SECURITY EXTENSION IN EXPORT SUPPLY CHAIN IN INDONESIA: AN AGENCY THEORY PERSPECTIVE

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Introduction

Security constitutes an important aspect of supply chain operations where the risk of terrorism, by its definition, has been a major concern (Voss et al., 2009, Urciuoli, 2010, Marlow, 2010). The risk of tampering with cargo and smuggling explosives in legitimate containers has raised security issues in port specific export supply chains. In response to the increasing global insecurity in supply chains, the World Customs Organization (WCO) has developed the Framework of Standards to Secure and Facilitate Trade, popularly abbreviated as the SAFE Framework. SAFE contains the Authorized Economic Operator (AEO) program, a security initiative that is claimed to have essential features for supply chains.

When risk in a supply chain is defined as the likelihood and impact of an unexpected event with adverse effects that leads to failure (Ho et al., 2015), an argument on the probability of risk occurrence often appears to rationalize security investment (Tang, 2006). Firms find it difficult to justify the investment for a robust security strategy (Rice and Caniato, 2003, Zsidisin et al., 2004), so that it is important for a security program to also support business continuity during "normal" conditions (Tang, 2006). The AEO addresses these concerns by not merely focusing on security measures, but also offering privileges from customs to certified firms when they conduct international trade (WCO, 2012).

More than its balanced approach to security and facilitation, the AEO has also been promoted for its chain integration and standard compliances of risk management (WCO, 2012). Meanwhile, many definitions of supply chain include a perspective on integration between the supply chain members regarding their activities (Soltani et al., 2011, Davison, 2008, Hodges, 2012). Jayaram and Tan (2010) defines supply chain integration as a coordinated cooperation to achieve mutual outcomes. This theoretical perspective that underwrites the supply chain integration provides an appropriate context for the AEOs intending to secure a safe delivery of goods. Supply chain is a sequence of operations where a single activity, regardless of its size and position will have a devastating effect on the delivery of merchandise if adequate security is not extended from one party to the other, specifically from the AEO-certified exporter to their chain partners, like forwarding agents, trucking companies, and container yard operators.

The paper, therefore, investigates the extent of security practised along the whole of the export chain and, the way chain integration can help in achieving that. Agency theory is chosen as a tool to diagnose the sustainability of the relationship where many problems are caused by ineffective management of inter-organizational relationships (Richey et al., 2010). The relationship is reflected in the integration mechanism assessed by the theoretical lens of agency theory defining AEOs as the principal and their chain partners as agents. Eisenhardt (1989) argues in his seminal work that agency theory sheds light on uncertainty and risk associated with supply chains comprising the principal and agents. Therefore, the agency theory is used here to explain the security extension from AEOs to their chain partners to assure equal security standards being performed along the chain, especially where principal-agent monitoring is lacking.
The next section presents a brief literature review related to studies in the area. Subsequently, a section on the methods employed in the study precedes the section on the discussion of the findings. The last section draws on the conclusion and limitations.

Literature Review

The growing concern of security forces the firms to assess risk and security in their business strategy (Rice and Caniato, 2003, Zsidisin et al., 2004). More related literature observes the global development of risk and uncertainty affecting supply chain post 9/11. For examples, Bichou et al. (2014), Banomyong (2005), Altemöller (2011), Grainger (2007), discuss the introduction of international security initiatives.

These authors agree that security initiatives must not add any burden to firms in a supply chain, rather the objectives must be consistent with the character of a supply chain where efficiency and speed are prominent. With the increasing risk of security issues, business sustainability lies not only within the business itself, but in their supply chain (Peck et al., 2003). Therefore, a security initiative that combines control and facilitation is more appropriate in this environment. However, very few studies have addressed the Authorized Economic Operator (AEO) program (Mikuriya, 2007, Ireland, 2009, Fletcher, 2007, Noda, 2004, Zhang and Preece, 2011) and none of them use agency theory to evaluate its implementation.

Agency theory is about delegation of works from one party (principal) to another party (agent) (Eisenhardt, 1989, Lassar and Kerr, 1996). This includes an authority regarding control and decision making about certain tasks (Wilding et al., 2012). Recognizing that AEOs' chain partners are not always security-certified entities, agency theory addresses a question on how security objectives are extended when the AEO exporters, as principals, outsource their logistics operations to chain partners, as agents.

Agency theory is particularly relevant for studies with problems of cooperative structure (Eisenhardt, 1989) which is appropriate in the AEOs' export supply chains. Moreover, Eisenhardt (1989) argues that agency theory *"offers unique insight into information systems, outcome uncertainty, incentives, and risk and is an empirically valid perspective (p.57)."* This argument is justified in this research. First, the extent of integration between AEO and the trading partners is likely to affect their mode of information sharing, chain outcomes, incentives and risks carried by each member in the chains. Their coordination and inter-relationship significantly contribute to those aspects of the AEOs' security objectives. Second, the security awareness among the trading partners appears to be quite low. When the AEOs are fully aware of their security measures and include terrorism as a risk, most chain partners only follow the agreed common terms and conditions without a complete understanding of the likely risks. Therefore, it is true that security values may deteriorate along the supply chains where goods change hands. At this point, the agency theory aims to explain the problems when the interests of the principals and agents conflict (Eisenhardt, 1989).

The literature reveals that there is a lack of study on a supply chain security initiative that involves both integration and risk management perspectives under the lens of agency theory. 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.

Methods

Recognizing the complexity of supply chains, a case study is an ideal method to provide a comprehensive description and evaluation (Zikmund et al., 2012). As a popular research method often employed across disciplines (Thomas, 2011), a case study approach is commonly agreed to offer a detailed approach to complex research objects (Simons, 2009). The data collection involves observation of implemented security measures, review of security related documentation, agreements and contracts, and compares implemented measures with AEO related standards. Semi-structured interviews are conducted with managers and staff in charge of export and security in the three AEO exporters and their chain partners that constitute the AEO export chains. Under the lens of agency theory, the research proceeds to identify agency cost in the extension of security concerns from the AEOs to their partners. This process evaluates measures taken by the AEOs to ensure that security is assured along the nodes and links in the flow of the goods from AEOs' premises to the port of exportation.

Thematic analysis (Braun and Clarke, 2006) is used to identify, analyse and report the patterns found in the data collected. Themes are determined prior to field work and classified in accordance with the research questions: integration mechanisms and security measures (Figure 1). Several analysis techniques are simultaneously considered to reveal similarities and differences between the cases. They are pattern matching, explanation building and cross case analysis (Yin, 2014). The result is a synthesis of themes across the interviews and observations to create a general description of the phenomenon (Collingridge and Gantt, 2008).

The scope of the research is the flow of containerized goods and information from AEOs to the port of export via their chain partners. This port oriented export starts from the AEOs' premises and finishes at the ports of exportation. The upstream part of the supply chain from suppliers to AEOs and the downstream part beyond the domestic ports are excluded from this research. The generic players in this logistics episode include customs brokers, forwarding agents, trucking companies, warehouse operators, shipment consolidators and port operators. These stakeholders are included in the interviews to investigate the extent of security they maintain while the goods change hands.

Findings and Discussion

The research starts by mapping the AEOs' chain structures and identifying elements of integration in each chain. The security-integration framework (Figure 1) used in this research is an adaptation of Robinson's Chain Constructs (Robinson, 2009). The modification takes into account the aspects of security in the context of supply chain integration. Parameters of chain structures include identification of individual players, their functions and context of existence. The integrating mechanisms and processes are assessed on ownership, contractual arrangements, operational interdependence, and information system for data transfer. The security per se includes cargo, conveyance, premises, personnel, trading partners, stated under AEO security standards (WCO, 2006). The identification of both integration and security parameters are to help determine the extent of security extension from the AEOs to their chain partners. It compares the security level of individual players and the collective measures as expected by the AEOs. This framework is designed to answer whether individual and collective security measures are at the similar level, as well as to identify the agency cost in ensuring their equality.

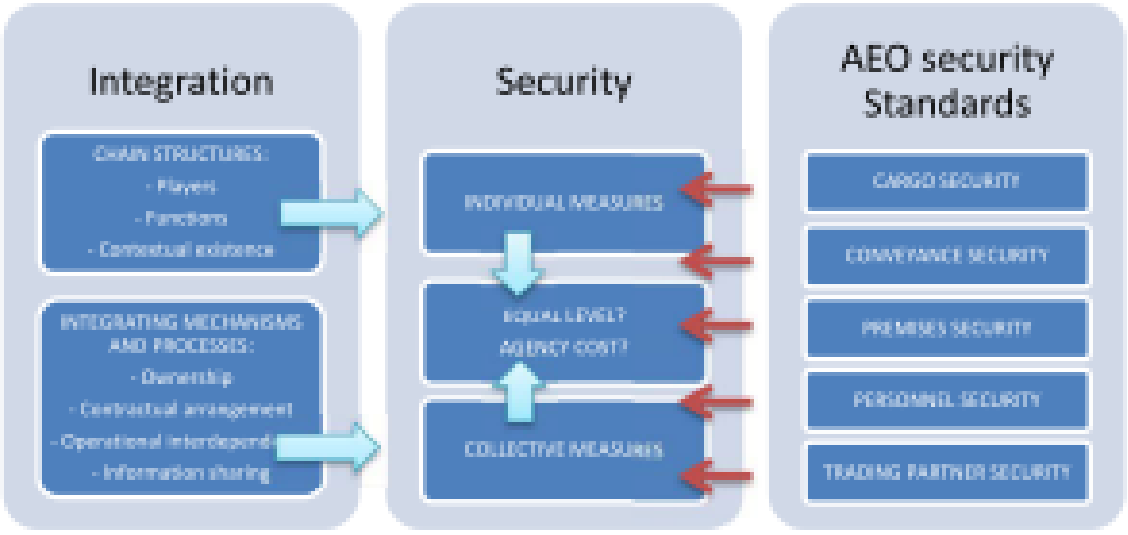

Figure 1: Security-Integration Framework

Integration mechanisms identified in each AEO are summarized in Table 1 with different patterns of distribution of responsibilities and risks. AEO-1 fully transfers the responsibilities to its forwarding agents as the only known chain partners. The dyadic relationship restricts the information flow between AEO-1 and forwarding agents who then extend the AEO-1 message to the other chain members engaged by them. The findings show that AEO-1 informs the forwarding agents about any new development of security certification. Other chain partners, like the trucking companies and shipping agents, are not aware of this development directly from AEO-1. This results in dilution of security information as it moves further away from AEO-1. The degree of integration is likely to deteriorate with the absence of direct control from AEO-1.

AEO-2 operates relatively in a more integrated way and demonstrates a full control over the whole export chain. It does not necessarily own all chain functions, but the individual contractual relationship with each chain partner allows AEO-2 to control and ensure the effective extension of security along the chain.

In the segment of goods flow from factory to ports of export, AEO-3 owns and manages all the logistics functions like the forwarding agent, warehouse, trucking company, empty container park and port. However, outsourcing of trucks, use of empty container parks, and shipping through other ports etc. are very common. These external parties involved have no contractual relationships with AEO-3. They work casually based on individual load. Given that AEO-3 has total control of ownership, it has no operational interdependence and no information sharing.

Integration aspects	AEO-1	AEO-2	AEO-3
Ownership	Use of total logistics service providers.	Partial ownership.	Total ownership.
Contractual arrangement	Contract is only with Forwarding agent as a single dyad.	Contracts are with all chain partners.	Contracts are with trucking companies and shipping agents.
Operational interdependence	- Regular plan sharing system only with dyad; - Dedicated team in each function; - Periodic meeting; - Functional training.	- Uniform regular plan sharing system for all chain players; - Dedicated team in each function; - Cross-posting of staff; - Periodic meeting; - Regular training and value sharing; - Vendors' improvement program.	- Staff cross-posting.
Information sharing	- Internal integrated information system; - 3PLs limited access (only FA); - Global access from international office; - Only email with other vendors.	- Internal integrated information system; - No 3PLs access; - Integrated 3Pls information network is under development; - Global access from international office; - Only email with other vendors.	- Internal integrated information system; - No 3PLs access; - Only email with other vendors.

Table 1: Integration mechanisms

Arguably, AEO-2 shows the most integrated activities demonstrating more integration features characterized by a contractual relationship with chain partners and operational interdependence. The chain organisation is the strong point of these chains. AEO-1 comes second with basic integration of operational security. AEO-3 comes last since there is no sign of external integration but total ownership promotes reasonable security within this supply chain.

Agency theory in AEOs' integration mechanism

The literature suggests that contract has been used as a tool to bridge the operational gap between the principal and the agent to reach their objectives (Wilding et al., 2012). All the efforts taken by the principal to ensure that agents are appropriately doing their given tasks is called agency cost (Eisenhardt, 1989). In this context, the integration mechanisms, except for ownership, represent the concept of agency cost. Measures found under the group of contractual arrangement, operational interdependence and information sharing are indeed the efforts to bridge the gap between the principal and the agents when ownership is absent at this function. The following discusses integration and security implementation in the three AEOs in the light of agency theory.

AEO-1

In the case of AEO-1, having only forwarding agents as its direct agents, the firm is minimising the agency cost by controlling its dyadic chain partner relationship. The legal contract acts as the direct control between AEO-1 and forwarding agents (FA). AEO-1 restricts the cost of operational interdependence and information sharing to the FAs. Further control from FA over other trading partners is very likely to deviate from the agreed work standard (Zsidisin and Ellram, 2003). The emerging risk results in security deterioration due to the lack of a principal's direct supervision.

The contractual pattern in AEO-1 is complex to embody several groups of agency patterns (See Figure 2). AEO-1 and the two FAs form the principal-agent pattern. The FA-1 has their own agency pattern with the trucking companies (TCs) who may also have vendors (Vs) to back up their operations during peak time. FA-2 works with different TCs, SL, and Container Consolidators (CC) who together constitute a separate principal-agent relation. Above the AEO-1 is its international headquarters which manages contracts with shipping liners (SL). The SLs then employ shipping agents (SA) in different countries who use the service of empty container parks (EPs). AEO-1 is central in this web of agency schemes interconnecting operations in its export chains.

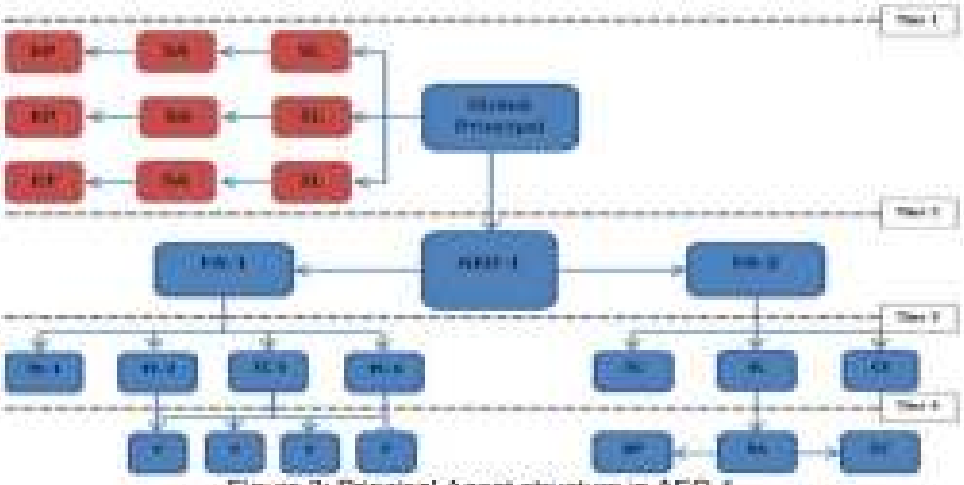

Figure 2: Principal-Agent structure in AEO-1

AEO-2

The approach taken by AEO-2 is different. AEO-2 extends the contractual relations to almost all members in its export chains. However, similar to the chain structure in AEO-1, SLs, SAs, and EPs are not included due to their direct contractual arrangement with AEO-2's headquarters in Asia Pacific region. AEO-2 manages most contracts by itself and executes direct control on all operations. This approach reduces the issue of monitoring in its agency relationship. It ensures selection criteria are fulfilled by all vendors through periodic tender every two years. Another similarity with AEO-1 is found where smaller fractions of agency relationship occur. In these chains, TCs and yard operator (YO) separately extend their contracts with vendors whose performances are their responsibility. AEO-2 admits that they do not have contractual relations with these vendors. But they claim that their control spans to include all operations within its chains, even though they are not under direct contractual schemes. This situation is portrayed in Figure 3 below.

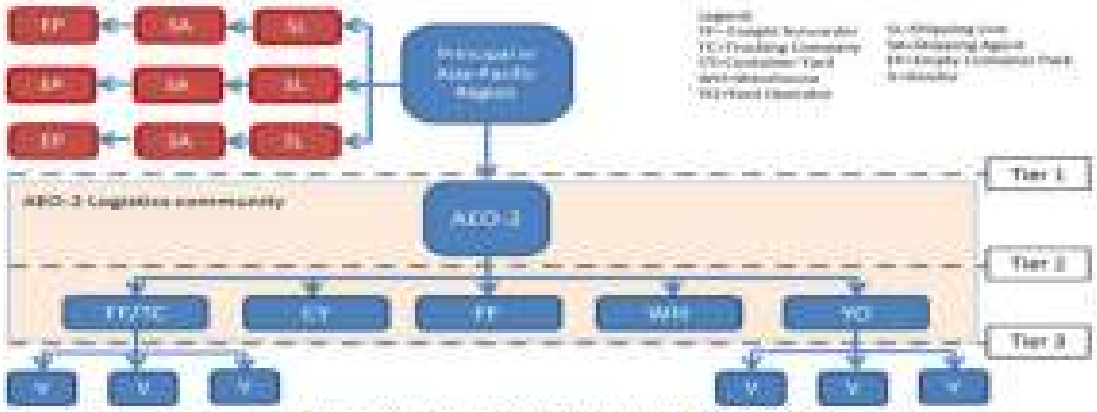

Figure 3: Principal-Agent structure in AEO-2

Compared to other AEOs, AEO-2 shows the widest range of measures in maintaining its relationship with its chain partners. AEO-2 demonstrates its fervent preference for extending its interests and ensuring that the whole chain operates by its standards. Moreover, its efforts in sharing its skills and institutional culture and values (Alfalla-Luque et al., 2013) lead compared to AEO-1 or AEO-3, where these features are not pronounced.

AEO-3

AEO-3 is relatively modest in demonstrating the principal-agent pattern (Figure 4). The ownership scheme in its chain function is more visible as it prioritizes the use of internally owned chain functions whenever possible. It engages external parties only when internal functions are not sufficient especially during peak times. Most of the time, the chain is dominated by players under the same ownership. However, these players are not always from the same division or even the same firm. There are tiers in their organizational hierarchy. AEO-3 is under a holding firm that owns several factories producing different types of paper products in Indonesia. They are located in different parts of Indonesia. The holding firm created a freight forwarding company to manage export and import for all factories under its ownership. It also owns empty parks and a sea port. So even though these entities are under the same ownership structure, there are distances between them where agency theory is still applicable (Eisenhardt, 1989). The distance is the gap that typically exists between silos in an organization. Each function still works in isolation rather than in collaboration. In this situation, the effort to extend security concerns, especially after becoming an AEO, has also been a challenge. With ownership extension, the agency cost that AEO-3 has to spend is relatively lower compared to chains where ownership is lacking. First, it does not have to conclude any contract with any agents. It significantly reduces the cost of control and monitoring or evaluation for the purpose of renewing the contract, as it normally occurs in a contract cycle. Second, it can avoid the cost of information sharing since they all are already connected with their internal system. Information freedom is also a benefit of their ownership structure. Third, the issue of equal concern for value and work culture should be minimized when they all share the same corporate values induced by the holding firm. However, in the process of internal integration, other agency costs such as sharing of risks, plan, and decision-making remain.

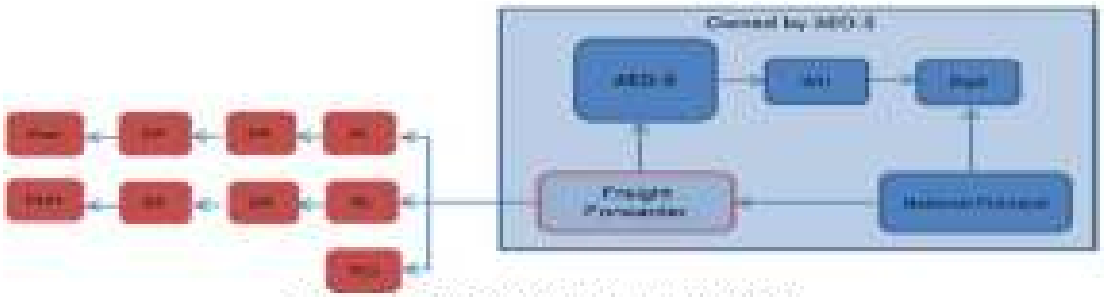

Figure 4: Principal-Agent structure in AEO-3

Agency cost in integration security

As a seminal reference in the literature of agency theory, Jensen and Meckling (1976) broadly define agency cost as any cost that might be incurred in any relationship characterized by any form of collaboration. This cost is not limited to those spent by the principal, but also includes those sustained by the agent. Furthermore, they argue that agency cost consists of monitoring expenditure by the principal, bonding expenditure by agent, and residual costs. In this research, the monitoring expenditure by the principal is represented by the physical existence of contracts, periodic tender, and extension of information, staff cross-posting, and training for chain partners. All these efforts are meant to ensure that the agents behave by the principal's expectation. Physical monitoring and reporting systems are also found to reduce adverse behaviour or moral hazards that potentially happen in agents (Wilding et al., 2012). On the other hand, the agency costs are represented in the forms of participation in tenders, efforts to improve performance and participation in a principal's security extension programs.

The Table 2 summarises the agency costs found in three cases and their relevance to integration mechanisms.

Agency costs			Integration mechanisms
AEO-1	AEO-2	AEO-3	
- Limited contract only with FAs.	- Multiple contracts with all chain members.	- No contract. Casual order only when needed.	- Ownership - Contractual arrangement
- Transfer all control risk to FAs.	- Maintain full control of all chain players.	- Internal FA maintains full control.	- Ownership - Contractual arrangement - Operational interdependence
- Periodic evaluation but no competitive tender.	- Periodic tender and competitive.	- No tender. Mostly under one ownership.	- Ownership - Contractual arrangement
- Periodic meeting with all chain members.	- Monthly meeting with all chain members.	- Weekly meeting with all chain members.	- Operational interdependence
- Staff cross-posting (FA and TC at warehouse).	- Staff cross-posting (TC at CY, FA at warehouse, AEO-2 at YC).	- Staff cross-posting (TC at warehouse)	- Operational interdependence
- Specialized unit to work with FAs.	- Specialized unit to monitor the whole chain.	- None	- Operational interdependence
- Distribution of shipment plan to FAs.	- Distribution of shipment plan to all players.	- Access to common system.	- Information sharing
- Training to vendors	- Training, improvement program, logistic community.	- None	- Operational interdependence

Table 2: Agency cost and integration mechanisms

Agency theory is effectively used in this research to help explain the relationship between integration mechanisms and security standards in the whole chain. Table 3 presents the agency costs found in each

AEO in their effort to ensure their security concerns to their chain partners. Most of these costs are found in the areas of cargo, conveyance and trade partner security. Security in chain partners' premises (WCO, 2006) does not come to the attention of these AEOs. However, temporary container yards where container stops or processed is an exception. AEOs do not observe security in chain partners' offices or truck parks. AEO-2 demonstrates more security awareness in the area of a chain partner's personnel who are supported by frequent training and certification programs. Truck driving and safety skills are examples of their popular programs.

Security Standards	Agency costs		
	AEO-1	AEO-2	AEO-3
Cargo	- Issue security procedures for cargo - Issue packaging standards to be followed by WH - Seal affixation procedures - Control on trucks' identity when they enter premises	- Global procedures for locking cars on car carriers - Multiple checks from truck arrival, loading and leaving premises	- Multiple checks from truck arrival, loading and leaving premises
Conveyance	- Require maximum age limit for trucks - Control delivery time - Reporting system	- Require maximum age limit for trucks - Truck inspection and certification - Control delivery time - Reporting system	- Require quality trucks
Premises	Not found	Not found	Not found
Personnel	Not found	Drivers training and certification	Not found
Trading Partner	- Security is not included in contract but in guidance and SOPs	- Security aspects are included in contracts - Continuous campaign and training internally and externally	No contract exists

Table 3: Relationship between security standards and agency costs

Conclusion

This research investigates the security aspects of export supply chains in the context of ports and the way the chain partners coordinate to achieve these. An analysis of interviews and observations of three AEOs reveal that the chain members focus more on their own objectives than the primary objective of the whole of chain integration for better security performance (Stock, 1997). In the relationship between principal and agent, the major challenges identified are the misrepresentation of agents' ability (adverse selection) and lack of their effort (moral hazard) that erodes a principal's objectives of achieving security (Wilding et al., 2012). While a contract is a metaphor for the relationship between the principal and agent in agency theory (Eisenhardt, 1989), the relationship in practice varies significantly from that agreed in the actual contract. This variance in terms and agreement from the original physical contract places the security of the chain at risk.

As a supply chain is characterized as a sequence of activities involving multiple actors to accomplish a wide variety of operations, every secured activity in the chain contributes to a safe outcome for the supply chain. The coordination of actors and their operations appears critical in defining the whole of the chain performance. Lack of any security initiative by one actor does affect the security of others in the chain. While the AEOs believe in a more integrated strategy encompassing multiple players to protect the chain from all possible threats, the security measure by each individual partner can contribute positively. This is where integration is perceived to play an important role in the study of security in supply chains.

However, the study has some limitations. Being newly introduced, the AEOs and the chain partners need more time to settle in terms of their integrated effort to secure the logistics operations. Future research needs to undertake either interviews (qualitative) or surveys (quantitative) of the AEO program to reveal more integrated effort to sustain security. Being exploratory in nature (Yin, 2014), this study does not measure the impact of the agency costs on security outcome. Thus, the future research will shed more light on the effectiveness of security measures from an integration perspective.

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