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Since the terrorist attacks in 2001 the security issue has become an important topic for the companies involved in international trade. It has been confirmed in numerous studies that the companies became more interested in conducting risk assessment or introducing supply chain security management. Although not all the companies are interested in enhancing security of their business, and often supply chain security is not their main concern, the security industry based on B2B services is growing. There are numerous new companies offering security related services such as monitoring of shipments, video monitoring, physical security, cyber security, consulting, and advisory. Also existing companies, especially in the area of logistics, consulting and physical security have started to offer supply chain security services.

The purpose of this paper is to analyze the supply chain security industry, categorize the services offered by the companies and to determine the advantages and disadvantages of outsourcing security related processes to other parties. The methodology involves analysis of business offers of companies representing the industry from several countries. The paper analyses also potential for future growth of the industry and its place in international supply chains.

Keywords: Supply Chain Security, Security Industry, Private Security, Supply Chain Security Management

1 Introduction

Since 2001 security sector has been one of the fastest growing industries. The growth on a year to year basis reached 10% between 2001 and 2011. It is characterized by great advances in technology and growing number of security product manufacturers and security service providers.

Supply chain security (SCS) and the decisions whether to introduce any security measures, and whether to outsource them or not, became very important for many companies. Some managers still believe that supply chain security should be provided by governments (Jażdżewska-Gutta, 2014), however more and more companies decide to introduce private security measures and outsource security services.

The aim of this study is to analyze the supply chain security industry, categorize the services offered by security companies and to discuss the potential for future growth and the role of the sector for the companies involved in the supply chains. The first section contains a brief description of SCS sector and explains the motivation for the research. This is followed by literature review presenting theoretical and practical background for further analysis. This chapter defines SCS and its role for the companies, as well as provides an analysis of the nature of supply chains and SCS measures. The next section presents the findings from desk research which involves analysis of business offers of companies representing the industry from several countries. It contains the analysis of the sector both from demand and supply perspective. The aim of the last section is to discuss the trends in the security market.

2 Theoretical Background and Literature Review

The aim of this section is to present review of the academic and industry literature on SCS and security sector. By integrating different areas and perspectives of research it sets background for further analysis of supply chain security industry.

2.1 The Nature of a Supply Chain

For the purpose of discussing supply chain security the most simple definitions of a supply chain can be applied. According to Lambert et al., supply chain is an alignment of firms that brings product or services to the market (Lambert et al., 1998). The Glossary of Council of Supply Chain Management Professionals states, that supply chain consists of "material and informational interchanges in the logistical process stretching from acquisition of raw materials to delivery of finished products to the end user, where all vendors, service providers and customers are links in the chain" (CSCMP, 2013). Supply chains, especially those of international range, are often characterized by long and complicated processes, and involvement of many actors. These actors are not limited to suppliers, manufacturers, distributors and retailers, but also involve public authorities, service providers in the area of logistics, transportation, finance, security etc.

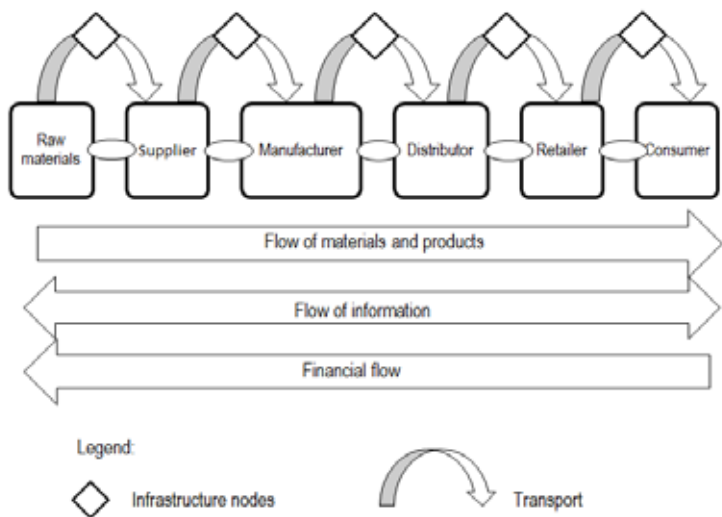


Figure 1 Elements of a supply chain

There are three types of flows in a supply chain (see figure 1) - flow of goods (materials and products), flow of information and financial flow, however the latter is often omitted in the analysis (Christopher, 2005; Harrison and van Hoek, 2008). From the perspective of supply chain security, the financial flow are also important, but in most cases, excluding cash transit, this is an area of interest for financial institutions and financial management. For this reason, the analysis of security of financial flows has been excluded from this study. All the above mentioned flows can be analyzed both in inter-organizational and intra-organizational dimension.

SCS covers not only aforementioned flows but also elements of transport, logistics or IT infrastructure, transport nodes, companies' fixed and movable assets (including inventories, vehicles, terminals, production sites) and

people. It includes elements of corporate security, facility protection or critical infrastructure protection. The security of the entire supply chain will depend on security of the least secured element. For that reason, all links in the supply chain should be involved in the process.

Usually the suppliers, manufacturers or retailers are the actors who are the most interested in enhancing security. Some companies protect their assets, people and information with their own resources but the protection of all aforementioned elements can be as well outsourced to specialized security companies.

2.2 Supply Chain Security

The term 'security' has a lot of meanings. The origin of this word is in Latin 'securus' (from se- meaning 'without' and cura meaning 'care'), which means 'feeling no apprehension' (Oxford). Based on that, Oxford dictionary defines 'security' as 'a state of being free from danger or threat'. In supply chain and business context, this definition can be developed into the safety of a company, organization or supply chain against criminal activity such as terrorism, theft, or espionage. Security thus implies a safe and predictable environment in which an organization can achieve its goals without disruption or fear of disturbance (Fischer et al., 2013) thanks to its ability to defend against threats. In a similar way supply chain security is defined as "general system property characterizing uninterrupted performance of a supply chain functioning to achieve its goals under protection against external purposeful threats" (Ivanov and Sokolov, 2010).

Security can also be interpreted through dynamic approach as it changes over time according to two factors: threat and vulnerability, and can be presented as a function (Hofreiter, 2012):

$$S(t) = f\{T(t) \times V(t)\} \quad (1)$$

where:

S - security, T - threat, V - vulnerability, t - time

Threat is an incident caused by human forces that makes sense of security decrease or disappear, and that may cause losses to the company if occurred. Vulnerability reflects the sensitivity of a company or supply chain to disturbance resulting from external or internal risks (Christopher and Peck, 2003; Waters, 2007). It may be interpreted as a combination of disruption probability and the scope of its possible consequences (Sheffi, 2007; Tandler and Essig, 2013). Wagner and Bode suggest that vulnerability depends on specific supply chain characteristics (Wagner and Bode, 2006). Svensson argues that preventive actions may reduce the likelihood of disturbances (Svensson, 2002). These actions should be aimed at reducing the probability of intentional disruption which will lead to increased security (Sheffi, 2007). These findings indicate that applying security measures by governments or companies may lead to higher level of security.

SCS measures can be proactive or reactive. Proactive measures include activities that are targeted at minimizing the risk of disruption. Reactive measures are, in turn, a reaction to a disruption. Proactive measures are thus more favorable for security and uninterrupted supply chain performance (Briano et al., 2009; Knemeyer et al., 2009; Craighead et al., 2007; Gould et al., 2010). The private security measures are believed to be more

proactive than reactive. For that reason they are regarded by companies as more efficient.

2.3 How, for Whom and at What Cost?

In order to determine the role of security industry for the corporations, their supply chains and for public security, some important issues have to be considered. Salter raises three major questions regarding security (Salter, 2008):

1. How is supply chain security assured?
2. For whom?
3. At what cost?

The first question refers to the choice between public and private security (SCS measures applied by public and private entities). Moreover, corporations have to decide whether to outsource or insource security activities. Insourcing (also called "proprietary services") would mean hiring in-house security personnel, such as CSO (Chief Security Officer) and security forces, while outsourcing (using contract services) would involve using services of outside companies representing security industry. Both activities fall under the definition of private security which is described in detail in the next section (Purpura, 2011; de Waard, 1999).

The application of SCS measures and the decision whether to outsource or insource security is in the area of interest of supply chain security management (SCSM), which can be defined as the application of policies, procedures, and technology to protect supply chain assets from man-made threats (Closs and McGarrel, 2004). There are three layers of SCS activities within SCSM: strategic, tactical and operational (see figure 2). Activities at

operational level are most common for outsourcing. More and more companies are offering also SCS related services at tactical level, i.e. consultancy or developing security plans. The most advanced SCS service providers can also manage all of their customers’ operational, tactical and strategic SCS activities, as the 4PL providers do in the area of supply chain management.



Figure 2 Layers of SCS outsourcing,
adapted from Tsiakis and Tsiakis (2013)

Companies may thus choose to design their security strategy on their own or to outsource the entire SCSM. After 9/11 many companies created the positions of CSOs at the level of senior managers (Ritchey, 2011), that were responsible for development and implementation of security strategies and security programs within the organization. Even if the risk assessment and development of security plans is the responsibility of the CSO, the company may still outsource such activities as technology design and implementation as well as training of the personnel.

The second question draws the attention to actual beneficiaries of security, and the problem of external benefits and public good. The last question concerns financial motivation for introducing supply chain security measures.

Although over many years the security issue has been in the area of interest of governments and public authorities, one can observe a clear trend toward privatization of security and growth of private companies representing security sector. Nowadays the security measures can be undertaken and financed either by public institutions or by private entities.

When it comes to public security it is usually the government who takes responsibility for introducing security measures. If, due to security measures, a disruption does not occur, the society will benefit from higher security level. In this context, security can be considered as an external benefit because it affects also third parties, not only those directly involved in the supply chain (Button, 2012). Supply chain security has also some features of public good (Dulbecco and Laporte, 2005; Button, 2012) which is characterized by non-excludability, (no one can be excluded from consuming this

good once it is produced) and non-rivalry, (it can be consumed by several individuals without diminishing its value) (Holcombe, 2007).

The public good approach to supply chain security is mostly relevant in case of low-probability, high-impact events, such as terrorism or WMD smuggling as they mostly affect the society. In case of these threats, the governments impose obligatory regulations for protecting the state, society, transportation networks from intentional criminal activity, that will affect companies and result in additional costs for supply chains. Other threats, such as thefts in transit or taking over the cargo by false carriers, affect companies and their supply chains rather than their environment. When security is financed by private sector (due to other than obligatory reasons), the effect for the society and surrounding are not so obvious.

2.4 Security Industry

The security industry represents private as opposed to public security. It is known also as corporate, organizational and commercial security, loss prevention or security management (Smith and Brooks, 2013; Fischer et al., 2013). Private security can be defined as a "profit-oriented industry that provides personnel, equipment and procedures to prevent losses caused by human error, emergencies, disasters or human actions" (Hess, 2009). Report of the Task Force on Private Security defines it as "self-employed individuals and privately funded business entities and organizations who provide security-related services to a restricted clientele group for a fee, for the individual or entity that retains or employs them, or for themselves in order to protect their persons, private property, or interests from varied hazards"

(NCJRS, 1976). According to these definitions, private security must be performed for a fee.

There are some more significant differences between private and public security. The tasks of public security are mainly to provide security to state and society, which is in line with the public good approach, whereas private security concentrates its efforts on protection of assets, people and information of its customer, who can be an individual or an organization (Smith and Brooks, 2013; Fischer et al., 2013, Cook and MacDonald, 2011).

Some researchers argue that private security (both outsourced and in-sourced), as opposed to public security, can only redistribute crime, instead of enhancing security through preventing crime. There are two basic effects of private security: diversion and deterrence, depending mainly on whether the implemented security measures are observable or not (Cook and MacDonald, 2011; Shavell, 1991; Zimmerman, 2014). Researchers suggest that observable security precautions might possibly displace crime to unprotected targets. In the scope of supply chain security such situation might take place when criminals move from protected truck parking spaces to unprotected sites, or from a fenced, guarded and monitored production site or warehouse to less secured locations. Such tendencies may be seen as negative externalities of private security. The situation is slightly different when it comes to unobservable precautions. If they are implemented, criminals are not sure which facility or element is protected so they might resign, causing the crime rates fall. This might be interpreted as a positive externality of private security. The use of private guards on board of commercial vessels (complemented by military efforts) led to minimizing the

number of pirate attacks in the Gulf of Aden. The pirates might resign as they are not sure which vessel is protected or not.

Cook and MacDonald also point out that remunerative opportunities need better protection (Cook and MacDonald, 2011). More valuable assets (from the point of view of possible thefts) and critical industries or infrastructure (from the point of view of terrorist activity) should be better protected than other venues as they are attractive targets for criminals and terrorists. This means that several industries such as energy sector, oil extraction and refining or pharmaceutical industry are more likely to become customers of security industry.

Security industry is not well and clearly defined. The main obstacle is the fact, that goods and services delivered by this sector are not easily separable from statistics based on the NACE classification, where they are combined with data on such industries as defense and private security activities, IT services and different areas of manufacturing (Directorate-General..., 2009). Security sector can be defined as the industry delivering goods and services required to protect people and property from insecurity (Martí Sempere, 2010). Due to the specific nature of supply chain, SCS industry provides not only a range of goods and typical security services, but would also management services i.e. risk and security assessment, planning, implementing and controlling security measures, required to protect supply chain flows, assets and people from crime and terrorism. Although this paper is concentrated on services, it includes also the analysis of material goods market, as usually the goods delivered by the sector are complemented by several services, such as design, assembly, maintenance, training and advisory.

European Commission in Action Plan published in 2012, distinguishes eight sectors of EU security industry (European Commission, 2012): aviation security; maritime security; border security; critical infrastructure protection; counter-terror intelligence; crisis management/civil protection; physical security protection; and protective clothing. Not all these sectors relate to supply chain security. Moreover, this list does not include security management which is also a part of SCS industry. The more appropriate classification distinguishes 18 core elements of security (ASIS Foundation, 2009): 1/ physical security, 2/ personnel security, 3/ information systems security, 4/ investigations, 5/ loss prevention, 6/ risk management, 7/ legal aspects, 8/ emergency/contingency planning, 9/ fire protection, 10/ crisis management, 11/ disaster management, 12/ counterterrorism, 13/ competitive intelligence, 14/ executive protection, 14/ violence in the workplace, 16/ crime prevention (general), 17/ crime prevention through environmental design and 18/ security architecture and engineering.

Both classifications are however for the entire security sector and not all the activities will be valid for supply chain security. For SCS analysis, at least the following sectors should be excluded - event security, custody of detainees and prisoners, supervision of apartment blocks, and all security services provided to individuals. In turn, other services such as security certification and supply chain security management should be added.

3 Costs and Benefits of Outsourcing Security

Many companies decide not to outsource security services because of fear, trust and loyalty issues or prestige associated with own security resources

(Hess, 2009; Fischer et al., 2013). There are some areas in the business activity that are not prone to outsourcing, such as management and formulating strategy and policy of the company. All other activities, including risk and security analysis and management, security planning, monitoring etc. can be outsourced.

3.1 Benefits

3.1.1 Reduced Cost

Most experts agree that the use of outside resources leads to greater efficiency and minimizing the cost of a certain activity. The same situation would apply to security services.

The external security providers, due to economies of scale, are able to spread the total cost over several customers lowering the unit cost per customer. The outsourced service becomes therefore more competitive than executing security through company's own resources. What is more, in-house corporate security officers tend to expect higher wages from the companies that hire them, which makes insourcing even more expensive (Fischer et al., 2013). By outsourcing security companies can also lower additional costs of insurance, equipment, training and holidays.

Moreover, outsourcing security allows to cover a broad range of supply chain activities which would be extremely costly if done with own resources only.

3.1.2 Expert Knowledge

Security industry experts usually possess in-depth knowledge on all aspects of security as well as on recent trends and newest technology. Training in-house staff to the same level of expertise would be very time and money consuming. Also hiring and keeping trained personnel is often very costly. What is more, security experts working for several customers usually have a broader view and fresh perspective on supply chain security issues than officers working in-house. Having access to expert knowledge is also useful in the certification processes.

3.1.3 Concentrating on Core Business

The companies that decide to outsource supply chain security can focus their attention and expenditures on other activities within the organization. They are able to reduce their administration efforts thanks to resignation from recruiting, training and supervising security personnel, especially when it comes to guards. Some expenditures for equipment can be also reduced through outsourcing.

3.1.4 Flexibility

Outsourcing allows the company for greater flexibility in staffing or replacement of technology. In case of technological changes, outsourcing of integrated security solutions might give the access to recent technical solutions without the need to replace all systems and equipment in-house. Problems with staffing can be solved due to no need to deal with trade unions' expectations, or with excessive or insufficient number of employees

during irregular seasons such as production shutdowns, rush seasons or holidays (Fischer et al., 2013).

3.2 Costs

3.2.1 Loss of Internal Control for the Organization

Outsourcing security activities such as monitoring or guards may lead to loss of control over several processes within the company. This is particularly evident when it comes to hiring new personnel as the process is usually more detailed and careful when performed for in-house employees.

3.2.2 Trust and Partnership

When leaving some functions to be performed by outside company, there is a need to establish trust between cooperating partners. The companies tend to hire trusted and approved security providers. This might explain the popularity of outsourcing security to market leaders and the existence of several security industry associations. However, even well-established partnership might fall apart when some communication problems occur and the vision of the service provider proves to be inconsistent with the plans of its customer.

3.2.3 Unexpected Costs

Whitworth names some hidden costs that can arise from outsourcing and which should be taken into consideration in decision-making process (Whitworth, 2005). This is basically the cost of switching to a new provider when the contract period ends or when the security provider goes out of

business. The cost might be also higher than expected due to poor service or increase of costs compared to the initially planned amount.

4 Supply Chain Security Sector – Results of Research

4.1 Characteristics of the Sample

The offers of supply chain security service providers were subject of desk research. The number of analyzed offers reached 70 companies from different countries. Almost 76% of the companies declared exporting their goods and services, of which 46% were present in the global market. The countries were thus aligned on the basis of origin of the company.

The choice of the companies was random, based on their presence in industry trade shows and on the Internet. The original intention was to investigate offers from the major security markets – i.e. United States, which is global leader of security industry, United Kingdom, which is a European leader and some Polish companies. Due to required country adjustments, the sample of the countries is different than expected. The sample contains 30 companies from United Kingdom, 18 from the US, 6 from Poland, 4 from Germany, 2 from Switzerland and one firm from the following countries: Sweden, Spain, Taiwan, Romania, the Netherlands, Malaysia, Italy, Canada, Australia and UAE.

Most of the companies were established before 2001. The foundation of only 27% of the companies took place in 2001 or later and the major part of them (42%) is represented by consultancy firms. This sector of supply chain security was characterized by great growth potential after 2001 as more

and more businesses were interested in implementing supply chain security management practices into their operation and strategy. However, also other segments developed after 2001, by expanding their range of products and/or services with new SCS solutions. One company grew out of aviation industry magazine into a big security consultancy group. Also some transport and guarding companies as well as manufacturers of monitoring and scanning equipment started to offer new services.

The sample contained companies of different size, from SMEs to big global companies hiring more than 10 thousand employees (see table 1). The small companies represented mainly consultancy and new technologies segment. The companies with more than 10 thousand employees are global players in labor-intensive guarding sector, or parts of bigger capital groups (i.e. in telecommunications sector), where only one branch of the company is involved in the security industry.

Table 1 Size of the companies

Number of employees	Number of companies
1-10	5
11-50	19
51-200	6
201-500	4
501-1000	6

Number of employees	Number of companies
1001-5000	7
5001-10000	2
More than 10000	11

4.2 Main Segments of the Market – Supply Side

Some segments of the market can be distinguished on a basis of services offered by the analyzed companies. Due to a small sample the results cannot be generalized to the entire population. The most represented sectors were consultancy, video monitoring, scanning, screening and detection, guards, IT communication systems, seals, customized security and integrated supply chain security solutions, fences and other security technologies. Other segments were represented by counter-espionage, engineering, inspection, maritime security (Private Maritime Security Company), packaging, security training and radar technology. The most strongly represented sectors are presented in table 2.

Table 2 Segments of security sector

Segment of the market	Number of companies	Average number of offered products and/or services	Characteristics of the size of companies
Consultancy	17	8	65% companies having less than 50 employees
Video monitoring	8	1,5	50% companies having more than 50 employees
Scanning, screening and detection	6	1,6	Varied size
Guards	5	4	100% companies having more than 10000 employees
Fences	4	1,5	Varied size
Seals	4	1,75	Varied size
IT and communication systems	3	3,5	Varied size

Consultancy companies usually offer wide range of security services and integrated security solutions. Apart from advisory, management and certification, they offer security architecture and engineering and some technological solutions. For example, many consulting firms are dealing also with CCTV and IP video monitoring, which used to be typical for manufacturers and distributors of equipment. Similar trend, but on a lower scale is observable in guarding sector.

The sample revealed that typical technology manufacturing firms usually offer only some complementary advisory services, so their portfolio is not as rich as in the case of consulting sector.

Most companies from the sample offered the following goods and services: training - 20 companies, risk assessment - 19, risk and security management - 18, consultancy - 17, developing security plans, programs and procedures - 16, video monitoring - 15, physical access control - 10, scanning and detection - 9, security software - 9, crisis management - 9, secure communication - 8, guards - 7, ISO 28000 certification - 7. The analysis of the sample reveals that SCS sector's focus is on implementing technology and supply chain security management practices.

4.3 Types of Customers – Demand Side

Almost 89% of the companies supply their goods and services to business sector. The rest is targeted towards government sector and public institutions or critical infrastructure (ports and airports). Only a few companies offered their services to the transport sector only.

Around 16% of those companies that were focused on business customers dedicated their services particularly to exporters and importers. Such companies usually offered certification and advisory for ISO 28000, TAPA, C-TPAT and AEO. The focus on AEO was typical for Polish companies, although it has a little in common with real supply chain security, as most of the companies are interested in the Customs and not in Security certificate. It is also important to mention that the business customers in general represent specific industries, which are more prone to terrorist or criminal activities. The analyzed companies' offers were usually customized according to different industries. Most of them concerned transport companies, energy sector, oil extraction, pharmaceuticals or industry in general. These are the most remunerative industries mentioned in the previous section, that are more likely to become a target of criminals. In order to protect supply chains, the companies decide to introduce private security measures.

5 Trends in Supply Chain Security Market

Several trends can be identified in supply chain security market:

1. The growth of the sector will be very dynamic. In some regions, mainly due to terrorist and other security threats, the growth will be relatively higher.
2. Human work in many sectors will be replaced by technology.
3. There will be greater demand for well-educated security specialists.
4. Integration of services and companies will be progressing.

In 2011 the security industry was ten times bigger than in 2001. Then the value of the market reached approximately EUR 10 bn, while in 2011 security goods and services accounted for around EUR 100 billion. The growth of security sector has shown such dynamics that in many countries it outpaces the economic growth. ADS Industry Outlook states that the sector in United Kingdom grew in 2013 five times faster than the country's economy (ADS, 2014).

According to several industrial analyses, the security market will be dynamically growing over the following years. The industry is expected to reach around EUR 300 billion in annual revenues at the end of the period (Risk UK, 2015).

Industry forecasts predict that the share of European security industry in the global security market will drop by 5 percentage points to 20% between 2010 and 2020. This is mainly caused by rapid growth of the industry in other locations such as Middle East, India, Kenya and Horn of Africa. G4S, a global security company, predicts high (at 10% on an annual basis) growth of security market in Egypt and Gulf States (FM World, 2015). The rise is driven predominantly by the need to protect from risks involved in extraction of natural resources.

As for human involvement in security sector, guarding services are still one of the most important segments of security industry. However in many locations they are replaced by recent technological advancements such as automated monitoring or CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) Detection systems. Even with such equipment, there is still need for a human that would supervise all the processes. The trend might be towards better trained security personnel, as well well-educated CSO,

who will be experts in security assessment, planning, architecture and engineering.

Another trend is towards the integration of security services. As a result of growing market potential, many security providers started to add new security services to their portfolio. For example, companies that started in the guarding sector, are offering broad range of consulting services and specialized security management. The companies that started with selling security equipment expand the scope of their services with security architecture and engineering. The other way of expansion is through mergers and acquisitions. As a result, the industry may see a new type of External Security Providers (ESP) - major security integrator. Such a service provider might be called Lead Security Integrator (LSI) or Lead Security Provider (LSP). Similarly to Lead Logistics Providers, such company can offer complete management of Security or Supply Chain Security, including planning, implementing, controlling and coordination of all security aspects within the company or supply chain. Security might be fully outsourced to LSI, however the control should always stay within the commissioning company.

6 Conclusions

The above analysis shows that SCS services sector is very diverse in terms of size, offered services or year of establishing. The common feature is that it started to grow after year 2001 and one can predict that in the increas-

ingly turbulent environment, it will continue to grow. Due to lack of harmonization of public authorities' efforts, companies will continue to turn to private security in order to minimize the vulnerability to disruption.

SCS sector is a vital component of SCSM. An important decision in this area that has to be made by the management is whether to outsource supply chain security or not. The benefits of using outside resources, a wide range of available security services and trends towards more integrated security services may encourage companies to outsource even more security activities.

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