SUPPLY CHAIN SECURITY PROGRAMS
COMPARING AUTHORITY AND BUSINESS CERTIFICATIONS

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ABSTRACT

Purpose of this paper
A new topic that during the last years has come to the attention of researchers is supply chain security. Stakeholders are progressively realizing the importance to join the authority regulations issued by governments (e.g. AEO) to reduce transport delays at Customs or other business certifications (e.g. TAPA) to reduce theft or counterfeiting. However the differences and impacts of security certifications are not always well understood. This paper has the main purpose to explore similarities and diversities of security certifications and to identify their effects on supply chain efficiency and security.

Design/methodology/approach
This research is based on a system-theoretical approach to describe security certifications, make a comparative analysis and deduct their impact on transport operations. The research design is primarily based on a literature search.

Findings
The findings put in evidence that authority and business security certifications can be complementary. Moreover transport operators and legislative bodies are recommended to initiate collaboration experiences.

Research limitations/implications (if applicable)
The comparative analysis will only focus on three main European certifications: the Authorized Economic Operator (AEO), the Freight Security Requirements and the Trucking Security Requirements issued by the Transported Assets Protection Association in Europe (TAPA EMEA).

Practical implications (if applicable)
The analysis proposed in this paper may support logistics and supply chain managers in the analysis and comparison of authority and business certifications for decision-making.

What is original/value of paper
Previous research focuses only on the impact of authority security certification programs on transport operations. None of the known literature makes a comparative analysis with existing business certifications to enlighten the different impact on security and efficiency.

Keywords: Risk Management, Supply Chain risk, Supply Chain Security Programs, Freight Forwarding, Transport Security.
1. INTRODUCTION

Security in supply chains, and more specifically in distribution networks, is a topic that has got more and more attention from researchers and practitioners during the last years. The increased criminal activities in form of theft and counterfeiting of cargo show worrying signals of vulnerabilities in supply chains. The European Parliament has reported theft of lorries and cargo in Europe for a value of about €8.2 billion yearly (European Parliament, 2007a). Likewise the Federal Bureau of Investigation (FBI) in US has reported cargo theft in the range between $10 and $30 billion per year (Anderson, 2007). Other statistical reports show that in Europe counterfeited and pirated items amounted to $176 billion in 2007 (Rodwell et al., 2007). According to another report from the European Commission, in 2006, almost 3 millions of pharmaceutical products were found to be counterfeits (EU Commission, 2008). These figures may be higher, since logistics operators have a tendency to hide the problem to their customers (Ekwall et al., 2007).

In Europe, supply chain actors interested in preventing and mitigating the consequences of antagonistic threats as theft, terrorism and counterfeiting are joining voluntary certification programs, business certifications. The most important organization in Europe, working in the field of logistics and transport security, is the Transported Asset Protection Association (TAPA EMEA). TAPA offers its members the possibility to access networks of certified logistics service providers, carriers, facilities etc. In addition the association promotes two certifications, the Trucking Security Requirements (TSR) and the Freight Security Requirements (FSR) and a database, the Incident Information Service (IIS), to spread and increase knowledge about crime trends across members. According to TAPA, the members joining their certification have benefited a strong reduction of criminal activities during the last years. The TAPA certification is exclusively voluntary and is primarily addressed either to logistics service providers and carriers that aim to offer customized security services or to facilitate agreement about security requirements among transport buyers and suppliers (TAPA EMEA, 2008).

Many security experts believe that supply chains could be the next target of terrorists (Burke, 2005; Johnston et al., 2004; Sheffi, 2001). For instance, the intentional counterfeiting or contamination of food or pharmaceutical products could kill or seriously injure hundred thousands of people. Global supply chains could be exploited to smuggle nuclear weapons or terrorists into a country. An evident example of such vulnerability is the anthrax attack in US in 2001 that exploited the existing postal distribution network to kill 5 people and sicken 17 (FBI, 2009). This situation has arisen the attention of governments around the world that are today working by issuing authority certification programs to prevent terror threats and ensure the security and safety of our communities (CBP, 2006; CBP, 2008; European Parliament, 2004; European Parliament, 2005; European Parliament, 2007b). Examples are the Aviation Transport Security Act introduced in the air sector, the International Ships an Port Facility Security Code (ISPS) in the sea sector, the Container Security Initiative (CSI) and the Customs Trade Partnership Against Terrorism (C-TPAT) regulating the procedures to inspect and identify risky cargo at customs locations, etc. In Europe, the Authorized Economic Operator (AEO) is an initiative similar to the C-TPAT; it is in force from the 1st of January 2008 as a voluntary program and is planned to become compulsory in the future. The scope of the certification is to stimulate operators to increase security as well as to expedite Customs procedures by reducing the amount of cargo that has to be screened when importing/exporting containers (CP3 Group 2005; CP3 Group 2006) (AEO both import and export to EU while C-TPAT only import to USA).
As a consequence, the new challenge faced by managers is to make decisions about how to improve security and most of all what certifications to choose. The logistics operators who were working with security before the AEO regulation may try to keep both the business and authority certifications to maintain their high security degree and contemporarily avoid delays at Customs. However these operators will have to face higher costs and an increased administrative burden. Therefore they may be interested in understanding how these costs may be compensated. The operators, who were not active in the security area, lack knowledge of these certifications and cannot really understand the differences and similarities between the TAPA and AEO regulations. As a consequence they will be more attracted by the AEO certification as a means to avoid delays at Customs and gain competitive advantage on the import/export market. However doubts about the real efficacy of this certification on security, so as the operators commitment to security may be arisen. Thus it becomes relevant to 1) enhance the understanding of these two certifications, 2) make a comparative analysis and verify the possible gaps concerning their impact on efficiency and security and 3) argument if these two certifications should be kept distinct or harmonized into a unique regulation.

Previous research can be categorized in two branches: supply chain risk management and analysis of the impact of authority certifications on supply chain efficiency. Research concerning risks in supply chains is fairly new and it started with risks and purchase (Khan, 2007). Since then several authors have addressed the relationship between risk and supply chains (Robinson et al., 1967; Burnes et al., 1998; Burnes et al., 1996; Womack et al., 1990; Cousins et al., 2004; Hood et al., 2005; March et al., 1987; and Kraljic, 1983). The turning point occurred with the aftermath to the terrorism attack against the World Trade Centre in 2001 which entailed that the threat from terrorism needed to be handled. Therefore several different supply chain security programs were launched and the most of scientific articles have been oriented to understand the effects of these programs both in security and on efficiency (Fletcher, 2007; Gutiérrez et al. 2007; Grainger, 2007). Lee and Whang (2005), in accordance to the Total Quality Management (TQM) doctrine, show how the implementation of RFID based technologies can speed up Customs’ inspections and provide operators with time and costs savings. Rice and Spayd (2005) and Sheffi (2001) state that applying to authority certification can also bring “collateral benefits” as trade facilitation, asset visibility and tracking, faster standard development etc. Haughton (2007) demonstrates the economical and competitive advantages for large and small shippers becoming FAST-approved (Free And Secure Trade, a Canadian security certification). Powanga (2006) adds that only large firms may have the possibility to trade-off the security costs with benefits related to supply chain transparency (Powanga, 2006). Willys and Ortiz (2004) emphasize that efficiency and security in supply chains are closely interrelated, since higher security may reduce Customs delays so as the higher transparency of information of goods flows may reduce shipping costs and time. None of the found literature makes a comparative analysis of business and authority certifications. Thus questions concerning the differences of business and authority certifications and their impact on security and efficiency and supply chain operations haven’t been answered yet.

By means of a system-theoretical approach, this paper has the main purpose to make a comparative analysis between authority and business security certifications as well as to deduct their effects on supply chain security and efficiency. Moreover it unveils needs for future research and improvement of existing certifications. The research design is exclusively based on a literature search. The comparative analysis performed will only focus on two main available European certifications: the Authorized Economic Operator (AEO), authority, and the Transported Assets Protection Association in Europe (TAPA EMEA), business.

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This paper is structured in six sections. After the introduction, the methodology adopted in this investigation is explained to readers. Next, the system of interest for this study, in which logistics and transport operations take place, is described. The two sections that follow provide a detailed overview of the TAPA and AEO certifications. Next, the two certifications are put into comparison and hypotheses about their impact on efficiency and security are formulated. Finally the results are summarized and grouped into a Boston matrix to enable the identification of similarities and differences between the security certifications. In the same section, implications for managers and decision makers are discussed.

2. METHOD

The research in this thesis follows the tradition in logistics of using a system approach to answer research questions (Aastrup et al., 2008; Hellström, 2007; Gammelgaard, 2004). According to Hellström (2007), one of the main issues in system theory is how elements interact with each other in the system. The system approach in this paper is more of a soft-system thinking where reality is described in subjective terms and the whole system has the distinctive trait of vague or undefined boundaries between system components and the surrounding environment (Checkland, 1999). A methodological strategy was formed based on the literature study. This strategy can be described as an abductive approach with a focus on understanding the business itself, the supply chain security programs and the interaction between the logistics business and these programs (Dubois et al., 2002; Kovacs et al., 2005). Hence, this research paper starts with a literature search to identify and describe transportation and logistics systems as well as the TAPA EMEA and AEO certifications. This phase is followed by a deductive study to formulate a set of hypotheses concerning differences and similarities between the TAPA EMEA and the AEO certifications. To enlighten the impacts on security and efficiency of the hypotheses made, the authors make subjective estimations that are visually illustrated into a Boston matrix.

3. TRANSPORTATION SYSTEM

The purpose of a transportation system is to physically move the goods within a certain supply chain in order to fulfil the scope of logistics. This means that the transportation network only physically integrates the supply chain with the fulfilment of the supply chains’ transport demand (Bowersox et al., 2002). Therefore several supply chains may be present at the same time and the same place in the transport network. This acknowledgement indicates that the relationship between supply chains and transport activities would be better described with complexity theory, especially if the interactions between components are the object for the research (Ekwall, 2009 - b).

Supply chains’ strain for efficiency is reflected in the actual design of physical transportation systems as well as in the planning of operations. The transport network affects cost and throughput time, and if used smartly it can even increase the value of the product (Lambert et al., 1993). More specifically, the efficiency constraints that have to be strictly monitored by managers are internal efficiency, fulfilment of supply chain demand, customer satisfaction, and transport network performance and layout (Hesse et al., 2004).

3.1. Transportation Security

The aftermath to the terrorist attack at WTC September 11 2001 brought attention to the security in today’s trade. The reasons are more than just terrorist attacks. According to Closs and McGarrell (2004) three factors can be outlined. First, the globalization of the world trade
which depends on and is generated by the free flow of people, goods and information. Second, the increasing demands from businesses for efficient supply chain operations. Third, the increasing threats of terrorist attacks. The third factor can be reformulated as illegal and antagonistic threats, of which terrorists are one type. Present supply chain security research outlines several changes in how security in a supply chain should be approached. First, supply chain security should incorporate not only theft prevention but also anti-terrorism. Second, the focus is now to address global issues and not just local or national issues (Sweet, 2006). Third, when conducting contingency planning, the concept of crisis management is to be included to obtain better resilience. Last, security is no longer an internal corporate question but an issue for all actors within the entire supply chain (Closs et al., 2004).

The security of freight transport was long under-developed, but when terminal security has increased in the links between terminals (Ekwall, 2009-a). This development is also valid from a supply chain perspective; while security in manufacturing facilities normally is both in focus and well managed, the rest of the chain is without security (Purtell et al., 2006). The need or demand for security during transport is to prevent unwanted negative disruption in the flow of goods. Transport security is the combination of preventive measures and human and material resources intended to protect transport infrastructure, vehicles, systems and workers against intentional unlawful acts (EU, 2003). The technological development, as far as range and sophistication of anti-theft devices and after-theft systems go, is increasing rapidly (Urciuoli, 2008). Especially attention is given to different tracking systems that track the goods throughout transport (ECMT, 2001). But applying different technological systems is only a part of transport security strategy (Tyska et al., 1983). The key issue is the successful coordination and cooperation of the actors involved in the transport. At present this cooperation is not widely developed (ECMT, 2001). The lack of cooperation, together with different barriers in the business, is indicated by the following: underestimated risks from the hauliers’ side; different standard in technologies; insurance companies do not always give premium reductions; technical standards do not yet exist (ECMT, 2001; Urciuoli, 2008). These barriers and lack of cooperation can be patched up by the use of common methods or standards in transport security (Tyska et al., 1983).

In transport security it is important to take an intermodal approach to avoid unwanted competition disadvantage between the various modes. This means also that the security methods need to be internationally accepted, at least to reduce the risk of duplication or sub-optimal solutions for security that may disrupt international trade (EU, 2003). In an intermodal transport the first and last parts of the freight are conducted by road transport, while in-between other modes of transport are used. As a consequence of this, road transport needs a parking place near the intermodal terminal, if there is no waiting area inside the terminal borders (Ekwall, 2009-b).

4. TAPA EMEA

TAPA (Transported Assets Protection Association) EMEA is a voluntary security association started in Europe in May 1999 to create a network of secure transports and terminals to protect industries moving high value cargo from theft. Besides certification TAPA offers activities as seminars and forums aiming to improve security by allowing members to share their experiences, ideas and best practices to combat cargo theft (TAPA EMEA 2008). Diverse initiatives have been started by TAPA. The most relevant ones include two certifications (the Freight Security Requirements, FSR, and the Trucking Security Requirements, TSR) and a central database to report crime incidents (The Incident Information Service, IIS).
The Freight Security Requirements (FSR). Standards included in this certification aim to ensure safety and security of in-transit storage and warehousing assets belonging to TAPA members. The adoption of the FSR standards shall be referenced in any contract (or formal agreement) issued among consignees and consignors. Any failure to implement the FSR can be used as an argument for contract’s breach. The main processes to be executed by the consignees (suppliers of the goods) to join the FSR certification are 1) the contract acceptance, where the consignee specifies the non-compliant areas and the recovery actions to be taken, 2) the designation of a security representative, 3) risk assessments and audits, including monitoring and loss investigation activities as well as waivers to be applied in exceptional circumstances. Diverse classification levels are also provided (A, B, C) according to threat levels and methods to be used to secure the terminals (TAPA EMEA 2007).

The Trucking Security Requirements (TSR). This certification includes standards for road cargo operators and should be seen as a complementary program to the FSR. The TSR has been issued to ensure the safe and secure transportation of TAPA members’ assets and can be combined with the FSR security requirements. The TSR shall be referenced in the contract (formal agreement) among consignor and consignee. Any failure to implement the TSR can be used by the parties as material to breach the contract. The processes to be accomplished are 1) acceptance of formal agreement, 2) designation of a security representative (by the consignee), 3) risk assessment and audit, including assessment process, monitoring and investigation of losses and terms for waivers. Also this certification provides three TAPA classifications (A, B, C) diversified according to the threat levels (TAPA EMEA, 2006).

The Incident Information Service (IIS). TAPA members report crime related incidents to their operations to a central database (Incident Information Service). A user interface is provided to access reports and bulletins from the database. Useful information that can be visualized includes trend identification, “hot spots” and criminal methods.

5. AUTHORIZED ECONOMIC OPERATOR (AEO)

The Authorized Economic Operator (AEO) is a concept integrated in the SAFE framework of standards designed by the World Customs Organization (WCO) to disseminate around the world the security requirements issued in US and finally to facilitate global trade (CP3 Group 2006). Hence, the scope of the AEO initiative is to detect high-risk cargo as early as possible in the supply chain and in a resource-efficient way (CP3 Group 2005). The AEO interpretation of end-to-end supply chains includes manufacturers, exporters, freight forwarders, warehouse keepers, Customs agents, carriers and importers (Figure 5.1).

![End-to-end supply chain](EU Commission 2007).

To categorize the economic operators joining the AEO, the Customs assess the operators’ administrative organization and its internal control system, including business processes, procedures, measures taken to reduce fiscal and non fiscal risks, etc. (EU Commission 2006). Existing relevant standards for safety and security are taken into account and recognized by the AEO as compatible (i.e. ISO 9001, 14001, 20858, 28000, 28001, 28004 and the ISPS code) (EU Commission 2007). More specifically to gain the AEO certification, firms have to comply with a set of four main criteria (CP3 Group 2006; EU Commission 2007):
• **Appropriate Record of compliance with Customs requirements.** Prospective members have to furnish a listing of information to Customs authority. This information includes the volume of business (annual turnover, profits and losses, stock capacity etc.) and statistics on Customs matters (tariff classification, % of import duties, % of VAT, origin of goods, Customs VAT value etc.).

• **Appropriate Record-Keeping.** Operators are required to maintain and store import and export operations in an accurate, complete, timely and verifiable manner. In addition information has to be carefully protected (i.e. by continuous data back-up and recovery). This is necessary to allow easy and appropriate Customs controls of fiscal and non-fiscal irregularities as well as keep track of other committed infringements over the last 3 years.

• **Proven Financial Solvency.** Financial solvency for the past three years has to be proven. This is in order necessary to ensure the commitments of operators applying to the certification.

• **Security and Safety Standards.** The operators have to show a high level of awareness on security and safety measures. A self assessment to identify risks and threats and measures in place may be performed by the operators. Recommendations about physical security of buildings (including entry and access), of cargo units of procedures for incoming, storage production and loading of goods, personnel security, security requirements imposed on business partners and policies about hiring of external security services are provided in the AEO guidelines.

To enable the identification of high-risk cargo, a risk model, called the COMPACT framework, is exploited by the Customs. This is exploited to evaluate the compliance of operators with the above criteria. The framework consists of five basic steps: understanding the operators’ business, clarify Customs’ objectives, identify the risks (those that may influence the Customs’ objectives), assess the risks, and finally identification of guidelines to handle the risks. The results of the risk assessment process are three: AEO granted, postponed or rejected. Those who are AEO granted can be further classified into three categories depending on what AEO criteria are fulfilled and what benefits are earned (EU Commission 2007):

• **AEOC (Customs Simplifications).** This certificate is given to operators that fulfill the criteria of customs compliance, appropriate record-keeping and financial solvency. The benefits of this certificate are easier admittance to customs simplifications (Customs authorities don’t need to reexamine the conditions examined when granting the AEO status), fewer physical and document controls, priority treatment and possibility to choose the place for control.

• **AEOS (Security and Safety).** To obtain this certification, the operators have to show that they are able to maintain appropriate safety and security standards. Benefits of this certification include prior notifications of inspections (the Customs may notify the AEOS operator when the cargo has been selected for further physical control), reduced data set for summary declarations, fewer physical and document based controls, possibility to request a specific place for the control.

• **AEOF (Customs Simplifications/ Security and Safety).** To obtain this status operators are requested to fulfill the criteria for customs compliance, appropriate record keeping, financial solvency, and maintain proper security and safety standards. The benefits will be all those related to AEO customs simplification and AEO security and safety certifications.
Table 5.1 summarizes the requirements of the above standards and the related benefits provided by AEO certifications.

Table 5.1 Summary of requirements and benefits of AEO certifications.

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<th>Customs</th>
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<th>Record Keeping</th>
<th>Financial Solvency</th>
<th>Safety and Security</th>
<th>Customs Simplifications</th>
<th>Fewer Inspections</th>
<th>Priority Treatment</th>
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6. AEO AND TAPA IMPACT ON TRANSPORT OPERATIONS

In this section hypotheses concerning similarities and differences between authority (AEO) and business (TAPA EMEA) certifications are formulated in terms of impact on efficiency and security of transport operations.

As stated in the previous section, the AEO certification is issued in three forms, the AEOC, the AEOS and the AEOF. Looking at Table 5.1 it can be noticed that only the last two certifications require the implementation of specific safety and security measures in transportation networks. The AEOC certification requires only proving customs compliance, record keeping and financial solvency. Thus the real impact on antagonistic threats can be seriously put into discussion. Comparing the AEOS and AEOF to TAPA FSR and TSR standards it appears that AEO is weaker, less comprehensive and only limited to the protection of terminals of distribution chains. Contrarily the TSR standards issued by TAPA, specifies also the minimum acceptable security standards for assets travelling between terminals on the road network.

From an efficiency viewpoint, operators joining AEO or TAPA EMEA may gain indirect benefits in form of supply chain visibility, transparency, theft security, improved inventory management, customer satisfaction, reduced cycle and shipping time, cost reductions, customer relationships and quick response (Rice et al., 2005; Sheffi, 2001; and Peleg-Gillai, 2006).

H1. The AEOC, that ensure fewer inspections and simplified customs procedures, has too much focus on financial and organizational aspects of supply chains relationships leaving the discussion, about how to protect operations from threat agents, unsolved. The AEOS and the AEOF include safety and security standards but these are only limited to terminals and don’t appear to have the same quality and maturity of the corresponding TAPA’s certifications. On the contrary TAPA is directly addressed to physical security requirements, despite the protection of transport links is limited to the road mode. From an efficiency viewpoint AEO and TAPA EMEA are more or less similar.
The different nature of authority and business certifications, put into discussion the ambitions and behaviors of operators applying to them. It can be hypothesized that operators that will comply with AEO will aim to maintain a competitive advantage on the import/export market and may not be committed to enhance their security level. As a consequence, given the significant differences of the three AEO certificates, AEOC, AEOS and AEOF, in terms of costs and resources demanded, and at the same time the rather similar benefits (Table 5.1), operators could find their optimal trade-off in the AEOC certificate. This, as stated in the previous hypothesis can certainly improve efficiency but it has a scarce impact on security. Moreover this hypothesis could become even more evident if the AEO will become obligatory. On the contrary, operators joining the TAPA organization have a genuine ambition to protect their goods from antagonistic threats and therefore will focus their efforts to enhance the security level of their operations.

H2. The existence of three different certifications with different requirements in terms of costs and resource demand leading to almost similar benefits can put forward the hypotheses that operators will choose certifications in a way to try to minimize their costs and maximize their benefits (cf. Ekwall et al., 2008).

The EU Commission is the main organization working with the stipulation of the AEO certification. However it is not clear how diverse competences, in form of human resources and knowledge, contribute to the security standards required for the certification. The only information available is that it has been formulated in accordance to the guidelines given in the US related certification C-TPAT and from the ISO organization. On the contrary, the TAPA EMEA , which is an organization that praises expertise from the logistics and security industry but also from the law enforcement, may ensure that crime trends are carefully followed and security certifications quickly updated. Existing research has demonstrated the opportunistic behavior of criminals that act either by transferring their attacks to vulnerable spots or by trying to deceive security systems in place (Ekwall, 2009 - a). This means that security measures have to be continuously updated to avoid a stagnation phenomenon. The impact on efficiency is estimated to be meaningless since monitoring and follow up operations are not performed by supply chain’s stakeholders.

H3. The AEOS and AEOF can support the reduction of risks on a short term basis. However they don’t have the capabilities to dynamically adapt to changing crime trends. Contrarily the TAPA EMEA organization has the capabilities to update and review security plans in accordance to changing crime trends.

Both the AEO (only the AEOS and AEOF) and the TAPA certifications require the adoption of contractual agreements to regulate the implementation of security measures. This puts in evidence one of the most important issues in supply chain security: security agreements among supply chain partners. A transport assignment starts with a contract between two companies, a consignor (goods’ seller) and a consignee (goods’ buyer), defining liabilities among the two about goods’ losses, damages, transport etc. (Stöth, 2004). In most of the cases, the consignor takes care of the transportation purchase and is responsible for the goods until these are delivered. However, when a transport service is bought, risks for goods’ damage or loss are usually transferred to a logistics service provider (LSP). The contracted LSP can in his turn sub-contract transport carriers and transfer its risks. Each player can purchase insurances to cover part of its risks (Stöth, 2004).

A difficulty encountered by transport operators is to make decisions about what security should be included in a transport assignment contract and most of all how to monitor contract keeping. Authority and business certifications give general guidelines about how to comply with their standards; however technologies, routines or procedures to be adopted are not
specified in details and cannot be monitored. In addition, none of the certifications establishes who of the contracted parts is supposed to pay for the increased security costs. This increases confusion, misunderstanding so as the difficulty to achieve an agreement. It is well known that the supply of freight transportation services often exceeds demand. Such excess of capacity gives more power to goods’ owners that can engage hauliers with short-terms agreements at a very low cost. In such a market where transport carriers are dropped and switched as soon as they cannot meet the customers’ requirements, transport buyers may excerpt power and try to transfer costs and risks as much as they can (Whyte, 1993). At the same time, transport carriers perceive severe competition in the market and are obliged to reduce their transport rates and consequently their marginal revenues. Hence, it is rather unlikely that carrier operators may afford investments in security measures. In the end, this situation may increase the administrative burden to be handled and affect negatively the efficiency of supply chains. In some cases, whenever agreement is not achieved, shipments may even be left unprotected.

**H4. AEO and TAPA certifications require members to prove that sub-contracted operators have agreed on contractual agreements where security requirements are specified. However, in both the certifications it is not clear how the requirements are established and agreed with the contracted parts. Thus it seems that difficulties to set up agreements and follow up of contract keeping can negatively influence efficiency and security.**

The procedures to audit, follow up and issue certifications adopted in TAPA EMEA and AEO are almost similar. Operators applying for the certification can perform a self auditing. Afterwards inspections are performed by external entities and a certification can be rejected, postponed or approved. The requirements are monitored with a yearly frequency and the certification can be withdrawn if these are not anymore covered sufficiently by the operator. The only difference that can be found in the procedures for risk assessments and audits is the emphasis on the acceptance of a contract including security requirements between consignor and consignee requested by TAPA EMEA. Obviously, the resources demanded to perform auditing and follow up will certainly negatively affect efficiency of operators.

**H5. The risk management approaches, including auditing and follow-up operations, used in the certifications present strong similarities. TAPA EMEA requires that risk assessments and audits are started with a contractual agreement. These processes can require some costs in form of resources from applicants, but certainly will ensure higher security.**

The major impact of the AEO certification is to ensure faster Customs operations. This will enable members to keep being competitive on the market place and avoid ineffective time delays at country boarders. The TAPA certificates cannot provide faster but only access to a network of secure certified operators. This will allow members to increase their visibility on the market of potential customers interested in improving the security of their shipments. Finally, some of the security measures specified in the AEO and TAPA certifications can provide industries as well as transport and logistics operators with enhanced visibility of operations and transaction of information.

**H6. The AEO will directly improve transport efficiency by ensuring faster and less time and cost demanding Customs clearance. Contrarily TAPA EMEA certification is not explicitly compliant to gain the AEO status. Both certifications may enhance visibility and transparency of operations.**
7. CONCLUSION

The findings reported in form of hypotheses in the previous section are summarized in Figure 7.1. In the figure, the qualitative impact of the two certifications on efficiency and security is illustrated by using a Boston matrix (Figure 7.1). The x-axis of the matrix represents the impact of the certifications on security. Similarly the y-axis corresponds to the impact on supply chain efficiency. The impact of these factors is measured on scale from low to high. The TAPA (business certification) and AEO (authority certification) certifications are symbolized respectively with a green triangle and a red square. These symbols are complemented with text labels indicating which hypotheses support the position in the matrix. The four quadrants of the matrix can be defined as it follows:

- **The 1st quadrant (upper left).** In this quadrant the certifications show to have a higher impact on efficiency than on security.
- **The 2nd quadrant (lower left).** The certifications in this area are assumed to have a scarce impact both on security and efficiency.
- **The 3rd quadrant (lower right).** In this part of the matrix, the certifications show a higher impact on security than efficiency.
- **The 4th quadrant (upper right).** From the perspective of a logistics or transport provider, this is the most interesting quadrant of the matrix, since in this area the certifications show their positive impact on both security and efficiency.

The analysis of the matrix supports the identification of similarities and diversities between the two certifications. To enhance the understanding of the reasoning followed in this paper, four areas are identified and brought to light in the diagram (Figure 7.1). These are the following:

- **Area1.** According to hypotheses, h1, h2, h3, and h6, the AEO certifications have a higher impact on supply chain efficiency than on security. The major determinant of the efficiency gap is ironically the inspection requirement set by the AEO certification itself. In addition, it seems that the AEOC cannot really obstacle antagonistic attacks to supply chains since it merely requires industries to open up their records concerning book keepings and financial solvency. Moreover the AEOS and AEOF don’t appear to show the same maturity and quality of TAPA EMEA certifications.
- **Area2.** According to the hypotheses, h1, h2, h3 and h6 the TAPA EMEA certifications have a higher impact on security than on supply chain efficiency. These certifications cannot give compliance to AEO and cannot benefit expedite operations at Customs. The benefits are only those related to higher visibility and transparency of supply chain operations.
- **Area3.** According to the hypothesis h4, both AEO and TAPA EMEA may experience difficulties in defining security requirements, risks and cost sharing for sub-contracted carriers and other logistics operators. The efforts required to set up and define agreements will certainly burden supply chain operators with costs in terms of time and human resources. In addition, a contract doesn’t really ensure the actual security of the supply chain. Once the agreement has been found it still remains ambiguous how to follow up the real implementation of the agreed security measures.
- **Area4.** Likewise according to the hypothesis h5, TAPA EMEA and AEO have a similar impact on supply chain efficiency and security. The risk auditing and follow up
operations to earn the certification and renew it periodically may improve security but reduce efficiency, because of the administrative work required.

Figure 7.1 Summary of difference and similarities of AEO and TAPA EMEA certifications.

This paper is meant to clarify main similarities and diversities between the AEO and TAPA EMEA certifications. The proximity of the triangle and square symbols in both the areas A3 and A4 gives indication of the similarities of the two certifications. The hypotheses supporting this finding are those pointing out the adoption of risk assessment, audit and monitoring processes as well as the problem concerning the definition and monitoring of security contracts. The Boston matrix developed in this section can also be exploited to demonstrate the complementarity of the two certifications and how their combination would result into a unique certification that could bring added values to supply chain stakeholders. Examining the matrix above, the areas A1 and A2 bring to light two regions where the certifications show a high degree of symmetry. Such symmetry gives us the occasion to speculate not only on the diversity of the two certifications but also on their almost perfect complementarity, i.e. the factor missing in one region is dominant in the other and vice versa. As a consequence the combination of part of AEO and TAPA guidelines would enable the development of certification that could be potentially positioned in the 4th quadrant of the matrix. In this region higher security can be achieved at lower costs because of the added values in supply chains.

The practical implication of the findings is that managers, that are facing the dilemma of choosing security certifications, will have the possibility to enhance their comprehension of AEO and TAPA EMEA as well as to acquire clarifications about the impacts of the certifications on security and supply chain efficiency. In addition, logistics providers are recommended to improve collaboration with the legislative bodies to have the ability to put forward their efficiency requirements and push the development of security certifications to be positioned in the 4th quadrant of the matrix. From a scientific perspective the approach of this paper has not been taken in any of the previous literature found. Previous researchers claim that authority certification can improve both security and efficiency. The comparison with business security certifications makes this judgement obsolete and emphasizes the adoption of a unique regulation. Hence, future studies should investigate how to merge authority and business certifications to achieve full logistics benefits from security regulations.
Finally, it has to be pointed out that this study takes into consideration only two certifications established in Europe: the AEO and the TAPA EMEA. Moreover, the findings are constrained by the subjectivity of the evaluations made by the authors when determining the hypotheses and positioning them into the Boston matrix. As a consequence we recommend carrying out future research to gather further empirical data from security and logistics experts (e.g. in form of interviews of surveys) to verify the proposed results.

REFERENCES


