plan the routes, which are approved by AEO-4. Contingency routes are prepared in times of emergency. These routes are evaluated regularly during a monthly meeting to assess current situations and whether new routes are necessary. This may be related to road conditions, traffic management or anything else that may affect the smooth flow of cargo, such as demonstrations and strikes. AEO-4 cooperates with police to gain information on any potential risk escalation. To monitor cargo movement, TCs employ time control systems to ensure that conveyance is completed within allocated timeframes and to detect potential route diversions. There is no age limitation for trucks, but the quality of vehicles is periodically evaluated. Table 5.18 below highlights the role of each actor in conveyance security measures.

Table 5.18 Conveyance security measures in AEO-4 chains

Chain actors	Conveyance security
AEO-4	Quality standards for trucks Approve routes and lead time for delivery from warehouse to port
FF	None
WH	Packaging in container
SA	None
CP	None
TC	Control on route and transport time
Port	Provide online container arrival information

5.6.4.3 Premises security

Security procedures at AEO-4 are clear and stringent, as shown in Table 5.19. The presence of guards is prominent, and security instructions are displayed in several places. Patrons entering the premises have to go through a single gate where identity verification takes place. Guests and employees must wear identity cards at all times inside the premises. AEO-4 provides identity cards for 3PL employees working inside AEO-4 premises, most of whom are casual workers employed by the FF at the warehouse. Their security cards are equipped with an information system that shows their work schedule so security officers can identify whether a worker is entering the premises at the time rostered for them. Security guards deny admission to anyone without an identity card and a procedure has been established to manage people with false identity cards.

Table 5.19 Premises security measures in AEO-4 chains

Chain actors	Premises security
AEO-4	Secure premises (fences, gates, access, identity) Procedures for access approved by police 64 cameras for CCTV Employee and crime database shared with other AEO-4 factories
FF	No observation
WH	Limited access CCTVs
SA	Not relevant
CP	No observation
TC	No observation

AEO-4 has installed 64 CCTV cameras to cover its premises. These monitor gates, warehouses, loading docks, and parking areas. Monitors are located in a security office in front of the building adjacent to the entrance gate. These cameras are reliable tools to improve security in combination with scheduled physical patrols around the premises. The use of CCTV is a standard measure implemented by the principal at all its subsidiaries.

However, this level of security is not found at the premises of AEO-4's chain partners. In the chain of chemical waste export to Japan, the FF's office has a low level of security. Gates are not guarded, no fence surrounds the premises, access is not restricted, and identity clearance is not required. Security guards only respond to patrons when they are approached.

5.6.4.4 Personnel security

*“Basically, security is the responsibility of all staff, not only security division.
This is the basic rules/values in the company” (AEO-4#3).*

The quote above underlines the approach towards security in AEO-4. As summarized in Table 5.20, AEO-4 provides security training to all employees, including the vendors' employees. This training relates not only to security in the traditional sense (i.e., theft or

trespassing), but all potential risks at every division. The training includes material related to security for non-security employees and is conducted twice a year to identify new risks and ways to manage and mitigate them. These activities are instigated by direction from the principal.

Table 5.20 Personnel security at AEO-4 chains

Chain actors	Personnel security
AEO-4	Recruitment involves security consideration Security training for all employees and 3PLs
FF	Security checks for new employees
WH	Identification at work
SA	No information
CP	No information
TC	Security checks for new employees

The training is extended to 3PL employees who work at AEO-4 premises, especially in the warehouses. These employees are mostly casual, helping load and unload cargo, but they must participate in training and follow the applied standards. Moreover, AEO-4 is involved in their recruitment. For security, AEO-4 reviews their background before an FF who operates the warehouse can employ them. Similar mechanisms have been implemented for drivers who work at TCs. AEO-4's security division actively updates their own information from police lists of wanted persons. This measure is additional to regular police check requirements during the recruitment process. After passing a security check with police, drivers must be checked against AEO-4's blacklist. This blacklist system was developed in 2012 and contains information about employees who have been dismissed because of misconduct. This system is connected across AEO-4 factories to avoid the same person working in a different factory after their dismissal from another. This is part of a global security system that records security incidents in AEO-4 worldwide. Only the security manager can access this system, distributing updates to security branches at every factory, as well as to the main 3PLs and TCs. Thus there are three layers of security to screen driver applications: AEO-4, police and TCs. The police also train and certify security managers (Garda Utama) and

provide information related to security updates. AEO-4 is also expected to report any security matters to police.

5.6.4.5 Trading partner security

The security manager in AEO-4 argued that security risks are more effectively addressed by people than equipment. While appreciating the importance of more CCTV cameras or x-ray machines at entry, he stated that employee education at all levels, especially those of the 3PLs, would ensure enhanced security. This also involves tighter security checks of partner employees, such as drivers, co-drivers, and casual workers at the warehouses. These improved measures are the result of AEO implementation.

AEO-4's involvement in the recruitment processes of 3PLs is an example of efforts to extend security. Induction of external employees emphasizes that security is not only the responsibility of AEO-4 but also its partners. General security aspects are also included in contracts and conveyed during bidding processes. AEO-4 believes that the current 3PLs maintain an adequate standard of security.

5.6.5 Integration mechanisms

In the export chain of chemical waste to Japan, AEO-4 demonstrates their preference to use a single 3PL to manage the whole export process. The FF is a common dyadic partner with an exporter who handles documents, shipping and trucking. AEO-4 only recognizes the FF as its partner, acting as a 3PL in the export process. Prominent integrating mechanisms in this chain include the sharing of facilities, long relationships, and involvement in 3PL recruitment processes. AEO-4 believes that the current practices are sufficient to extend security to the whole chain. AEO-4 takes the initiative to expand security measures with its partners. Its involvement in the recruitment processes of its chain partners (warehousing and trucking), as well as participation in security induction, reflect AEO-4's integrative efforts to enhance security in its chains.

5.6.6 AEO-4 summary

AEO-4 is a full logistics service user with a strong preference to focus on its core business. The size of the business, its extensive market, variety of products, and complex network of supply chains, influence its preference for employing multiple 3PLs for different products. The number of actors in its chains challenges the efforts of integrating operations and maintaining security. However, AEO-4 pays careful attention to security in its export chains and internal security awareness is prominent in AEO-4.

5.7 Chapter summary

This chapter has addressed the first case study purposes: to explore and describe the current state of integration and security in AEOs. Export chain structures have been mapped to depict the actors, their functions, and interdependence. The maps also show ownership of the functions in the chains and the contractual relationships between the AEOs and their chain partners. These aspects are important elements of integration, which serve as critical determinants on the state of integration in the whole export chains. Security measures were identified, not only in each AEO but also in the nodes and links of the chains.

The data collection has provided rich data, with similarities and differences found in the case studies. Each AEO displays a unique structure with different chain members and different patterns of ownership or contracts. Common practices in export chains and typical actors in international trade and cargo movement are found in all AEOs. The fact that all of these AEOs are large companies and three of them are part of multinational companies may contribute to the typical security standards and common practices. The findings that each AEO has a unique character in terms of integration and security approaches have made this research more interesting. In the next chapter, the findings are further analysed using thematic analysis and cross-case analysis methods.

CHAPTER 6

THEMATIC AND CROSS-CASE ANALYSIS

6.1 Introduction

Chapter 5 analyzed the individual cases. The chain structure of each AEO was mapped with their integration mechanisms and security measures. This chapter presents a comparative analysis between and among the cases (Yin, 2014). Following Braun and Clarke (2006) approach to thematic analysis, the findings in each AEO were categorized and clustered into three groups of discussion from the theoretical framework: chain structures (discussed in Section 6.2); integration mechanisms (discussed in Section 6.3); and security measures (discussed in Section 6.4). The thematic analysis is done by aligning the data with the theoretical framework. Findings related to integration mechanisms are grouped into themes as outlined in the framework. This grouping technique was adopted to develop topography of the chains in relation to their integration and security. Following the grouping, a cross-case analysis was conducted to compare integration mechanisms and their effect on security extension. This cross-case analysis compared findings by identifying symmetries and discrepancies (Yin, 2014).

Following a discussion on the comparative evaluation, Section 6.5 presents an analysis of multiple tier relationship and gaps of security awareness in each AEO chain (Section 6.5.1) and the agency costs of extending security (Section 6.5.2). Section 6.6 concludes the chapter by presenting key findings in relation to the propositions.

6.2 Export supply chain structure

6.2.1 Variety of chain structures

The case study AEOs were found to be engaged with more than one supply chain when exporting their products to various countries. This research focused on the export supply chains representing their major exports. Variables that affect the AEOs' export chain structures include products, manufacturer's location, and operational strategies.

The CBU cars in AEO-2, the mill and two port locations in AEO-3, and the temporary container yard in AEO-2, are examples of how products, locations and operational strategies contribute to the variation of chain structures in AEOs' export chains.

AEO-1 manages two separate export chain structures operating for two different products (i.e., finished products and component parts). However, the structures of the two chains are identical and the actors perform similar roles. Each chain has a set of actors mostly under the responsibility of freight forwarders who act centrally on behalf of AEO-1. These 'one-stop-service' freight forwarders (Hertz and Alfredsson, 2003) are authorized to choose the trucking companies as their direct dyads in the chains.

AEO-2 operates with two export supply chains for two different products (i.e., CBU and component parts). As a finished product, the characteristics of CBU, such as size and shape, influence the unique chain structure. The existence of CBU vehicle yards and car carriers (special trucks used to carry cars) signifies the difference in the structure. On the other hand, the component chain shows a more complex operation with more actors involved in logistics activities. The existence of temporary container yards as additional nodes to adjust with operational requirement prolongs the process and enlarges the number of parties. This is because of the limited time between production and shipment, as well as rigid requirements to submit the correct export documents. The temporary container yard allows post-production confirmation of cargo data that leads to the accurate creation of export documents. AEO-2, then, is able to ensure on-time delivery by avoiding lengthy delays due to late shipment or incorrect documents. Therefore, AEO-2 sets an example, with product characteristics and regulations influencing the chain structures.

AEO-2 export chains show both similarities and differences with AEO-1 in regard to ownership and control. Neither AEO-1 nor AEO-2 own most of the functions in their chains. However, AEO-2 maintains direct control of all functions and operations, while AEO-1 transfers this control to its freight forwarders.

AEO-3 employs simpler chain structures for its two different factories. The ownership of most chain functions and their site locations make them distinct from other export chains. For example, the extent of ownership in the chains, together with the location of factories, warehouses, and ports in the same premises for its Perawang Mill (refer to

Figure 5.10 in Chapter 5), reduces the number of chain partners and simplifies the chain structures. AEO-4s' export chain structures vary to reflect the variety of their products and export destinations. Chemical waste export involves a simple chain structure with very few actors, while consumer goods export is more complex with different warehouses locations and multiple 3PLs that handle different products based on their brands and importers.

In terms of security extension to the whole chain, the chain structures composing actors, functions, and contextual existence, affect the security approach taken by the AEOs. For example, AEO-1 only conveys security standards to its freight forwarders for their functions as 3PLs and their contextual existence that bridges AEO-1's interests to extend the security standards to the subsequent actors. Another example is AEO-2, which has additional nodes in its component chain that enlarge its chain structure. It is evident that chain structures with more actors require greater effort from focal firms to extend security to the whole chain. The more complex the chain structure, the greater the challenge to maintain security. The following sub-section discusses this in more detail.

6.2.2 Actors, functions, and contextual existence

While the flow of logistics activities is generally similar in the four AEOs, variations are evident in the type of actors and their individual activities. AEO-1 and AEO-3 display equally simple structures, owing to their limited product variety and the warehouses being located in the same premises as the factories. On the other hand, AEO-2 and AEO-4 have more complex structures that involve more actors and activities within the chains. AEO-2 (especially for CBU) and AEO-4 have adapted their chain structures as the products have very different characteristics. CBU cars in AEO-2 and chemical waste in AEO-4 require special treatments in a port yard or warehouse located outside the factories. Therefore, special transportation from factories to the warehouse is needed pending their transportation to ports. In case of the component parts in the AEO-2 chain, the existence of a temporary container yard is a compromise between document accuracy and the limited time available between cargo readiness from the warehouse and vessel loading time at the port. The export documents can only be completed accurately after the container is ready for shipment and it is impossible to

park all containers within their premises. Therefore, a temporary container yard warehouse is needed to park ready-to-ship containers pending document creation and vessel scheduling.

The variation of chain structures demands the variation of actors to be engaged along the chain. However, the typical actors in port-oriented containerized export chains are commonly found in these AEOs' chains. They are manufacturer (i.e., the AEOs), warehouse operator, trucking companies, empty container park operator, warehouse operator, container yard operator, freight forwarder, shipping agent, shipping line and port operator. However, their ownership and inter-relationships vary significantly. Shipping lines, shipping agents and empty container park operators are connected in their operations, and often involve the same ownership.

Generally, the AEOs choose the shipping lines represented by shipping agents. The container parks are appointed by the shipping agents. The shipping agent and container park used in an export automatically follow the choice of the shipping lines made by the AEOs. The shipping lines conclude contracts with the shipping agents and empty container park operators. In many cases, shipping lines own these two functions. This practice is found in all AEO chains and will be discussed further from the perspective of agency theory in Section 6.5.

The use of multiple sources of service providers is also commonly found across the AEOs. All chain structures show that multiple sources are employed for the same logistics functions. AEO-1 employs two freight forwarders for different types of exports. Each forwarder hires multiple trucking companies that represent the second-tier service providers. In AEO-2, the number of vendors working in particular functions is more than three. AEO-3 contracts eleven trucking companies. AEO-4 is more complex. Whether these chain partners play the same roles or whether their responsibilities are divided into different products or destinations, multiple sources are often preferable to mitigate risks (Marasco, 2008).

It is common to see the use of multiple trucking companies in one chain. All AEOs have more than one trucking vendor to provide the trucks. Some vendors source the trucks from sub-vendors. The difference is the approach used by each AEO in distributing their orders to each vendor. This approach obviously mitigates the risk of dependency

on a single vendor (Zsidisin and Ellram, 2003). However, involvement of multiple vendors or service providers attracts security threats at different parts of the supply chain operations.

Furthermore, the location of each function may also affect a chain structure. Some AEOs have their warehouses located inside their factory premises, such as AEO-1, AEO-2, and AEO-3. These in-house warehouses require minimal transport to store final products. The proximity of these warehouses offers easy movement with minimal risk. AEO-2 and AEO-3 own and manage their warehouses. AEO-1 chooses to subcontract the management of its two export warehouses to 3PLs. These 3PLs separately handle the export of spare parts and finished products.

AEO-4 in Surabaya has two types of warehouses. It owns warehouses inside the factory premises, but outsources their management to various third parties. Different 3PLs are assigned to manage the warehouses separately, depending on the product groups. For the warehouses outside the factory premises, AEO-4 outsources the ownership and management to third parties.

The four AEOs are situated in different locations in Indonesia, as illustrated in Figure 6.1. Three AEOs use public seaports, except AEO-3, which owns its own port in Merak. AEO-1 and AEO-2 use Tanjung Priok Port, AEO-3 uses Perawang Port, Merak Port, and Tanjung Priok Port, and AEO-4 uses Tanjung Perak Port. Distance and travel time partly determine which port to use. AEO-3 has more options since it owns a port and also uses public ports, depending on the countries of destination and the choice of ship. When the freight forwarder manager was asked how to choose between Merak or Priok port, he explained:

It is determined by ocean freight, vessel availability, and destination. We used to have five vessels. For example, Evergreen, Wan Hai calling to Merak, but now only two. Ocean freight is the biggest cost element in shipping. So we are very keen to achieve efficiency in freight. We prefer Merak port with those two shipping lines. (AEO-3_#2)

In contrast, AEO-2's CBU export has no option but to use the designated car port in Tanjung Priok, namely the Indonesia Vehicle Terminal. This specially designed car port is the only one in Indonesia for vehicle import and export.



Figure 6.1 AEOs' geographical locations

6.3 Integration mechanisms

As presented in the theoretical framework (refer to Section 2.6 in Chapter 2), the integration aspects studied in this research were modified from the study by Robinson (2009). The integration of logistics activities was explored along the AEOs' export chains for their ownership, contractual arrangements, operational interdependence, and information sharing. The following section provides a cross-case analysis using these dimensions.

6.3.1 Ownership

The case studies show a variety of ownership patterns in their export chains to manage their logistics functions. The general preference for manufacturers is to focus more on their core business, and this is associated with their choices in chain ownership. AEO-1 and AEO-4 focus on their core businesses and appoint specialists to support their logistics activities. Except for warehousing, they do not own any other logistics functions and are entirely dependent on their freight forwarders as their first party dyads. AEO-4 employs more 3PLs in almost all logistics functions, making their chain structure more complex. This is similar to AEO-1, which employs total logistics service

providers. AEO-2 owns and operates the warehouse and vehicle yard, but subcontracts all other logistics functions. In contrast, AEO-3 owns and manages all functions by itself. Except for shipping lines and their agents, AEO-3 owns trucks, warehouses, container parks, and even seaports. However, AEO-3 still uses resources other than their own, especially when their export loads outnumber the available capacity.

AEO-3 maintains the broadest range of logistics functions ownership. However, AEO-3 still has to involve third parties to service their logistic needs, such as trucking companies, shipping agents, and ports. The evaluation of AEO-3 export chains reveals that the breadth of ownership in chain functions carries benefits in at least the areas of information security and work values. The first benefit allows them to use the same information sharing system and exchange data unreservedly, which in turn, results in speedier and smoother processes. Below are examples of cases mentioned by the AEO-3 export manager that describe how the same internal information system is used in their operations.

Within internal office, each division uses information system (SAP) for communication. We have weekly meeting. Warehouse has an analysis on occupancy rate and communicates this information to marketing and monitored by the mill head. Basically each division must have communication. Sometimes we decide to drop the price significantly to space up warehouse. Production plan is issued weekly and disseminated to each division on weekly meeting. (AEO-3_#2)

We have a system about cargo readiness inside internal SAP. We can communicate with marketing and production in this system. There are cases where marketing decides to ship the cargo even though it is not complete (minus one box) because, for example, the customer needs the goods immediately and vessel schedule cannot wait. (AEO-3_#3)

Second, operating under the same corporate values and ethics leads to smoother cooperation between the nodes in the chains.

In the information system we can see activities in the other divisions. For example, logistics division can see the occupancy rate in the warehouse

through SAP. Warehouse can see production plan. So we can all prepare. Daily production also gives information on their activity. If there is problem in logistics, production needs to know so over production can be avoided. (AEO-3_#4)

On the other hand, the preference of AEO-1 and AEO-4 to outsource does not necessarily impede smooth operations. Their claim that the current mechanisms are sufficient to achieve their objectives in their export chains was justified during observations. Partner coordination and integration of activities were reflected in cross-posting, regular meetings, and collective decision-making. However, they agreed that they cannot freely and fully share critical information with their chain partners, and are dependent on email as their sole information sharing method. The use of email admittedly requires additional data generation and process, but was deemed sufficient to support their current operations. Additionally, differences in work culture demand extra effort from the AEOs to ensure their partners follow the expected security standards on top of quality performance.

6.3.2 Contractual relations and span of control

A formal contract is a legal instrument signed off between AEOs and their chain partners to initiate a contractual relationship. The existence of a contract ensures a binding extension of the AEOs' interests to their chain partners. The national customs administration, in compliance with the WCO, in fact, encourages the AEOs to explicitly include security aspects in their contractual agreements (WCO, 2006). However, all AEOs admit that there is no such detailed agreement on security written in the contracts. The statement from AEO-1 export manager below represents similar situation in the other AEOs.

AEO-1 does not have contract with vendors working for the FF. Security matters in the contract assure that vendors are responsible for security during transportation. Detailed procedures and requirement, such as condition of containers and seals, are not stipulated in the contracts but in separated documents. The contracts are simple that mostly related to amount and value of works. It broadly regulates responsibilities of each party. (AEO-1_#1)

Instead, as a matter of practice, security standards are conveyed separately through work instructions for each operation. All AEOs also discuss their security expectations through meetings, evaluations, workshops, and tender requirements. While it was not possible to access the signed contracts, during the interviews AEOs shared information related to the materials regulated in the contracts. Table 6.1 provides a summary of contracts in the four AEOs.

Table 6.1 AEO contractual agreements

AEO	Contract duration	Contracting parties	Security content
AEO-1	One year	Freight forwarders	General
AEO-2	Two years	All chain partners	General
AEO-3	One year, quarterly	Shipping lines	General
AEO-4	One to two years	Freight forwarders	General

The structures of contractual relationships between the AEOs and their partners reflect the span of control of the AEOs. AEO-1 and AEO-2 demonstrate more complex structures than AEO-3. There is a hierarchy of contracts determined by the parties concluding the contracts. The focal parties in each level of the hierarchy are the AEOs' headquarters, the AEOs and the AEOs' chain partners. This results in the existence of tiers of contractual arrangements and divisions in areas of control. The international headquarters of each AEO undertake contracts with shipping lines as the first party, they then appoint the shipping agents and container parks as the second parties, which then work with AEOs. The AEOs control the freight forwarders and the trucking companies. These freight forwarders appoint subcontractors. This practice is evident in AEO-2's export chain. Similarly, trucking companies subcontract smaller trucking companies in AEO-1's export chain. This way the export chain gradually branches out to a supply chain network to accommodate all chain partners. This process potentially erodes security standards in the chain.

The first tier 2 exists following the contracts signed off by entities hierarchically above the AEOs. For example, AEO-1 is guided by its international headquarters and AEO-2 is under the control of the Asia Pacific regional office. AEO-3 does not have this tier. AEO-4's contractual relations are precluded from discussion due to insufficient data.

It is a common practice for multi-national companies to sign a contract with shipping lines for their international or regional operations. This helps achieve lower prices (Sussman, 2000). The export manager from AEO-1 explained:

The choice of which shipping line to use in each export is automatically determined by our IT system. The choice is based on the country of destination. The global logistic team from AEO-1's HQ develops the IT system. The price for the shipment is fixed in the system. (AEO-1_#2_Warehouse)

Tier 1 represents the domain in which AEOs have the sole authority to choose their chain partners. Recruitment and evaluation are carried out by the AEOs with different mechanisms in this tier. Contractual relationships mostly occur between AEOs and freight forwarders and trucking companies with different relationship structures. The second tier 2 is where the 3PLs connect with their dyads without involvement from the AEOs. Within tier 3, vendors under the 3PLs subcontract other vendors. For example, trucking companies might work in cooperation with other trucking companies to provide more trucks for AEO-1 exports, especially when their capacity is limited. In this tier, a contract may not exist to regulate this level of relationships.

The existence of these tiers is further evaluated from an agency theory perspective in Section 6.5.1.

AEOs do not undertake direct control of vendors beyond the first tier. They are not involved in the recruitment process and hand over the responsibility to their immediate dyads to ensure that these extended dyads demonstrate agreed performance levels. However, AEOs maintain the authority to evaluate their performance if it affects the whole chain performance. This contractual pattern reflects a degree of span of control from the AEOs towards their partners. Relationships that are regulated under contracts establish direct control. The process of concluding the contract represents one element that indicates their level of control.

Most contracts are won through a bidding process that is conducted once in one to three years. The export manager in AEO-1 explained that:

The contract is renewed annually. If there is no evaluation, contract is renewed automatically. Most potential reason (for an evaluation) is efficiency. There is no security reason big enough to evaluate contracts. However, incidents like loss of goods occur very rarely. Normally insurance covers this risk. (AEO-1#1)

AEO-2 conducts bidding every two years for all functions, while AEO-4 goes to tender every one or two years. The internal freight forwarder manager of AEO-3 stated:

We work with shipping lines, trucking companies, and freight forwarder. Our contract with shipping lines can be yearly, quarterly or monthly. The length of the contract is determined by volume and price. We conclude contract yearly if we use the service frequently, which is good to secure place and price for the whole year. Monthly contract is new and only when supply is bigger than demand. (AEO-3#2)

The bidding process is different for each AEO. In AEO-1, bidding for the freight forwarder functions is not competitive. AEO-1 has a very tight relationship with its current freight forwarders, who have worked with them for an extended period. The freight forwarders' extensive experience in the electronic industry, their competitive price, and ability to manage all other functions have made AEO-1 reluctant to seek replacement. In contrast, AEO-2 is very competitive in its recruitment processes. Many logistics service providers are interested in working for AEO-2. Not only is the business interesting, but the experience of working with AEO-2 adds reputational value. AEO-2 details the requirements in tender offers and participants are carefully scrutinized. An example of container quality as an element of evaluation in the bidding process is seen in the quote below:

It should be the obligation of the drivers (to assure container quality) since this checklist is part of the bidding process and JMP (a trucking company) must follow the AEO-2 requirements. AEO-2 has delegated this control to JMP. (AEO-2#4_2)

AEO-3 only has contracts with shipping lines. These contracts are concluded by the freight forwarding company owned by the AEO-3's holding firm. In this situation, the freight forwarder is internally embedded in the AEO-3 structure. The contract with shipping lines is made to guarantee the price for a certain time period. There is no agreement on the work volume or other details, or even security. AEO-3 recruited trucking companies once without a thorough bidding process and intend to improve the process and aim for a lower price.

All AEOs admitted that contracts only regulate general agreements that focus on price and volume of work. Other operational details, including security, are commonly communicated during bidding and detailed further in operational documents, such as guidance, letters, instructions, and memos.

6.3.3 Operational interdependence

To map the strength of integration in different operational areas in AEO export chains, the following dimensions were used: access to planning system (Frohlich and Westbrook, 2002); organizational relationship linkage (Lee, 2000); collaboration and shared decision-making; collaboration leading to risk, cost and gain sharing; and sharing of skills ideas and institutional cultures (Bagchi et al., 2005).

AEO-1 and AEO-2 share their export plan with their chain partners, but not AEO-3. In AEO-1 and AEO-2, a forecast of work volume is disclosed to their vendors during the tender process. AEO-1 and AEO-2 claimed that the forecasts are highly accurate since they have annual production plan. As multi-national companies, this forecasting system supports their global production platform through which their international headquarters distribute works to their subsidiaries. While the shared forecast is more of a general plan that includes production volume, AEO-1 and AEO-2 distribute more specific plans that include the type of goods and export destinations. These specific plans are distributed periodically, either monthly or weekly. The final plan is disseminated one day before actual shipment. These plan sharing activities are systematically embedded in their work processes, allowing every party involved to anticipate their operations as well as predict their business plan. On the other hand, AEO-3 does not share their work plan. Instead, it starts sending work instructions to other actors for individual export one week before the shipment.

The second integration dimension is organizational relationship linkage (Lee, 2000). The researcher found that this concept was represented by staff cross-posting and the establishment of dedicated teams. Examples of this are trucking companies that post their staff in AEO warehouses and ports, or a dedicated team from the AEOs is appointed in freight forwarder offices to supervise their exports exclusively. All AEOs have these features in their operations, which are standard practice in export activities.

The third integration element is collaboration and shared decision-making, which is reflected in all AEOs by regular meetings. Such meetings are intended mostly to review previous performance and plan future operations. The meeting outcomes are also representations of the fourth aspect of operational and strategic collaboration (Bagchi et al., 2005), with improvement plans usually discussed during these meetings, resulting in collective action plans with shared risks, costs, and gains.

The last element is skill and value sharing (Bagchi et al., 2005), which constitutes the most prominent differentiating aspect among the AEOs. There is an element of skill sharing in AEO-1 with the conduct of packaging training for warehouse staff under the freight forwarder. None of this sort of training was found in AEO-3. AEO-2 organizes various activities related to skill and organizational value sharing. The creation of an organization called the logistics community, which accommodates almost all of its chain partners, is a very effective avenue through which to share AEO-2's skills and values. Currently, under the direction of AEO-2, this organization holds truck driving and operational problem-solving classes. There are also social events during which company culture and values are shared among all members. A greater shared understanding of common goals in daily activities and closer personal relationships are examples of factors that support stronger integration and smoother chain operations leading to better chain performance. In term of knowledge sharing, the relationship between AEO-2 and its chain partners characterizes the institutionalization stage where long-term relationship is envisaged (Marasco, 2008). The logistics community in AEO-2 represents an ideal avenue for improving collaboration between an AEO and its chain partners, as noted by AEO-2's manager of export vendors:

In this vendors' community, we can be closer to them to absorb their needs in meeting our standards. We require them to do a lot of things, (so it is

impossible if) we do not develop them. By establishing this community, we expect to develop them too. (AEO-2_#2)

6.3.4 Information sharing

The four AEOs have well-established internal information and communication systems, which provide a basis for SCI, especially in the transportation of cargoes (Tiffin and Kissling, 2007). AEO-1 and AEO-2 have their systems vertically connected to their headquarters, enabling them to monitor progress in their export chains. However, dedicated information sharing systems with external partners are non-existent in all AEO export supply chains. Table 6.2 summarizes the coverage of information systems in each AEO.

Table 6.2 Information system in AEOs

AEO	Information sharing system		
	Internal	External	Vertical
AEO-1	✓	X	✓
AEO-2	✓	X	✓
AEO-3	✓	X	X
AEO-4	✓	N/a	N/a

Even though none of the AEOs have a dedicated information sharing system with their external partners, some sharing of internal systems with external partners was identified in AEO-1, with the 3PLs managing their warehouses. Access to this information is restricted by password credentials specially created for the warehouse staff. The information is limited to those who need to check goods and the accuracy of related documents, and is used to create export documents that include goods descriptions, volume, and destinations. All other information is shared through email. Internally, AEO-2 has acquired modern systems that provide detailed information to related divisions. For example, the movement of CBU cars from post-production in the factory, to pre-shipment delivery inspection, to CBU parks, and finally to port, can be

monitored by the export department in their national headquarters as well as their principal abroad. AEO-3 claimed that their current system, which relies on email communication, is sufficient for their purpose.

Most of the large chain partners working in the AEO chains use their own internal systems. During interviews, although the AEO managers agreed that providing external actors with more access to information would enhance integration and improve performance, they were still concerned about issues related to information security. This indicates that the AEOs are not integrated with their chain partners in relation to the dimension of information sharing.

6.4 Security measures and their extension

In practice, security measures are often confused with safety measures and the terms are used synonymously to refer to similar intentions. While many related measures can address both security and safety, these two terms have different meanings. Unlike safety, which does not require a conscious effort to cause harm, security risks involve perpetrators (Brooks and Button, 2006b). However, many measures are meant to address both security and safety. For example, AEO-2 has internal guidelines to review their vendors, which covers both security and safety. The manager explained:

There is a potential to change vendors. The change can be done without waiting for the two years contract period end. Every month our operation staff evaluates vendors' performance using QCDSM parameters (quality, cost, delivery, safety, morale). Security is included in safety element in QCDSM parameters. (AEO-2#1)

From an observation of security practices, the AEOs apply common standard security measures in their export supply chains. A degree of influence from their international patrons often characterizes their security standards. These practices are mostly found in the transportation of containers and already existed before the introduction of the AEO program. They are also implemented in non-AEO export supply chains. For example, document signing during handovers between truck drivers and warehouse operators, assuring container quality at container parks, and transportation route control, are consistently found across the AEOs. Nevertheless, new measures are

specifically undertaken by AEOs to follow customs' requirements during their AEO certification audits. These measures did not exist before AEO implementation. For example, these include the development of security procedures in AEO-1, internal and external security campaigns in AEO-2, and internal managerial security workshops in AEO-4.

6.4.1 Cargo security

Most activities in this security standard are similar in containerized port-oriented transportation. Findings from the pilot case study, literature and the researcher's empirical knowledge confirm this. However, as different types of products carry different risks (Speier et al., 2011), each AEO shows unique safety and security measures in handling their cargo relevant to the risk they carry. For example, AEO-1 uses bubble wrap for their electronic goods, as these are vulnerable to impact, AEO-2 uses locking procedures for CBU cars, and AEO-3 and AEO-4 demand quality leak-free containers for their respective paper and food products.

The use of CCTV is a requirement in this standard. Except in AEO-2's component export chain and in AEO-3, surveillance cameras were found at loading bays in all other AEO warehouses. AEO-1 installed the cameras following a recommendation from CTPAT, which was important during AEO certification. In addition to the use of security cameras, archiving management requires that each cargo carries a unique record. This allows any issues to be traced back to the point at which it occurred (e.g., when the cargo was loaded to the container). Records and CCTV can be used as proof when there is a dispute between a shipper and buyer related to goods. According to the AEOs in this study, such disputes occur frequently and the cause is often related to theft in destination countries.

6.4.2 Conveyance security

All AEOs aim to make sure that their cargo is transported safely and securely. To achieve this objective, they control the trucks, routes and packaging. The AEOs explicitly regulate the trucks carrying their cargoes to ensure they meet their requirements. AEO-1 applies an age limit for their drivers. AEO-2, in addition to applying an age limit, also periodically certifies the trucks used for their operations and

attaches stickers on cars for control during entry to their premises. AEO-3 and AEO-4 put more stress on truck quality, including cleanliness. All AEOs state their requirements during the tender process.

The routes taken by trucks from the AEOs' premises to the ports carry an element of risk, requiring security measures to be implemented. There have been several cases of theft related incidents during this stage of transportation. A trucking company for AEO-1 employee shared their experience:

Another security example is when export is cancelled and container needs to stay temporarily and await documents processing. At this container yard, security and safety are poor. Containers may be damaged by extreme weather and theft has been recorded once, but not for AEO-1. (AEO-1#8_2)

The measures associated with conveyance security differ between AEOs, but they all agreed that routes are pre-approved by the AEOs whether during tenders or periodical meetings. Deviations are allowed only under certain circumstances, such as floods or riots along the pre-determined routes. AEO-4 explained that several contingency routes are identified in case of such incidents. AEO-1 and AEO-2 stressed the importance of their reporting systems and noted that any deviations must be reported immediately, especially if this might affect the arrival time at ports. All AEOs want to avoid the risk of being late for vessel loading.

To ensure compliance with the determined route, all AEOs use time controls. Truck drivers are advised of the time they should normally take to arrive at their destination. In addition, AEO-1 and AEO-4 have established control posts along the route to monitor and time the transportation. AEO-2 uses a GPS tracking system in every truck, although currently this system is not in full operation due to the lack of resources needed to review the tracking data.

AEO-2 has extra measures in place to ensure conveyance security. It certifies not only the trucks but also the drivers. AEO-2 offers its transport providers a program to improve drivers' skills and knowledge of safety and traffic regulations. AEO-2 also conducts skill competitions for drivers. These are well-known among drivers and trucking companies and are not found in other AEOs.

6.4.3 Premises security

There were significant security gaps in chain partners' premises compared with those of the AEOs. Even though security in partners' premises is not included in the evaluation for AEO certification, chain partners' premises security is relevant to the security of the whole chain. For example, container tampering can happen in empty container parks or in truck parking areas at the trucking companies' premises.

All AEOs have security measures and procedures in place to limit access to their premises. Single gates, guest identification, and CCTV cameras are standard at AEO premises. AEO-1 has the additional measure of metal detector gates and x-ray machines to detect suspicious goods carried by their guests. AEO-4 developed a security database in coordination with its branches and the police. This contains profiles of criminals and people considered high risk, so that guards at entry gates can check individual identities on their computers. Furthermore, access to more sensitive areas, like factories and warehouses, is becoming increasingly tighter at all AEOs. However, not all security operations are the same. For example, AEO-1, AEO-2 and AEO-4 share truck loading schedules with security officers at their entry gates. This practice allows them to control entry of the trucks and ensure their legitimacy. This activity is not found in AEO-3.

As already indicated, in contrast, the above security measures are generally not found in chain partner premises, regardless of their function in the chain. Standard security measures are often absent at chain partner offices. The empty container parks are also barely guarded and there are no identity checks for visitors. The weakest security was found at the truck park in AEO-1's export chain. The premises do not have a clear boundary, with no fences or gates. There is only one employee managing the premises, responsible for the security of twenty trucks. This includes administrating the truck keys, distributing orders to drivers, as well as securing the premises. Even though this truck park is not directly connected to the movement of cargo, vulnerability increases when the risk of cargo tampering is not appropriately managed.

6.4.4 Personnel security

The four AEOs have high standards with regard to the security of their personnel. Identity checks and police security certificates are commonly required during recruitment. Similarly, their chain partners apply security checks to their employees. However, this is not the case in trucking companies, which regularly hire casual workers as drivers and co-drivers. These drivers are typically hired for a short contract period with limited scrutiny. In many cases, senior drivers recommend new recruits and guarantee their performance.

Additionally, across the AEOs and their chain partners, there is no system to identify high-risk positions and relevant security programs. Different positions and functions in the export chain operations carry different levels of risk. For example, there is a risk that staff responsible for loading cargo into containers may insert illegal material into those containers. At an operational level, the loading of goods into containers and the locking procedures are the most critical points at which illegal penetration can occur. These represent the last operational stage with opportunities to insert illicit goods into containers without having to break into the container and damage the seals. Consequently, they should be considered as high risk and subjected to strict security checks. Similarly, the staff who are responsible for distributing and checking container seals, as well as the drivers and co-drivers of the containers, should be subjected to high-level security checks to avoid any security breaches.

With regards to risk of terrorism, security measures are enhanced to include insertion of illegal materials into containers. The existing measures were evaluated by customs for their ability to deter the related risks. The existing measures were maintained and additional measures were added. In terms of personnel security, as discussed in each case study report in Chapter 5, the AEO program has affected the supply chains to improve security awareness related to terrorism. However, the level of this awareness varies between AEOs. AEO-1 limits this awareness only to its direct 3PLs. Similar situation was found in AEO-3 and AEO-4. AEO-4 was more confident about their improved personnel security development by conducting security trainings to their employees. However, the firms beyond the 3PLs do not realize about their new security status. Differently, AEO-2 showed the broadest extension of its being AEO and the new security risks of terrorism to its chain partners. In general, all AEOs believed that the

security measures before AEO certification were deemed sufficient to deter risks, including terrorism. Additional measures sharpen the focus of the new risks. The AEO-4 supply chain manager represented this view:

Terrorism was not yet included as risks of security (in the previous measures). However, (the existing) security standards may already able to deter terrorism. For examples, body check before entering factory or offices, the use of metal detector, and personnel security check. (AEO-4_#1)

6.4.5 Trading partner security

The term trading partner refers to chain partners working for the AEOs, whether a 3PL with multiple tasks or a vendor with a single task. As discussed in Chapter 5, generally, potential risks were identified in the chain partners' domains. Table 6.3 below summarizes these findings. All export chains have similar risks and the structure of each chain may be impacted by different aspects that affect risk exposure. This observation recognizes the extent of risk exposure in the chains, allowing for a more effective evaluation of the strategies adopted by each AEO to manage risk.

Table 6.3 Risk identification in AEO chain partners

Nodes	Risks
Container park	<ul style="list-style-type: none"> - Container tampering - Damaged container - Concealment in container - Poor seal quality
Warehouse/port yard	<ul style="list-style-type: none"> - Adulteration of packaged goods - Unauthorized loading to container / CBU car
Temporary container yard/car terminal	<ul style="list-style-type: none"> - Container / CBU car tampering
Port	<ul style="list-style-type: none"> - Container / CBU car tampering
Links	Risks
Truck /car carrier movement	<ul style="list-style-type: none"> - Route deviation - Container tampering

Table 6.3 shows that risks are related mainly to the flow of goods as opposed to the flow of information. However, information flow may also be breached by manipulation of information in export documents. This may relate to alteration of goods descriptions to avoid detection of any suspicious cargo.

When security risks are associated mainly with chain partners' domains, contracts are critical to ensure and formalize security extension (WCO, 2006). This is where the connection of integration mechanisms and security extension is materialized. The contractual relationship affects security extension through the element of trading partner security. All AEOs conclude contracts with their chain partners, whether with all functions or only with their direct dyads. AEO-2 and AEO-4 are very competitive in their bidding process and impose high standards on their vendors. Although AEO-1 was not keen to change their current freight forwarders, they claimed that their partners' performance is consistently being evaluated. AEO-3 only has contracts with shipping lines, used to regulate pricing.

In terms of security aspects, while details of the contracts were not disclosed, AEO-2 and AEO-4 claimed that general security aspects are included in their contracts. AEO-1 and AEO-3 stated that their security requirements are elaborated in the subsequent guidance and instructions on every operation, rather than in their contracts. Even though all AEOs expect their chain partners to adopt the required security practices, it is evident that security concerns are not formalized adequately in the contracts that connect AEOs with their chain partners. A comment from AEO-1's export manager captures this point and is relevant to all AEOs:

We don't have security reasons to evaluate contracts. Incidents like loss of goods occur very rarely. Normally insurance covers this risk. The contract is made between the freight forwarders and us. We do not have contracts with vendors working for freight forwarders. Security matters in contracts assure that vendors are responsible for security during transportation. Detailed procedures and requirements, such as the condition of containers and seals, are not stipulated in contracts but in separate documents. The contracts are simple and mostly relate to amount and value of works. It broadly regulates responsibilities of each party. (AEO-1#1)

AEO-1 and AEO-2 claimed that they continuously encourage their partners to improve security practices. The interval visits to AEO-1 and AEO-2 reinforced this claim, with security improvements in AEO-1 and certification of chain partners in AEO-2 chains. AEO-2 is outstanding in its program to improve the quality of its vendors. Corporate values, including security awareness, business updates, and AEO security standards, are shared with partners through its logistics community. In contrast, as noted in the case of AEO-3 and AEO-4, there are chain partners who are not even aware of AEO and its security standards.

6.5 Integration and security: an agency theory perspective

The role of a theory in case study analysis is to provide a foundation upon which further knowledge is built and generalized to enhance possible insights in the specific areas under study (Yin, 2014). Agency theory is based on the delegation of works from one party (principal) to another party (agent) where they operate under a situation of information asymmetry (e.g., hidden characteristics, hidden actions and hidden information), task uncertainty, and risk vulnerability (Eisenhardt, 1989, Lassar and Kerr, 1996). The delegated works include authority in terms of control and decision-making about certain tasks where the relationship between principal and agent is ideally moderated by contract mechanisms (Fayezi et al., 2012).

It is not reasonable for AEO-1 to handle all logistic operations without support from 3PLs. It is about efficiency. Training and education to employees in 3PLs is a good way to share values and concerns about security that is held by AEO-1. (AEO-1_#1)

The quote above is taken from AEO-1 export manager to describe the relationship between the AEOs and their chain partners. Recognizing that many AEOs' chain partners are not security certified, the use of agency theory is appropriate to address how security objectives are followed through when chain partners have conflicting business objectives and varying degrees of understanding of security standards. From the perspective of agency theory, the integration mechanisms between AEOs and their chain partners affect the way they share information and risk in chain operations. The gaps in security awareness, as evident in the case studies, are significant. When the AEOs fully implement standardized security measures and include terrorism as a

threat, most chain partners only follow the agreed common practices without completely understanding the potentially devastating effect of such security breaches. Chain partners' ignorance indicates that the value of security is likely to deteriorate along the chains as more parties expand the chain structures.

Supply chains are often characterized as works of multiple members with multiple operations (Alexandru, 2014, Jayaram et al., 2010). In the case studies, the flow of goods in the chain is initiated by the AEOs, which produce and move the goods downstream to ports of export. The AEOs as the principals have the objective of delivering their goods to reach their export destinations. In most cases, the chain members that are responsible for the operations in each node are not AEOs. Arguably, their concerns, awareness, and attitudes towards security, especially as defined in the AEO program, are not likely to meet the standards and potentially create risks of disruption and security. This is exacerbated by the complexity of export chains, which makes it difficult for AEOs to monitor their agents continuously.

Agency theory helps explain the relationship between the AEOs and their chain partners in extending security to the whole supply chain. This is achieved by understanding the tiers of contractual relationships in the AEOs' export supply chains and identifying the agency costs (e.g., the cost of monitoring and control) borne by the AEOs to ensure equal security standards are implemented along the nodes in their chains.

6.5.1 Multiple tier relationship and gaps in security awareness

A contract is used as an instrument to bridge the gap between principal and agent to reach their objectives (Fayezi et al., 2012). As discussed in Chapter 5, there are multiple tiers of contractual relationships between all AEOs and their chain partners. From the perspective of agency theory and the findings from interviews and observations, these tiers create two consequences: different patterns of agency costs to control chain partners; and greater distance in extending security to the whole chain. These multi-tier relationships and their consequences are portrayed by the AEO-1 export manager below.

The freight forwarder is determined by our Headquarters in Korea and is responsible for exports. The freight forwarder handles warehousing, trucking, sea freight booking, customs broker, and invoicing (for logistics purposes). During security Audit, we were asked to audit the freight forwarder. Including the trucking companies worked for the freight forwarder. (AEO-1_#1)

We own the warehouse but managed by freight forwarder. Warehousing system is provided by AEO-1 but operated by staff from freight forwarder. Access is limited in conjunction with freight forwarder's authority and it requires verification process. (AEO-1_#1)

The different levels of security awareness among chain partners from different relationship tiers indicate that these tiers are barriers to both security extension and SCI. While these relationships were discussed individually in Chapter 5 and cross-analyzed in Section 6.3.2, this section focuses on their relevance in terms of security awareness gaps between the AEOs' chain partners.

The AEO program has brought significant awareness to the AEO exporters as focal firms. This awareness, however, is not consistently extended to their chain partners. The interviews revealed a gap of awareness among chain partners about the new AEO status of the focal firms in the chain. Any awareness that was apparent reflected effective security extension from AEOs to their chain partners. An interview with a trucking company in the AEO-1's export chain provides an example where security awareness is limited at procedural and operational level. This signifies the lack of understanding of the AEO program and the risk of terrorism. It also indicates the failure of security extension from AEO-1 to their chain partners.

We (trucking company) are responsible in the condition and security of the container, not the driver (of the container truck). We are not aware that our client is an AEO. (AEO-1_#9)

Table 6.4 summarizes the responses from participants representing each function in the chain. Functions with superscript "a" indicate the presence of awareness, and superscript "b" indicates absence of awareness. As previously discussed, a function

may be served by multiple vendors and the assumption used in the table is that when awareness is absent in one of the vendors, there is a risk in the chain, so the function is colored yellow. The absence of security awareness is more likely to create a security risk in the chains.

Table 6.4 Chain partner awareness of the AEO program

AEO-1	AEO-2	AEO-3	AEO-4
Warehouse ^a	Warehouse ^a	Warehouse ^b	Warehouse ^a
Freight forwarder ^a	Freight forwarder ^a	Freight forwarder ^a	Freight forwarder ^a
Shipping agent ^b	Container yard ^a	Empty container park ^b	Empty container park ^b
Empty container park ^b	Trucking company ^a	Trucking company ^b	Trucking company ^b
Trucking company ^b	CBU yard operator ^a		

Note: 'a' = presence of awareness, 'b' = absence of awareness.

AEO-1 minimizes agency costs by limiting its efforts to control only freight forwarders as its direct chain partners. Contracts only exist between AEO-1 and freight forwarders, restricting the cost of operational interdependence and information sharing to freight forwarders. The control of subsequent nodes in the chain is transferred from AEO-1 to the freight forwarders. In this situation, as agents tend to deviate from the agreed work standard (Zsidisin and Ellram, 2003), performance deterioration becomes an emerging risk due to the lack of the principal's direct supervision. There is a high degree of dependency on the freight forwarders to ensure security measures and outcomes along the whole of chain meet expected levels. The risk is immediately obvious given that AEO-1 only employs a single freight forwarder for each group of products. Table 6.4 above indicates that AEO-1 had informed their freight forwarders of their newly awarded AEO status and the associated security compliance requirements. The freight forwarders, however, failed to extend this information to the subsequent chain partner tiers. This is reflected in the absence of security awareness in shipping agents, empty container park operators, and trucking companies.

The approach taken by AEO-2 differs from that taken by AEO-1. AEO-2 extends contractual relationships to almost all members, including freight forwarders, and container yard, warehouse and yard operators. The AEO-2's export supervisor explained:

In total we have sixteen vendors excluding shipping agents. We have bidding once in 2 years. They are all members of the Logistics Community.
(AEO-2_#2)

Shipping lines, shipping agents, and empty container park operators remain exceptions in this relationship due to their direct contractual arrangement with AEO-2's headquarters in the Asia Pacific region. AEO-2 manages most contracts, giving it direct control over all operations and reducing the issue of monitoring in its agency approach. This ensures that all vendors meet the selection criteria stated in tender documentation, and are subject to bidding processes every two years. Like chain partners in AEO-1, freight forwarders, trucking companies, and yard operators in AEO-2 extend their own contracts with vendors, whose performance is under their control. AEO-2 has no contractual relationships with vendors operating in this tier. However, all chain partners claimed that AEO-2 had informed them about the new AEO status and expected them to pay more attention to security compliance during their logistics operations.

AEO-3 has a low level principal-agent relationship since ownership is more prominent. It engages external parties only when internal functions are insufficient to support its operations, especially during peak times. AEO-3 representatives were able to provide examples to show that extensive ownership and control reduce agency costs. First, AEO-3 does not have to enter into any contract with agents, which significantly reduces the cost of control and monitoring or evaluation for the purpose of renewing a contract as normally occurs in a contract cycle. Second, it can avoid the cost of information sharing since AEO-3 is integrated in terms of internal information and communication systems. Unrestricted information access is also a benefit of their ownership structure. Third, the issue of different values and work cultures is minimized by shared corporate values stemming from the holding firm. It was evident that the benefits of ownership significantly support SCI in AEO-3.

In terms of security extension, however, AEO-3 has failed to optimize its overarching ownership to extend security to the whole chain. Being the only AEO with full ownership in all functions, AEO-3 does not demonstrate a full extension of security awareness to all functions even though they operate under the same firm. The warehouse manager in AEO-3 premises admitted that he did not know about the AEO

program, and advised that the trucking company and container park operators also knew nothing about this new security status.

In AEO-4, multiple tiers of contractual relationships exist. The size of the chain structure and network is considerably larger than the other AEOs to accommodate the variety of products and export destinations. During interviews, the container park operators and trucking companies admitted they were unfamiliar with AEO status and its related security requirements.

6.5.2 Agency costs in security extension

Agency cost is the term used to indicate the effort taken by the principal to ensure that agents are fulfilling given tasks appropriately (Eisenhardt, 1989). Integration mechanisms, except for ownership, are representations of the agency cost concept. Measures found within contractual arrangements, operational interdependence and information sharing are indeed associated with the effort to bridge the gap between the principal and agents.

The identification of agency costs in each AEO is essential. In a situation where a firm outsources logistics functions to agents, the cost of outsourcing is a direct cost. The principal may also incur additional monitoring and control costs (Shook et al, 2009), particularly in relation to security standards as stated in the AEO guidelines. These security standards relate to cargo security, conveyance security, premises security, personnel security, and trading partner security (WCO, 2006).

This research reveals the monitoring expenditure incurred by a principal as the cost associated with the development of contracts, periodic tenders, information and communication technology (ICT), staff cross-posting, and training of chain partners. These measures are positively related to integration mechanisms. Table 6.5 summarizes these agency costs and groups them under relevant integration mechanisms. All these efforts are meant to ensure that the agents behave in accordance with the principal's expectation. Physical monitoring and reporting systems are also found to reduce adverse behavior or moral hazards among agents (Fayezi et al., 2012). From the agent's perspective, agency costs include costs in the form of

participation in tenders, efforts to improve performance and participation in the principal's security awareness programs.

Residual loss can also be a cost in an agency relationship, incurred by the principal as a result of any discrepancy between the principal's expectations and the agent's behavior in relation to those expectations (Jensen and Meckling, 1976). Residual loss can relate to a security incident caused by the failure of an agent to maintain security when goods are in their custody. Participants in this research indicated that there were a few security incidents before AEOs status was granted, relating to loss of goods due to theft, pilfering or container tampering. For example, AEO-1 recorded the loss of goods in a container in the port of destination and AEO-2 had several theft cases when gear knobs in their CBU cars went missing in the port yard. These cases were not included in the agency evaluation since all of them happened before AEO implementation. Additionally, relating a security incident to agency failure requires further study that is beyond the scope of this research.

Table 6.5 Relationship between agency cost and integrating mechanisms

Grouping of integration mechanism	Agency costs		
	AEO-1	AEO-2	AEO-3
Ownership and contractual arrangement	- Limited contract with FFs.	- Multiple contracts with all chain members.	- No contract. Casual recruitment only when needed.
	- Transfer control to FFs.	- Maintain full control of all chain actors.	- Internal FF maintains full control.
	- Periodic evaluation only, no competitive tender.	- Periodic competitive tender.	- No tender. Multiple functions mostly under one ownership.
Operational interdependence	- Periodic meeting with all chain members.	- Monthly meeting with all chain members.	- Weekly meeting with all related internal departments.
	- Staff cross-posting (FF and TC at warehouse).	- Staff cross-posting (TC at CY, FF at warehouse, AEO-2 at YO).	- Staff cross-posting (TC at warehouse).
	- Establish dedicated unit to work with FFs.	- Establish dedicated unit to monitor the whole chain.	- None
	- Training to agents.	- Training, improvement program, logistics community.	- None
Information sharing	- Distribution of shipment plan to FFs.	- Distribution of shipment plan to all actors.	- Access to common IT system.

Agency theory is effectively used in this research to help explain the collaborative efforts to achieve security standards in the whole chain. Table 6.6 presents the agency costs incurred by each AEO when seeking to ensure their chain partners adopt the security standards as suggested by the AEO guidelines (WCO, 2006). Most of these costs are associated with cargo, conveyance and trade partner security. Security in chain partners' premises is excluded due to minimum direct relevance to the security of goods flow. AEOs do not observe security in chain partners' offices or truck parks, except for the nodes where loaded containers stop or are processed (e.g., temporary container yards). AEO-2, however, promotes security awareness with its chain partners' personnel through frequent training and certification programs, such as truck driving and safety skill training. Compared to other AEOs, AEO-2 incurs the highest agency costs, covering a number of contracts and the cost of managing the frequency and extent of information sharing. AEO-2 ensures the whole chain operates in accordance with its security standards. The effort they put into sharing their skills, institutional culture and values with their chain partners (Alfalla-Luque et al., 2013) is significantly higher when compared to AEO-1 or AEO-3, where these features are not pronounced.

Table 6.6 Relationship between security standards and agency costs

Security standards	Agency costs			
	AEO-1	AEO-2	AEO-3	AEO-4
Cargo	<ul style="list-style-type: none"> - Issue security procedures for cargo. - Issue packaging standards to be followed by warehouse. - Seal affixation procedures. - Control on trucks' identity when they enter premises. 	<ul style="list-style-type: none"> - Global procedures for locking cars on car carriers. - Multiple checks from truck arrival, loading and leaving premises 	<ul style="list-style-type: none"> - Multiple checks from truck arrival, loading and leaving premises. 	<ul style="list-style-type: none"> - Multiple checks on cargo and seals during entrance, loading and exit at premises. - Control on trucks' and drivers' identity when they enter premises.
Conveyance	<ul style="list-style-type: none"> - Require maximum age for trucks. - Control delivery time. - Reporting system. 	<ul style="list-style-type: none"> - Require maximum age for trucks. - Truck inspection and certification. - Control delivery time. - Reporting system. 	<ul style="list-style-type: none"> - Require quality trucks. 	<ul style="list-style-type: none"> - Quality standards for trucks. - Approve routes and lead time for delivery from warehouse to port.
Premises	N/a	N/a	N/a	N/a
Personnel	N/a	<ul style="list-style-type: none"> - Drivers training and certification. 	N/a	N/a
Trading partner	<ul style="list-style-type: none"> - Security is not included in contract but in guidance and SOPs. 	<ul style="list-style-type: none"> - General security aspects are included in contracts. - Continuous campaign and training internally and externally. 	No contract exists	<ul style="list-style-type: none"> - General security requirements are included in contracts with 3PLs.

6.6 Key findings: addressing the propositions

6.6.1 Relationship between chain structure and security standards

Proposition P1: Supply chain structure, comprising of actors, functions and their contextual existence, affects the extension of security standards in export supply chains.

The research reveals that the four AEOs operate in different chain structures. The mapping of each AEO's export chain structure shows both similarities and differences. Common generic export functions are found as are unique operations that characterize each structure. While the similarities are derived from common practices in international trade and cross-border trade (Böhle et al., 2014), the differences are dependent on, among other factors, products, manufacturer locations, and operational strategies. The mapping of the AEOs' chain structures reveals the number of chain actors involved and the flow of cargo.

The chain structures of AEO-1 and AEO-4 are fully dependent on 3PLs for their export operations, which reflects limited security control. AEO-2 prefers to control all of its logistics functions directly. Whereas, the chain structure in AEO-3 is virtually confined within its ownership, thus allowing more focus on internal security control. The chain structure affects the way security is extended. The mapping of the AEOs' chain structures reveals that the more actors in the chain, the longer the chain, and the greater the potential for diluting security extension. AEO-3 and AEO-4 provide contrasting examples of chain structures. AEO-3 owns almost all functions in its chains, resulting in a simple chain structure and minimum engagement with external actors. Security standards are easily extended since most functions are under the same administration within the company. In contrast, AEO-4 has multiple chain structures with a lot of actors engaged to accommodate different product types requiring different handling and the involvement of many partners in the chain. This situation creates a challenge for AEO-4 in trying to extend its security interests effectively to its chain partners. Again, the more actors involved in the chain, the higher the risk that security standards become deteriorated. Each node in the chain has its inherent security risks and risks associated with non-compliance. Hence, security risks increase in cargoes, conveyances, premises, personnel and trading partners as the chain structure is more

complex, with more nodes, such as 3PLs, warehouses, temporary container yards, and empty container parks. Therefore, Proposition P1 is supported.

6.6.2 Relationship between security standards and integration mechanisms

Proposition P2: Extension of security standards from focal firms to chain partners can be facilitated by integration mechanisms.

The AEO program encourages AEOs to extend their security standards to their chain partners to enhance security in the whole chain. However, the four AEOs in this study demonstrated different integration mechanisms, which affected their security extension mechanisms. For example, AEO-1, whose span of control terminates at the 3PLs, does not maintain effective security extension to the rest of the chain. It was evident that many of AEO-1's chain partners were not aware of the AEO program, creating weak links in the chain that are vulnerable to security risks. On the other hand, AEO-2 involves all chain partners in improving their security in relation to the new AEO status. AEO-2's full control of all chain actors through contractual integration contributes significantly to effective security extension.

Although ownership and formal contracts serve as the basic elements of integration, the case analysis shows that operational interdependence and information sharing play vital roles in integrating partners. Activities such as regular meetings and staff cross-postings can be seen as improving smoother operational flow and reducing friction. Additionally, the approaches taken by the AEOs to share key information with their chain partners indicate a significant step toward integrating with chain partners. These approaches include methods, type, and frequency of information shared. All AEOs claimed that their current information sharing systems were sufficient to support smooth exports. This shows that these elements are useful indicators of integration mechanisms in supply chains. These findings, therefore, support Proposition P2.

6.6.3 Relationship between chain structure, integration mechanisms and extension of security standards

Proposition P3: Overall security extension is dependent on the effectiveness of the interactions between security standards, chain structures and the integration mechanisms.

The interactions between security standards, chain structure and the integration mechanisms were represented by the use of ownership, contractual relationship, operational interdependence and information sharing to extend security standards from the AEOs to their chain partners. Section 6.3 and 6.4 have presented the varying degrees of integration mechanisms in each AEO and their impact to security standards through the cross-case analysis. It was highlighted that a formal contract between AEOs and their chain partners is an effective instrument to support inter-party coordination to help extend security. The study supports this argument in the sense that a formal contract provides a more explicit relationship between the AEOs and their chain partners. This allows a broader span of control that can guarantee the extension of security in the whole of the chain. This approach is found particularly effective in a complex chain structure. However, the AEOs have different arrangements, depending on the structure of ownership and contractual mechanisms. AEO-1 and AEO-4 have limited contracts with 3PLs, AEO-2 has multiple contracts with almost all chain partners, and AEO-3 has no contracts. These difference of contractual arrangements are reflected further in each AEO's agency costs (i.e., the cost of control and monitoring) relevant to the mechanisms of operational interdependence and information sharing.

The optimum use of these integration mechanisms in the efforts to extend security determines the effective security extension in the whole of chain. From the agency theory perspective, AEO-2 incurs more agency costs than the other AEOs, especially in the mechanisms of contractual relationship and operational interdependence. This is, however, compensated by the most effective security extension throughout the chains. AEO-2's chain partners are compliant and show extensive knowledge of security requirements in export chains. The findings indicate that security extension is influenced by the varying degrees of ownership, contractual arrangements, operational

interdependence, and information sharing. The findings, therefore, support proposition P3.

6.7 Chapter summary

This chapter discussed the findings within the components of the theoretical framework and addressed the propositions developed for this study. The elements under the groups of chain structure, integration mechanisms, and security measures were compared across the AEOs. A clearer description of differences and similarities was presented to provide the topography of integration and security in AEOs. While the findings reveal different integration schemes with unique internal or external integration mechanisms, the four AEOs also share similarities, such as common practices and the involvement of typical actors.

At this stage of the thesis, two purposes of the case study approach have been achieved. First, as a descriptive case study, the phenomenon of AEO implementation in environments where integration varies has been discussed. Second, as an exploratory case study, in-depth explorations of different chain structures and integration environments where security measures are extended have been revealed. Study propositions discussed in Chapter 2 were confirmed in this chapter and summarized in the table below. The next chapter will discuss all the findings in relation to the literature to provide further insights into the connection between integration and security in supply chains.

CHAPTER 7

DISCUSSION

7.1 Introduction

This chapter builds on the findings of the thematic analysis and the cross-case analysis in Chapter 6. The focus is on reviewing the AEOs' SCRM and strategies (Section 7.2) and discussing their integration emphasis and the influence of these on security extension (Section 7.3). This chapter examines the approach taken by each AEO in implementing security measures in relation to integration with their chain partners.

7.2 The AEO program and ideal SCRM strategies

The AEO program suggests two requirements for an ideal SCRM strategy. First, the strategy must reduce the operational cost during normal situations. Second, the same strategy must be able to mitigate the risks so that the firm can sustain its operations during and after disruptions (Tang, 2006b). The analysis of the interviews validates the notion of the relationship between the choice of SCS measures and the investment that needed to be made. As in almost all other dimensions in a corporate decision-making process, the variable of cost is always in consideration and often acts as a determining factor (Martens et al., 2011). The necessary security cost often challenges the implementation of a SCS strategy (Tang, 2006a). For this reason, the AEO program does not only encourage improved security in the supply chains, but also offers more facilitation for the AEOs in their customs related procedures. Another reason that makes the implementation of the AEO program was relatively smooth is the already high security level of these exporters. Considering that the AEO pioneers were invited by customs for their high compliance level resulted in the less challenges in their security certification process. The reasons to participate in the government regulation and to improve their security are more apparent. The interview with the AEO-4 manager represents the AEOs' acumen to participate in the program.

(Our) management reviewed the benefits of the AEO program and concluded that current benefits of being an AEO are intangible because the current export procedures are already simple. We do not implement

CTPAT. We have security measures before AEO. AEO supports justification for our existing security measures. (AEO-4_#1)

For the chain partners who are not yet AEO certified, the challenges are more conspicuous. Many of the 3PLs work with the AEOs are smaller entities and more financially sensitive to security investment. As the AEO-4 manager continued:

AEO is implemented in chains where quality of players varies widely. This gap is a challenge for AEOs to extend security awareness. Some local players are not even ISO certified. Multinationals players tend to have more security compliance. (AEO-4_#1)

When the risk is not immediate and tangible, a justification for such an investment is more difficult. This is one of the reasons why SCS initiative does not receive adequate support and attention from corporate management, despite the potential for detrimental risks. It is difficult to evaluate the effectiveness of a security strategy (Tang, 2006b, Martens et al., 2011, Sheffi, 2001). The connection between a strategy and an outcome is not exact as many variables may affect the outcome (Sheffi, 2001). Measuring security is complicated because security is not visible in the normal state and becomes visible when an incident occurs (Böhle et al., 2014). On the other hand, a secured supply chain does not necessarily imply the effectiveness of a security strategy. This creates another challenge when developing a robust security strategy, especially when a high investment may be required.

The balanced principle of control and facilitation is strongly embedded in the AEO program (WCO, 2006, WCO, 2012). The program requires implementation of security standards and concurrently offers benefits in customs' procedures, including relaxed regulations, speedier processes and a closer connection with customs. Firms enjoy these benefits during their normal activities, which are subsequently translated into more efficient and cost-effective export operations. The AEO program guidance also encourages the development of an explicit post-disruption procedure (WCO, 2006). This procedure should contain the coordinated emergency actions that would be taken by parties that may be affected by disruptions so that quick recovery can be achieved. As an alternative strategy, insurance may be one safety net to mitigate security risks. However, the increasing cost of insurance premiums prohibits many firms from relying on insurance to secure their supply chains (Rice and Caniato, 2003). Additionally, insurance cannot recover the intangible effects of disruption, such as market loss or

customer disappointment (Tang, 2006b). Such issues encourage firms to implement security strategies to manage risks instead of relying on insurance. The AEOs participating in this study agreed that it is easier for them to justify their participation in the AEO program due to the benefits gained by implementing security requirements.

Each AEO experienced different security measures prior to the introduction of the AEO program by the Indonesian customs administration. Those who had implemented other security initiatives, such as CTPAT, found it easier to adapt to AEO requirements. This was the case with AEO-1. AEO-2 and AEO-4 had no prior experience in security certification prior to obtaining AEO status, but being part of multi-national companies with global orientations gave them greater access to AEO certification. All AEOs claimed that international exposure was a major factor in their decision to participate in the AEO program. While there was no demand from their stakeholders to become an AEO, their extensive international operations aligned with AEO objectives. The AEOs had already implemented a high standard of security before their participation in the AEO program, which gave them a great advantage. This was especially the case for CTPAT members whose security standards are similar to those of the AEO program.

As a domestic company, AEO-3 does not have a global orientation or the accentuated focus on security values associated with that orientation (Altemöller, 2011). AEO-3 developed its security standards according to conventional practices and experience, with guidance from local authorities. Therefore, they only managed traditional risks that are evident in their immediate surroundings, such as theft and vandalism. Updates on international risk like terrorism were not on their radar. AEO implementation has introduced awareness of terrorism as a new risk in supply chains. Traditional security measures focused on addressing the risk of loss of goods from containers have now been expanded to address the risk of illegal insertion of goods in containers.

Most of the security measures identified in the four case studies are general security measures, which have also been identified by Böhle et al. (2014). The use of seals, handover between parties, container traceability, and route and arrival time controls are examples of standard practices in container transportation. Security measures at premises are even more common. Hence, the AEO program does not introduce completely new security techniques or measures at supply chain premises, instead it encourages a new approach to these measures so they become more relevant to the risk of terrorism. Arguably, the findings demonstrate that it is this change of mindset

and approach towards addressing broader security risks that the AEO program has brought to these firms. Their security awareness is now escalated to a new level in line with the objectives of the AEO initiative.

Moreover, the findings show that the four participants were attracted to the AEO program not for security reasons. All of them indicated that security practices before they became AEOs were sufficient to manage their immediate risks, even though terrorism was not yet on their radar. In these case studies, participants indicated that the threat of terrorism to their businesses did not seem immediate and when the risk is not obvious, it tends to be underestimated. Consequently, it is more difficult to calculate a risk that seems so remote and manage it accordingly through an appropriate strategy (Rice and Caniato, 2003). Furthermore, it is difficult to justify the cost of implementing a robust SCRM strategy for something that seems so unlikely. Recognizing this issue, the introduction of the AEO program in the four firms under study triggered a new level of security awareness. The interviewees confirmed this increasing awareness, as evident in the following statement from a security manager in AEO-4:

With AEO certification, security receives more attention and it makes security duties easier and enjoys more support from the management.
(AEO-4#3)

One significant difference noted after AEO implementation was the growing attention paid to security by management, who now realized that security initiatives are not just about security per se, but also improve the AEO's reputation in the eye of their stakeholders. Customs authorities attach a higher security status to AEOs for their increased compliance in reducing security risks, leading to more relaxed treatment in their export and import operations. Another benefit was evident in AEO-1, with participants claiming that improved security measures also help mitigate traditional risks of theft and trace back incidents for insurance purposes. For example, the existence of more CCTV cameras and security incident recording procedures allow them to provide more evidence.

The involvement of various chain actors in different operations highlights the importance of control strategies (Manuj and Mentzer, 2008). Control is associated with the ability of a firm to manage its chain members by sharing identified risks and transferring the responsibility for addressing those risks along with the operation flow. This is closely related to integration, through which a company is able to control

processes, systems, methods, and decisions in a chain. The research confirmed the importance of managing relationships with all chain members. Under the AEO initiative, where integration is strongly encouraged, relationship management with chain partners constitutes a strategy for extending security concerns. Within this context, integration of SCS is inter-related with the AEO emphasis on integration mechanisms, as evident in the interviews and observations. The following section elaborates more on this.

7.3 Emphasizing integration and the impacts on security extension

Levels of integration in each AEO are different and characterized by a unique emphasis on the four integrating mechanisms: ownership, contractual relationships, operational interdependence, and information sharing. SCI is the coordination mechanism of business processes internal to the company, and externally with other companies (Jayaram and Tan, 2010). However, in reality, supply chains differ from this ideal because of day-to-day challenges and potential risks. Interviews and observations reveal that integration mechanisms vary in each AEO export supply chain and influence their preferences on how to integrate security into their operations.

To illustrate these preferences, radar charts were created to compare performance on multiple dimensions simultaneously (Mosley and Mayer, 1999). Radar charts display the data in a two-dimensional chart of the four integration mechanisms as the variables. These charts (presented and discussed in the following sections) provide a simplified graphical presentation of integration emphasis on the four mechanisms represented on axes starting from the same point. The emphasis was characterized as strong, medium, and weak, based on the interviews with the AEOs and the relative positioning of their performance analyzed from the interviews and direct observations. Strong was assigned the number 3 when the measures were found to be stronger than those of other AEOs. Medium was assigned a number 2 when similar measures were found in all AEOs. Weak was assigned a number 1 when fewer measures were found compared to other AEOs. The ranking and allocation of numbers was purely subjective, developed by the researcher from his experience in the interviews and direct observations.

7.3.1 AEO-1

Participants from AEO-1 were convinced that their security standards were sufficiently attended to by all actors along the chain without their direct control and supervision. The export manager in AEO-1 admitted that:

Implementation of information sharing system reduces security risks and it has a big influence in security level. However it requires continuous maintenance to assure smooth implementation. (AEO-1_#1)

An operational staff in AEO-1 added to inform that:

One security measure is (designed) to monitor the time limit for shipment transportation from the warehouse to port. When the time exceeds the normal duration, procedures to investigate has been prepared that involves all parties in the chains i.e. freight forwarders, trucking company, and AEO-1. AEO-1 does not require GPS tracking system on the trucks due to high investment. Time control is in place to assure security during transportation. (AEO-1_#1)

AEO-1 relies on the capability of its freight forwarders to extend its interests. Common practices have assured AEO-1 that they have met the expected standards. The case below was conveyed by a warehouse manager of a freight forwarder in AEO-1. It shows that high confidence of AEO-1 in their operational interdependence with the FF.

Packaging for TV module (front part of TV) is solid to assure safety and security. Most of FF's employees (who work in the warehouse) used to be AEO-1's employees who share their experiences with new employees. AEO-1 has standards that include the use of plastic, boxes, and labelling. AEO-1 does not check the packaging anymore. They already believe with us. There was an incident, however, where a band-aid was found in the packaging. This triggered an evaluation. (AEO-1_#6)

Ultimately, competition in the chain forces all actors to keep their performance above standards, including their performance in maintaining the integrity of the chain. However, when contractual relationships extend to another tier, integration levels become more fragile (Fawcett and Magnan, 2002). Diluted security awareness along the chains indicates the fragility of integration in AEO supply chains.

AEO-1 demonstrates extensive elements of operational interdependence (Lee, 2000, Bagchi et al., 2005) by fully transferring risks and responsibilities, and limiting their span of control, to their freight forwarders as their only direct chain partner. The freight forwarders then extend their interests to the other chain members. AEO-1 only owns the warehouses and outsources all other chain functions, including the management of those warehouses. Therefore, as Figure 7.1 illustrates, the researcher scored 3 for its prominent operational interdependence, 1 for minimum ownership of chain functions, and 2 for its contractual information sharing and contractual relationships, which were similar to the levels of other AEOs.

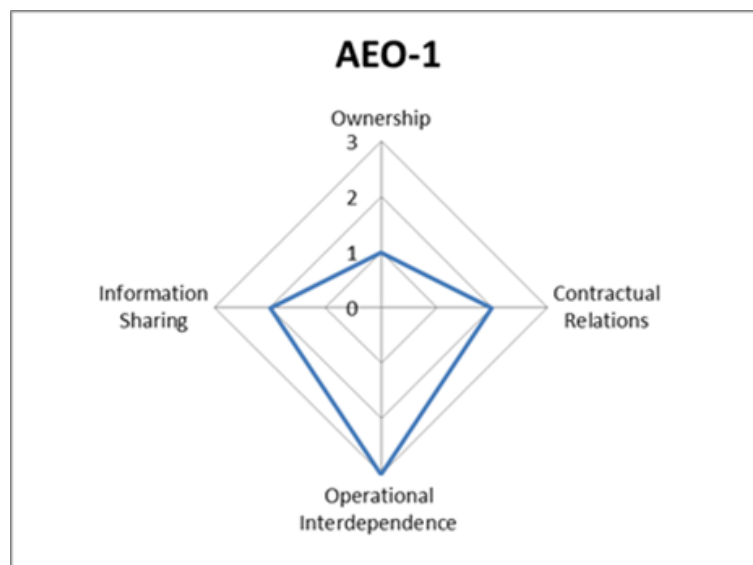


Figure 7.1 Integration emphasis in AEO-1

The findings show that only the freight forwarders in AEO-1's chain are aware of the new AEO status. Other chain members like the trucking companies and shipping agents have not been informed of this development. Consequently, the new values and requirements of the AEO program have not been extended to reach all chain members. As suggested by Fawcett and Magnan (2002), the absence of direct control over second tier chain partners deteriorates the degree of integration, which is the case with AEO-1. Table 7.1 presents a summary of the impact of AEO-1's integration mechanisms on security extension.

Table 7.1 Integration mechanisms and security extension in AEO-1

Integration mechanisms	Integrative activities	Impact on security extension
Ownership	<ul style="list-style-type: none"> - Full logistics service user. 	Gaps in security interest with all chain partners and full reliance on 3PLs to extend security concerns.
Contractual arrangement	<ul style="list-style-type: none"> - Contract is only with freight forwarders as 3PLs. 	Direct control is limited only to freight forwarders who do not effectively extend security concerns to other chain partners.
Operational interdependence	<ul style="list-style-type: none"> - Regular export plan shared only to freight forwarders; - Dedicated team in each function; - Periodic meetings; - Functional training. 	Security standards are conveyed through these channels but limited to operational level. Comprehensive understanding of AEO program is absent.
Information sharing	<ul style="list-style-type: none"> - Internal integrated information system; - 3PLs limited access (only FF); - Global access from international office; - Only email with other vendors. 	Security in internal information system is assured with limited and coded access. Email for external system is exposed to risk of open access.

7.3.2 AEO-2

AEO-2 has been in contractual relationships with almost all its chain partners, demonstrating a strong bond through which agents abide by the interests of the principal (i.e., AEOs) (Jayaram and Tan, 2010). However, all AEOs claimed that there was no specific mention of security requirements in their contracts. This also applies to AEO-2, which conveys security standards to their chain partners through other avenues like guidelines, regular meetings, and training, representing the concept of operational and strategic collaboration (Bagchi et al., 2005) and providing substantial evidence of operational interdependence. A manager confirmed this as below:

We have standard operating procedures (SOPs) agreed in the very beginning of the contract. Our safety and operation team have agreed on this and share them with the 3PLs. (For example), in a yard operator, we had incidents where cars were damaged (scratched) by an employee whose contract was terminated. We changed the policy to directly prevent

an employee from working again after we terminate their contract. Incident in this yard operator was their responsibility. We extend our security concerns by these SOPs. We have developed SOPs after (participating in) the AEO (program). Another example is an SOP to check related risks of suspicious goods inside vehicles. (AEO-2_#1)

In addition to the number of contracts existing in the chain, a robust bidding process characterizes the emphasis on contractual relations. AEO-2 conducts a careful bidding procedure every two years. The bidding procedure consists of developing specific criteria and providing business forecasts. During this process, security and safety requirements are conveyed to potential bidders to allow them to run a cost-benefit analysis. Interviews with all of AEO-2's chain partners provided positive impressions of this bidding process, noting that it was hard but rewarding. AEO-2 participants believed that the tight bidding process helps manage their chain partners' performance and integrity, including when it comes to security compliance. Therefore, the researcher allocated a score of 3 for contractual relationships and operational interdependence. However, despite its advanced internal information system, score 2 was given for its average external information sharing system and 1 for its minimum ownership of the chain functions (see Figure 7.2).

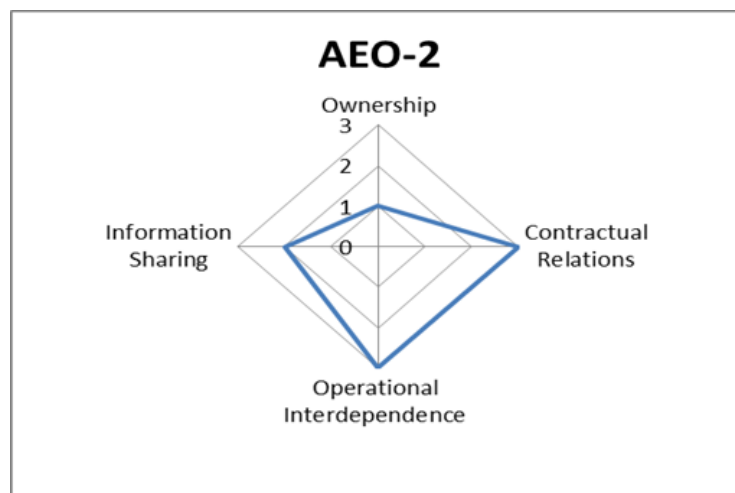


Figure 7.2 Integration emphasis in AEO-2

AEO-2 has the most integration features and demonstrates full control over the whole export chain. It does not necessarily own all chain functions, but the individual contractual relationships with each chain partner allows AEO-2 to control and ensure

the effective extension of its interests. AEO-2 imposes direct control over its chain partners to address the network-related risk of a lack of ownership (Jüttner et al., 2003). This approach requires AEO-2's thorough understanding of the network structure, flows and operational dynamics and complexities.

The existence of a logistics community with all chain actors is an effective avenue to efficiently update them on new developments, including AEO status and its requirements. The logistics community represents an institutionalization of higher level relationships between a firm and their 3PLs (Marasco, 2008). This level is characterized by a wider sharing of knowledge and technologies as found in the activities of this AEO-2 logistics community. This community actualizes the concept of sharing of skills, ideas, and institutional culture and organization (Bagchi et al., 2005). Table 7.2 summarizes the connections between integration and security extension in AEO-2.

Table 7.2 Integration mechanisms and security extension in AEO-2

Integration mechanisms	Integrative activities	Impact on security extension
Ownership	- Partial ownership.	Gaps in security interests with chain partners with different ownership.
Contractual arrangement	- Formal contracts with all chain partners.	Direct control over all chain partners to compensate for absence of ownership and ensure effective security extension.
Operational interdependence	- Regular meetings - Export plan shared to all chain actors; - Dedicated team in each function; - Cross-posting of staff; - Periodic meetings; - Regular training and value sharing; - Vendors' training and improvement program.	Chain partners display good understanding of AEO security concerns at operational and managerial levels.
Information sharing	- Internal integration of information system; - No vendors access; - Integrated vendors' information network is under development;	Risk in external information sharing system.

	<ul style="list-style-type: none"> - Global access from international office; - Only email with other vendors. 	
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7.3.3 AEO-3

AEO-3 has the added benefit of strong ownership and control in ensuring security in the whole of chain. AEO-3 operates with the same values and culture along the chain and supports easy implementation of security standards. For example, all staff wear the same uniforms, follow the same safety regulations and perform routine security practices. They are well aware of the consequences of not following the security standards. Therefore, the security practices (e.g., closing and sealing containers) are easier to implement. Further, as information integration is defined by Lee (2000), functional units have no issue in sharing confidential information with each other. This benefits AEO-3 in relation to securing the chain from all threats. However, it was evident that functional silos between departments challenge the internal integration (Rice and Caniato, 2003). For example, information sharing, as agreed by the interviewees, is still limited for internal purposes despite the benefits of greater external access. Accordingly, the researcher scored the ownership structure 3, compared to 1 for all other dimensions. Figure 7.3 presents a radar chart for AEO-3's integration mechanisms based on ownership compared to other dimensions.

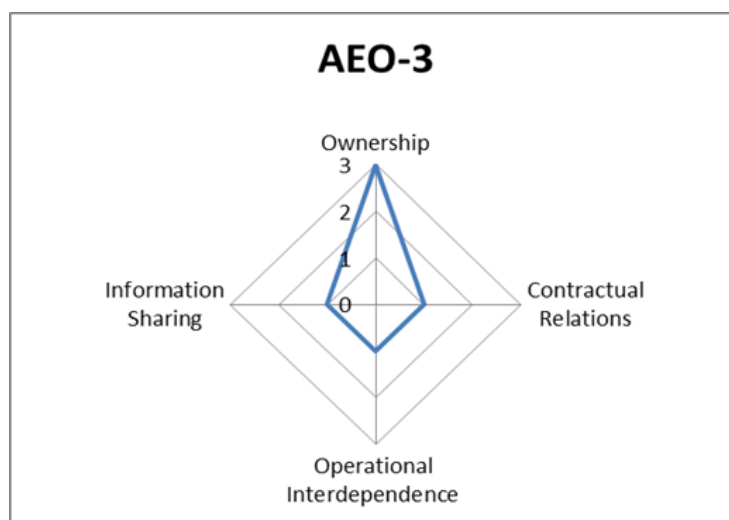


Figure 7.3 Integration emphasis in AEO-3

AEO-3 owns and manages all logistics functions from the factory to ports of export. It owns freight forwarding, warehousing, trucking and empty container parks and a seaport. However, occasionally it outsources services to truck companies, empty container parks, and ports at peak hours of business, or as the need arises. These external parties do not have contractual relationships with AEO-3 and show minimum operational interdependence, as represented by score 1 in Figure 7.3. They work casually and, for obvious reasons, lack operational dependency and information sharing. Table 7.3 summarizes the findings that connect integrative activities in AEO-3 with their impact on security extension.

Table 7.3 Integration mechanisms and security extension in AEO-3

Integration mechanisms	Integrative activities	Impact on security extension
Ownership	Full ownership.	Security standards well extended along the chain under full ownership.
Contractual arrangement	Casual contracts with trucking companies and shipping agents.	Direct control but security standards are not well conveyed to partners.
Operational interdependence	Cross-posting of employees.	No evidence of security extension to tier 2 trucking companies.
Information sharing	Internal integration of information system.	No internal risk.

7.3.4 AEO-4

Like AEO-1, AEO-4 demonstrated four indicators of integrative activities in their operations: export plan sharing system, representing common access to planning systems (Frohlich and Westbrook, 2001); dedicated team representing organizational relationship linkages (Lee, 2000); periodic meetings representing collaboration and shared decision-making with network partners (Bagchi et al., 2005); and functional training representing sharing of skills, ideas, and institutional culture and organization (Bagchi et al., 2005). This emphasis characterizes strong operational interdependence and was scored 3 (see Figure 7.4). However, ownership is minimum (score 1), and contractual relationships and information sharing were considered comparable with other AEOs (score 2).

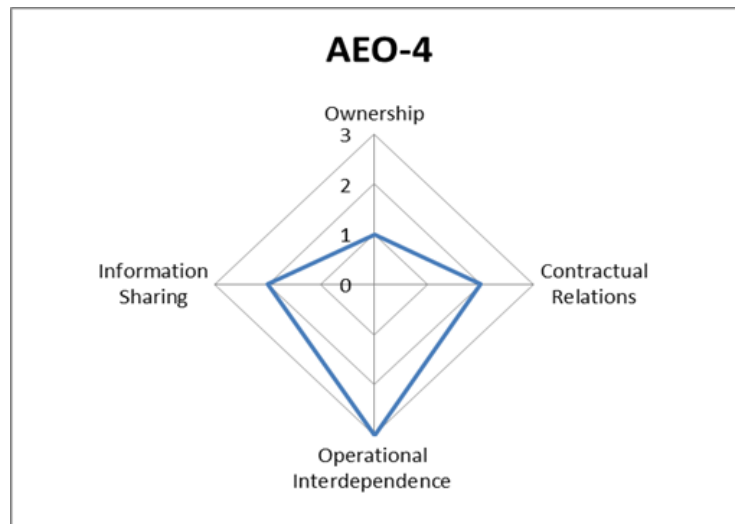


Figure 7.4 Integration emphasis in AEO-4

The evaluation of AEO-4 was limited due to insufficient data. However, the interview with the security manager confirmed that security has been enhanced with AEO implementation.

After AEO, security is more highly considered. We receive more attention and it is easier for us to propose new measures. Our global headquarters reduces the country risk of Indonesia. This may not be relevant to the AEO initiative, but we currently enjoy this evaluation. It is due to the decrease in incident report. (AEO-4_#3)

The interviews and observations revealed that AEO-4 operates in a similar pattern to AEO-1, but with more complex operations to adapt to a significantly larger variety of products and export destinations. Table 7.4 below summarizes the connection between AEO-4's integration mechanisms and security extension.

Table 7.4 Integration mechanisms and security extension in AEO-4

Integration mechanisms	Integrative activities	Impact on security extension
Ownership	- Full logistics service user.	Gaps in security interest with all chain partners and full reliance on 3PLs to extend security concerns.
Contractual arrangement	- Not enough data.	N/a

Operational interdependence	<ul style="list-style-type: none"> - Regular export plan only shared to 3PLs - Dedicated team in each function; - Periodic meetings; - Functional training. 	Channel to extend security in operational level.
Information sharing	<ul style="list-style-type: none"> - Not enough data. 	N/a

7.3.5 Improving integration and security extension

From the radar charts, arguably, AEO-2 shows the most integrated activities, characterized by contractual relationships with almost of its chain partners and operational interdependence. The logistics community is an important contributor to integration. AEO-1 and AEO-4 demonstrate basic integrated operations, as commonly found in other export chains, where the focal firms prefer to outsource their logistics functions. At the same time, AEO-1 and AEO-4 demonstrate the most extensive elements of operational interdependence by fully transferring risks and responsibilities to their freight forwarders as their only direct chain partners. AEO-3 shows very little sign of external integration given its almost total dependence on internal sources.

The tables above show that different levels of integration have different impacts on security. Typically, two important aspects of integration were absent in the AEOs' efforts to extend security to their chain partners: the inclusion of security in their contracts; and the optimal use of external information sharing systems.

7.3.5.1 Security standards in contractual relationships

A contract is an integrative element that characterizes the relationship between focal firms and their chain partners (Marasco, 2008). However, the case studies show that the AEOs do not use the contract per se to optimize their security extension to their chain partners. It was evident that the extensive contractual relationships, as found in AEO-2's supply chains, increase the level of integration in the whole chain and address the risks of indirect control due to a lack of ownership. Yet, the case studies show that it is not the regulations in the contracts that are used to effectively share chain security risk and responsibilities, as none of the contracts between AEOs and chain partners regulate security. Even though contracts allow direct relationships and extend the span of control, the contracts in the AEOs were not optimized to ensure effective execution

of security standards along the chain. Instead, as evidenced in the research, the AEOs preferred to utilize the dimensions of operational interdependence to communicate their security standards to chain partners. Therefore, in order to legally and formally strengthen the existing contractual relationships, it is suggested that security standards be included into existing contracts.

The tiers of contractual relationship found in the AEO's downstream export chains is analogous to the concept of multi-tier in upstream supply chains (Tachizawa and Wong, 2014) in terms of the fragmented operations between the focal firms and the logistics vendors or material suppliers respectively. They are different in their nature where vendors offer their logistics services, while suppliers offer components for the final products of the focal firms. However, the need for focal firms to extend visibility and knowledge beyond the first tier in upstream supply chain was also evident in this study. The general outcome of a supply chain (e.g., product quality, timely delivery) is likely attributed to the focal firm regardless the size of contributions made by its suppliers or logistics vendors and how the focal firm manages its chain partners (Hartmann and Moeller, 2014). This emphasizes the need for the AEOs to assure security extension to their chain partners.

Therefore, broadening contracts is also necessary to incorporate more actors involved in the chains. As the case studies show, the different tiers of contractual relationships complicate the relationship between the AEOs and their chain partners. This makes it more difficult for the AEOs to extend control and security standards. The multi-national AEOs (i.e., AEO-1, 2, and 4) include layers of control and multiple relationship tiers that make their supply chain structures complex, causing security standards to deteriorate among external parties. The international headquarters of these multi-national AEOs conclude the contracts with shipping lines to handle global shipments for all subsidiaries. Further, these shipping lines continue to appoint shipping agents and empty container park operators without further formal agreement with either the AEOs or their headquarters. This arrangement highlights an agency problem, with the AEOs not involved directly in signing contracts with second tier agents who invariably lack appropriate security standards. Empty container parks represent nodes with the highest security risk as they play an important role in the flow of cargo but implement minimum security measures. Recognizing that the container park is beyond the AEOs' contractual relationship and has little involvement in any AEO integrative activities, it is important to extend security standards to reach these functions. It is suggested that

security standards be included in the contractual agreements between the AEOs' headquarters and shipping operators to improve security in the whole chain.

7.3.5.2 Information sharing to optimize integration and security extension

The absence of information sharing with external parties was evident in all AEOs' export supply chains. This research revealed that the AEOs had relatively high-level IT systems for their internal operations, but not for their external export supply chain partners. AEO-2 employs the most advanced technology allowing its international stakeholders to access its system to monitor the progress of their orders. This seems to be a typical feature in multi-national companies. However, AEO-2 currently does not use an information sharing system with its export chain partners. The same can be said for AEO-1 and AEO-4, and especially AEO-3, which has the least external chain partners. While they all had internal IT systems in place, all AEOs used similar mechanisms for their external information sharing, generally communicating with their chain partners through emails. A small number of chain partners who work directly with the AEOs (e.g., warehouse operators in AEO-1 and freight forwarders in AEO-2) are able to access their respective AEO's internal systems (with limited authority), allowing them to carry out their duties. The AEOs, except for AEO-2, showed a degree of reluctance to advance their external information sharing systems, despite admitting that advancements could help streamline processes.

Information sharing is vital, especially in companies with complex webs of functions that would benefit from information systems applied across both internal and external operations (Jayaram et al., 2010). This complexity is found in the four AEOs, in their international and national trading activities, and with organizational divisions responsible for different functions. In the four AEOs, issues related to export chains come under the responsibility of export and import departments. In addition to these functions are warehousing, distribution, and transportation, which are potentially subcontracted to 3PLs. Each function works in conjunction with others and often it is essential for one department to know about the work progress of other departments in order to carry out their functions efficiently. This is where information sharing plays a vital role (Sahin and Robinson, 2002).

Information sharing represents a collaboration between chain members, allowing them to access each other's data so they can monitor the movement of cargo in each

process of the supply chain (Simatupang and Sridharan, 2002). In this research, information sharing was defined as the methods used by the AEOs, and the extent to which they were used, to share information with their chain partners related to exports. Through information sharing, chain members are provided with clearer data on the progress of cargo flow and updates that enable them to make better decisions (Davenport et al., 2001). Such information includes production and export planning data, shipment bookings and schedules, cargo transport and routing information, as well as incident reports that are of value for security purposes. SCI often features information sharing, where criteria such as relevance, accuracy, timeliness, and reliability can be used to determine the level of its contribution (Simatupang and Sridharan, 2005). As the dimension of information sharing positively contributes to SCI and is recognized as critical to a firm's performance (Yu, 2015), this research proposes that wider external information sharing systems should be used to optimize security extension to the whole chain.

7.4 Chapter summary

This chapter has presented a discussion on the AEOs' SCRM. The integration emphasis found in each AEO was reviewed in terms of their impact on security extension. It was evident that wider and more intense use of integration elements was associated with more effective control, potentially resulting in stronger security extension. Based on these findings, this research has proposed a number of ways to improve integration for achieving security extension. Chapter 8 presents the overall findings of the research and addresses the research question.

CHAPTER 8

CONCLUSION AND IMPLICATIONS

8.1 Research summary

This thesis has examined the relationship between chain integration and security extension in export supply chains. The implementation of the AEO program in Indonesia has served as the context in which to evaluate the extension of security standards from the AEOs to their chain partners through integration mechanisms. The complex chain structures, varying degree of security measures, and fragmented supply chain operations constitute challenges to the achievement of the AEO objectives of achieving extension of security standards in the whole export chains. Four independent AEOs in Indonesia were investigated through interviews and observations. A thematic analysis of the data was undertaken with integration and security themes as developed in the theoretical framework. These themes were then cross-analyzed to identify differences and similarities in integration mechanisms and security extension. From the perspective of agency theory, the study addressed the agency problems in AEOs' current state of integration and the efforts to extend security to their chain partners.

In summary, Chapter 1 presented the background of the study and knowledge gap in the literature. A detailed literature review, presented in Chapter 2, was undertaken to reveal the studies on the relationship between SCI, SCS, and SCRM that helped understanding the related issues of the research and identifying the knowledge gap. The theoretical framework and propositions were developed in this chapter. Chapter 3 provided further details on the AEO program and its implementation in Indonesia. Chapter 4 elaborated on the research design and methodology that led to the use of a qualitative multiple case studies approach, as reported in Chapter 5. The research benefitted from the participation of four AEOs with a wide variety of integration mechanisms, allowing for a rich exploration of how security is extended to different parts of export chain. Chapter 6 presented the thematic and cross-case analysis with the integration and security themes following the propositions developed in the theoretical framework. Further, as agency theory is relevant in principal-agent problems in this research, this chapter revealed that the presence of multiple tiers of contractual relationships and information asymmetry jeopardize the security extension along the

export chains. The discussion in Chapter 7 reviewed the findings in the context of the literature. The different integration levels applied by each AEO was examined in relation to their impact on security extension. Finally, this chapter concludes the research by responding to the research question (Section 8.2), presenting the contributions of this research (Section 8.3 and 8.4), acknowledging the research limitations and opportunities for further study (Section 8.5), and presenting a concluding statement (Section 8.6).

8.2 Response to the research question

In response to the research question, this research followed the constructs proposed in the theoretical framework through the multiple case studies of four AEOs in Indonesia: identification of the AEOs' chain structures; evaluation of security measures and standards in the AEOs and their chain partners; and analysis of integration mechanisms in the whole chain. These stages are reflected in the discussion below.

Research question: How does the integration mechanism influence the extension of security standards from focal firms to chain partners in Indonesian export supply chain?

The research mapped the structures of the four AEOs' export supply chains. This revealed the actors of each chain, their functions, and contextual existence. The maps also display the flows of cargoes, which involve a different number of nodes and links, starting from the AEOs' premises and ending at the ports of exportation. The maps show similarities in terms of the inclusion of typical actors with common functions, as well differences in flow patterns and the number of actors involved, depending on the unique characters of each AEO. The table below summarizes the key findings in relations with the research proposition as elaborated in Chapter 6.

Table 8.1 Propositions and summary of findings

Proposition 1	Proposition 2	Proposition 3
Supply chain structure, comprising of actors, functions and their contextual existence, affects the extension of security standards in export supply chains.	Extension of security standards from focal firms to chain partners can be facilitated by integration mechanisms.	Overall security extension is dependent on the effectiveness of the interactions between security standards, chain structures and the integration mechanisms.
Key findings		
Proposition P1 is supported. When the chain structure is complex involving more actors and operations, the focal firms have more efforts to extend security standards.	Proposition P2 is supported. Contractual relationship, as one of the integration mechanisms, shows the most dominant role to effectively extend security standards, especially when the chain structure is complex.	Proposition P3 is supported. The breadth of the chain structure influences the efforts to extend security standards where integration mechanisms show significant roles to help facilitate.

There are several major highlights related to security measures in all AEO case studies. First, there is a gap in security levels between AEOs and their chain partners. While the AEOs display the expected security standards as outlined in the AEO guidelines, their chain partners do not always show similar security standards. Large chain partners with major functions in the chain show relatively high security standards in their premises. Most of these are international companies with a close affiliation to the AEOs that are also multinational companies. Freight forwarders with an international reputation in AEO-1 and port yard operators in AEO-2 are examples of chain partners with high security standards in their premises. However, these standards dilute in smaller companies, especially those with a minor role in the export supply chain. Small trucking companies in AEO-1's chains are examples of this.

Second, the AEOs generally focus more on physical security at nodes and links where there is direct contact with cargo. Security in premises such as warehouses, container yards, and container conveyances receive more supervision from the AEOs. On the

other hand, security at premises indirectly connected with the goods flow receive less attention from the AEOs. This approach is understandable given the assumption that there may not be an immediate risk to cargo at, for example, a freight forwarder's office, except in terms of data and communication systems. However, during the fieldwork for this study it was observed that truck yards, where there is the potential risk of empty trucks be tampered with, sometimes had very minimal premises security.

The third key research highlight is that security measures implemented in each function are similar and generally found in export chains. Common practices such as checking empty containers, using seals, and taking over procedures between functions are generally practiced in export chains. These security practices are not unique to AEOs. The AEOs' chain partners, who also work for non-AEO exporters, confirmed this point.

The security measures extended from the AEOs to chain partners are relative to the type of goods and functions of those chain partners. AEO-1 and AEO-2 are relatively strict in ensuring that their chain partners handle their cargoes carefully because their products require special handling (e.g., electronic goods that are sensitive to water in AEO-1 or cars that use special car carriers to transport them from manufacturer to the port). These AEOs periodically produce new products that require different handling. Therefore, AEO-1 and AEO-2 provide their chain partners with security training programs every time they introduce new products. AEO-1 and AEO-2's training and education is specific to certain functions. These training programs are often confused with safety considerations, but their purpose is generally aimed at securing the integrity of goods. These programs are not intended to protect the chains from the risk of terrorism. AEO-3 and AEO-4 do not have particular training programs for their chain partners since their products tend to be the same and are less sensitive.

It should be noted that most of the above security practices in the chain partners did not all result from the AEOs' security extension efforts. Many are common practices that existed before the AEO program was introduced. Security extension includes the awareness of risks related to terrorisms from the AEOs to their chain partners. This awareness is shown in their understanding that security risks are not limited to traditional threats of losing their cargoes. These threats are generally associated with theft. The current AEO program expands this threat to add terrorism where the risk includes the insertion of illegal material to their cargoes. The awareness of this new risk

varies in the internal AEOs and their chain partners. The success of their security extension is portrayed by the level of awareness of terrorism as the new security risk.

A number of provisions in the AEO guidelines encourage integration in supply chains. First, the guidelines urge the use of contracts to regulate the relationships between functions in the chains. Second, the AEOs need to be aware of the players in every part of the chain and how they operate in terms of security. However, the case studies do not show a significant change in integration mechanisms before and after AEO certification. All AEOs admitted that they all had to add specific security measures to pass the certification process, but these new measures barely changed their existing state of integration.

However, the case studies conclusively showed that the way the AEOs extend their security interests is influenced by the ownership and contractual structures of their chains. The integration mechanisms of operational interdependence and information sharing also determine effective security extension in the whole export supply chains. Since each AEO has a different chain structure, their methods for extending security concerns are also different and, therefore, must be discussed individually. AEO-4 is excluded from the discussion due to insufficient data on how security is extended to its partners.

AEO-1 is a total logistics service user, lacking a direct relationship with other chain actors except for its freight forwarders, who function as 3PLs. It only owns the warehouse and uses third parties to run other functions in its chains. AEO-1 conveys its security concerns to the 3PLs who then, ideally, extend them to the other chain actors. However, during interviews and observations this was found not to be the case. Even though the 3PLs were well aware of the new AEO status of their client, participated in the certification process and were audited by customs for their security compliance, they did not show a good understanding of their responsibilities to extend security concerns to the chain actors under their control. The study also observed that the security practices found outside AEO-1's premises were carried out without any awareness of terrorism as a risk.

Like AEO-1, AEO-2 does not own most of its chain functions, except warehouses and vehicle yards. The major difference, however, is that AEO-2 prefers to maintain direct relationships with all functions in its chains. It conducts periodic bidding processes and establishes contracts with each partner. These direct relationships imply direct control

and supervision, which are translated into an effective security extension in the whole export supply chains. Contracts between AEO-2 and their chain partners are effective instruments to convey the AEO's interests. However, in many cases, the contracts do not regulate security agreements in detail. More detailed guidance is conveyed through operational means, such as operational guidance documents, periodical meetings, and training. Moreover, AEO-2 created an organization with its chain partners as members (i.e., the logistics community). This organization is an effective means through which to share operational updates and interests, as well as security concerns. It constitutes a highlight in the integration mechanisms used to extend security awareness.

AEO-3, which owns almost all functions in the chains, does not conduct any measure of security extension to external actors. Since most of the functions are under the same company, they share the same corporate culture and values, including security concerns. The only external parties in its chain are small trucking companies to whom security concerns are not extended.

8.3 Theoretical contributions

This research contributes to the theory on supply chains in a number of ways. First, this research enhances the conceptual understanding of the relationships between SCI and SCS. The use of SCI mechanisms to facilitate security extension in export supply chains in the AEO program is the unique contribution of this study. As proposed in the theoretical framework, this research demonstrates the inter-relationships between chain structure, security standards, and integration mechanisms. It shows that security standards deteriorate in multiple-tier supply chain relationships. This research proposes ownership, contractual relationship, operational interdependence and information sharing as the elements of integration mechanisms to comprehensively evaluate security extension in whole supply chains. This study offers a new perspective on how chain structure and integration mechanisms impact security standards compliances, hence the extension of these standards into the export supply chain.

The case study analysis enabled the topography of the chain structures that influenced the approaches of the focal firms to extend security standards. The topography demonstrates that when chain actors adopt wider integration mechanisms, they create more avenues to extend their security, leading to more effective security extension across the entire chains. Each case study presents unique integration mechanisms and

their influence on the inter-relationships between chain actors and methods of security extension. Ownership facilitates standardized security measures, contractual relationships strengthen security control and coordination, and operational interdependence together with information sharing support security coordination.

Second, this study reveals the agency cost of implementing a SCRM strategy and security extension through a qualitative examination of a theoretical model of the principal-agent relationships. Theorizing from the literature at the intersection of SCI and SCS, and by observing, documenting and analyzing complex supply chain networks with multiple tier relationships, this research highlights that extending control beyond the direct dyads is critical. It was evident that the agency cost stretched to reach all chain members with effective contractual relationships, compensated by the effective extension of security. The most intense agency cost of extending security control and coordination exemplifies the argument that the relationship between principal and agent is ideally moderated by contract mechanisms (Fayezi et al., 2012). Additionally, the concept of security extension in this research provides a further understanding of the way the intersection of SCI and SCS is developed.

Terms such as collaboration, cooperation, or coordination dominate the definitions of SCRM (Tang, 2006a, Thun and Hoenig, 2011, Jüttner et al., 2003), which indicate the equal roles and responsibilities of chain member in managing risks in supply chains. This research offers a formula of “single intelligence” (Robinson, 2015), as represented by the AEOs in extending integration and security to all chain members. The term ‘extension’ implies an element of power from the AEOs to share security risks and roles with their chain partners, which has been absent in the current definitions of SCRM.

Third, this research fills a gap in relation to the relationship between SCI and SCS. It examines the use of integration mechanisms in extending security to chain partners from the perspective of the AEO program. This research has expanded constructs of integration mechanisms modified from Robinson (2009), originally designed to evaluate performance, to a broader application in SCS. Therefore, this study contributes to the body of knowledge on SCI that focuses on integration between focal firms and their logistics partners, especially for security purposes. While previous SCI studies have focused on the benefits for the performance of firms or supply chains, this study fills the knowledge gap by examining integration strategies aimed at achieving security extension across four supply chain case studies.

Much of the earlier research in this area have used firm as the unit of analysis. This research however used the export supply chain as the unit of analysis. Adopting this approach allowed a comprehensive evaluation of SCI and SCS in an export supply chain, making this study unique in its contribution.

Fourth, a number of national and international security initiatives are offered for improving SCS in the context of international trade. The AEO program is gaining traction for its potential to influence the development of international logistics and supply chain practices (Altemöller, 2011). Despite their importance, SCS initiatives, particularly the AEO program, are still under-researched. This study further contributes to the security literature by presenting the complex network of port-oriented and maritime logistics and export supply chains that challenge the implementation of SCS initiatives.

8.4 Practical contributions

This research presents practical implications for the AEOs, exporters and other firms operating in international trade in general, as well as customs administrations in their AEO policy development. First, for the AEOs, these findings can be used to improve their efforts to manage security risks in their export supply chains. While security standards are inherently embedded in the AEO program and the AEO status is granted based on the evidence of security practiced, the AEOs still need to be mindful of the risk that their security standards may be weakened as more partners from different relationship tiers are incorporated into the chain operations. Additionally, this research highlights that awareness about the AEO program is weak in some chain members and is even absent in others. Multiple tiers in contractual relationships complicate the AEOs' efforts to extend security. Chain members in more remote tiers tend to dilute security extension, especially where the involvement of the focal firms is limited. Extending security to these tiers is crucial in this context. Therefore, the AEOs need to use the power of integration mechanisms, such as contracts and information sharing, with all partners across the supply chain to manage and mitigate the risk of terrorism. This research highlights that AEOs need to understand the significance of SCI and how it can assist in extending chain security to partners across the tiers through integration mechanisms.

Second, the study demonstrates that the four AEOs must articulate the security standards and compliance requirements to their chain partners. Inclusion of the standards and expected security measures in contracts or other binding documents will assist in improving the compliance of chain partners. Moreover, the risk of terrorism poses a new security threat that differs from the traditional security risks. Therefore, chain partners need to be updated about security policies through regular training and awareness programs. This training should include the identification of vulnerabilities in every node and link of the chains. Training should be focused on educating chain partners about the risks of terrorism and how managing those risks requires different approaches than those applied to traditional supply chain risks.

Third, for customs, this study highlights that the existence of an AEO in a supply chain does not necessarily eliminate risks along the chain. An AEO chain partner with poor security measures introduces a weak link susceptible to security breaches. Therefore, customs risk management strategies to assess security should consider security along the entire chain, including consistent evaluation of all actors and their operations.

8.5 Limitations and opportunities for further research

While this research has made both theoretical and practical contributions at the intersection of SCI and SCS literature, there are few limitations of the study that offer opportunities for further research. First, as the AEO program is increasingly being adopted, further analysis with a larger number of case studies would be useful. This interview-based qualitative study gathered findings from four AEO cases out of a total of five at the time of study. Future research could include more chain actors with AEO status because AEO numbers have increased to include additional functions such as importers and freight forwarders. Inclusion of these AEOs in future studies would provide more insights on whether the security extension is better achieved when more AEOs operate in a supply chain. In addition, future research in the context of a different country or a different security program could benefit from the approach and theoretical framework used in this research to further enrich the empirical examination of SCI-SCS relationships.

Second, while this qualitative case study has produced a comprehensive and in-depth evaluation of the relationship between integration mechanisms and security extension, the influence of integration levels to security outcomes requires further scrutiny. For

that purpose, a cross sectional questionnaire-based survey of the AEOs and their chain partners will help testing the hypothesized relationships in the theoretical framework.

8.6 Concluding statement

The aim of this research was to study the relationship between SCI and SCS in export supply chains. The AEO program in Indonesia provided a fertile ground to investigate different models of export supply chains and security standards via the four AEO case studies. The theoretical framework, together with agency theory, helped to systematically examine the use of integration mechanisms to extend security standards in these different chain structures. The research identified security deterioration in the extended tiers of logistics service outsourcing, especially when direct control from a focal firm is absent. Therefore, the agency cost of extending contractual relationships to all chain actors is an effective strategy to extend security in the whole export supply chain. These findings highlight the importance of placing an emphasis on developing a positive relationship between SCI and SCS for effective SCRM strategies.

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Appendix 1: Example of data analysis process (Thematic and cross case analysis on integration mechanisms)

THEMES (Integration mechanism)	SUB-THEMES (Integrative activities)	AEO-1	AEO-2	AEO-3	AEO-4
Ownership/ Managerial level interviewee		Interview #1: - Only own the warehouses but operated and managed by 3PLs.	Interview#1: - Elements of common ownership: International AEO-2 and Toyo Fuji (yard operator), national AEO-2 and car carrier vendors. - Warehouse and CY are owned and operated by AEO-2.	Interview#2: - AEO-3 created and owns the FF to handle export import in all companies under AEO-3 group.	Interview#1: - We only focus on manufacture and distribution. We outsource other logistic needs. Ex. Distribution center is handled by 3PL. They have high standard on performance and security.
Summary:		Total logistics service user.	Partial ownership.	Total ownership.	Total logistics service user.
Contractual arrangement/ Managerial level interviewee		Interview #1: - FF is determined by international HQ. - Our contracts are only with direct dyads. - Renewed automatically annually. - Contract is general only about price and estimated workloads. Security is regulated in separate documents. Interview #2: - Shipping line is determined by global principal through global bidding. Interview #4: - Competition between 3PLs occurs in bidding for spare parts export. - 3PL has annual contract with main and big TC to assure 50 trucks are provided and dedicated for AEO-1 needs.	Interview#1: - AEO-2 and YO renew contract every two years. Interview#2: - Bidding in two years for all vendors. Totally 16 vendors. - Shipping lines is not included in the logistics community. They are appointed by Regional HQs for all international affiliates that result in efficient price. Interview#3: - Bidding is once in two years but will be changed to once in three years. Interview#4: - Contract between AEO-2 and CY only covers price and area reserved for AEO-2. - AEO-2 pays per container stored in CY and services.	Interview#1: - Contracts are only with shipping lines and are renewed annually. Interview#2: - FF negotiates contract with shipping lines for all AEO-3 operations. - Contract with shipping lines can be annually, quarterly or monthly based on volume and price. Interview#3: - Bidding with trucking is every two years. Last one was not real bidding because we needed more trucks than the participating bidders. So we basically accepted all of them. - Now when business is low, it is a good time to evaluate their price and performance.	Interview#1: - What is included in contract: Service quality, price, confidentiality, code of conducts, "UK anti bribery", safety, compliance. - Contracts are renewed periodically: one or two years. - Security is also an element of evaluation. Safety is easier to evaluate. Security is more related to theft, etc. - Less number of 3PL does not always mean more integration. Warehousing is easiest function with most profits. It is similar with trucking and freight forwarding. It is different with customs broker who has high risk but small revenue. It requires many

		<ul style="list-style-type: none"> - No contract between 3PL with small trucking companies. <p>Interview #5:</p> <ul style="list-style-type: none"> - Contract exists between component's 3PLs and one trucking company. Not detailed. <p>Interview #7:</p> <ul style="list-style-type: none"> - Truck vendor can subcontract to other vendors if necessary and with approval from 3PL but without permission from AEO-1. <p>Interview#9:</p> <ul style="list-style-type: none"> - TC-2 started to have contract with FF-1 from 2013, before that was on-call basis. - The contract was won through bidding with 60 trucks dedicated for FF-1 and AEO-1 operations. <p>Interview#10:</p> <ul style="list-style-type: none"> - Contract with liner is managed by HQs. It only mentions fees and estimated shipment. Nothing about security. 	<p>Ex. Lolo (lift on, lift off).</p> <p>Interview#8:</p> <ul style="list-style-type: none"> - Terminal operator employs two vendors for car drivers. No contract and contact between AEO-2 with these vendors. 		resources.
Summary:		Global contracts for shipping lines; AEO-1 is only with direct dyads (FF); evaluated annually; Contain standard and general elements like price, work scope and forecasted volume.	Global contracts for shipping lines; Contracts are concluded by AEO-2 with all vendors except sub-vendors; renewed per 2-3 years; Contain standard and general elements like price, work scope and forecasted volume.	Contracts are concluded between internal FF with shipping lines; evaluated per 2 years; Similar contents.	Contracts with 3PLs; evaluated annually; Include safety and security. (Not enough data from chain partners for validity test).
Operational interdependence / Managerial and operational level Notes:	Access to planning systems (Frohlich and Westbrook, 2001)	<p>Interview #2:</p> <ul style="list-style-type: none"> - Shipment plan is shared weekly and daily. Weekly plan to help prepare trucking. - Information contains stuffing 	<p>Interview#1:</p> <ul style="list-style-type: none"> - Export plan is shared monthly, weekly and daily. - Monthly meeting to distribute timetable to all vendors that include 		

Information collected from different interviews with different people from different companies provides data triangulation and support data validity.		<p>plan, part number, destination, quantity, buyer.</p> <p>Interview #4:</p> <ul style="list-style-type: none"> - AEO-1 shares monthly export forecast and weekly detailed export plans. <p>Interview #5:</p> <ul style="list-style-type: none"> - For spare-part exports, AEO-1 shares weekly plan and daily details (shipping Instructions). 	<p>production plan, number of cars produced, destinations, etc.</p> <ul style="list-style-type: none"> - In timetable, vendors are informed of their shares of upcoming work (who will get what). - The daily plan is in line with monthly plan with more detailed information. Probability of deviation is low (less than 5%). <p>Interview#3:</p> <ul style="list-style-type: none"> - Vendors receive information only for fixed plan N-1. - Information distributed to vendors in the form of Work Instruction for one month (N-1). This is generated from AEO-2 system. - For components or containerized export, it contains information like buyer, vessel booking, shipping agent, vessel names, number of containers. - Working instruction is one sheet for all vendors allowing every vendor to know other's work share. - Daily trucking plan (DTP) is issued by Logistic planning division. - Export division issues monthly plan. - Shipping schedule is globally developed by international HQ. <p>Interview#4:</p> <ul style="list-style-type: none"> - TCs receive DTP D-1 morning for next day operations. <p>Interview#5:</p> <ul style="list-style-type: none"> - Monthly timetable and DTP 	
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			are received through email. - YO: with monthly timetable, we prepare the space.		
	Organizational relationship linkage (Lee, 2000)	Interview #1: - Dedicated internal unit to supervise 3PLs. - Dedicated team in 3PLs to handle AEO-1's business.	Interview#1: - Three AEO-2 staff are posted in YO to supervise car handling and loading to vessels. They make monthly evaluation using QCDSM approach (quality, cost, delivery, safety, morale). Interview#5: - AEO-2 is serviced by dedicated team/contact persons in CY that specially handles their containers. Interview#7.1: - Car carrier vendor posted staff at vehicle yard to collaborate with AEO-2.	Interview #3: - "We don't have data of drivers. But we have representatives from TC posted in AEO-3. They will make sure that the drivers are really from the correct TC."	
	Collaboration and shared decision-making with network partners (Bagchi et al., 2005)	Interview #1: - Monthly business review only with FFs. Interview#3: - Weekly meeting to respond shipment plan. Interview#8.2: - FF and TC meet monthly to review lead time, KPI, etc.	Interview#7.1: - Weekly meeting every Wednesday between AEO-2, TO, IKT and SLs.	Interview#2: - Weekly internal meeting: production, warehouse, marketing, FF. Interview#4: - Communication with production, marketing is led by mill head. We meet weekly. - In SAP system we can see activity from other divisions. Ex. Logistics division can see occupancy rate in the warehouse through SAP. Warehouse can see production plan. So we can all prepare.	
	Collaboration leading to risk, cost and gain sharing (operational and strategic collaboration) (Bagchi et al., 2005)	Interview#2: - Customs documents are prepared by FF using AEO-1's identity and signed by AEO-1.	Interview#1: - Customs documents are prepared and signed by AEO-2.		
		Interview #8:	Interview #5:		

		<ul style="list-style-type: none">- Handover is done by signing documents. Ex. Truck driver at warehouse.	<ul style="list-style-type: none">- Exchange of hard documents as control system on arrival of container and its condition at CY. YO reports to AEO-2 as result of DTP.		
Sharing of skills, ideas and institutional culture and organization (Bagchi et al., 2005)	<p>Interview #6:</p> <ul style="list-style-type: none">- In part's chains, AEO-1 trains the warehouse operator on packaging and management. Some employees are AEO-1's former employees.- All AEO-1's warehouses around the world are similar in layout, aisle design and measurement, management and equipment even though they are operated by 3PLs.	<p>Interview#1:</p> <ul style="list-style-type: none">- AEO-2 prefers to have a long relationship with partners. Some of its vendors have been working since the first export.- Logistics Community (LC) as a venue to share values with all logistics vendors. <p>Interview#2:</p> <ul style="list-style-type: none">- All current 16 vendors are LC members.- We have a lot of demands to our vendors and expect to develop them too.- In LC, we absorb their needs in meeting our standards.- Our vendors also use LC to share ideas with other vendors about their strategy to meet our requirements. They are competitors, but they can support each other. <p>Interview#3:</p> <ul style="list-style-type: none">- We need to maintain and level up our vendors in their knowledge and capacity.- Our vendors are also members of different organization relevant to their nature of business as trucking, FF, etc. (e.g., ALFI, ALI).- CSR program collected from each vendor.- Vendor award for logistic in February 2016.	<p>Interview#3:</p> <ul style="list-style-type: none">- We promote "New life activity" (ex. Speed limit for truck and all employees inside mill, parking discipline, rest at parks, fire extinguisher, SIM). We give penalty to vendors who don't comply. If they don't pay, they will not gain access next time.		

			<ul style="list-style-type: none"> - LC office in Graha Serra. - Motto: to be the best and flexible global vendors. - LC is only in Indonesia and an initiative from EID (Exim Dept. at AEO-2) <p>Interview#6:</p> <ul style="list-style-type: none"> - TC participated in AEO-2's truck driving contest. "It is good to improve our drivers' knowledge and skills. So that they do not only pursue volume and neglect safety." <p>Interview#7.1:</p> <ul style="list-style-type: none"> - AEO-2 trains vehicle carrier drivers about locking procedure (Tie-down procedure) to secure the position of cars on the carriers that is different between each type of car. This procedure refers directly to HQ who issues the procedure for each car type. - AEO-2 trains new car drivers. <p>Interview#8:</p> <ul style="list-style-type: none"> - YO trains vendors for driving skill and safety. 		
Summary:		Regular plan sharing system only to direct dyads; Dedicated team in each function; Periodic meeting; Functional training.	Uniform regular plan sharing system to all chain actors; Dedicated team in each function; Cross-posting of staff; Periodic meeting; Regular training and value sharing; vendors' competition and improvement program.	Cross-posting.	Not enough data.
Information sharing / Operational level	<p>Joint EDI access/networks (Frohlich and Westbrook, 2001)</p> <p>Notes: Other similar terms and</p>	<p>Interview #1:</p> <ul style="list-style-type: none"> - The use of the same information system with limited authority relevant with the jobs. - It helps visibility in all episodes of the chain. 	<p>Interview#1:</p> <ul style="list-style-type: none"> - No external integrated system with chain partners. - We have internal integrated system. Each division can download the information and share them to related 	<p>Interview#1:</p> <ul style="list-style-type: none"> - SAP only for internal communication between divisions. - Only email is used for external. 	<p>Interview#1:</p> <ul style="list-style-type: none"> - We have internal logistic planning in Unilever (SAP). - But for external parties, access to internal system is limited depends on their needs and authority. 3PLs

	<p>concepts from other scholars:</p> <ul style="list-style-type: none"> - Degree of information sharing and decision-making coordination as two major dimensions of SCI at the operational level (Sahin 2002). - Information integration (II) (Lee 2000) - Information sharing and communication across the SC (Bagchi, 2005) - Integration using information technologies includes EDI (Jayaram et al. 1998; Frohlic 2001) 	<ul style="list-style-type: none"> - 3PLs has limited access to AEO-1's ERP sufficient with their functions in different episode. Ex: warehouse. - 3PLs has a system to track shipment until destination. AEO-1 can access this system only to check. - AEO-1's HQs has a global system that enables control on production and logistics. Each national system, including Indonesia, both manufacturer and 3PLs are mandatory to update their production and delivery progress to the system. <p>Interview#2:</p> <ul style="list-style-type: none"> - Communication with other partners is through email. Ex trucking, shipping agents. - AEO-1 has "on time delivery" service to its buyers that also increase visibility because when goods are ready in the warehouse, the information is uploaded to the system and buyers can be notified. - AEO-1 controls containers arrival at port from port's website. - 3PLs control it from 4 hours lead time. <p>Interview#3:</p> <ul style="list-style-type: none"> - Observation on the use of Global Enterprise Resource Planning (GERP) that is accessible by intl HQ. - Direct 3PLs can also access it. - Security access with pin 	<p>vendors via email. But we do not share this system with vendors.</p> <ul style="list-style-type: none"> - The system is also used by international HQ so we cannot share it with our vendors. - Through this system, our international HQ and affiliates can see the progress of our production and their order. <p>Interview#3:</p> <ul style="list-style-type: none"> - There is an international global system for all production bases for export in Thailand, India, and Indonesia. Every month our performance is controlled. The global system will give alert if there is a short shipment. <p>Interview #4:</p> <ul style="list-style-type: none"> - DTP is sent by email from AEO-2 to all trucking companies. - All communication from AEO-2 to vendors use emails. AEO is developing a portal system to replace email. Production supply chain has portal to communicate with suppliers. We are developing similar system in import and export chain. - AEO-2 issues monthly timetable for work estimates. <p>Interview#5:</p> <ul style="list-style-type: none"> - Timetable and DTP is enough to prepare the coming works. - Other than communicating through email, LC has Whatsapp group when there is a change, the group will 	<p>Interview#2:</p> <ul style="list-style-type: none"> - Information system only internal. - Internal system AWQ can tell the time of truck arrive at warehouse, loading and leaving the warehouse. <p>Interview#3:</p> <ul style="list-style-type: none"> - "We have a system about cargo readiness inside internal SAP. We can communicate with marketing and production in this system. There are cases where marketing decides to ship the cargo even though it is not complete (minus one box) because, for example, the customer needs the goods immediately and vessel schedule cannot wait." - This system is only shared with related divisions and with limited authority. 	<p>will reformat the information into excel for easy use in their domain.</p> <ul style="list-style-type: none"> - AEO-4 contacts 3PL on logistic planning, through system or email. <p>Interview#2:</p> <ul style="list-style-type: none"> - No integrated system with vendors. All communication by email.
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		<p>and SMS authorization code.</p> <ul style="list-style-type: none"> - 3PLs entries shipment details following shipment plan from AEO-1. <p>Interview #4:</p> <ul style="list-style-type: none"> - 3PLs input container departure time in the system that connects to HQ. <p>Interview #5:</p> <ul style="list-style-type: none"> - For spare parts export, communication is only done through email between AEO-1 and 3PLs and trucking. No information sharing system. <p>Interview #7:</p> <ul style="list-style-type: none"> - Truck vendors only communicate with 3PL through email. Google drive is also used to share information. <p>Interview #8:</p> <ul style="list-style-type: none"> - No integrated information system between FF and TC. <p>Interview#8.2:</p> <ul style="list-style-type: none"> - TC has used 'new client' system offered by port (UTC III) that allows traceability at port and online payment. <p>Interview#9:</p> <ul style="list-style-type: none"> - TC-2 has its own information system (SQL) not connected with FF-1 or AEO-1. - Data in SQL includes client's name, FF-1, driver's name, fee. <p>Interview#10:</p> <ul style="list-style-type: none"> - AEO-1 communicates with shipping agent through emails. 	<p>be noisy.</p> <p>Interview#7.1:</p> <ul style="list-style-type: none"> - Business process in CBU export utilizes integrated information system not found in component. It internally connects the plant, VY and EID. - Externally there is no sharing information system in export. So email is used. - IKT (car seaport) has its own system but does not connect to AEO-2. <p>Interview#7.2:</p> <ul style="list-style-type: none"> - The movement of new cars in VY is monitored through the system that can be accessed internally by different divisions. <p>Interview#8:</p> <ul style="list-style-type: none"> - TO scan car barcode and upload the information in the internal system, so AEO-2 knows that cars have arrived in port. 		
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		<ul style="list-style-type: none"> - Shipping agent provides tracking system online. - No shipping agent has information sharing system with clients, but some clients have asked for similar service and it is being developed. <p>Interview#11.1:</p> <ul style="list-style-type: none"> - CP has no communication with other actors, except to shipping agents. Only manual exchange of D/O and empty containers. 			
Summary:		Internal integrated information system; 3PLs limited access (only FF); Global access from international office; Only email with other vendors; hardcopy document used.	Internal integrated information system; No vendors access; Integrated vendors information network is under development; Global access from international office; Only email with other vendors; hardcopy document used.	Internal integrated information system; No vendors access; Only email with other vendors; hardcopy document used.	Integrated internal system but not with external.

Appendix 2: Case study protocol



CASE STUDY PROTOCOL

Case study protocol contains procedures and general rules important to guide the investigator to carry out the case study (Yin, 2003). Developed from Yin's model, this case study protocol includes:

1. Overview

- Objectives
Indonesia is currently implementing an International security initiative in supply chains, the Authorized Economic Operator (AEO). Currently there are five exporters certified as AEOs. This initiative aims at securing international movement of goods by emphasizing the importance of integration and a whole of chain perspective. Recognizing the novelty of SCS in Indonesia and the tendency of supply chains to operate in disintegrated manner, this case study aims to identify chain structure and integration level of each AEO. These objectives are in relation to their efforts in extending security interests with their chain partners under the scheme of AEO initiative.
- Assumption/proposition
 - o Higher integration offers higher security
 - o Higher security requires inclusion of security aspects in integration.
 - o Security should be elaborated in every aspect of integration.
- Case study issues
 - o What is the chain structure of each AEO?
 - o What are integration aspects existing in the chains?
 - o How does the AEO extend its security interests to its chain partners?
- Unit of Analysis
An estimate of 15 to 20 participants is expected for interviews and observation. This number consists of a minimum of three from five total populations of AEO and maximum five chain partners from each of three AEO. Each AEO is expected to have different chain structure that represents different level of integration.
- Pilot study
Select an exporter and chain players to test the prepared questions and gain more knowledge about security and integration on operational level. Modify plan if needed.

2. Field procedures

- Access to sites

Information on AEO contacts have been gained by the investigator before starting the research. Correspondence has been made and schedule is prepared prior to departure.

- Procedures
 - o The investigator seeks to obtain initial agreement through phone and email correspondence. Brief introduction on the research has been conveyed.
 - o On sites and at interviews, re-introduction will be made about the research and conducts of research.
 - o Ethics forms are distributed and explained. Participants to fill and sign the forms.

3. Data collection

Multiple sources of information (verbal, documents, observation, literature review) are pursued to allow triangulation of evidence that converge on the same facts.

- Interviews
 - o Questions are arranged in groups determined by level of importance/relevance in answering research questions.
 - o Interviewees should be in managerial and operational level who have sufficient knowledge in company's policy and operation related to AEO and security as well as on export operations and interdependent operations with chain partners. Ex. Export manager, Compliance manager, Government relation manager.
 - o Key information are obtained by open-ended, semi-structured interview with focus on chain structures, integrating mechanisms and measures in extending security interests to chain partners.
 - o Interviews are to be conducted in participants' premises and to be audio recorded with their permission.
 - o Self-voice recording is done prior to interviews to describe situation, information about interviewees or companies. Self-audio recording is also conducted during observation.
- Observation
 - o Visit sites to understand export operations and identify related security measures.
 - o To observe security measures implemented in AEO premises and compare with those implemented in their chain partners.
- Documents
 - o Business plans, reports, company profile related to security awareness.
 - o Contract with chain partners to learn whether and how security is regulated. If not possible, a template on security measures may suffice the need.
 - o Export declaration that shows the use of customs broker/freight forwarder.

4. Report plan

- Develop case study report so that information collected suit the format that ultimately aims to answer the research question.
 - o Identification of chain structure where individual AEO firm operates.
 - o Studying integrating mechanisms represented in the chain.
 - o Evaluation of integration level of each chain.
 - o Identification of measures to extend security concern with partners in the chain.
 - o Analysis on the relevance of integration and security in supply chain.

- Interviews are to be transcribed immediately after when possible. If it is not, a summary is a must to avoid losing momentum and important information.
- Transcribed interviews or their summaries are to be sent to participants for approval and validation.
- Discuss each chain separately and develop standard format (chain structure, integration level, security extension, etc.).
- Analyze and compare at discussion chapter.
- Identify what are the most and least important integrating aspects necessary to extend security.

5. Attachments

- AEO Contacts and summary of correspondence
- Questions list
- Schedule of interviews and observations (AEOs first, then chain partners from different layers accordingly)
- Background information on AEOs
- Generic functions of chain player participants (exporter, warehouse, trucking, customs broker, freight forwarder, port operator, container yard, etc.)

Appendix 3: Consent form



CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS:

We would like to invite you to be a part of a study on supply chain integration and security in the implementation of Authorized Economic Operator (AEO) program in Indonesia.

This study aims to observe the AEO implementation from the whole of chains perspectives and observe the mechanisms in extending security concerns between firms in the chains.

Participants are expected to respond to questions about their export operations, the use of logistic service providers, internal security measures, and security relations with other firms in the chains.

CERTIFICATION BY SUBJECT

I, (name)....

of (company)...

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study:

SECURITY AND INTEGRATION IN EXPORT SUPPLY CHAINS THROUGH THE PORT OF TANJUNG PRIOK, INDONESIA being conducted at Victoria University by: DR. Himanshu Shee

I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me by:

Student researcher: Dicky Hadi Pratama

and that I freely consent to participation involving the below mentioned procedures:

- Interview
- Observation of export operations and related security measures

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardize me in any way.

I have been informed that the information I provide will be recorded and treated as agreed.

Signed and date :

Any queries about your participation in this project may be directed to the researcher

Dr Himanshu Shee / Phone +61 3 9919 4077 / Email Himanshu.shee@vu.edu.au

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Appendix 4: Interview questions



INTERVIEW QUESTIONS

Chain Structure

1. Please describe your export chain and operations.
2. Who are your chain partners?
3. What are their functions?

Integrating mechanisms

- Ownership
 4. Do you own other firms supporting your export operations?
 5. What is the hierarchy/structure of the organization?
- Contractual
 6. Do you have contractual arrangement with your chain partners?
 7. What is the type of the contract? (Renewable, binding level, etc)
 8. How do you evaluate the implementation of the contract?
- Operational interdependence
 9. How do you describe your interdependence with your chain partners?
 10. What functions do you share with other chain players?
- Information Systems
 11. What information do you share with your chain partners?
 12. How do you share them? (System, technology, frequency, etc)
- Power
 13. How do you evaluate performance of your chain partners?
- Behavioural
 14. What is your relationship with your chain partners? (friendship, kinship, etc)
 15. How does this relationship affect your cooperation?

Security

16. How do your company define security?
17. What are common risks related to security in your chain?
18. Do you have records on incidents related to security?

19. What are security measures that you are implementing related to your export operations?
20. Do you have security agreement with your chain partners?
21. What is regulated in the agreement?
22. How do you conclude, implement and evaluate the agreements?
23. How can you guarantee that your chain partners attend security at the level expected?

Opinions on integration in export supply chains, security extension, and AEO implementation

24. What are elements of integration implemented in your chain?
25. Do you see other potentials for your chain to be more integrated?
26. Do you consider your chain is integrated?
27. How would you relate integration to security?
28. Is there any new measure related to integration implemented during you AEO application or after certified as AEO?
29. Do you think security is more guaranteed after you become an AEO?
30. What is the trend of security related incidents before and after becoming an AEO?