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Supply Chain Integrity and Efficiency – creating a new service concept

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Laurea University of Applied Sciences **Abstract**
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The purpose of this study was to develop a holistic service concept for enhancing supply chain integrity and efficiency. The service was developed for Turvatiimi Oyj, one of the four largest security companies in Finland. Turvatiimi has functioned for years as Eurowatch Finland enabling it to serve its customers who want to protect their mobile assets anywhere in Europe.

The research behind this thesis was done using the Constructive Approach, which is a research procedure for producing constructions and solving problems that emerge in running business operations. As a result of the research, a completely new service concept and new models for serving the logistics sector were created.

As part of the overall development project, a survey was conducted to chart how similarly or differently logistics and security people view the threats and problems along the supply chains. To this end, the responders were asked, which elements of the supply chains would be suitable to be included in an outsourced service. The survey results show the increasing importance of shipment condition monitoring and protection of supply chains from also other threats than security related ones. The scattered opinions about the threats related to logistical integrity indicate the complexity and variety in the logistics sector, which consequently creates new challenges for the service providers.

The developed SCIE service (Supply Chain Integrity and Efficiency) is actually a portfolio of services available to customers in the logistics sector or any other sector, where mobile objects need to be monitored and safeguarded. SCIE's core function is the track and trace service, which utilizes the latest technologies to locate and serve vehicles, trailers, drivers, individual shipments or individual people.

The service package also includes other types of services that support the security and integrity of the supply chain. Such service options consist of security training and security arrangements of static sites along the supply chain (operational, technical, constructional). Turvatiimi can provide many of these services itself, and for the rest it has gathered a network of geographical and operational partners to enable the company to provide a comprehensive service to its customers.

The "I" in SCIE refers to the integrity monitoring of selected objects along the supply chains. The "E", on the other hand, points to efficiency development, which can take place through professional consultancy or collaborative development projects. Anyway, the objective is not to be contented with the minimized risks, but also to actively look for possibilities to improve lead time efficiency and to utilize the opportunities of the ever developing technologies to streamline the operations to be as fluent and cost-effective as possible.

A fundamental idea of the SCIE concept is to promote collaboration in the logistics sector. As a service provider, Turvatiimi wants to prove in practice how cooperation along the supply chains creates more coordinated operations and new levels of efficiency, transparency and cost savings.

Key words: Security service, Integrity service, Tracking, Alarm monitoring, Logistical security, Securing mobile assets, Supply chain development, Collaboration

Laurea-ammattikorkeakoulu **Tiivistelmä**
Leppävaara
Turvallisuusosaamisen ylempi koulutusohjelma

Timo Lahtinen

Supply Chain Integrity and Efficiency – uuden palvelukonseptin luominen

Vuosi 2010 Sivumäärä 114

Tämän tutkimuksen tavoite oli kehittää kokonaisvaltainen palvelukonsepti toimitusketjujen integriteetin ja tehokkuuden edistämiseen. Palvelu kehitettiin Turvatiimi Oyj:lle, joka on yksi neljästä suuresta turvallisuuspalveluyrityksestä Suomessa. Turvatiimi on myös vuosia toiminut Eurowatch Finlandina, mikä on mahdollistanut palvelut sellaisille asiakkaille, jotka haluavat suojata liikkuvaa omaisuuttaan Euroopassa.

Tähän opinnäytetyön tutkimustyössä käytettiin konstruktiivista tutkimusta, joka on tutkimustapa rakenteiden luomiseen ja ongelmien ratkaisemiseen liiketoimintaympäristöissä. Tutkimuksen tuloksena on aikaansaatu kokonaan uusi palvelukonsepti ja uusia toimintamalleja logistiikka-alan palvelemiseksi.

Osana kokonaiskehitysprojektia tehtiin kyselytutkimus ja selvitettiin, kuinka samantyyppisesti tai erityyppisesti logistiikka- ja turvallisuusihmiset näkevät uhkakuvat ja ongelmat toimitusketjuissa. Vastaajilta kysyttiin myös, mitä toimitusketjujen elementtejä he pitävät soveltuvina ulkoistettuun palveluun. Kyselytulokset osoittavat lähetysten olosuhdevalvonnan ja myös muidenkin kuin turvallisuuspainotteisten suojaustoimenpiteiden kasvavan merkityksen. Integriteettiuhkakuviin liittyvien vastausten hajonta osoittaa logistiikkasektorin moniulotteisuuden, mikä luo palveluntuottajille merkittäviä uusia haasteita.

Kehitetty SCIE-palvelu (Supply Chain Integrity and Efficiency) on itse asiassa palvelukokonaisuus logistiikka- tai mille tahansa muulle alalle, jolla tarvitaan liikkuvien kohteiden valvontaa ja turvaamista. SCIE:n ydintoiminnot liittyvät paikannus- ja seurantapalveluun, joka hyödyntää viimeisimpiä teknologioita ajoneuvojen, trailereiden, kuljettajien, yksittäisten kuljetusten tai yksittäisten ihmisten paikantamiseen ja palvelemiseen.

Palvelukokonaisuus kattaa myös muunlaisia palveluita, jotka tukevat toimitusketjujen turvallisuutta ja integriteettiä. Tällaisia palveluoptioita ovat mm. turvallisuuskoulutus ja kiinteiden kohteiden turvallisuusjärjestelyt (toiminnalliset, tekniset, rakenteelliset). Turvatiimi voi toimittaa useimpia näistä palveluista itse, ja muilta osin sillä on käytettävissään alueellisten ja toiminnallisten yhteistyökumppaneiden verkosto, mikä mahdollistaa kokonaisvaltaisen palvelun tuottamisen asiakkaille.

SCIE:n I-kirjain viittaa valittujen kohteiden integriteettivalvontaan toimitusketjujen varrella. Sen sijaan E-kirjain tarkoittaa tehokkuuden kehittämistä, jota voidaan tehdä ammattilaistyönä tehtynä konsultaationa tai yhteisinä kehitysprojekteina. Riippumatta toimintamallista tavoite on olla tyytymättä pelkkään riskien minimointiin ja pyrkiä aktiivisesti löytämään uusia mahdollisuuksia lead time-tehokkuuden kehittämiseen, jatkuvasti kehittyvien teknologioiden hyödyntämiseen ja toimintojen virtaviivaistamiseen niin sujuviksi ja kustannustehokkaiksi kuin mahdollista.

Eräs keskeinen SCIE-konseptin perusajatus on edistää yhteistyötä logistiikkasektorilla. Palveluntuottajana Turvatiimi haluaa osoittaa käytännössä, kuinka toimitusketjuyhteistyö luo paremmin koordinoitua toimintaa, uutta tehokkuutta, läpinäkyvyyttä ja kustannussäästöjä.

Avainsanat: Turvallisuuspalvelu, Integriteettipalvelu, Paikannus- ja seurantapalvelu, Hälytysvalvonta, Logistiikkaturvallisuus, Liikkuvan omaisuuden suojaaminen, Toimitusketjujen kehittäminen, Yhteistyö

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1. Introduction

1.1 Background

Turvatiimi initiated the SCIE (Supply Chain Integrity and Efficiency) development project in order to create a new service concept to better serve customers in the logistics sector and anybody else wanting their mobile resources and assets protected. The SCIE project was funded by TEKES (The Finnish Funding Agency for Technology and Innovation).

Turvatiimi is also continuously looking for new possibilities in developing and updating its service portfolio, and for the new SCIE service concept project, it gathered a project team of selected companies to develop a new service based on the project findings:

- Turvatiimi, a service provider
- 4TS Finland, a technical partner
- Outokumpu, a heavy industry exporter
- Schenker, an international logistics company
- Pohjola Vakuutus, an insurance company
- Tuotekehitys Oy Tamlink, project coordinator

- external expertise from VTT and LogiSec

The writer is a long-time Key Account Sales Manager at Turvatiimi, and he has also been continuously involved in the service and quality development at the company. He also functioned as the Project Manager of the SCIE project.

Turvatiimi Corporation is one of the four large security companies in Finland. After a recent company acquisition of Otso Palvelut, its estimated annual turnover for 2010 is about 37 M€ and it has over 1,000 employees. Turvatiimi is listed at Nasdaq OMX Helsinki. Turvatiimi operates countrywide in Finland offering a comprehensive range of security services and technical solutions to businesses, public sector and private households.

Turvatiimi Corporation also functions as Eurowatch Finland, providing security services for customers requiring logistical security on European scale. The idea of Eurowatch is to provide response services for border crossing vehicles in all Europe. The scope of Eurowatch services is still expanding geographically and functionally, making it possible for Turvatiimi to use the network as an effective platform for expanding services as well.

According to the European Union, the theft of high value and high risk products moving in the European supply chains is worth over € 8.2 billion a year. Percentagewise, even small achievements in cost saving efforts represent substantial sums of money, making improved supply chain security and fluency worth pursuing.

1.2 Purpose of the study

The purpose of this study is to develop a holistic service concept for enhancing supply chain integrity and efficiency. In the security market there is an obvious need for a new kind of a service that helps customers protect their logistical arrangements, make them more resilient against problems as well as more flexible in alarm and response situations.

The objective of the SCIE concept is to find the most suitable methods for realtime monitoring of supply chains and immediate responses to normalize alarm situations. By approaching supply chains as holistic systems, finding new ways of sharing and utilizing information as well as applying technical innovations the SCIE service gives customers coordinated and enduring solutions that save money. This paper reflects the concept design of the development project.

It is unfortunate that in most security related development work the driving forces have been the American disasters of 2001 and various other setbacks in maintaining security rather than the objectively assessed opportunities of actually making operations more effective and achieving cost savings that cover the current security costs many fold. With hard work, open minds and collaborative attitudes anything is possible.

1.3 Key terms

Supply chain

ISO 28000 defines a supply chain as the linked set of resources and processes that begins with the sourcing of raw material and extends through the delivery of products or services to the end user across the modes of transport. A supply chain may include vendors, manufacturing facilities, logistics providers, internal distribution centres, distributors, wholesalers and other entities that lead to the end user (ISO 28000 - specification for security management systems for the supply chain, 2007).

According to Wikipedia (20 Jan 2010) a supply chain is the system of organisations, people, technology, activities, information and resources involved in moving a product from supplier to customer. Supply chains can be global, cross national boundaries and use all modes of transport.

Supply chain integrity

In this context integrity means in practice that the transported goods preserve their overall quality as well as arrive securely, safely and on time to the final destination.

Supply chain efficiency

Supply chain efficiency includes e.g. the measures aiming at harmonizing supply chain functions, optimizing lead times, achieving optimal cost-efficiency, creating the best possible collaboration environment and minimizing the disruptions that challenge the supply chain fluency and integrity as well as sustainable development. Carried out systematically, supply chain efficiency work helps ensure minimized security and integrity weaknesses that might otherwise have been neglected or remained unoptimised.

1.4 Restrictions and exclusions

This report covers the background, concept design and development work of the larger SCIE project. The SCIE project was finalized in August 2010, and the testing and pilot runs showed the actual operational readiness of Turvatiimi to provide the new service.

The subject restrictions for this thesis became almost self-evident due to the public nature of this report and the secrecy requirements of many development aspects. Many of the practical results of the project will be presented in other, confidential project reports.

To start with, the SCIE service vision covers Europe as a geographical area, with the reasonably easy option of expanding the service onto a global scale. Only after the day-to-day services reach routine levels, can wider ambitions come to question.

1.5 Structure of the report

The next paragraph handles the general background and existing practices around the supply chains. In the paragraph it is argued that both security and logistics sectors are in a constant change and to some extent in a turning point, after which those companies that are not able to adapt to new business environments start to fade away.

Paragraph three is about the strategy implications of the planned service and the different aspects that a company like Turvatiimi needs to take into account when adapting the service into a larger service portfolio.

Paragraph four examines the background and challenges in product development in general and especially when used in the development of security services.

Paragraph five clarifies the method used in this development project. The Constructive Approach and its applications in practice are described in detail.

Paragraph six portrays the essential empirical findings that have been gathered by the project and the researcher.

Paragraph seven outlines the development results. The main result of the project is the service concept itself. However, as the project has progressed, it has also produced useful ideas that support Turvatiimi's other service areas.

Paragraph eight lists the value and benefits of the new service concept to the customers, Turvatiimi, security and logistics sectors as well as insurance companies.

Paragraph nine concludes the report with a brief description of the major innovations and research results that have been reached in the SCIE project.

2. Protection and enhancement of supply chains

2.1 Logistics sector and crime

According to the annual report by the Finnish National Bureau of Investigation (Keskusrikospoliisi 2009, 21) various forms of criminals target the Finnish logistics sector in variable frequency, methods and elements, ranging from single shipments and vehicles, trailers and other transportation units to logistical terminals. Transportation services provided by Finnish companies have been targets in certain West European countries and Russia. Furthermore, the logistics business is to some extent plagued by losses related to fraud and embezzlement.

The NBI report notes that the international nature and the operating speeds make the logistics business particularly vulnerable to professional and organized crime, both as target and tool.

Kelo (2010, 6) has listed phenomena influencing the crime levels in the Finnish logistics sector:

- economic boom after the recession of the early 90's
- EU integration and expansion (authorized and esp. unauthorized migration)
- Schengen agreement
- nature of high tech products (package sizes, quality, value)
- organized crime
- narcotics trade
- terrorism
- inadequate training of drivers and other personnel
- poor internal control (65 % of loss of whole shipments include use of insider information)

Europol's OCTA (European Organised Crime Threat Assessment) 2008 and 2009 reports describe aspects of the crime situation in Europe. The 2008 report (OCTA 2008, 17) warns about EU-based as well as non-EU-based criminal groups and their interest to get more involved in the final phases of the supply chain, namely distribution and money laundering and to expand their business into other criminal markets in the EU. The criminals regard the borderless European Union as a good location to invest some of the criminal proceeds to profitable legal businesses. The 2009 report further analyses the criminal groups in Europe and describes in detail five criminal hubs in different parts of the continent.

TAPA's Vigilant News (6/2009, 3) quotes a report about the European security situation published in 2008 by the International Road Union (IRU) and International Transport Forum (ITF) highlighted that over the period 2000-2005:

- 17 % of all drivers have experienced an attack during the investigated period
- 30 % of attacked drivers have been attacked more than once
- 21 % of drivers were physically assaulted
- 60 % of the attacks targeted the vehicle and its load
- 42 % of the attacks took place in truck parking areas
- 30 % of the attacked drivers did not report the incident to the police
- countries where the highest number of surveyed attacks occurred (per million tonnes of international traffic) are Romania (5.03/Mt), Hungary (1.31/Mt) and Poland (1.21/Mt)

According to Havo & Kekäläinen (2006,iii) the Finnish logistical companies are not ready to invest in expensive security systems, because the logistics sector is so heavily competed and any investments in enhancing security are very difficult to transfer into the service fees. Havo

and Kekäläinen also state that the average operating profit of Finnish logistics companies is less than 10 percent. Many customers insure their shipments and expect the logistics companies to handle the shipments securely. Most problems are thought to be matters between the logistics company and the insurance company. All this means that any new solutions introduced to the logistics sector must be particularly cost-effective and they need to create savings worth more than their costs.

2.2 Supply chains and security

Supply chain security is generally understood as a collection of measures to enhance the security and safety of various transport and logistics systems. Typical security activities related to supply chains can include e.g.:

- supply planning and contracts
- identification and credential evaluation of the supply chain members
    - background checks
- screening and validation of the contents of cargo
    - physical inspections and audits
- notifications related to the shipment
    - to the destination
    - to the logistical operators
    - to the authorities
- protection of the integrity and security of cargo while in transit as well as at warehouses and terminals en route
    - physical security arrangements
    - required alarm systems
    - monitoring services
    - security escorts
- inspection of the cargo on entry
    - entry verification
    - quality and integrity verification

2.3 Changing approaches to supply chain security

The security sector is changing constantly, just like most other sectors. Customers change and start appreciating new ways of doing things. Knight (2003, 3) has evaluated the following trends to describe the evolution of supply chain security (SCS).

According to Knight the focus is generally shifting in the following SCS dimensions:

FROM:		**TO:**
Corporate security	⇨	Cross functional team
Theft prevention	⇨	Theft prevention and anti-terrorism
Inside the company	⇨	End-to-end supply chain
Vertically integrated supply chain	⇨	Outsourced business model
Country or geography	⇨	Global approach
Contingency planning	⇨	Contingency planning and crisis management

Hameri & Hintsa (2009, 748-749) have assessed the drivers of change for cross-border supply chains and listed 14 change drivers, most of which have direct integrity and efficiency dimensions. The drivers are (not in prioritized order):

- business ethics, good corporate citizenship
    - transparency and regulatory compliance will have ever increasing role in successful operating models for the global companies of the future
- customs regulations compliance
    - interfaces between different supply chain players and customs administrations are to improve as supply chains become ever more complex and global
- consumer demands and wishes
    - consumer finances and will finance future suppliers that can best meet their expectations, be it cost, quality or value wise satisfaction
- corporate taxation schemes
    - the parameters related to taxation in various countries continue to impact component sourcing, factory location and geography related decisions
- energy concerns
    - the beginning of the new millennium has already indicated that energy sources and prices strongly affect the performance of global supply and delivery processes
- environmental concerns and regulations
    - environmental issues with emission quotas will reshape both how supply chains are structured and how companies will seek energy efficient manufacturing and transportation solutions
- global pandemics and natural hazards
    - potentially devastating pandemics such as avian flu and earthquakes are threats, which have to be considered when planning supply chain structures and contingencies in the future

- information and data management complexities
    - the apparent increase in supply chain network complexity will challenge information management on a global scale with many players involved
- Internet and e-commerce technologies
    - timely and correct information on operations continues to be the key to efficient supply chain operations, which means that the Internet related services and trading platforms will have an ever increasing role in coming decades
- manufacturing and low cost labour
    - manufacturing companies continue to be driven by scale and lower cost, which continues to change the supply chain structures and makes supply chain management all the more challenging
- new technologies for physical operations
    - various technological means to track, detect and control global material flows will develop further and their application will become commonplace
- raw material concerns
    - continued global growth has led to a surge in raw material prices and companies exploring and refining natural resources will play a more important role in the global economy
- security concerns and regulations
    - security issues have gained significant momentum through terrorism, and this trend will continue into the future and complementary and dedicated regulatory, voluntary and involuntary programs to improve global security will shape the global business environment
- technical trade barriers
    - governments and economic areas may have increasing incentives to regulate local and/or regional trade in order to control the impact of globalization

2.4 Supply chain security management

2.4.1 Standards and requirements

According to Ahokas & Visuri (2008, 66) the networked economy brings about more pressure for companies to manage the information related to international security programs, which involve new obligations and costs, but also add to the company know-how, improve reliability and company image as well as create payback by added fluency of the supply chains.

Some of the most essential security programs, guidelines and standards are briefly described in the next few paragraphs.

TAPA

Transported Asset Protection Association (TAPA) is a forum of security professionals and related business partners who have organized themselves to promote standardized security arrangements in international logistics and to reduce losses from international supply chains. TAPA organisation is divided geographically into three areas: Europe, the Middle East and Africa (EMEA), the Americas and Asia.

The objective of the association is to create a positive change in the security practices of freight transporters and insurance companies, and little by little it has emerged as the major security standard in the global logistics. In Europe all the major logistical companies work within the certification, and many others are already developing their operations based on the guidelines.

TAPA standards aim at protecting the trouble-free continuity of operations. The system includes auditing procedures for security in terminals, offices and distribution as well as safe parking. TAPA consists of the following elements:

- FSR (Freight Security Requirements)
- TSR (Truck Security Requirements)
- PSR (Parking Security Requirements)
- TACSS (TAPA Air Cargo Security Standards)

Each element has its own principles and regulations, but in the near future they will be integrated to be compatible with the same auditing matrix (TACSS).

Incident Information Service (IIS) is an information service, where TAPA collects all relevant information for its databases and shares it with TAPA members, who can use the cargo crime intelligence data to avoid incident hotspots more efficiently. TAPA also publishes Vigilant News, which is a monthly bulletin reporting incidents and interesting developments in the logistics sector.

ISO 28000

ISO 28000:2007 specifies the requirements for a security management system, including aspects critical to security assurance of the supply chain. Security management is also linked to many other aspects of business management, including all activities controlled or influenced by organizations that impact on supply chain security. These other aspects should be considered directly, where and when they have an impact on security management, including transporting these goods along the supply chain.

ISO 28000 is applicable to all sizes of organizations, from small to multinational, in manufacturing, service, storage or transportation at any stage of the production or supply chain that wishes to:

- establish, implement, maintain and improve a security management system
- assure conformance with stated security management policy
- demonstrate such conformance to others
- seek certification/registration of its security management system by an Accredited third party Certification Body
- make a self-determination and self-declaration of conformance with ISO 28000

AEO

On the basis of the Community Customs Code, EU member states can grant an AEO status to any economic operator meeting the following common criteria:

- customs compliance
- appropriate record-keeping
- financial solvency
- security and safety standards, where relevant

The status of AEO (Authorised Economic Operator) granted by one member state is recognized by the other member states. However, this does not automatically allow them to benefit from simplifications provided for in the customs rules in the other member states. Other member states can grant the use of simplifications to authorized economic operators, if they meet specific requirements.

Economic operators can apply for an AEO status to have easier access to customs simplifications or to be in a more favourable position to comply with the new security requirements. Under this security framework, economic operators will have to submit pre-arrival and pre-departure information on goods entering or leaving the EU. The security type of AEO certificate will allow their holders to benefit from facilitations with regard to the new customs controls relating to security. (European Commission - Taxation and Customs Union, 2009)

C-TPAT

The American equivalent to AEO is called C-TPAT (Customs-Trade Partnership Against Terrorism). It is a voluntary government/private sector initiative for building cooperative relationships that strengthen and improve overall supply chain security as well as U.S. border security. Through close cooperation with importers, carriers, consolidators, licensed customs brokers and manufacturers C-TPAT partners aims at ensuring the integrity of their security practices and guidelines. (U.S. Customs and Border Protection, 2006)

OHSAS 18001

When considering comprehensive security service packages, one cannot neglect the occupational health and safety matters. OHSAS 18001 (Occupation Health and Safety Assessment Series) provides policies and procedures for creating full codes of practice. It is intended to help organizations to control occupational health and safety risks. It was developed in response to widespread demand for a recognized standard against which to be certified and assessed. The system specification comprises two parts (18001 and 18002) and embraces a number of other publications.

The OHSAS specification is applicable to any organisation that wishes to:

- establish an Occupational Health & Safety (OH&S) management system to eliminate or minimize risk to employees and other interested parties who may be exposed to OH&S risks associated with its activities
- assure itself of its conformance with its stated OH&S policy
- demonstrate such conformance to others
- implement, maintain and continually improve an OH&S management system
- make a self-determination and declaration of conformance with this OHSAS specification
- seek certification/registration of its OH&S management system by an external organisation

ISPS code

The International Ship and Port Facility Security (ISPS) Code is an amendment to the Safety of Life at Sea (SOLAS) Convention (1974/1988) on minimum security arrangements for ships, ports and government agencies. ISPS prescribes responsibilities to governments, shipping companies, shipboard personnel, and port/facility personnel to detect security threats and take preventative measures against security incidents affecting ships or port facilities used in international trade.

The main objectives of the ISPS Code are:

- to detect security threats and implement security measures
- to establish roles and responsibilities concerning maritime security for governments, local administrations, ship and port industries at the national and international level
- to collate and promulgate security related information
- to provide a methodology for security assessments so as to have in place plans and procedures to react to changing security levels

Insurance company requirements

Insurance companies have sets of instructions related to certain minimum - security requirements of logistical arrangements. Meeting the requirements is often a precondition of getting insurance. Obviously, the instructions serve to minimize occurring damages, and mostly they are parallel with more general guidelines and give practical advice on how to avoid problems. In Finland the insurance company requirements do not vary very much.

Supplier codes of conduct

Many companies using various services provided by supplier networks maintain sets of business conduct standards describing the basic standards and requirements for providing the service to the company and its end-customers.

2.4.2 Projects and groups enhancing logistical security

There are numerous ongoing projects and groups, which aim at bringing about new knowledge and efficiency to the logistical security. Some of them are EU or public sector driven and some are groups of businesses with the objective of shared security standards.

SATERISK project

In his MBA thesis Mr. Jouni Viitanen (2009, 88) describes SATERISK, which is an ongoing joint research project of universities, public organisations and private companies aiming at development of positioning, navigation and tracking systems. The aim of the project is to evaluate risks as well as technical and legislative requirements for positioning and tracking, now and in the future. The project also aims to raise the level of tracking know-how in the European security sector and to minimize the problems of comprehensive *m2m* (machine-to-machine) monitoring across country borders. The project also charts possibilities and risks around the upcoming Galileo system, which is the European counterpart and rival of the widely used American GPS satellite positioning system.

SETPOS

Secure European Truck Park Operational Services (SETPOS) is an EU financed project with the aim of establishing secure parking areas in all EU countries. The project has developed a Best Practice Handbook describing safe and secure procedures for drivers in their parking needs.

SETPOS has created fully functional parking areas with comprehensive services, but so far they have not attracted vast numbers of clients. The reluctance to use these services is largely related to the very low profit margins of the subcontractors. Service fees, which amount to reasonable levels of a few dozens of Euros, are unreasonable for many drivers.

LOGY ry

The purpose of the Finnish Association of Purchasing and Logistics (LOGY) is to develop procedures for purchasing of materials and services and to promote physical logistics (i.e. transport, storage and handling) and the professional skills of employees in logistics for the benefit of the Finnish economy and society. LOGY's objective is to improve logistics and increase the internal and external integration of logistics, to develop the utilization of computer processing and data interchange in logistics and to present Finnish logistics services. In order for LOGY to achieve its goals in efficiency of the logistical arrangements of its members, it also promotes the security and integrity of the operations.

C.A.S.H.

Connecting Authorities for Safer Heavy Goods Traffic in the Baltic Sea Region (C.A.S.H.) is a development programme with the aim of promoting cooperation especially between the authorities of the EU countries in the Baltic region. The project is coordinated by Turku School of Economics and funded by Baltic Sea Region Programme 2007-2013.

According to the project summary C.A.S.H. aims at connecting the proper authorities across borders and creating collaboration and dialogue between them in order to improve and promote safer border crossing of heavy goods vehicles (HGV). The main emphasis is on road transport, but some port/maritime and border officials will also be involved.

C.A.S.H. focuses on three main themes:

1. harmonising training requirements of HGV and dangerous goods (DG) inspection officials in the Baltic Sea region
2. enhancing cooperation between authorities involved in safety of HGV, DG and oversize transport
3. testing state-of-the-art safety and security equipment and IT systems to be used by relevant authorities

CBRA - Cross-Border Research Association

Cross-border Research Association (CBRA) is an academic, non-profit research association, which is located in Lausanne, Switzerland. The mission of CBRA is to innovate and execute various types of research, analysis and case studies surrounding the broad field of supply chain security management programs, standards, measures, trade-offs and costs. The research is aimed at:

- helping companies in international trade and logistics to better plan and prepare for the implementation of new supply chain security standards
- helping governmental administrations (mainly customs and transportation agencies) to better understand the realities and constraints of international supply chains, while developing new security standards, public-private partnerships, etc.

SAFE Framework of Standards to Secure and Facilitate Global Trade (WCO)

World Customs Organization (WCO) has endorsed a strategy to secure the movement of global trade and to facilitate its movement. WCO members have defined standards to secure and facilitate international trade. The SAFE framework sets forth the principles and the standards and presents them for adoption as a minimal threshold of what must be done by WCO members.

STACCATO

STACCATO (Stakeholders platform for supply chain mapping, market conditions analysis and technological opportunities) defines methods and solutions of integrating the overall security market and the supply chains. It also suggests recommendations to develop a common European Security Equipment Market (ESEM), taking into account regulatory issues and coordinating regional, national, international and EU security-related research programs.

PSYM 2000

PSYM 2000 codes (General Instructions by the Nordic Forwarder Union) give general and special instructions to forwarders concerning their rights and responsibilities. The instructions cover the union members in the Nordic countries.

System Alliance Europe

System Alliance Europe is a cooperation group of freight forwarders with a focus on developing logistical reliability, security and delivery dependability. The member companies use similar security methods meeting at least the agreed standards.

Business Alliance for Secure Commerce (BASC)

BASC is an international business alliance created to promote secure international trade in cooperation with governments and international organizations, focusing in Northern and Latin America. BASC was created to promote supply chain security in cooperation between government agencies and international organizations. It functions on purely voluntary basis and has no government-imposed mandates. The participants are expected to follow BASC's security standards that are designed to improve their security practices and in the process deter contraband smuggling and terrorism.

CMR Convention

The CMR Convention (full title Convention on the Contract for the International Carriage of Goods by Road) is a United Nations convention signed in Geneva on 19 May 1956. The abbreviation CMR comes from the French title (Convention relative au contrat de transport international de marchandises par route).

CMR relates to various legal issues concerning transportation of cargo, predominantly by lorries. All the European countries are members of the CMR Convention. Outside Europe, a few countries are also members (e.g. Lebanon, Iran). Based on the CMR, the International

Road Union (IRU) has developed a standard CMR waybill. The CMR waybill is prepared in three languages, and it is accepted and recognized throughout Europe. Checked by the customs and police, a transport document is required to be presented when the shipment is transported.

ADR

European Agreement concerning the international carriage of Dangerous goods by Road (ADR) defines the responsibilities of different parties involved in international road transport of substances that are categorized as Dangerous Goods (DG). An ADR license is required from drivers carrying more DG than permitted maximum amounts. Almost all the European countries have signed the ADR agreement. As for fixed sites, the Seveso directive lists precaution requirements for factories and institutions that are vulnerable to major catastrophes.

IAATI

The International Association of Auto Theft Investigators (IAATI) is an organisation aiming at developing high professional standards in the crime security within the logistics sector. IAATI provides an exchange of technical information and development and cooperates with all law enforcement agencies and associations that are engaged in the prevention, detection and suppression of vehicle theft and kindred crimes.

2.5 Security is not enough

Due to the utter randomness of life anything can happen and sometimes does, even in more organized and developed structures like supply chains. Eventually in any environment considered safe and secure, negatively surprising things will happen, and not all of them fall into the categories of conventional security or safety.

As a part of their work in the C.A.S.H. project the Institute of Business Logistics and General Management (LogU) carried out a survey on the comprehensive risk management of supply chains. According to the survey (C.A.S.H. 2010, 2-3) the importance of risk management has risen to the level of 2.7 (scale of 1-5) in 2005 to the level of 3.8 in 2010. The level is expected to rise to the level of 4.4 by 2015. The LogU survey also analyzed the relevance of certain transport risks for the logistics sector. The survey showed that time is considered to be the most critical factor in the logistics sector followed by costs and quality. Security is there, but clearly the logistics sector needs more.

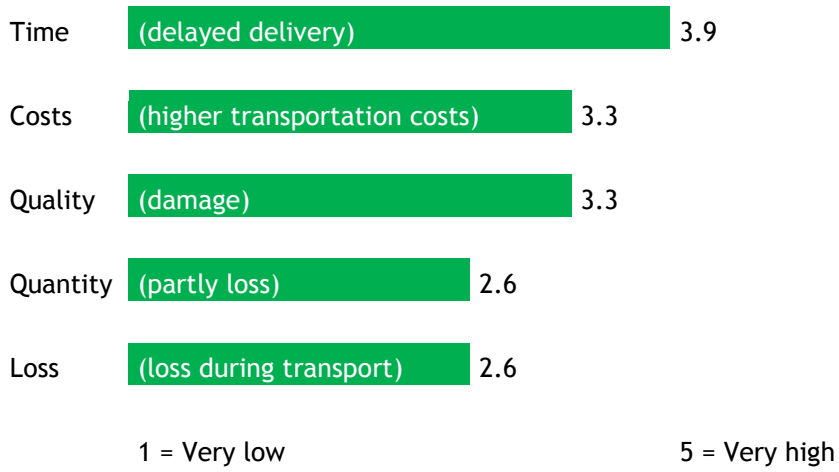


Chart 1. Relevance of transport risks for the logistics sector (C.A.S.H. 2010, 3)

According to Pittman and Atkinson (2008, 3) today's supply chains are stressed, because they must deliver the right product at the right time and place, while responding to changing stakeholder demands around issues such as environment, quality and safety. Therefore, the supply chains must be looked at from a wider perspective and include holistic analysis of all non-wanted events in the service. Flexibility and readiness to respond quickly and efficiently to all kinds of threats will make it easier for companies to maximize the efficiency of the supply chains and to minimize the damage to them.

2.6 Acceptable and non-acceptable losses

Tyska and Fennelly (2001, xiii) claim that there usually is no hard data to rely upon when assessing losses in the supply chains, which can result in ambiguous explanations and explanation categories such as "mysterious disappearance", "lost in the system", "bill of lading/no freight", "lost on dock or in transit". To large extent companies cannot afford this obscure approach to actual losses. Based on interviews with many experts it is obvious that in most cases reasons for the freight going astray or damaged need to be clarified, and only some minor cases can be classified as mysteries.

Losses have apparent financial consequences, which all sensible operators minimize in order to practice profitable business. It is essential to monitor the type and amount of all kinds of losses and to be able to evaluate their cumulative effect. Practically all losses should be non-acceptable and the reasons behind all essential losses should be known.

2.7 Consequences of supply chain disruptions

According to Pittman and Atkinson (2008, 14) the overall supply chain integrity consists of operational and reputational dimensions. Operational integrity refers to the ability of the supply chain to meet objectives for quality, productivity and financial performance. Reputational integrity refers to the ability of the supply chain to protect and enhance the brand, to respond to customer and investor concerns and to comply with the growing burdens of legislation.

In their daily existence many logistical operators are satisfied, when the supply chains operate at a reasonable level. However, there are many important abstract consequences of supply chain disruptions that many advanced operators take into consideration. In addition to the obvious direct economic effect, supply chain problems can cause more indirect consequences to the companies concerned. Pittman and Atkinson (2008, 3, 8-10) quote PricewaterhouseCoopers's analysis on 600 companies with supply chain disruptions. According to the analysis at the time of the disruptions average shareholder value plummeted, their stock prices experienced greater volatility and they suffered sharp declines in return on sales and return on assets.

Pittman and Atkinson point out that mostly there is only anecdotal evidence to suggest that stakeholders reward companies that maintain the integrity of their supply chains. However, according to Pittman and Atkinson, the following consequences of supply chain disruptions can be identified:

- disruptions can take a significant toll on profitability
- the markets can be quick to punish companies that report disruptions
- companies do not recover quickly from disruptions
- the investment communities view companies experiencing disruptions unfavourably
- uneasiness can spread to customers, employees and suppliers

2.8 Challenges in supply chain security

2.8.1 Typical threats and problems

Due to their nature, supply chain environments face more threats than fixed sites. Many problems can occur also at the fixed points along the supply chain, but the real challenges arise when shipments pass unstable or unknown territories, the risks of which have not been completely pre-assessed. For a logistical operator it is vital to recognize all the possible unwanted incidents that can take place on the road. The threat areas include e.g.:

Security related threats

Security awareness and motivation of the personnel along the supply chains

- effects of security training, work culture and team spirit
- collective and individual sense of responsibility

Crime

- thefts, robberies, hijacking
- fraud, embezzlement, internal misuse
- tampering, mischief, vandalism, graffiti
- smuggling, human trafficking and illegal migration
- implications of the “grey economy”
- crime preparation activities (e.g. signal jamming)
- illegal espionage (esp. industrial espionage)

Terrorism

- terrorism is mostly expressed in unexpected ways, making it very difficult to prevent it (many of the basic security measures also support anti-terrorism goals)

Safety related threats

Driver’s personal safety, security and wellbeing

- driver’s occupational health and safety
- personal security during transit
- factors endangering ergonomics and work efficiency

Consequences of inadequate cargo binding

- cargo shifting
- breakage
- damage to the trailer/vehicle

Fire risks

- vehicle/trailer/shipment fire

Quality related threats

Quality deterioration

- harmful deviations in temperature, moisture, etc.
- impacts and other physical damage
    - e.g. due to rough or otherwise improper handling
- fire, smoke
- dirt, dust, pollution

Other loss and wastage

- overages, shortages
- leaks
- pests, vermin

Confusion

- poor access control at warehouses or terminals
- poor process discipline
- inadequate procedures
- poor documentation quality

Vehicles and equipment related threats

Technical problems

- truck
- trailer
- communications
- navigation
- vehicle out of gasoline / other essentials

Timetable related threats

Route obstacles

- traffic jams or deviations
- road blocks (natural or man-made)
- border queues

Extreme natural conditions

- storms
- floods
- snow
- ice
- forest fires

Getting lost

- incorrect navigation
- changing environments (e.g. new traffic arrangements)

Disturbances in the society

- strikes in the logistics sector (or any other relevant sector)
- civil unrest for any reason
- large public events in the area of operations

Unknown timetable situations

- e.g. due to lack of SC schedule information or arrival confirmation arrangements

Information related threats

Information gaps

- route information
- shipment information (short shipments not actually short, just incorrectly informed?)
- border red tape

Information security

- information leaks at any stage
    - especially border crossings
- secure documents

Other threats

Problems with hazardous materials (HM)

- radiation
- bio-hazards
- pollution

Consequences of own actions

- unwanted action by supply chain personnel
    - crime, environmental negligence, intentional or unintentional harm, etc.

Failures by cooperation partners

- e.g. failures to do their share in the operations

Reputational risks

- any negative impacts to the corporate image
    - importance of pre-planned crisis communication, through which damage to the reputation or the brand can be minimized

A service such as SCIE can aim at taking into consideration all relevant deviations, exceptions and problems that can arise along the supply chain. Some of them can be included in the realtime monitoring service, some can be influenced in the consultancy elements and some must be accepted as part of life and its challenges. Many large-scale obstacles can arise regardless of careful preparation. The supply chain route can lead to areas of sudden demonstrations or other unrest. Weather or road conditions can produce unwanted surprises. According to Mäntylä (2010, 19) strikes in the logistics sector do not necessarily represent major problems for Finnish trucking companies, because they are increasingly outsourcing their truck services and using services of small one-man companies that will not join any strikes, because they themselves are employers.

2.8.2 Critical stages

There are obvious phases and stages along the supply chain that are more critical or carry more risks than others. Typically the following vulnerable supply chain stages include more risks than just driving in normal traffic:

- loading
- unloading
- change of transport or transport mode
- slowing, stopping and parking en route
- static points along the routes (warehouses, terminals, harbours, borders, etc.)
- passing through dangerous geographical areas

Craddock & Stansfield (2005, 3) have studied container security, and they have assessed likely incidents that can take place during a container journey. There are obvious parallels to supply chains in general, and many threats are similar with other transport modes as well.

The next table describes some supply chain stages and their threats:

Stage in container journey	Incident							
	Container integrity			Container contents			Container movement	
	Intrusion	Unauthorised door opening	Breach	Theft of contents	Unauthorised Addition	Unexpected movement inside container	Unexpected movement of whole container	Route deviation
Stationary on land during transport or in store	•	•	•	•	•	•	•	
Load / unload land transport			•				•	
Land transport moving			•				•	•
Stuff / strip contents				•	•	•	•	
Venting	•			•	•	•	•	
Moving by crane at port			•				•	
Customs check				•	•	•	•	
Load / unload sea transport			•				•	
Ship waiting at port or at anchor	•		•	•	•	•	•	•
Sea transport moving			•				•	•

Table 1. Incidents that may occur at different stages in a container journey (Craddock & Stansfield 2005, 3)

Once an unwanted incident takes place, the next logical step is to figure out what to do about the problem. In many existing supply chain security services the service providers monitor the supply chain on realtime basis and report about exceptions and deviations. However, without effective response measures that can normalize the situation or at least minimize the damage without unnecessary delays, the overall result remains limited.

2.9 Security and current supply chain services

2.9.1 Existing supply chain security services on the market

Most logistical operators monitor the shipments by themselves, but often the monitoring is not carried systematically. Only a few of the biggest operators have their own 24/7 centres for keeping track of their fleets. The usual method is to nominate a suitable person in the organisation to be on call in case the drivers call them in problematic situations. However, these persons are often not reliably available on 24/7 basis due to e.g. personal, technical, communicational or environmental reasons.

There are multitudes of different kinds of commercial supply chain security services available in Europe. However, there are no comprehensive services similar to SCIE available on the market. The existing services include:

- conventional track and trace services for trucks and trailers
    - some with alarm and panic button monitoring
    - some with response service (Eurowatch, etc.)
    - some with shipment condition monitoring
- consultancy and risk assessment services
- collaborative supply chain systems, SAAS solutions (Software as a Service such as e2open, etc.)
- security programs
- auditing services
- technical hardware and software
- security services of static sites (logistics centres, warehouses, etc.)

2.9.2 Eurowatch network

Eurowatch is a technology-enabled police access service designed to deal with crime against vehicles (commercial and private) and goods in transit in Europe. The service is designed to ensure that alarms from drivers or telematics systems are responded to wherever the truck and its cargo are in Europe.

Chart 2. Eurowatch coverage map (Jan 2010)

Specifically the service enables subscribers who raise an alarm to obtain effective and rapid access to the police wherever and whenever an incident occurs. With thousands of stolen trucks and trailers each year security continues to be an important component of telematics offerings and often a qualifier.

For most organisations, when transport assets or vehicles move outside their country of registration or operation (either in the course of business or after theft), securing fast, effective and reliable access to the appropriate local police in the event of a criminal incident can be extremely difficult, if not impossible. The reasons for this are:

- the driver, the dispatch centre controlling the shipment, the owner or lessee are unlikely to speak the local language
- the driver is unlikely to know what number to call (different public access numbers in each country)
- the dispatch centre, owner or lessee is also unlikely to know what number to call, and in any event it is not possible to call a national emergency number across borders
- the police are becoming less and less willing to respond to emergency calls from un-accredited sources, let alone a foreign driver or company, especially related to telematics alarms
- if any GPS information is available, it cannot be provided in realtime to the police to enable them to manage the incident better

As an example the UK police estimated that it takes on average 4.5 hours for the right police to be contacted in cases where the vehicle is from continental Europe. Furthermore, police in some countries now have stringent requirements to qualify for any reasonable response where telematics alarms are being used. E.g. in Belgium the police need to receive a completed police designated fax form from an accredited security company before any action can be undertaken.

If appropriate measures are not taken to address this gap, in what might otherwise be a solid security strategy, losses of trucks, trailers and cargo are likely to occur that might have been avoided and other security precautions (which obviously need to be funded) may be rendered useless because of the simple lack of someone to call. The problem is that most companies do not discover this until they have an incident and the heavy investments on security can be wasted due to the inability to get the police to the scene of the incident quickly.

In contrast, Eurowatch subscribers benefit from a service delivered by a network of police and government accredited National Service Providers (NSP's) in over 40 countries. The service includes following strengths:

- NSP's all speak their local language, as well as a common language (English), and so can communicate seamlessly with each other and with the drivers speaking their native languages
- NSP's all have direct and accredited access to all the relevant law enforcement agencies within their country, including the rail and transport police and are up to date with all police requirements
- NSP's all operate on 24/7 basis
- NSP's all operate according to established and proven standards and protocols which are adhered to across the entire network
- the service uses leading edge web-based technology to facilitate effective communication
- the service has the ability to forward live incident and tracking data from any telematics system to the police, enabling NSP's to respond far more effectively
- in addition, NSP's can all provide day-to-day monitoring/alarm handling services on request
- NSP's all do this as part of their normal day to day business

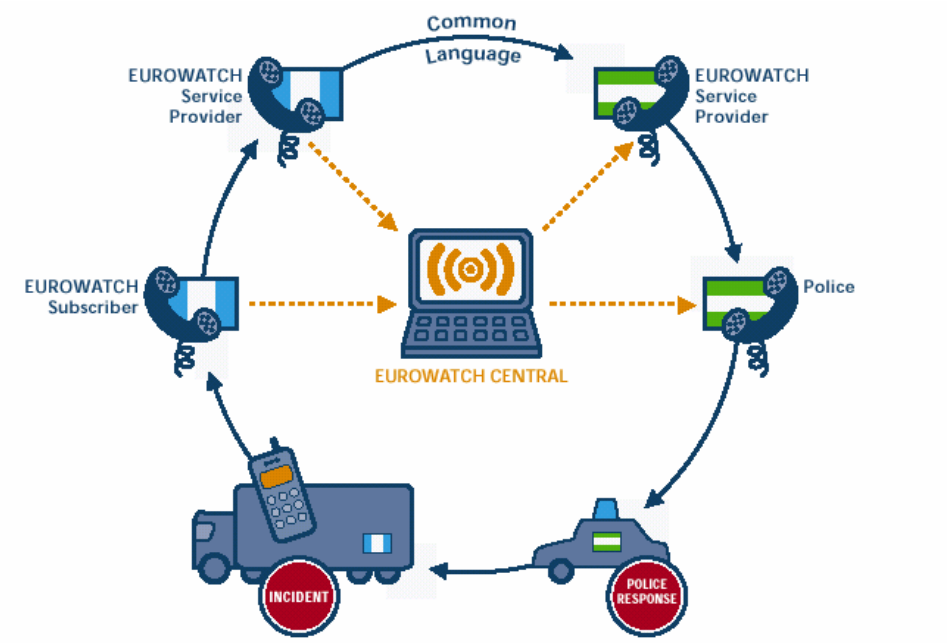


Chart 3. Eurowatch service principle

All NSP's operate under licence enabling Eurowatch to change partners if required or force immediate improvement if required (as a contractual obligation). In addition to access to police via Eurowatch, all Eurowatch partners can and do provide GPS alarm monitoring services for day-to-day alarms and logistics support. Often customers contract for alarm monitoring from an NSP and police access via EUROWATCH.

Eurowatch is in the process of expanding and becoming Globalwatch. The coverage is being extended in order to cover all essential parts of the globe.

Chart 4. Globalwatch coverage map (Feb 2010)

(Source: Eurowatch central)

2.9.3 Outsourcing of supply chain services

Before selling the service itself, service providers need to sell the idea of outsourcing to companies that handle their supply chain integrity themselves. The analysis process includes many options and aspects to be considered. A simplified chart by Fawcett et al (2007, 80) describes the service elements that need to be analyzed in order to find out the most practical and cost-effective solution.

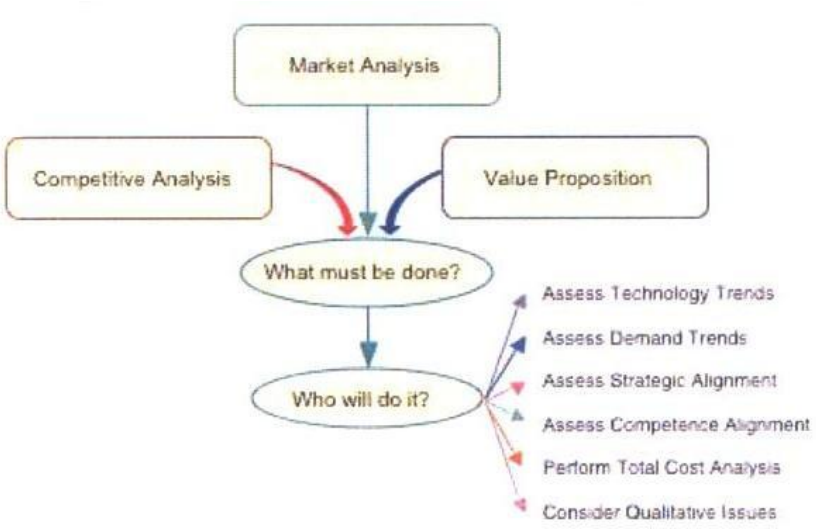


Chart 5. Strategic competency and outsourcing analysis (Fawcett et al 2007, 80)

Jalanka et al (2003, 11) have studied what kind of reasons companies have for making the outsourcing decision. They came up with the following arguments:

- the company does not have the required premises or equipment
- the company cannot or does not want to invest in own systems or know-how
- the company does not want to learn new functions
- the company wants to give up certain functions
- fixed costs changed into variable expenses
- better knowledge of actual logistical costs
- cost savings

For a long time the logistics sector has been aggressively competed in Finland. This has affected the levels of profitability, which in turn has turned many logistical operators to actively look for saving possibilities from outsourcing. In most cases outsourced services are clearly more cost-effective and often the service quality can improve, when professionals that are seasoned experts in their particular fields provide the support service as their core business.

The security services are functional products. Ojasalo & Ojasalo (2008, 43) describe functional products as arrangements, where the customers purchase certain functions into their processes, and all the equipment, their use and maintenance are the service provider's responsibility.

In many companies supply chain departments focus on internal logistics and at the same time procurement departments primarily handle external suppliers. With a holistic approach possibly through an outsourced service a balance between internal and external logistics could be optimized. Large-scale and complicated services require a higher level of cooperation, e.g. a strategic partnership.

An outsourcable holistic service necessitates close contact with the client organisations and active cooperation with their key personnel, which eventually result in fluency of the services as well as mutual trust.

2.9.4 Influence of the sales and delivery terms

The International Commercial Terms (INCOTERMS 2008) is a set of international sales terms used all around the world. They define the role responsibilities and monetary transaction aspects for both sides (buyer and seller). The aim of the standardized terms is to clearly determine export and import clearance responsibilities, who owns the risks for the condition of the products at each stage in the transport process and who carries the responsibility for paying for whatever is done along the supply chain.

It is quite clear that the interest of most future clients of the planned service is mostly restricted to the supply chain legs, which the clients themselves are responsible for. However, for many exporters and importers it can be also important to be able to maximize the possibility of on-time delivery without any unwanted incidents or developments. Supply chain disruptions can have direct consequences in end-customers' processes, satisfaction and eventually willingness to continue the business relationships, regardless of under whose responsibility the damage or the delay has occurred.

2.10. Advances in technology

2.10.1 Tracking technology

The rapid development in positioning tracking technology and increasing options in satellite services (GPS, GSM, Galileo, etc.) also provide new possibilities and new risks, of which many are still to some extent covered in mystery. The European Galileo system is to be operational in 2013, and the Russian Glonass project has been revived, largely motivated for political reasons. Also, the Chinese have ambitions in this area and they are developing their own system called Compass.

For a long time the dependency on GPS has troubled European organisations requiring reliable track and trace service even in more troubled times. GPS has been created for military purposes and for the most part it still is managed by organisations close to or part of the U.S. defence structures. GPS has been designed by DARPA (Defense Advanced Research Projects Agency), which is a research and development office for the U.S. Department of Defense. DARPA's mission is to create innovations of technological superiority to the U.S. military and prevent technological surprise from harming the security in the USA as well as to create technological surprise for their adversaries. It is rather logical that in certain kinds of crisis situations the Americans can pull the plug on the European part of the system, if it serves the larger purposes of the USA. The new European and other systems bring healthy competition to the market as well as freedom from one-system dependency.

Turvatiimi's technology partner in the SCIE project is the Finnish high-tech company, 4TS Corporation, which has developed many location and sensor based technologies and innovations. 4TS has several patents and patents pending in this area of technology.

2.10.2 Jamming prevention

According to Viitanen (2009, 89) tracking devices can be interfered with in several ways, and each of them has its own countermeasures. Just like with any other satellite navigation systems, GPS frequencies are commonly known, and therefore they can be easily disturbed. Furthermore, tracking device transmissions can be easily stopped by creating noise to GSM and 3G frequencies. Another way to neutralize a tracking system is to use pseudolites (fake satellites). Instead of jamming, pseudolites imitate satellite signals and give corrupted data to the tracking devices.

The SCIE centre needs to actively follow the technology development around signal jamming and to optimize the countermeasures in order to maximize the reliability and continuity of the service. The SCIE instructions will incorporate detailed models for operating in signal interference situations as well as pre-planned countermeasure plans even for complete blackout situations.

2.10.3 Overall integrity protection

There are lots of potential sources of information, which can provide value and added value to the integrity monitoring and which can transmit revealing data about the situation at the problem site. Craddock and Stansfield (2005, 4) have listed potential sources of information that can be gathered from suitable sensors, documents and plans as well as environmental information and warning systems.

Data from sensors	Container related data	Environmental data
• Inside a container • On the outside of a container • On the transport vehicle (lorry, train, ship, barge) • Remote from the vehicle e.g. GPS, satellite imaging	• Packing list • Cargo manifest • Dangerous goods note • Expected route for journey • Expected timings for journey	• Weather reports & forecast • Wind speed and direction • Temperature, humidity, light • Sea state • Road traffic conditions • Flood warnings

Table 2: Potential sources of information (Craddock & Stansfield 2005, 4)

Many of the technologies used in traditional security services that can be directly or with little adjustment used in monitoring of mobile assets. There is a multitude of devices that can provide information about the security or integrity status of the object being monitored. The next dimensions can be easily monitored by current technology:

- security
    - movement sensors, door magnets, etc.
    - conventional and electronic seals
    - light, sound
    - air pressure
- safety
    - fire
    - gas (e.g. CO2 or CO)
    - radiation
- product (or vehicle) integrity, quality and environment
    - temperature
    - humidity, moisture, water
    - acceleration
    - free fall
    - shock/breakage
    - leakage
- other interests
    - location, direction, speed
    - utilisation of camera surveillance

2.10.4 Technology and the future

It remains to be seen how technical innovations will change the world in the longer term. In the logistics sector track and trace services will very likely become an even more natural phenomenon, and once we reach a point where the technology cost comes down to reasonable levels, we will be able to monitor any mobile object anywhere. In the future, we will monitor objects, which we now consider trivial and not worth tracing.

As almost a truism, also shipment condition will become more important. When the technologies and the services are easily available, it would be very odd, if the insurance companies did not become more and more demanding in forcing their customers to protect their assets on the road.

The web-based applications have already made the supply chains very transparent, and this development with secure realtime connections, realtime alerts, realtime handling and realtime reporting will make life easier for the people involved, but it also requires new learning, open-mindedness and a willingness to embrace new technologies.

The future GPS, GSM, GPRS developments, their competitors and successors will probably again and again revolutionize the utilization of satellites. In the nearer future the track and trace services will become more accurate and the data transfer capacities and costs more consumer-friendly. There will be kinds of wireless sensor networks and networks utilising different kinds of technologies. Hopefully, already in the near future we will have integrated systems that fluently combine data from very different kinds of sources (GPS, RFID, net-based services, etc.)

2.11 Supply chain enhancement possibilities for a service provider

According to Fawcett et al (2007, 9) supply chain collaboration can be defined as the ability to work across organizational boundaries to build and manage unique value adding processes to better meet customer needs. True collaboration goes beyond managing transactions for efficiency to managing relationships for creativity and continuous improvement.

As an external partner the service provider has no direct possibilities to change the customer’s supply chain elements. However, with fresh eyes it is possible for the service provider to assess the working environment with constructive criticism and to come up with recommendations about ways to enhance the supply chains and their elements. Development work requires joint efforts from both the customer and the service provider, which is so much

easier, if both parties are committed to the partnership and are able to see the direct and indirect benefits also for themselves.

Inside supply chains the existing security culture is critical to the implementation of security. In practice, a security culture can be defined as the way that security interacts with the organization's employees in terms of sustainable norms and expectations (Williams et al 2009, 256). A security service company can directly influence the security culture of its customers and their supply chains by providing suitable training packages. According to Williams et al (2009, 244) the development of a supply chain security culture (SCSC) is thought to be important for a number of reasons, including the increasing focus that governments are placing on supply chain security, as well as the significance of culture in terms of its influence on strategic, operational and tactical firm and supply chain goals.

Many companies focus their environment related development of their supply chains to reach both environmental and direct business benefits. A typical and impactful way of showing awareness in green thinking is to go "Lean and Green". Calculating the benefits and savings of the arrangements along their whole life cycles can authenticate profitable sustainability. Savings can be achieved e.g. by updating obsolete systems, getting rid of unnecessary or harmful by-products and benefiting from pre-planned and minimized resourcing of regulatory adherence.

The importance of ethic business principles and especially environmental awareness seems to be constantly rising, and many customers are knowledgeable enough to expect responsible service also related to its carbon, water and other footprints. The good news is that most development work can incorporate various environmental aspects without a need to initiate separate green projects or to invest in expensive systems serving only one goal. With a holistic approach the development work can produce multiple benefits in different areas of operation.

3. Strategy implications of a new service

3.1 Starting points for strategy planning

Fawcett et al (2007, 9) have defined SCM (Supply Chain Management) to consist of a collaborative process and project management in order to meet the needs of the end-customer efficiently and effectively.

Supply is transforming from an administrative function to a strategic contributor to organisational competitiveness (Monczka & Petersen 2008, 8). Companies are more and more dependent on fluent and efficient supply chains, which has resulted in an increasingly significant role of supply chains even in the overall strategy planning of companies.

Strategies can be defined as plans about achieving particular goals. By making correct strategies on the correct basis, companies can more systematically anticipate future changes, sharpen supply network planning, reduce service costs, increase flexibilities, streamline unnecessary complexities, develop partner cooperation, enhance product development and create beneficial transparency across their supply chains. When supply chain strategies take into consideration all essential supply chain elements in a comprehensive and holistic manner, they can truly give the operational units a possibility to function efficiently towards the focused target.

Companies depending on logistical fluency require a supply chain strategy to support their overall strategy and add value to it. Turvatiimi is moving into new territories with its SCIE concept, and in its development work there are still unknown factors to be taken into consideration.

According to Carter et al (2009, 21) effective integrated supply chain strategies are built on a clear and articulated vision of the organisation's future supply network. Similarly, Turvatiimi needs to create a specific service strategy based on the data and tools prepared by the SCIE development project, as well as the overall strategy of Turvatiimi.

Changing times

According to the TEKES technology Review called "Seizing the white space: Innovative service concepts in the United States (2007, foreword) there are five models of innovating, which are strongly emerging in the "white space", i.e. beyond the traditional competitive levers at the markets:

1. the customer is the new reference point
    - customers have replaced competition as the reference point for strategy and innovation
    - we have to produce what the customers want and need
    - if we follow the competition, we can never get ahead of it

2. changing who does what
    - the traditional boundaries are changing
    - more and more operations are outsourced and arranged in new ways

3. the driving force of entrepreneurship
    - an effective service requires the entrepreneur attitude with flexibility, courage and customer-orientation; all businesses should adapt these attributes

4. IT as the service "factory"
    - huge amounts of service information need to be harnessed into a repeatable, easy-to-operate and efficient system

5. the Internet as the key distribution channel
    - the majority of information is in a way or another channelled via the Internet and its risks need to be taken into consideration

The globalised world is continuously becoming increasingly complicated, and the pace of development and change seems to accelerate all the time. In their study Carter et al (2009, 10) analyzed research by Wiggins and Raefli (2002 and 2005), who had listed examples of the rapid change that have been taking place in the supply chains of the companies studied. These include e.g.:

- faster than anticipated market shifts to new products and technologies
- erosion of dominant worldwide market positions
- increasing supply constraints and upward pricing pressure from suppliers

- increasing size and complexity of projects
- remote and complex project locations worldwide
- fewer available suppliers
- increasing customer requirements for cycle-time reduction
- rapidly changing customer mix with pressure for reduced response times
- significant price/cost squeeze with less available market share
- flawless execution required from new product and service introductions
- product design cost reductions with product innovations
- significant emphasis on lean and agile systems

Fawcett et al (2007, 11) have compared their research of 2001 and 2007 and listed changing opinions of supply chain managers about achieved benefits as well as barriers and bridges in the logistics field. The table on the next page lists the Top Ten themes to do with these categories, and it is easy to notice that in six year period the customers appreciate, expect and worry about things and have constantly changing priorities.

2001		
Benefits	**Barriers**	**Bridges**
Increased customer responsiveness	Inadequate information sharing	High levels of managerial support
More consistent on-time delivery	Poor/conflicting measurement	Open and honest information sharing
Shorter order fulfillment leadtimes	Inconsistent operating goals	Accurate, comprehensive measures
Reduced inventory costs	Organizational culture and structure	Trust-based, synergistic alliances
Better asset utilization	Resistance to change — lack of trust	SC alignment and rationalization
Lower cost of purchased items	Poor alliance management practices	Cross-experienced managers
Higher product quality	Lack of SC vision/understanding	Process documentation and ownership
Ability to handle unexpected events	Lack of managerial commitment	SC education and training
Faster product innovation	Constrained resources	Use of SC advisory councils
Preferred and tailored relationships	No employee passion/empowerment	Effective use of pilot projects
2007		
Benefits	**Barriers**	**Bridges**
Lower costs and higher quality	Organizational structure and turf	Relationship-building skills
Improved customer satisfaction	Resistance to change	Collaborative organizational culture
Higher value-added relationships	Poorly aligned measures	Process redesign
Better inventory performance	Lack of trust	Change management
Faster responsiveness/velocity	Lack of managerial support	Information sharing
Broader product offering	Poor information-sharing capability	Aligned goals and metrics
Enhanced SC visibility and coordination	SC complexity	Training and learning
Being preferred customer/supplier	Lack of employees with needed skills	SC rationalization
Lower logistics costs	Lack of SC vision/understanding	Total cost perspective
SCM as a strategic opportunity	Lack of process transparency	SC champion

Table 3. Top ten benefits, barriers and bridges to Supply Chain Management (Fawcett et al 2007, 11)

Need for strategic advantages

Business operations are largely based on managing information, material and finances as well as related contract obligations. At their best supply chains can be significant competitive advantages, which enable companies to meet their strategic goals and to strengthen their strategies on the whole. However, when managed poorly as compulsory burdens, supply chains can limit the growth and profitability. (Björkenheim 2010, 6)

A successful company needs to find competitive advantages and ideally sustainable advantages in order to be able to beat the competition at least often enough. With the help of strategic innovations it is possible to achieve real competitive edges, which inevitably have strategic implications that the company management needs to analyse and process.

Ojasalo & Ojasalo (2008, 190) divide strategic innovation into two main lines: market driven and market driving innovation. In market driven innovation companies closely follow the market developments and provide services based on market demand. On the other hand, market driving innovation redefines the whole sector by new revolutionary services outdating the old ways of providing the service. In the SCIE project Turvatiimi is definitely working towards a market driving innovation that has potential to become a major business opportunity and a sustainable advantage in a market that is becoming increasingly important, largely due to its global and vulnerable nature.

Elements of strategy management

Hamel (2000, 70) divides strategic management into four areas, which are logically linked to each other:

- customer interface
    - fulfilment and support - describing how a company operates with the customers
    - information and insight - describing all the customer knowledge
    - relationship dynamics - describing how a company interacts with its customers
    - pricing structure
- core strategy
    - business mission
    - product / market scope
    - basis for differentiation

- strategic resources
    - core competencies - describing all the essential skills and unique capabilities within the company
    - strategic assets - describing all the strategically relevant assets, material and immaterial
    - core processes – describing the operational methodology and routines
- value network
    - suppliers
    - partners
    - coalitions

Strategy planning cycles are nowadays becoming shorter and shorter. All business models eventually reach the point of diminishing returns, and these days this happens sooner rather than later (Hamel 2000, 53). Recent waves of technical innovations have made strategy life cycles shorter than before also in the Finnish security sector. Expanding across other service sector boundaries and harnessing the possibilities of modern technologies are making business planning more and more challenging and anticipating market changes increasingly difficult.

Hamel's (2000, 119) advice for companies is not to worry too much about the future. The goal is not to speculate on what might happen, but to imagine what one can actually make happen. Most things in life will happen regardless of what one as an individual or as a company does or don't do. Therefore, all companies must make their own destinies and their own futures.

Big organisations need to divide their operations into a large number of revolutionary cells (not anarchists, but loyal opposition capable of innovative development work), which are quicker, more flexible and more focused than bigger units (Hamel 2000, 119). In independent cells it is much easier to innovate. In order to remain innovative also in the future, Turvatiimi's management needs to support the active developers and enable them to continue their development work without unnecessary obstacles and give them the necessary resources and direction.

Adjusting to different kinds of customer relationships

Different customers require different kinds of approaches and most customers have potential only for a limited type of partnership or alliance. The majority of customers have little interest in developing any deeper relationships with their service providers and are happy with a cost-effective service that meets the basic standards. More and more companies realise that closer cooperation can benefit them in a better service quality and ultimately cost savings achieved by active and innovative service planning.

It is important for both the service provider and its customer to identify the signals, based on which they can determine, whether it is worthwhile for them to pursue a more intense relationship. In the following chart Fawcett et al (2007) describe various alliance levels and their dimensions.

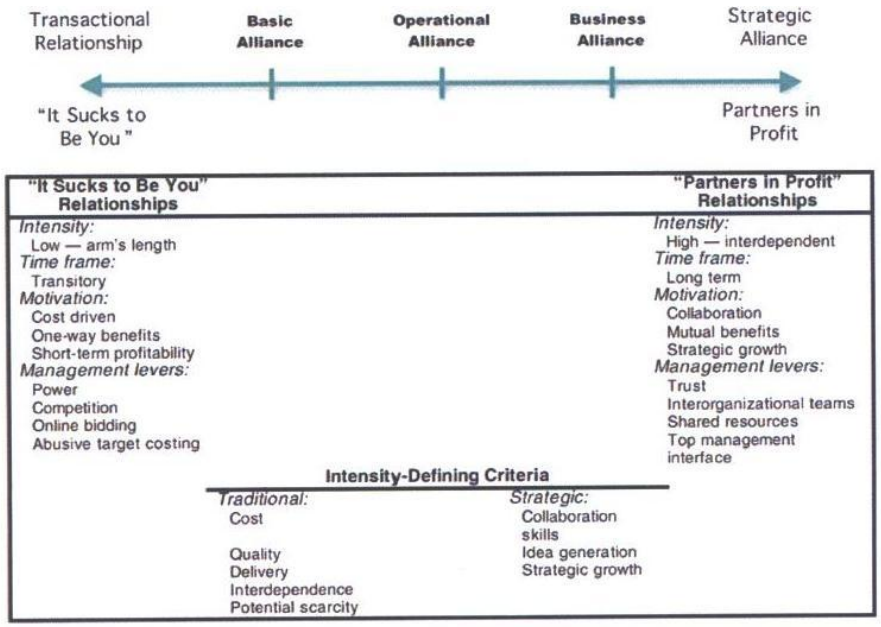


Chart 6. The relationship intensity continuum (Fawcett et al 2007, 82)

In any cooperation ranging from a marriage to a complex business alliance it is important know one's partner and the potential both parties have for developing the relationship. However, first both parties need to really know themselves and have a realistic view of their own strengths and weaknesses, limitations and possibilities. By basing the planned alliance intensity on one's own capabilities, a company on either side already has a 50-50 chance of success and by learning more about the partner candidate, the odds become better and better.

3.2 Current strategy thinking in the security sector

Conservative history

In the past the Finnish security sector service companies have been careful and deliberate in their moves towards change and evolvement. There has been no substantial innovation culture in the service development for ages. Much of the development work has been limited to restructuring and gift-wrapping old services. So far the technical innovations have been the major driving forces of any substantial development work, and that has been the case also in many aspects of the SCIE project with new technologies enabling Turvatiimi to function in new ways.

Technology enabling new ways of doing things

Security related technology is advancing quickly and enabling security companies to replace old methods and to support the existing field services in new ways. Remote monitoring and control makes it possible to support and replace labour-intensive service solutions. In addition, new types of cooperation create possibilities to cross-use of resources in new ways and with new tools, introducing new cost saving and quality improvement methods.

Companies wanting to excel are nowadays forced to look for something completely different and optimize their innovation processes. In real life this can happen efficiently only if the company's strategy supports an innovative business culture and provides the required resources. Being in the forefront of service or technology development requires increasing amounts of high tech know-how, all of which does not have to come from one's own company. A chosen network of professionals and subcontractors can also provide supporting expertise.

Rare specialisation in the Finnish security sector

The Finnish security service sector has four larger service providers that have by acquisitions cleared the field of all security companies that have been for sale in Finland. The four companies provide more or less similar services with not so different working methods. Most of the smaller local companies provide only basic security services and are generally more restricted geographically, operationally as well as financially.

The relative quietness in the development front has lead to an increasing role of service prices as the decisive factor in so many buying decisions. When the playground remains stable and unchanged for a long time, competitors and their services eventually become similar, and

ultimately the real difference a buying customer can pinpoint is the price. By differentiating and creating unique or personal solutions, companies can highlight the new values and benefits, which at least to some extent can shadow the importance of pricing.

3.3 Strategy implications around the SCIE project

3.3.1 Requirement for changes at Turvatiimi

Making sure that the SCIE strategy is in line with the company strategy

Carter et al (2009, 6) stress the importance of alignment and linkage in strategy planning related to supply chains. Alignment refers to common vision, goals, purpose and objectives across organisations, functions and processes in the supply chain. Alignment ensures that there is consistency in the direction and objectives as these plans and decisions are made. Linkage, on the other hand, refers to the communication and sharing of information needed for planning and decision-making, and the interaction of people involved in planning and decision-making. Linkage ensures that the information necessary for decision-making is available, and that different functions and entities in the supply chain are working with the same data as decisions are made.

The new SCIE service is required to serve and support the overall company strategy, which on the other hand, needs to take into consideration the new requirements arising from operating in a new way and in new markets. From the alignment point of view Turvatiimi's strategy encourages innovation and new business possibilities, so there is no fundamental problem in moving towards business areas outside the box Turvatiimi is now operating in. Obviously, there need to be general directions arising from the general strategy and in the daily life of development certain guidance and management, but the leash can remain relatively long.

From the linkage point of view the existing communication systems serve well the purposes of the project, but the project results can bring needs for new kind of information sharing and management, and parts of the new information system do not exist as yet.

A new service, a new service unit

By creating a new service Turvatiimi also creates the requirement for a new kind of a service unit, which needs to fit seamlessly into the existing organisation at the Alarm Service Centre as well as the whole company. Fortunately the service can be initiated with the existing Eurowatch service unit and expanded based on actual project needs and customer additions as they occur.

Readiness for larger-scale international operations

Turvatiimi has handled various international operations in the past, and the existing Eurowatch service has kept the company in touch with customers on the European scale. With the new service the scale of activities is planned to expand onto new levels, which will require wider capabilities and know-how of international logistics, wider world of legislation and regulation, network management, language and cultural skills, etc.

Readiness to operate with increased flexibility

Turvatiimi needs to reinforce and enhance its ability to react quickly to changes and to highlight the importance of agility and flexibility also in the strategy planning. By going in new directions the company forces its operational units to apply new working methods and to constantly organise their services in new ways. It is likely that the future pace of development will surprise us over and over again, and most strategy life cycles will become increasingly inconstant.

New kind of co-operation beyond traditional company boundaries

Turvatiimi itself needs to be an active and willing partner, when it is convincing supply chain operators about the benefits of information sharing. According to Fawcett et al (2007, 13) winning supply chains build chemistry – a common understanding of the supply chain objectives and individual roles, an ability to work together and a willingness to adapt in order to create and deliver the very best products and services possible. When the right companies with the right capabilities establish the right relationships to perform the right roles, a collaborative supply chain team emerges.

Development of new reporting methods

In addition to expanding customer expectations concerning documentation and information security, Turvatiimi will be expected to develop its reporting systems in order to be able to adapt to new requirements placed by the new information sharing system as well as the new possibilities of web-based reporting technology.

3.3.2 Challenges

New challenges unique to the logistics sector

There is still a multitude of unknown factors in the world of logistics that Turvatiimi and its SCIE personnel need to identify and embrace before being able to provide the service on a larger scale. The project and the wide variety of internal and external experts will give the company a good start in understanding the sector-specific characteristics of the logistics business. It is in the interest of the company to distribute this learning to as wide a base as possible.

Challenges of maintaining and developing an international network

Turvatiimi needs to work out, how developing from a national operator to a global operator influences the strategy and what kind of limitations it needs to set for the service. Working on European scale requires whole new capabilities and investments that are not required in domestic services. Partner choices and partner dependency represent potential areas of vulnerability, which can bring down the whole service, at least as the worst case scenario. Turvatiimi's own desirability as business partner for companies, who have not heard about Turvatiimi or even Finland, requires a lot of network preparation and marketing work. To some extent international credibility can be achieved with the renewed NSA/DSA certification system, which gives certain security guarantees for operators introducing themselves at the arenas of international cooperation and business.

The Finnish DSA's (Ministry for Defence and the Security Police) have recently released the national security audit criteria (KATAKRI) aiming at giving Finnish companies internationally compatible guarantees of high security standards. The criteria cover four areas of security: security management, personnel security, physical security and information security. In order for Turvatiimi to further improve its credibility at the international markets, it needs to join the KATAKRI system and to adapt to its requirements.

Measuring the performance

Measuring in a reliable way the level, quality and security of the planned service is critical to its long-term success. According to Fawcett et al (2007, 74) metrics drive understanding and behaviour. If measures do not support strategy, decision-making will be counterproductive. If measures are not aligned, conflicting behaviour will result.

Customers expect more and more transparency from their service suppliers. By using reliable ways of measuring quality and service levels, service providers can convince their customers about being able to deliver the service as well as the sales and marketing people have promised.

Accurate measuring can also function as an efficient management tool and basis for rewarding the service personnel. According to Carter et al (2009, 7) in addition to reward systems, metrics are critical factors in driving behaviour within an organisation and among organisations. To a large extent people respond to metrics and rewards regardless of strategies and philosophies to do with the supply chains. Customer-centric metrics that are aligned and consistent across the supply chain's functional groups and across organisations will encourage behaviour that leads to aligned and consistent decisions.

3.3.3 Opportunities

Possibilities of low-risk experimentation

Establishing a completely new service can include heavy investments and large-scale risks. Hamel (2000, 269) recommends experimenting in smaller scale before going for the finalised service arrangements. According to Hamel it is better to make a lot of small bets and to think of experiments as a portfolio of options, as well as to accelerate learning and celebrate the pathfinders.

All the planned services can be initiated using the existing Alarm Service Centre and its resources. Therefore, Turvatiimi has an excellent opportunity to create something completely new without investing in various obligatory service resources and without taking any essential financial risks along the way. The SCIE centre at the Alarm Service Centre can operate as an integral part of the operations and use the resources only when dealing with SCIE matters, and working with other Alarm Service Centre customers, when there is nothing happening around the SCIE service.

Growth expectations and life cycle of the new service

Turvatiimi has already identified many potential customer segments and customers, who are actually ready to pay for the services (possibly requiring the company to refocus some of its strategies). With the Finnish logistics operators being financially squeezed to living with very limited profit margins, a larger number of customers are willing to pay for the service and the eventual growth can be found from wider European markets and eventually from the global logistics circles.

By achieving a sustainable advantage over the competition, Turvatiimi can create new competitive edges that competitors cannot follow easily or quickly. Depending on how well the company can take advantage of the headstart, the business potential on the global scale in practically limitless. Ideally, SCIE will become a synonym for a comprehensive supply chain integrity service as well as the development platform for many new spin-off services.

3.3.4 Conclusions about SCIE strategy implications

Before the upcoming launch of the SCIE service, Turvatiimi needs to reassess its overall strategy and the implications the new service has concerning it. With the project going ahead, there are definite direct and indirect influences that will take place regardless of the scope and nature of the new service.

Turvatiimi needs to prepare itself to be able to adjust to changing customer expectations, increasing demands for agility and flexibility, new international environments and market differences and new ways of cooperating with a multitude of network partners.

In the logistic sector there are still many challenges and unknown factors that the project team is in the process of clearing. The project has started quite recently, and there are still possibilities to influence the directions to which the project team is taking the eventual service.

Although much of the initial work can be done by existing service experts, eventually a new service unit needs to be established separately with all possible resources and other investments, quantities of which can mostly be adjusted to the actual needs of paying customers. The planned service requires new and versatile methods of measuring service levels and quality, information management and service reporting. However, to a large extent much of the continuous modernisation in all these fields needs to be carried out anyway.

The focus on all kinds of troubles and challenges described in earlier paragraphs do not represent the whole truth. There are huge possibilities in launching a new service that can utilize sustainable advantages, which the competition cannot follow easily. SCIE's growth potential is mostly limited by the restrictions of our own imagination. There is an obvious need for a coordinated service like SCIE at the global market level, and without any doubt the quick development of technology will enable service providers to provide even more value adding services in the near future.

Whichever direction Turvatiimi management takes with the SCIE strategy, it needs to continuously analyze the changing markets as well as to communicate the renewed ambitions to the whole company and train the personnel accordingly. If the strategy remains the knowledge of chosen few, it becomes meaningless in practice.

Finding the right partners and maintaining an efficient network will be critical to the success of SCIE. Providing a new service on a European or global scale requires a complex network that can cooperate fluently across borders. Fawcett et al (2007, 8) quote Kenichi Ohmae, who has said: "Companies are just beginning to learn what nations have always known: in a complex, uncertain world filled with dangerous opponents, it is best not to go it alone".

4. Product development and security services

4.1 Services and service development

Services are in time and space linked activities and interactions provided as solutions to customer problems (Edvardsson 2007, 8). Any service to be designed needs to solve real problems that need to be solved. A new service will need to be flexible and able to serve very different kinds of customers and at its best also to indirectly enhance the customer operations taking into consideration the overall interests of the customers. The service needs to be transparent, and at least in some ways the service impact needs to be objectively measurable.

Cooperating with different kinds of customers and partners

According to Gattorna (2009) products and services only move through supply chains as a result of human decision-making, and everything else (e.g. technology, process, KPI's) are simply enablers. Gattorna also reminds that one has to understand the human behaviour and the power of unseen cultural forces. The service designers need to remember that they are designing services provided by different kinds of people for different kinds of people. Understanding at least the basics of human behaviour and cultural differences certainly helps in trying to make people do or not do certain things.

Fawcett et al (2007, 72) have compared three relationship styles of sellers and buyers and come up with a list of their typical characteristics. For a seller or a buyer it is essential to recognize one's own capability and readiness to progress onto new levels of cooperation and with that knowledge to pursue towards realistic goals. At its best the cooperation between service providers and buyers can become strategic partnerships or even strategic alliances, which in their true form are quite rare.

Relationship Characteristics	Relationship Type		
	Customer of Choice	High-Value Relationships	Transaction Relationships
Resource Intensity	Very high: high levels of tailored or customized service are provided. The goal is never to disappoint these customers.	Moderately high: services may be customized, and efforts are made to fulfill special requests. Menu pricing may be in place.	Low: deliver high levels of standard, efficient service. Service recovery is used to compensate for service failures.
Rationale	These customers are profitable, and the company is well positioned to fulfill their needs.	These customers are profitable and represent either significant volume or strong growth potential.	These customers represent low volumes or profits. They are respected as future growth possibilities.
Percent	Because they are resource intensive, these relationships are selective — perhaps only 3% to 5% of all customers.	Approximately 15% to 20% of customers fall into this category.	Perhaps 80% or more of all customers fall into this category.
Communication	Frequent communication occurs at many levels, including marketing, engineering, logistics and senior management.	Customer input is actively and frequently sought, often through a dedicated contact point or key account team.	Contact is infrequent and often customer initiated. Web sites often represent these customers' best access to the company.
Support	Dedicated teams are formed to solve problems and work on SC initiatives such as new product development.	Formal relationships are built and often supported by a key account team and a long-term contract.	These relationships receive very little personal attention.
Information Systems	Systems are integrated to enable real-time information exchange on inventory levels, order status and future demand.	Information systems may be linked to share information and reduce the costs of transactions.	Web-based systems may allow these customers easy contact. Other information systems are seldom integrated.
Processes	Fulfillment processes are designed for flexibility to accommodate customers' special requests.	Processes are designed to accommodate customers' special requests. Customers may be charged more for extra service.	Processes are designed to deliver high levels of standardized service. They are designed for maximum efficiency.
Policies	Policies and procedures s upport extraordinary efforts to meet unexpected needs or unusual requests.	Policies value these customers, but they weigh the costs of meeting their unusual needs.	Policies seek to treat customers fairly and meet their unusual needs when possible.

Table 4. Characteristics of different levels of customer intensity (Fawcett et al 2007, 72)

In the field of security and integrity services the benefits of closer collaboration can be achieved, because deep and effective development can only take place, when both parties fully commit to reaching new levels of security. In many other fields there are obviously services that do not require close cooperation.

According to Pittman and Atkinson (2008, 34) the best sources of information reside within the supply chains themselves. The companies need to be closely tied to their partners and suppliers working together towards common objectives, including supply chain development. The close cooperation and information sharing provide an early warning system that can expose possible threats more efficiently than traditional solo operators.

Fawcett et al (2007, 98) have recognized attitude changes (from 2001 to 2007) in approach to supply chain collaboration. The table below describes the changes in maturity of supply chain practices and general willingness to cooperate in different aspects of development work.

	Stage 1: Functional Focus	Stage 2: Process Integration	Stage 3: External Collaboration	Stage 4: Collaborative Innovation
Introspection				
SCM Begins with the Customer	D	(D) L	(L)	
Collaborative Systems Thinking	D (D)		(L)	
SC Design				
SC Scanning	(D)		L (L)	
SC Mapping	D	(D)	L (L)	
Strategic SC Costing	(D)	L	(L)	
Competencies & Outsourcing		(D)	L (L)	
Rationalization	(D)		(L)	
SC Collaboration				
Relationship Alignment	D (D)		L (L)	
Information Sharing		D (D)	L (L)	
Performance Measurement	D (D)	L	(L)	
People Empowerment	(D)	L	(L)	
Collaborative Learning	(D)	L	(L)	

2001: D Dominant Practice L Leading Practice
2007: D Dominant Practice L Leading Practice

Table 5. Maturity of supply chain practice (Fawcett et al 2007, 98)

Ideally, beneficial innovation collaborations can evolve into strategic partnerships. Young (2009, 1) surveyed executives at global manufacturers and retailers noticing that 95 % of them regarded collaborative innovation very important to achieving their business objectives, but only 12 % reported having actually incorporated the needs of strategic partners into their innovation planning. There is a similar general willingness among supply chain managers, but in practice many operators still seem to remain cautious and protective concerning their innovation processes.

Fawcett et al (2007, 94) emphasized in their study the need to identify, understand and communicate regarding the forces driving change. Human nature and its desire to avoid taking unnecessary risks and new vulnerabilities that come with change, reinforce the resistance and the traditional way of doing things. It is very understandable from the point of view of human behaviour as well as business realism that businesses and business units want to protect their work and to minimize the risks (incl. information security risks), which at least theoretically can be increased by added exposure in a larger supply chain. By describing in detail the arrangement and its information security solutions, the supply chain coordinator can to large extent remove doubts of the network companies about the added vulnerabilities caused by new kinds of collaboration and information sharing methods.

Fawcett et al (2007, 16) have listed driving forces as well as resisting forces that directly or indirectly influence the collaboration capabilities and need to be understood when developing arrangements depending on collaborations:

External driving forces

- more demanding customers
- greater competitive intensity
- shifting channel power
- economic globalization
- compressed technology cycles
- merger and acquisition activity
- an information revolution
- increased financial pressures
- shift to SC-based business models

Social dilemma-based resisting forces

- inability and unwillingness to share information
- lack of trust among decision makers
- an unwillingness to share risks and rewards
- cross-functional conflicts and “turf” protection
- non-aligned strategic and operating policies

Organizational disenablers

- lack of top management support
- inflexible organizational systems and processes
- inconsistent performance measures
- inadequate training for new mind-sets and skills

According to Fawcett et al (2007, 80) leading companies are starting to recognize the potential and power of “right brain” competencies, i.e. the ability to coordinate the competencies of various supply chain members, coaxing higher levels of collaboration and creativity from the chain. The SCIE service and Turvatiimi’s other services as well could benefit from finding suitably open-minded and innovative people to develop the service network.

True collaboration between supply chain operators does not happen automatically. A win-win situation is required for all concerned. In a way or another all participants need to be able to achieve something that can motivate them to share their information and to invest in resources that also benefit others.

It is apparent that customers in general and also in the logistics sector are becoming more and more demanding, which in practice leads to new kinds of transparency requirements concerning the supply chain information. Similar developments are taking place in other fields of security service. Customers require new levels of transparency and flexibility well beyond the old expectations. A brutal fact is that the paying customer (at least a large one) can dictate to large extent how information around its service is utilized and shared. However, in order to achieve adequate levels of network motivation, the coordinating operator needs to convince each player in the network about the rewards of more open cooperation.

4.2 Trade facilitation

In its supply chain security work the Swedish National Board of Trade (2008, 9) uses a perspective that is based on the ambition to achieve overall trade facilitation. Trade facilitation is a concept that aims at reducing transaction costs of international trade by simplifying trade procedures across the entire supply chain. The fundamental principles for trade facilitation are transparency, harmonisation, standardisation and simplification. To achieve optimal trade facilitation, full and close cooperation and at least to some extent a certain level of new kind of goodwill are necessary between different operators and authorities involved in the supply chains.

The Swedish National Board of Trade recommends the following to enhance the facilitation of supply chain processes:

- harmonisation of legislation and regulations
- simplification of administrative processes and documents
- standardisation of information and requirements as well as using IT to exchange information efficiently
- transparency, which ensures that information, requirements and processes for crossing borders are clear and specific as well as easily accessible for all involved

Stated probably as wishful thinking, similar types of Finnish trade facilitation projects could help Finnish businesses in optimizing their supply chains from the point of view of easier collaboration and streamlined processes.

4.3 Holistic approach

Jarkko Lehtinen, a senior research scientist at VTT, says that many companies fail to see beyond the scope of their own operations and look at the entire logistics chain. He also compares the transportation chain to an orchestra with dozens of different players joining in. (Anteroinen 2009, 32)

According to Fawcett et al (2007, 74) process visibility is needed to help managers see how a process really works. Only then can they grasp the interrelationships and tradeoffs involved in process management.

The ability to monitor the whole supply chain and to solve its problems is an important precondition for a successful service provider. A supply chain is a comprehensive system, which optimally should be handled as a whole and with a cooperation attitude. When all the supply chain operators understand their role as important elements of a larger mechanism and when they see the benefits of transparent collaboration, the development work can reach new levels of efficiency.

4.4 Mass customers

In addition to more demanding customers, the SCIE service will serve large numbers of mass customers who only need the monitoring services. Grönroos (2009, 14) warns service providers about treating mass customers as mass. Each customer expects to be treated as an individual and not as an anonymous and passive receiver of marketing messages and invoices. The same applies to all the Turvatiimi customers that utilize the security monitoring services at their fixed sites. It is important to make all individual bulk customers feel important through occasional interaction, customer magazines and other cost-effective measures.

4.5 Tailoring and mass customizing

According to Ojasalo & Ojasalo (2008, 171) the markets are becoming more and more fragmented and turbulent making it more and more difficult for the service companies to generalize the customer requirements or to find common segments. Because the needs and requirements are changing quickly and more unpredictably, efficient and flexible processes are required to make the service preparation as cost effective as possible.

During the development project a service takeover system with many mass-customizing aspects has been designed to facilitate the start of a new service. Taking over the service of a new customer is one of the most labour-intensive and demanding phases of an assignment. It

is essential to make it as easy as possible for all the parties concerned. The takeover system includes information and instruction forms, risk survey forms and check lists to make sure that all essential background information is collected systematically and efficiently. Furthermore, the takeover system has to adapt itself to different environments and it must adjust to segment-based or maybe even product-based tailoring. Also, supply chains to be monitored will be evaluated and categorized based on their strategic importance and vulnerability.

It is important not to develop SCIE into a rigid product. According to Grönroos (2009, 8) service is a process that can be developed to be flexible. A product, on the other hand, can be understood as constant and unchangeable by nature and in order to maintain optimal cost-efficiency it does not easily adapt to the customer's needs.

4.6 Service quality

For any service the key objective is to produce customer satisfaction, which to large extent is a result of subjective and often random experiences. However, the not so quality oriented companies are often satisfied with what they regard as the minimum quality, i.e. focusing in meeting the quantity requirements of the contract. This is obviously not enough. In order to even be able to talk about service quality, the service providers need to fully understand the service realities and the expectations of their customers.

According to Edvardsson (2007, 10) the total perceived service quality is directly in relation to the total burdens carried by the customer i.e. the price and other sacrifices. Grönroos (2009, 5) points out that it is not enough for the service provider to support the customer processes in the agreed manner. The service quality perceived by the customer depends on the experience of the client and how much better the daily functions work with the help of the service than without it.

Grönroos (2008, 7) also points out that customers buy services in order to create value for themselves in their consumption processes. Because the value is often created as value-in–use in the customers' own processes by the customers themselves with the support of the service provider, the service provider does not actually deliver ready-made value to its customers, but supports the value creation of the customers. Therefore, Grönroos claims that a service company cannot really create value for its customers. It can only serve as a value facilitator and create opportunities to become a co-creator of value.

When perceived by a customer, a service product is mostly a package of benefits. Different customers regard different aspects of the service as important, and in order to be able to want to buy a service each customer needs to understand and appreciate its values and benefits. Many potential customers do not know what they really need, and on the other hand, they do not know what kind of new solutions and opportunities there are available for them. It is also obvious that many unmotivated sales people do not know what customers need or want, and in some cases they even try to make their customers adapt to their service concept. It is up to the marketing and sales forces to promote the market awareness and to bring about understanding of what is possible and what is not. The better a realistic view can be conveyed, the easier and quicker it will be to reach common ground and a solid basis for collaborative development work.

4.7 Measuring quality

Measuring quality in an objective way is generally considered to be difficult. According to the research results of Landrum et al (2009, 30) the performance dimension of reliability, which refers to the ability of a firm to perform promised service dependably and accurately, and the dimension of responsiveness, which is the ability to provide prompt service, consistently rank highly in respondent groups, while the more emotive dimensions of tangibility, assurance, and empathy vary in importance depending on the user's state of mind and the circumstances. When experiencing job related pressures, users may well demand speed and reliability, because this is what their deadline requires. Stress melts some of the veneer of collegiality and with it the need for tangibility, assurance, and empathy, which may become relegated to a relatively less important role in the work place.

In practice most customers appreciate services that make their lives easier and are easy to use. Also, overall reliability and flexibility are characteristics that usually describe high quality services. All these dimensions are difficult to quantify or measure in terms of quality. Therefore, one of the critical aspects of the SCIE project is to determine suitable ways to measure the service and quality levels of the SCIE service. Many suitable KPI's are already in use at Turvatiimi, but a new service also requires some new methods of measurement.

Measuring the service and quality is one of the key challenges when providing any service. Trying to measure a service that aims to achieve such goal-directed conditions as security and integrity is even more challenging, because there are so few objective indicators capable of showing the value or the quality of a service which aims at preventing unwanted incidents. When the service functions perfectly, nothing bad happens. Without comparisons this can be falsely interpreted as a waste of time and money.

4.8 Integrating existing and new services

The initial plan in the SCIE project has been the idea of using the existing Eurowatch service as the platform for the new service and to see in practice how far it can stretch to new directions and what kind of new partnerships need to be made besides it. During the development this starting point has turned out be a successful one, and given the new service a flying start.

Tax and Stuart (1997, 121-127) have introduced an integrative process for planning service integration, and they suggest seven systematic steps to carry out the change without unnecessary surprises.

Step 1. Conduct an audit of the original service system

Step 2. Assess the new service concept from a market perspective

Step 3. Assess the new service concept from a process perspective

Step 4. Assess the new service concept from a participant perspective

Step 5. Assess the new service concept from a physical facility perspective

Step 6. Assess the impact of integrating service systems on the original and new service in each of the key service dimensions

Step 7. Assess the capability of the company to manage the change involved

In practice introducing SCIE into Turvatiimi's Alarm Service Centre and the existing Eurowatch service will be easier than larger-scale integrations, which require new service units or new operational models. Turvatiimi has provided track and trace services for years, and expanding gradually towards more versatile services is a relatively painless process.

5. Method

5.1 Constructive Approach

This thesis has been made by using the Constructive Approach, which is a research procedure for producing constructions and solving problems that emerge in running business operations. Kasanen et al (1993, 246) characterize the Constructive Approach as problem solving through the construction of models, diagrams, plans, organisations, etc. and divide the research process into the following phases (not necessarily in this order):

1. finding a practically relevant problem with research potential
2. obtaining a comprehensive understanding of the topic
3. innovating, i.e. constructing a solution idea
4. demonstrating that the solution works
5. showing the theoretical connections (research contribution of the solution concept)
6. examining the scope of applicability of the solution

In this research the Constructive Approach has meant digging into the theoretical background, finding new paths for the existing product development, making observations and logical relations, talking with experts of related fields as well as having group discussions, brainstorms and workshops. By bringing their expertise and input to the project, the project team members boosted the project to reach new levels on top of the ones already reached by previous development and testing pursuits.

Information gathering

There are abundant sources of relevant theoretical background information about supply chains and to some extent also their security. There are quite many English language books on the subject, and ASIS turned out to be one of the best sources of good scientific literature. Through the Internet one can find multitudes of research papers and articles about logistical security. Finding material did not represent any problems. A bigger challenge was to locate the relevant needles from the haystacks and to find reliable sources and logical argumentation to support conclusions that help in building the new service concept.

The literature consisted of books on logistics, security, logistical security and service development. Other valuable sources included research papers, articles in science, security and logistics publications, case studies as well as seminar and other presentations. The Finnish language research material was quite scarce and limited to the activities of a few active researchers.

Social media

Social media has played an interesting and important role in acquiring wisdom from large networks of experts working the supply chain and security environments. Interesting group discussions as well as practical hints and advice by the group members on the LinkedIn network (e.g. Logy ry, Cargo Security, Global Logistics & Supply Chain, Supply Chain Today, European Logistics Community, European Community: Logistics/transportation, Logistics & SCM in Eastern Europe, Global Security Professional, Security Industry Group, ASIS International) proved to be invaluable additions in the hunt for relevant information.

Workshops and discussions

During the SCIE project many experts were involved in the information gathering. Actual theme interviews were not conducted, but many open discussions, brainstorms and development sessions were held with chosen people in the security and logistics sectors. During the project year altogether 18 people representing wide field experience in logistics, security and logistical security tested the SCIE idea and its assumptions, conclusions and eventual feasibility. Partly the discussions were purely about SCIE and partly SCIE matters were discussed among other themes.

VTT provided additional logistics expertise in long discussions with experts in service development. All the key elements of the service concept were deeply discussed and further developed during regular project meetings and workshops throughout the project year. The methods and results of the workshops and discussions are to some extent presented in paragraph 6.2.2.

Survey

In addition to various internal and external discussions, a survey was conducted using a net-based questionnaire form. The survey invitation was sent to selected security and logistics people, who represent central figures in the fields of logistics, security and logistical security.

The survey was prepared both in Finnish and in English, and links to selected security and logistics experts were sent by email. With 79 responses, the response rate was slightly over 20 percent. See more on the survey methods and results in paragraph 6.2.1 and appendix 2.

Tests

The main practical objectives of the project were very clear from the beginning. Turvatiimi had already carried out several tests around the existing track and trace service, and it was rather natural to look beyond the earlier results and the existing realities, when trying to find new business possibilities. Turvatiimi and the project team carried out many internal and external tests with different equipment related to the track and trace service. Already now, the tests have proven the feasibility of the service and the adaptability of most tested devices in versatile environments. The test results are briefly described in paragraph 6.4.

At the time of writing this report, the SCIE project tests, workshops and meetings had already taken place. However, Turvatiimi will carry on the development work continuously also after the end of the project in August 2010.

5.2 Strengths and delimitations of the method

According to Kasanen et al (1993, 258) the possibility of checking the steps of a construction, linked with the criteria of objectivity, criticalness and autonomy, contributes to the issue that anybody can try out the construction and obtain results similar to the person who has made the original construction. It should be borne in mind that making constructions, though goal-directed, is in itself largely a self-supporting activity and as such independent of economic, political, etc. considerations. However, a constructive research process as a whole is of course value-laden, and the preferences of the managers in question tend to play a significant role in this respect.

In this type of development work the reliability and validity are very difficult to assess accurately. However, there are grounds to be able to rely on the results that are based on numerous sources and experience of several experts. The real usefulness of the service can be confirmed only by an actual operating service. It certainly seems that the chosen method has made it possible to chart the existing Turvatiimi services related to SCIE, to find adequate basis from the theoretical framework and to create a new kind of service package.

5.3 The thesis as a part of a larger development project

This thesis is a part of a product development project, which rather obviously incorporates many aspects that are classified or confidential by nature. This means that many aspects and results of the project cannot be disclosed as business secrets and competitive strengths that could be utilized by the competition.

The structure of the overall project reporting (excluding the financial reporting to TEKES) includes the following elements:

- part 1: general elements of the concept (incl. this thesis)
- part 2: detailed elements of the concept (various smaller reports)
- part 3: final results of the project (test analysis report, final report, business plan)

6. Empirical findings

6.1 Project team work

Definition of demands

Most of the external expertise to the project was obtained from VTT (Technical Research Centre of Finland), and their first assignment was to prepare a report on the definition of demands. The report covers all the major demands and influencing factors that need to be taken into consideration. The report also includes various analyses concerning the service and its design processes.

Project workshops and meetings

The project team held numerous workshops, training sessions and follow-up meetings during the project year. Various project related topics were covered to get deeper into the subject matter and find the best possible solutions to the questions in hand. Several blueprints, charts, spreadsheets, descriptions and sets of instruction were created during the project to fine-tune different aspects of the planned service. The project results will be presented in the final project report.

Picture 1. The multitude of cargo traffic on European roads (Grym)

6.2 Background questionnaire and interviews

6.2.1 Questionnaire

A questionnaire was prepared to survey the needs and requirements of the logistics sector, perceived by people working in the logistics and security sectors. The questionnaire was made in Finnish and in English (detailed reports of both as Appendix 2) and published at the Webropol system, through which the respondents could fill in the questionnaire electronically.

372 participation requests were sent by email to selected logistics and security professionals in Finland and to some extent abroad (roughly half and half to security and logistics people). Additionally, the questionnaire was promoted on three LinkedIn group sites (Global Logistics & Supply Chain; Cargo Security; Supply Chain Security), the users of which are experts in logistical security.

The response rate was 21.24 percent, which can be valued as a success, considering the general excess of information around most people. The overall respondent group consists of security people (69.62 %) and logistics people (30.38 %). The difference in the response ratio between the two groups can be explained by the relative unfamiliarity of Turvatiimi and the surveyor himself in the logistics sector. Logy ry (Finnish Association of Purchasing and Logistics) boosted the reply rate by encouraging its members to be active. Without Logy's help the reply rate would have been minimal on the logistical side.

The supply chain elements most suitable to be included in an outsourced service

The respondents were asked to choose five supply chain elements that best fit into an outsourced service. Rather obviously cargo security is the most popular choice (72%). Other security related matters are also considered important, but also cargo condition is regarded essential by 47 percent (evenly by the logistics and security people). The approach to security training requirements creates a visible difference in the chart. 63 percent of the logistical responders feel that the improvement of security skills fits in the service scope, when only 41 percent of the security responders feel similarly. This indicates real will among the logistics people to harness also their own resources along the supply chains to participate in maintaining security and preventing losses.

Furthermore, the logistical responders feel more than their security counterparts that by an outsourced service there are possibilities to enhance the information flow of the supply chains. Also, the logistical experts see more opportunities in handling information about natural phenomena and traffic problems along the routes. All these factors can play an important role in the efficiency development and streamlining of supply chains.

The on-time arrival of shipments ranks number seven (28 %), which indicates real concern for lead time efficiency that at its best can clearly support the competitiveness and profitability of the product supplier. If an exporter can improve its lead time efficiency even slightly, the benefits easily outweigh the savings achieved by prevented thefts or accidents.

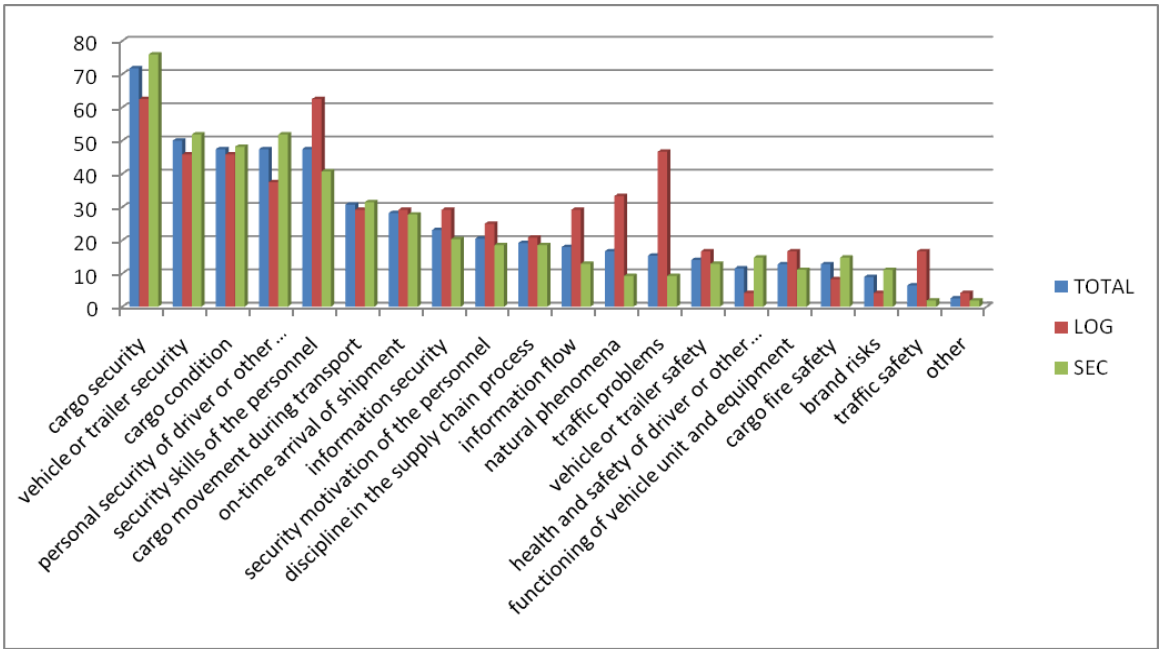


Chart 7. Suitable elements of an outsourced integrity service

Vulnerability of supply chain legs

The respondents were asked to name three supply chain legs that are the most vulnerable. When looking at the vulnerability of a supply chain, it is natural for security people to approach the subject from mainly a security point of view, and logistics people maybe have a more comprehensive and practical perspective. This could explain why the responses for this question created so much variation. Overall, the two most popular choices (driver stops and transport on the move) are not considered particularly sensitive to unwanted incidents by the logistics people, who regard especially the loading and unloading phases as the most dangerous legs. Probably the logistics people are better aware about the actual statistics on unwanted incidents in the logistics sector, but still the differences are substantial.

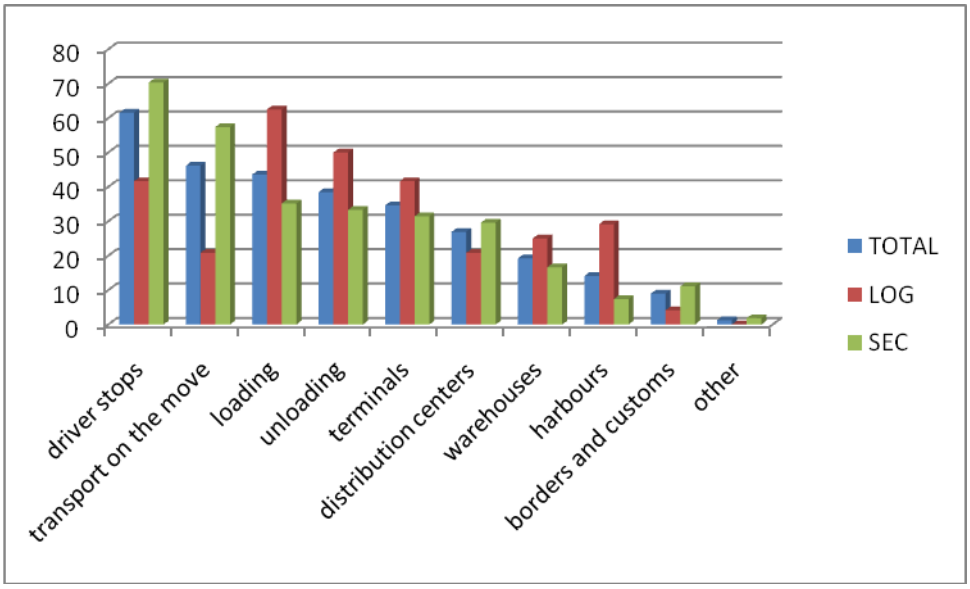


Chart 8. The most vulnerable stages of supply chains

Necessity of location data

Clearly the majority of the responders are already familiar with the opportunities and benefits arising from the use of location data in the monitoring of supply chains. Altogether 89 percent of the responders feel that location data is either compulsory or necessary. No responders have chosen the option “not at all required”.

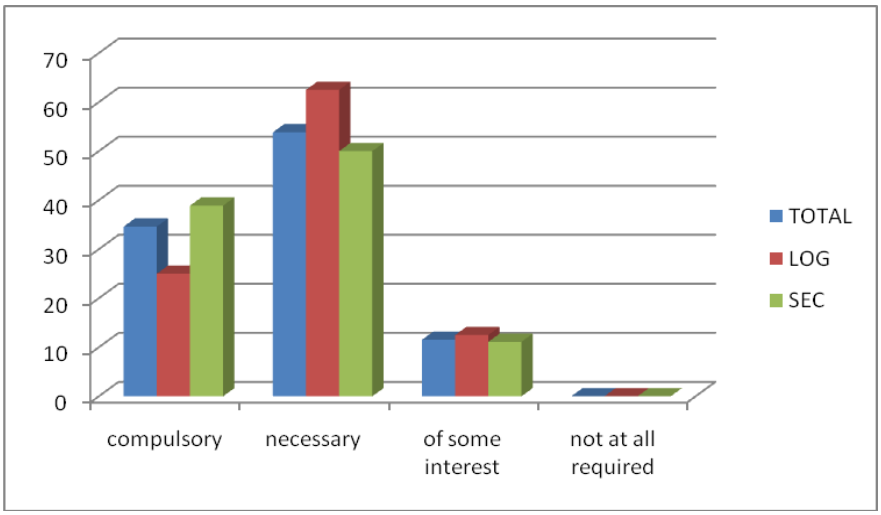


Chart 9. The usefulness of location data in supply chain monitoring

Necessity of shipment condition data

Traditionally, the track and trace service providers have not focused their attention to condition data related to their customers' shipments and their immediate environments. Mostly, this has been due to the limitations of technology, which so far has not enabled the service providers to provide these services in an efficient and especially cost-effective manner. Now this technology is available, and the awareness of its capabilities and usefulness is spreading.

Two thirds of all the responders (67 %) think that getting relevant data concerning shipment condition is either necessary or compulsory. Only nine percent feel that condition data does not play any role in controlling supply chains. In this question the biggest difference between the logistics and security people is in the choice of "necessary" (L 50% / S 61%), but this is largely compensated by the choice rate of "compulsory".

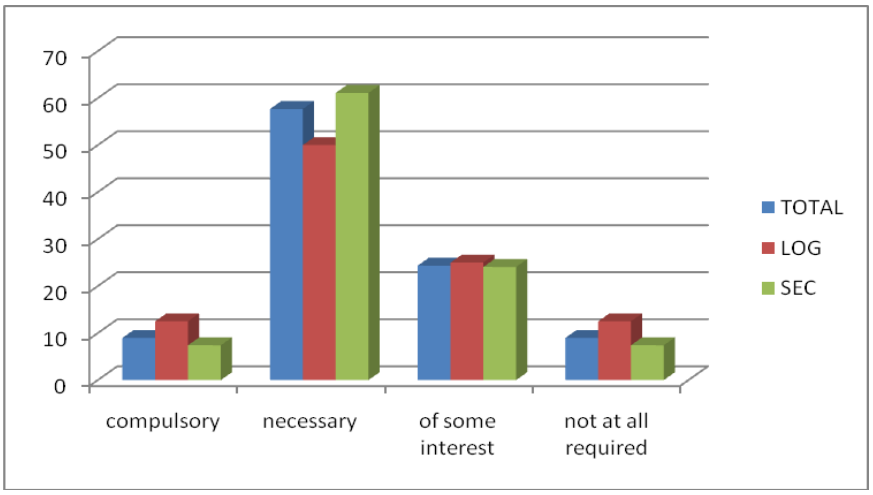


Chart 10. The usefulness of shipment condition data in supply chain monitoring

The obstacles for cooperation and transparency

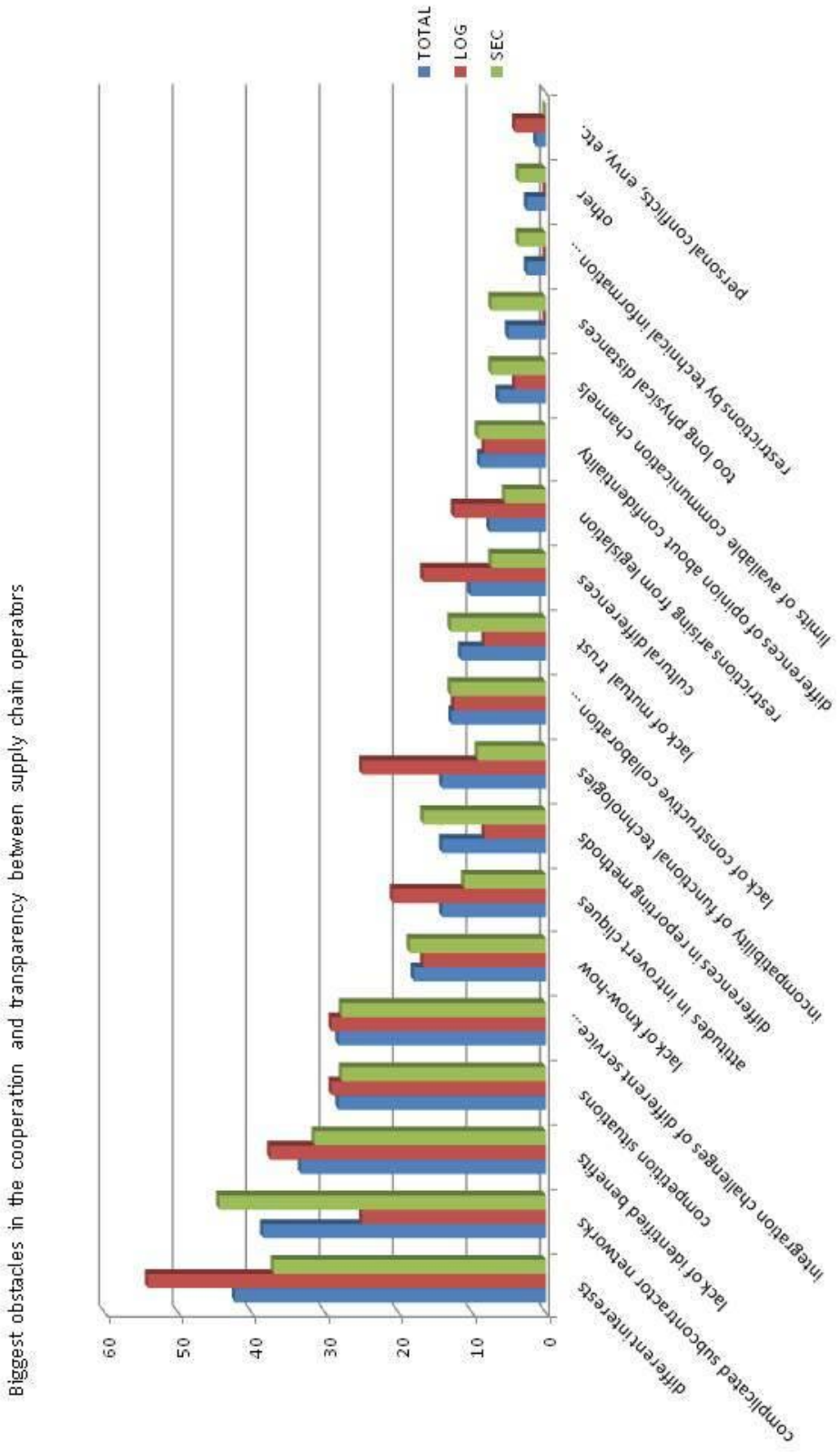


Chart 11. Obstacles for cooperation and transparency

In spite of many benefits of collaboration in supply chain networks, true cooperation is difficult in practice. There are numerous forces and counterforces at play, many of which are baffling even to the ones working inside the networks. The survey charted the importance of the factors which affect the interest in cooperation and the required transparency.

As an after-thought, the fear of additional work and consequently additional costs would have been a suitable element to be added in this particular question. Many logistical operators are plagued with almost non-existent profit margins, and any additional cost to their tightrope-balancing act is considered threatening.

Survey conclusions

As empirical results show, there are no substantial differences between the threat evaluations of logistics and security professionals. Most results show that the security people naturally focus in security matters, and the logistics people base their evaluations in their practical experience that covers everything possible along the supply chains.

From the survey results we can clearly see the increasing importance of shipment condition monitoring and protection of supply chains from also other than security threats. So far, the outsourced services have largely focused on track and trace and security functions. Now the quickly developing technology enables the service providers to cover many more useful areas with almost the same effort and cost.

In general, the results of the questionnaire survey show scattered opinions about the threats related to logistical security. To large extent, this indicates the complexity and variety in the logistics sector, which requires more versatile skills and understanding from the security service providers and a more comprehensive approach than with most other sectors.

6.2.2 Workshops and discussions

The project included regular (mostly monthly) meetings, where the project team held discussions, brainstorms and workshops, some of which included guest experts of required fields. The workshop themes included e.g. definition of demands, service concept, test planning, possible service exceptions and emergencies, service takeover procedures, service instructions and service finalization. Furthermore, in most meetings the project members were given assignments to advance the development work between meetings. Much of this longer-term development work is reflected in this thesis and presented in detail in other project reports, such as the final report and the business plan.

Also, during the SCIE project the researcher and other project members carried out discussions and informal interviews, through which a lot of information was gathered from experts in the relevant fields. Many of these discussions sparked further discussions in the project meetings and helped the project come up with more informed and logical choices and solutions.

6.3 Utilization of social media

The social media and especially the LinkedIn network turned out to be a very valuable source of useful information. Most LinkedIn groups related to logistical security have relatively active group discussions, where current topics are discussed daily from different points of view. The group members contemplate current topics and seek advice from each other. The members also provide links to other Internet sites with interesting data on the discussed areas of interest.

The LinkedIn poll function could provide a very useful addition to surveys and polls, but the current system limits the free-of-charge functions to one's own network, and any other poll is ridiculously expensive, considering the nature of the site.

6.4 Field tests

The practical customer service cases as well as individual and collective learning from operational experiences have provided useful data on the possibilities, challenges, threats and bottlenecks that arise from operating as part of an international service network. The existing Turvatiimi customers represent various individual elements of the larger SCIE service package, but none of them utilize all its possibilities.

Picture 2. Turvatiimi personnel fixing the devices onto a test shipment (Grym)

Throughout the project year, Turvatiimi and the project team carried out extensive device tests and internal track and trace service with all Turvatiimi's patrol vehicles. Turvatiimi has several years of experience in monitoring customer shipments in Finland and elsewhere in Europe as part of the Eurowatch service. The monitoring of the company's own production vehicles has made vehicle monitoring a routine function, and extensive tests and service pilots have given a lot of useful information on practical aspects of the service (winter and summer variations, influence of different device fixing points, etc.).

Several field tests were carried out during the project period. Suitable supply chains were chosen, and selected shipments were monitored from start to finish. The monitoring tests covered shipments to e.g. Sweden, Estonia, Poland, Italy and Belgium. Furthermore, some tests were done with short-distance shipments within Finland.

Train transport

Parts of the tested supply chains included certain legs by train. The train transport turned out to be slower than anticipated, because much of the cargo transport takes place at nighttime. In Europe trains are so often late that combined transports are out of the question, if the transported goods cannot tolerate delays. In many delivery tests during the project there were surprising exceptions in the actual schedules compared to the planned ones. Based on the measurements and test experience it can be concluded that the timetable delays are normal and to be expected in intermodal supply chains.

Sea transport

In relation to Central Europe, Finland is located beyond the sea, which makes it natural for Finns or companies exporting to Finland to include also sea voyages as part of many supply chains. A long sea voyage places particular requirements the devices and the operating time of their batteries. The devices collect information about the shipment condition also during the sea leg, but do not waste energy in trying in vain to send it forward. Even if was possible to get realtime information about a problem in a shipment at sea, there would be very little that could be done about it. In order for the SCIE centre to know where a particular shipment is located, it can use e.g. ship locating services on the Internet.

Environment and condition monitoring (ECM)

During the project the tests and actual services to certain customers covered basic track and trace service, geofencing properties as well as most typically monitoring of temperature, humidity and acceleration. It became evident that the alarm levels of many monitored dimensions are challenging to define exactly (apart from temperature). Also, the realtime monitoring requires exact data on the supply chain leg and location, so that the service provider can analyze the situation correctly and initiate responses according to the correct instructions.

The daily variation in temperature was reasonably wide, but within a scope that can be considered normal. Humidity did not cause any problems for the shipments, and they did not get wet in-transit. It is notable that the weather during the most tests in the spring was dry. Even if the level of humidity arises to 100 %, it does not necessarily cause damage to most transports. If there is a need to find out the real situation in humidity-sensitive shipments, it is possible to utilize specialized water/liquid sensors. Altogether, in the tests no real surprises arose concerning the environment and condition monitoring.

Return logistics

During the tests also the return logistics leg was monitored, when possible. The monitoring devices are still quite expensive and cannot be used regularly as disposable equipment. At the end of the supply chain somebody needs to strip the device from the shipment and send it back for recharging and reuse. That person can be anybody in the system, but he/she must be nominated and committed to make sure that most devices are returned. Inevitably, many devices will be lost, but with further development of return packages and envelopes the losses can easily be minimized. During the tests very few devices were lost.

Device fixing and integrity

The fixing of the monitoring devices and the implementation of the monitoring service have been made easy in order for anybody in the customer's organisation to be nominated as the responsible persons in the beginning of the supply chain. During the tests the cooperation with various dispatch units went very well, and the fixing of the devices did not represent any major concerns.

The modern monitoring devices can be contacted remotely and reprogrammed according to the requirements of the situation. However, the device cannot usually be checked in other ways, because according to normal procedures the transport units are sealed and opened only at the very end.

Device batteries

One of the major challenges in the project field tests was the reliability of the device batteries. In some cases the battery ran out well before reaching its final destination. This can be mostly explained by the experimental use of beta versions of the tested equipment. The situation improved case by case, and ultimately the battery capacity was prepared to cover even longer unexpected delays. During the field tests it became apparent that the battery life has to be carefully planned on transports that take several weeks to reach their final destination at the other end of Europe.

To some extent new and more efficient batteries obtained by 4TS improved the reliability of the devices. The denser the GPRS or GPS transmitting frequency is the shorter the battery lifetime becomes. Also, the use of GSM cell location decreases the power consumption by about 10 percent. In practice, the operating time is directly linked with the communicating frequency, and with good planning it is possible to optimize the battery lifetime. Where possible, it is obviously sensible to utilize current from the vehicle or the transport unit.

7. Development results

7.1 Service concept

The goal of the SCIE service is to support customers in a comprehensive manner in protecting and developing their supply chains. At a Supply Chain Security group discussion in the LinkedIn service, Michael Brady aptly pointed out that effective business practices and efficient controls are themselves good security, and it is very difficult to add security or

efficiency, let alone integrity. To large extent, any well-planned and executed operation also has a lot of in-built security and integrity.

A comprehensive service package

SCIE can be understood as a comprehensive service package providing all the essential security and integrity solutions required by the supply chain customers. The services include track and trace services with possible environment and condition monitoring as well as holistic solutions that raise the security arrangements of the customers to new levels (according to TAPA and other standards) and maintain these levels. This can be achieved by seamless service cooperation with consultancy services, technical and constructional arrangements and appropriate security services.

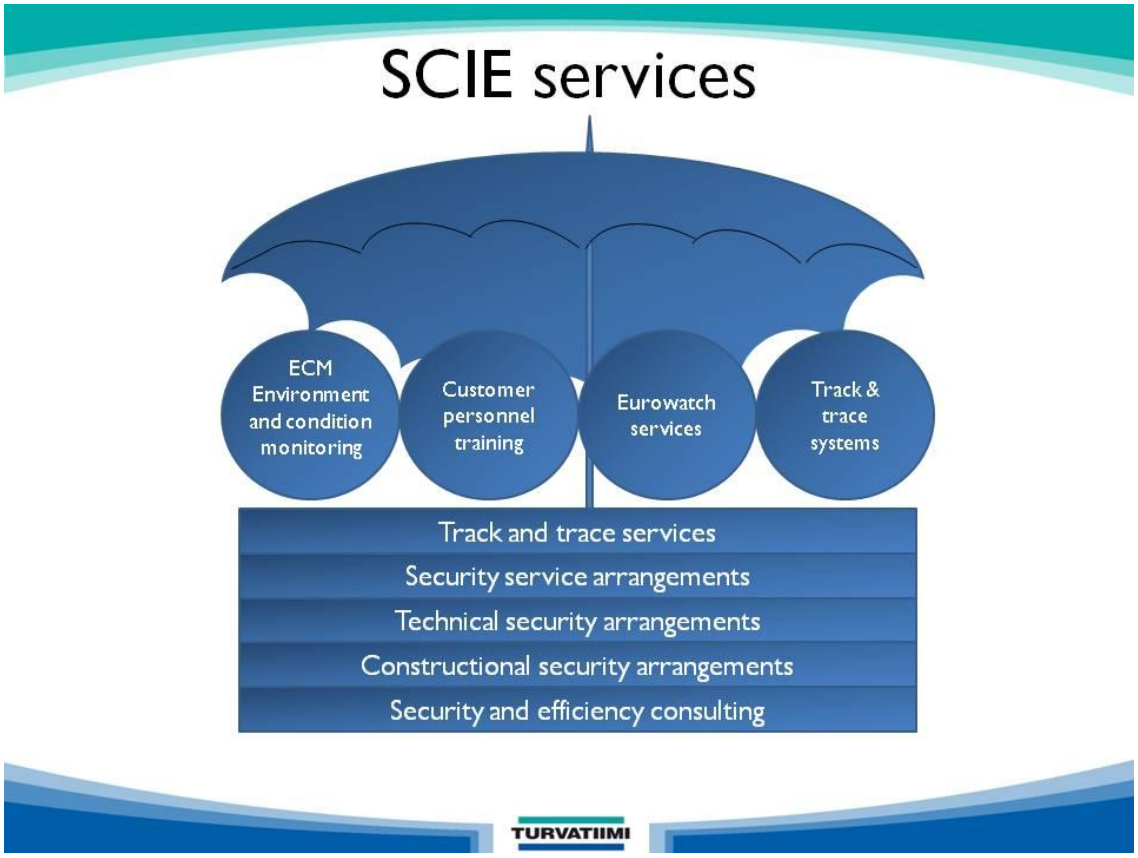


Chart 12. Elements of the comprehensive service package

SCIE monitoring

The SCIE monitoring service consists of the basic service and customer-specific tailoring elements. The basic service includes the realtime monitoring and alarm handling as well as the appropriate field responses. The basic track and trace monitoring includes the positioning and the basic security alarms, and the non-security features form a portfolio of tailoring

elements. The monitoring is mostly reactive by nature, meaning that most measures taken are initiated by exceptions and deviations or technical alarms detected and forwarded to the SCIE centre.

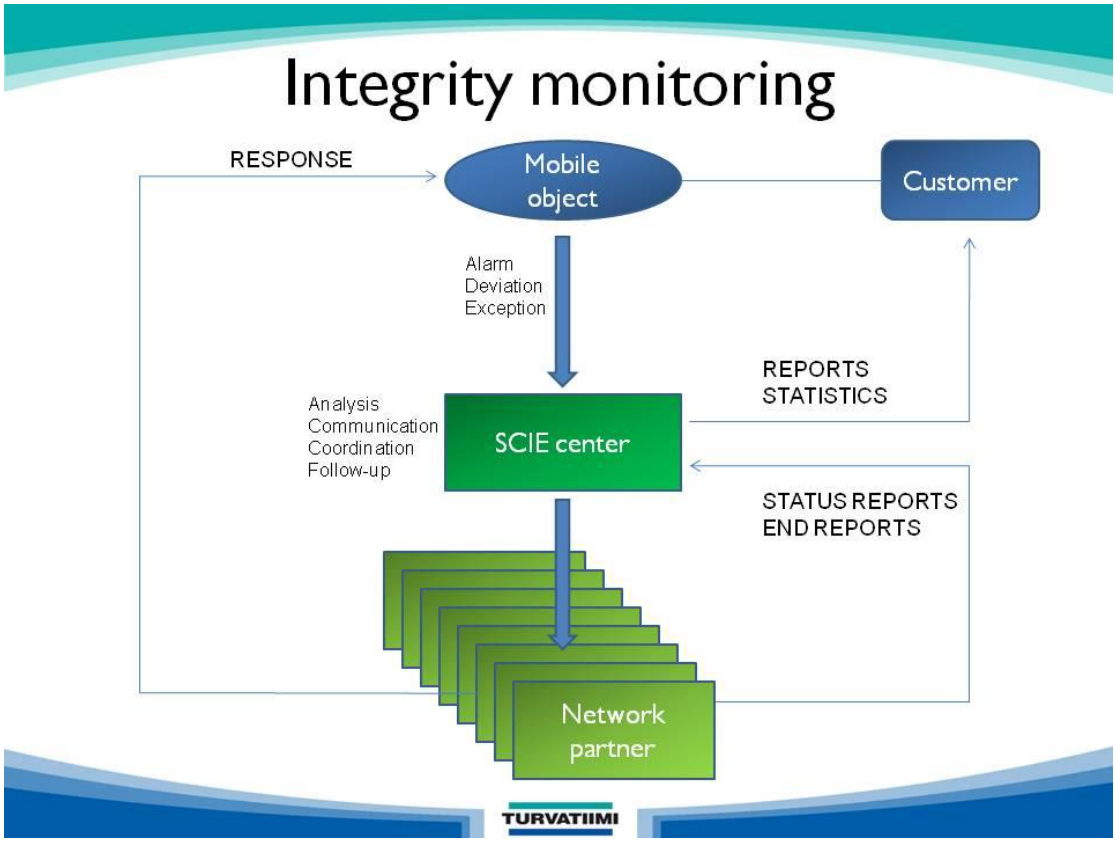


Chart 13. The simplified integrity monitoring principle

Various sorts of information are received from partners and operators along the supply chains. The SCIE centre collects and coordinates the data, and after analyzing the situation it initiates responsive actions and sends summaries and reports to the agreed partners and/or customers.

There are obvious proactive elements as part of the monitoring service, but they are mostly used as supportive tailoring elements along the supply chains. A key objective of the service design has been the optimal cost-efficiency, which makes it possible for the cost-conscious logistics sector to utilize the service.

The idea of the monitoring service is to minimize all unwanted incidents and developments en route all the way to the final destination. With continuous monitoring and comparative analysis all relevant deviations can be detected and appropriate response measures initiated anywhere in Europe and eventually on a global scale.

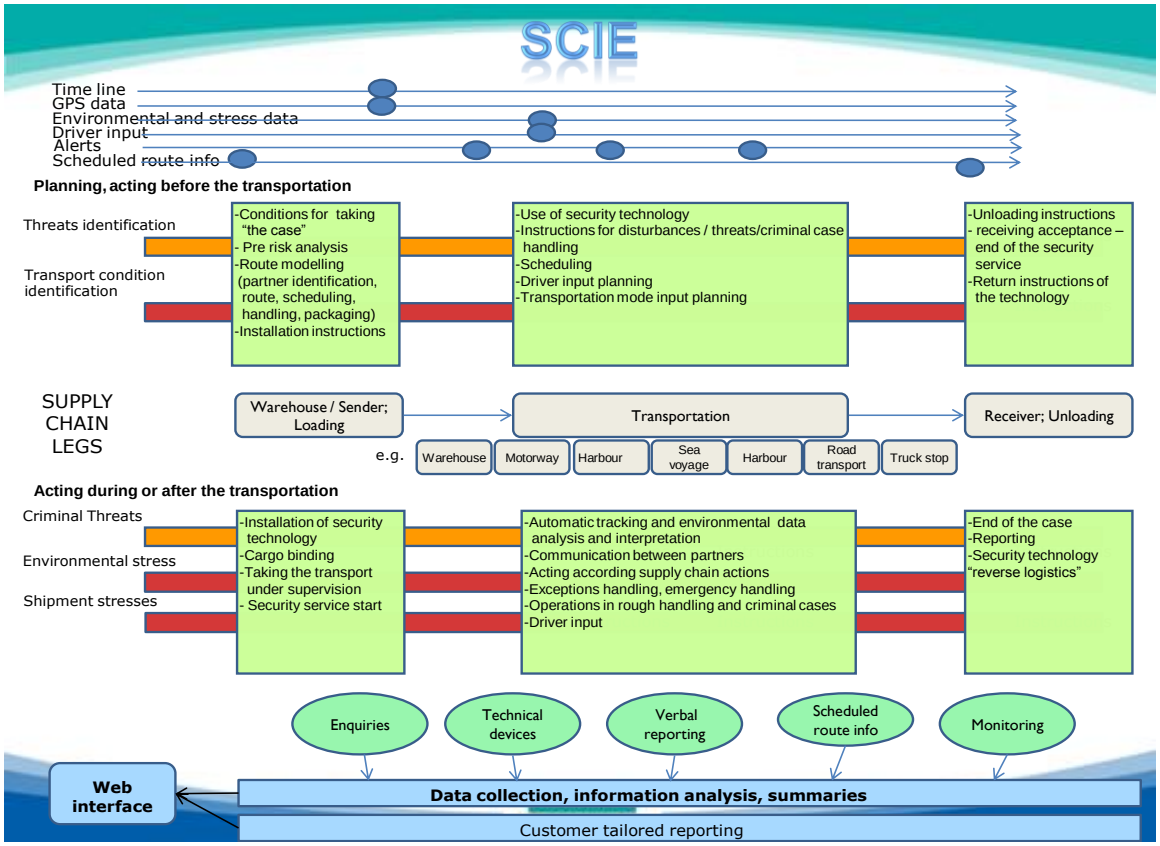


Chart 14. The SCIE monitoring principle in more detail (Turvatiimi/VTT, SCIE project, 2010)

Support services

In addition to the realtime integrity protection, the SCIE service includes various measures aiming at improving the efficiency of the customer's supply chains. To some extent security consultancy is part of the basic service as part of the service takeover process, when the supply chains are surveyed and the overall risks assessed. When deeper analyses are needed, SCIE experts can carry out detailed development projects, which can include e.g. security or safety consultancy (compatible with e.g. TAPA, AEO and/or ISO28000), fire safety, training programs, technical systems, traditional security services, logistical efficiency or other operational elements that have improvement potential.

7.2 Service system

7.2.1 Organisation and control

Human resources

In the beginning Turvatiimi does not require new resources to carry out SCIE service functions. The SCIE service can be run by the existing Eurowatch personnel and expanded in a flexible manner, as new paying customers require more resources. The existing personnel responsible for the current Eurowatch service can handle any and all possible SCIE assignments, and once the service volumes rise, the personnel resources will be adjusted accordingly.

Service personnel profiles

The SCIE service will have Service Manager responsible for the overall service. Gradually, the SCIE centre will form a more independent unit in the Alarm Service Centre, and maybe at a point in the future it can even establish its own 24/7 SCIE alarm centre.

The unique nature of the logistics sector requires new kind of know-how from the duty officers. Therefore it is essential to recruit people with supply chain experience and give them security training. By combining people with security and logistics experience, it is possible to tackle most situations fluently without any problems. A wide network of external experts will be valuable in locating the best possible solutions and the most suitable assistance arrangements in challenging situations.

A suitable profile of the SCIE duty officers is a versatile combination of both security and logistical experience. People with a suitable background in both fields will be difficult to find, and a more practical way to fill the vacancies is to train experienced logistics experts in security monitoring work, and vice versa.

Cooperation network

Serving customers with service needs outside Finland requires a trustworthy collaboration network outside the country. Eurowatch provides such a platform, and with those resources it is possible to solve all the security problems and increasingly also other kinds of problems that the customers might be facing.

In many cases the primary response mechanism especially in non-security incidents can be the existing arrangement that has been used before. Many operators have their own partners that have been tested through years of service together. As a flexible service, SCIE can utilize these resources in new coordinated manner. If the customer needs external assistance, SCIE duty operators contact suitable companies. As a worst case scenario, the situation can require immediate locating a completely new source of assistance in a strange environment, but SCIE has to be ready for that, too.

The SCIE service network can be expanded by other suitable operators (e.g. FreightWatch, suitable non-security operators) that can provide those elements of the service that the Eurowatch network partners are not able or willing to do. Turvatiimi will continue to explore potential collaborative networks in Europe. Already with the existing coverage the SCIE service can sort out most typical difficulties or problems along the European supply chains.

7.2.2 Customers

According to Ojasalo &Ojasalo (2008, 217) the customers form the second part of the overall service system. In order to be able to fluently serve a customer in any field, it is imperative to know and understand its operations, background, requirements and wishes. A customer is not only an object of service functions and invoices. Especially with a new service, the customer's key personnel need to be trained and familiarized with the service. In many services, SCIE included, the customer needs to restructure some of its existing operations and adapt its supply chains to new procedures. However, this adjustment does not have to be extensive, and the service itself is designed to be flexible. Also, any adaptive measures are taken together with the service team as part of the service takeover process.

7.2.3 Technical resources

Information sharing and other flow of information

According to Fawcett et al (2007, 74) the leaders in supply chain management collect, analyze and share tremendous amounts of information so that they can make more good collaborative decisions. They need to invest in both the technologies and the culture needed to make the sharing a functional reality.

Turvatiimi already has a recently upgraded Alarm Service Centre that has just moved into a new location. Its operational and technical systems give SCIE an existing platform that requires only minor adjustments. Therefore, launching SCIE requires minimal investments in

technical resources or even labour. A bigger challenge is to convince other links of the chain to share information in a useful way and to actively participate in the joint effort.

The modern IT technology enables companies to develop easy and inexpensive solutions to gather information at huge scales and to store it with practically infinite capacity. The real challenges arise, when companies attempt to create intelligent systems that can automatically analyze data from different sources and refine it through smart software and maybe sometimes in the future increasingly through applications of artificial intelligence.

The obvious concerns of a partner asked to join a collaborative network with new levels of transparency are the realities around information security. All members of a network need to be convinced that information they bring to others' disposal is handled securely by authorized people only.

7.3 SCIE service package

One of the first things to be done when starting a security service for a new client is to carry out a comprehensive risk survey in order to learn what the service provider is faced with. All good services originate from actual needs, and the better the needs are charted, the more accurate and cost-effective the service can be. History and experience show many good examples of things going wrong on the road, but ultimately each supply chain has its unique characteristics and therefore its own risks, which need to be surveyed and taken into consideration individually. Before any SCIE service is initiated, a proper background and risk survey is conducted in order to get the optimal service result.

All the potential SCIE customers have a natural and in-built need to harmonize their supply chain processes and to make them as effective as possible. By utilizing the SCIE service they can achieve new levels of coordination and streamlining, which ultimately will improve their efficiency and save them money.

The SCIE service package consists of two larger elements: Basic service package and Extended service package. The basic package concentrates on the integrity monitoring of the supply chains and the extended package includes the various support services that can be used to support the integrity monitoring or to improve the efficiency of the supply chains. Both the basic and the extended packages include the basic elements and the optional tailoring elements.

SCIE service supports the customers' green approach by realtime monitoring and response services around environmental deviations and exceptions as well as applicable environmental considerations in the efficiency development work.

7.4.1 Basic service package

Turvatiimi's Alarm Service Centre includes a gradually growing SCIE centre, which receives alarms and other information from different elements of the supply chain. Appropriate devices or analysis-based exceptions or deviations can initiate alarms. SCIE centre monitors alarms and handles them according to the situation and the pre-planned instructions. SCIE centre will also function as a HelpDesk carrying out various call centre tasks and coordinating the field activities along the supply chain.

The SCIE centre utilizes many existing security and track and trace systems at the Alarm Service Centre. Combined with the customer and supply chain data in these systems and other databases, sets of instructions, a logistics vocabulary as well as data from internal and external services the coordinated system provides the duty officers with everything they need to know about the objects they are monitoring.

The basic service includes the following:

- handling intruder and security alarms
    - door magnet, electronic seal, panic button, motion detector, other device
- track and trace service
- basic hardware, if required (leased or sold)

The tailoring elements can include some or all of the following elements:

- relevant integrity alarms (and warnings)
    - temperature, humidity, air pressure, acceleration, shock, free fall, etc.
- geofencing alarms
- timetable alarms
- event management tasks related to operational deviations and exceptions
- additional technical systems, if required

The tailoring elements are chosen based on customer wishes and surveys of the supply chains. The initial surveys are made as systematic as possible, enabling the data handling to use information that is collected and analyzed in the same compatible manner. Another key objective is to make the service takeover as easy as possible for the customers.

At least in security related incidents the response service can be carried out the by the Eurowatch network. Many other requirements can be settled through Eurowatch, but it remains to be seen, what kind of new supportive partnerships need to be established in order to be able to serve customers in the planned comprehensive manner.

7.4.2 Extended service package

The extended service package includes all the services that the basic service package does not offer:

Supportive services at fixed sites

- static and patrol guarding, reception services with security functions
- monitoring of alarm and environmental systems at fixed sites
- remote camera monitoring (alarm or situation based or regular camera rounds)
- regular security audits

Security consultancy

- personnel recruitment and vetting
    - procedures concerning personnel recruitment and background checks
- contractor and subcontractor vetting and auditing
- deeper supply chain analyses, security plans, instructions, etc.

Security training and awareness programs

- basic security training for customer personnel (as a part of other training of the customer)
    - risk awareness and threat identification
    - responsible attitude training
    - use of security equipment

Safety and fire safety consultancy

- OH&S consultancy and training
- fire safety consultancy and training

Security and safety of mobile workforce

- realtime tracking of key personnel (top management, overseas travellers, expatriates, lone workers)
- monitoring of panic button systems and distress calls

Technical systems supporting the security services (installation, repair, maintenance)

- camera surveillance systems
- access control systems
- track and trace systems
- intruder alarm systems
- environment and condition alarm systems (temperature, humidity, G forces, etc.)

Constructional arrangements at customer sites

- gates, barriers, fences
- fluency of traffic arrangements inside compounds

7.5 "E" in SCIE - improving supply chain efficiency

Efficiency development

When providing the SCIE service Turvatiimi is not contented in merely monitoring the integrity status of its customers' shipments. In order for the company to achieve the most effective solution possible, the continuous efficiency improvement as well as operational streamlining and harmonization need to be included in the larger service package. The development work can take place through professional consultancy or collaborative development projects, in which the service provider and customer together survey the problem areas and find the most suitable solutions to tackle them.

Turvatiimi provides various types of security consultancy and training services, separately or as part of larger service packages. The company also has a number of partners providing additional expertise in safety, fire safety, specialist areas in logistics, etc. Turvatiimi's key partner in logistical security is LogiSec Oy. Together with LogiSec, the company can make the customer arrangements TAPA, AEO and ISO28000 compatible in practice and assist customers in a comprehensive manner in maintaining their security levels at the levels required by the standards.

Improving lead-time transparency with realtime forecasts

According to Carter et al (2009, 12) companies are struggling to forecast demand for an increasing array of products. Nearly all companies base their supply chain planning and execution demand forecasts and yet only a minority considers those forecasts to be reliable. The execution of an integrated supply chain is confronted by a difficult dilemma: effective planning requires reliable forecasts, but increasing demand volatility and product proliferation is making forecasting increasingly inaccurate and unreliable.

In a world that is becoming increasingly complex, companies need to look for ways to improve the realtime responsiveness of their competitive dynamics. The new service will not help them in forecasting demand, but it can provide useful information in a new way by producing forecasts about shipment arrivals. By utilizing realtime information from various sources the service unit can produce increasingly accurate ETA information, which is available to the customers and their end-customers enabling them to make more exact schedules and operational plans.

7.6 Technology applications in other security services

Already in its very beginning, the SCIE development project provided Turvatiimi with new tools to enhance other areas of operation. Turvatiimi put all its production vehicles under the internal track and trace service, making it easier for the Alarm Service Centre to utilize the field resources in an easy and optimal way. The location of every patrol vehicle is known in realtime, which gives a completely new transparency to the operations, which directly benefits also the customers.

The new technologies also enable Turvatiimi to locate any other object related to its customer service. Turvatiimi can quickly find its own service personnel, but the service can also be extended to cover selected customer personnel or outsourced personnel that closely cooperate with the security service. The track and trace service can also include monitoring of vehicles, machinery, large tools, service equipment or any object, big or small.

The location data is particularly useful in alarm situations as well as optimal use of resources, protection of lone workers and follow-up of the use of vehicles and equipment. The GSM cell locating system enables the service provider to reliably track objects also indoors, and the intelligent track and trace devices can be used as mobile alarm systems at static sites (practical and handy especially at construction sites).

7.7 Reporting

Nowadays, customers require a more and more transparent service with realtime reporting, where possible. Turvatiimi’s existing electronic reporting systems are easily adapted to incorporate new elements from the SCIE service.

The service provider is obviously required to provide in realtime performance reports, such as alarm reports and various procedure reports related to the actions and reactions in the SCIE alarm centre as well as in the field. Furthermore, the service reporting includes periodical

(e.g. daily, weekly, monthly, quarterly, annual) reports that give the customer a more comprehensive understanding of the situations and problems along the supply chains.

Various quality reports (e.g. audits and enhancement projects) provide useful information as seeds for mutual collaboration and continuous development. Also, the service provider can gather statistics data on any chosen element of the service.

The SCIE customers will have an easy data access and sharing ability with the service, making it possible for them to see in realtime all essential aspects of the service on their own computers. In the future the reporting will include the first versions of On-time Forecast, which will give a gradually specifying forecast of the arrival of a particular shipment to its destination. This information will be available to the customers and also to their end-customers, if required. At the time of finalizing this report, the automated forecast system was still in its early design stage.

7.8 Service launch

Ojasalo & Ojasalo (2008, 226) recommend testing all the competitive factors before launching the service to the market. When all the essential factors (prices, product features, availability and communications) are represented in the testing phase, also the various departments (sales, marketing, operations, personnel, etc.) get fully informed and committed. It will also become easier to fine-tune the service in a comprehensive manner.

The larger-scale marketing and selling of the end-product, i.e. the SCIE service has not started yet. There have been SCIE presentations at various occasions and initial discussions with people, who represent potential customers.

The initial idea has been to rely on word-of-mouth and hard footwork in spreading the word about a new service. Possibly there will be a limited campaign focusing on the service benefits and perhaps some more test and pilot customers, but ultimately the service launch execution will depend on the company strategy in the short term as well as in the long term.

According to Ojasalo &Ojasalo (2008, 228) the features and characteristics of a service define how easy or hard it is to launch the service and how quickly customers embrace the innovation and actually start buying it. The diffusion (expansion of the innovation) depends on the following factors:

- relative benefits (price/performance ratio)
    - incl. price, achieved savings, image/social status influence, etc.

- compatibility of values and experiences
    - is the new service compatible with existing social and cultural values as well as actual customer needs?

- concreteness of service description and benefits
    - services with physical elements and concrete benefits can be easily demonstrated, but more abstract services with indirect and subjective benefits require more attention from the customers

- testing possibilities
    - how easily the service and its benefits can be tested/piloted?

- the overall degree of difficulty or easiness of understanding, buying and actually using the service

Target customers

The SCIE service can have a wide variety of customers with versatile needs and requirements. The service is designed to be able to serve customers of any nature or origin. Typical customers could include e.g.:

- exporters and importers
    - shipment responsibilities depending on the delivery terms and the shipment condition requirements
    - safe and on-time arrival of the goods is in everybody's interest
    - certain shipments are obviously more vulnerable than others and require different service scopes
- logistical operators (truck companies, forwarding agents, other service providers)
- any company or organisation requiring security or integrity for its mobile elements (goods, vehicles, trailers, key personnel)
- private people requiring security for their mobile arrangements

Ultimately, it does not matter geographically, where the future customers of the service are located and where the shipments start from or end up. The monitoring service can monitor vehicles or shipments anywhere in Europe or the world and not come even close to Finland. However, it makes sense to start acquiring new customers near the home base and expand little by little from there.

The service is ready

The SCIE service is already in use at Turvatiimi. At the time of writing this report, the first stages of the service launch had been initiated, and the first customers were being served. When facing the complex challenges of the logistical world, Turvatiimi remains humble and realizes that providing a service such as SCIE requires continuous and active learning by all involved. The company is committed to serving the logistics sector and further developing the service together with relevant experts.

7.9 Delimitations of the service

Any service is vulnerable in relation to certain critical components. With SCIE the risks include dependency on essential partners. Closest individual partners are relatively easy to monitor, but following and auditing the network's furthest elements can be challenging. It will be difficult to foresee bankruptcies or other larger problems of major suppliers or partners in other countries.

Globally, there are many areas, where there is no GSM network or equivalent available. Many of these regions are located in developing countries, where also the security and safety situations are at developing stages. In many such areas the service communication can become a bottleneck, just when the service is needed the most.

If satellite and network communications are jammed, garbled or in any other way prevented from operating normally, it will have direct and immediate consequences on the service fluency. In worst-case scenarios the service could become completely blind and lose most possibilities to communicate with the outside world.

7.10 Reliability of the service

According to Ahokas (2005, 2) a service is reliable, when it is available at the right moment and is appropriate so that the situation can be normalized. Even in chained service environments, such as supply chains, the reliability of a service can be measured and tested. Ahokas also points out that the preventive impact of the different service chain elements cannot be objectively measured. Therefore, it is essential to look at the whole service chain and to set it against the real damage risks of the company.

The weakest link of a service chain or other operational chain can play a surprisingly significant role in the service reliability. Even if only one link functions poorly, it consequently deteriorates the overall reliability in a perceptible manner, as shown in Ahokas' example, which first shows an evenly performing chain with 90 % reliability in all links. This is followed by another chain, where one of the links performs with only 50 % reliability. The difference in the overall reliability is substantial.

$$0.9 \times 0.9 \times 0.9 \times 0.9 \times 0.9 = \underline{0.59}$$
$$0.9 \times 0.9 \times 0.9 \times 0.9 \times 0.5 = \underline{0.33}$$

Chart 15. Chain reliability (Ahokas 2005, 5)

Regardless of their complicated nature, supply chain services and their reliability can be objectively measured by using suitable quantitative evaluation methods. Tillander (2004, 78-111) has researched operational reliability of fire departments, and the principles can be easily applied to the world of supply chains. In any monitoring service it is nowadays already routine to require the service provider to measure and report queuing times, telephone answering times, response times in the monitoring center and in the field as well as operating times (duration of the whole intervention process). All of these dimensions can be effortlessly reported to SCIE customers, and the only slightly challenging part is the mobility of the monitored objects. The travel times of the intervention providers can strongly fluctuate due to the large operating areas. This and e.g. seasonal changes, strange environments as well as the uniformity of the data gathering make the statistics more difficult to interpret.

The focus of the previously mentioned measurements is in the service performance, but the aspects that really interest the SCIE customers are the service impact and the actual results that can be linked to the service. Many quality related KPI's reveal interesting developments, but if they do not show the real influence of using the service, they cannot convince the decision makers about the sense of investing in it. The SCIE service will gather statistics on unwanted incidents and developments that take place along the supply chains. The decrease in their numbers and the savings achieved show the real reliability and usefulness of the SCIE service, regardless of which SCIE element of the service is used.

8. Value of the study

According to Kasanen et al (1993, 253) the actual usefulness of a managerial construction is never proved before a practical test is passed. The practical value, relevance, simplicity and easiness of operation will become evident only after the service has been in use with an adequate number of customers for an adequate time. However, it is obvious that there are numerous benefits that can be achieved with the use of a successful SCIE service.

8.1 Value to the customers

Customers responsible for shipping goods within Europe (and eventually on the global scale) have a new service at their disposal. The service helps them minimize disruptions to the integrity of the shipments and their carriers. In problematic situations quick field response measures can be initiated to assist the operators in their needs, regardless of their nature.

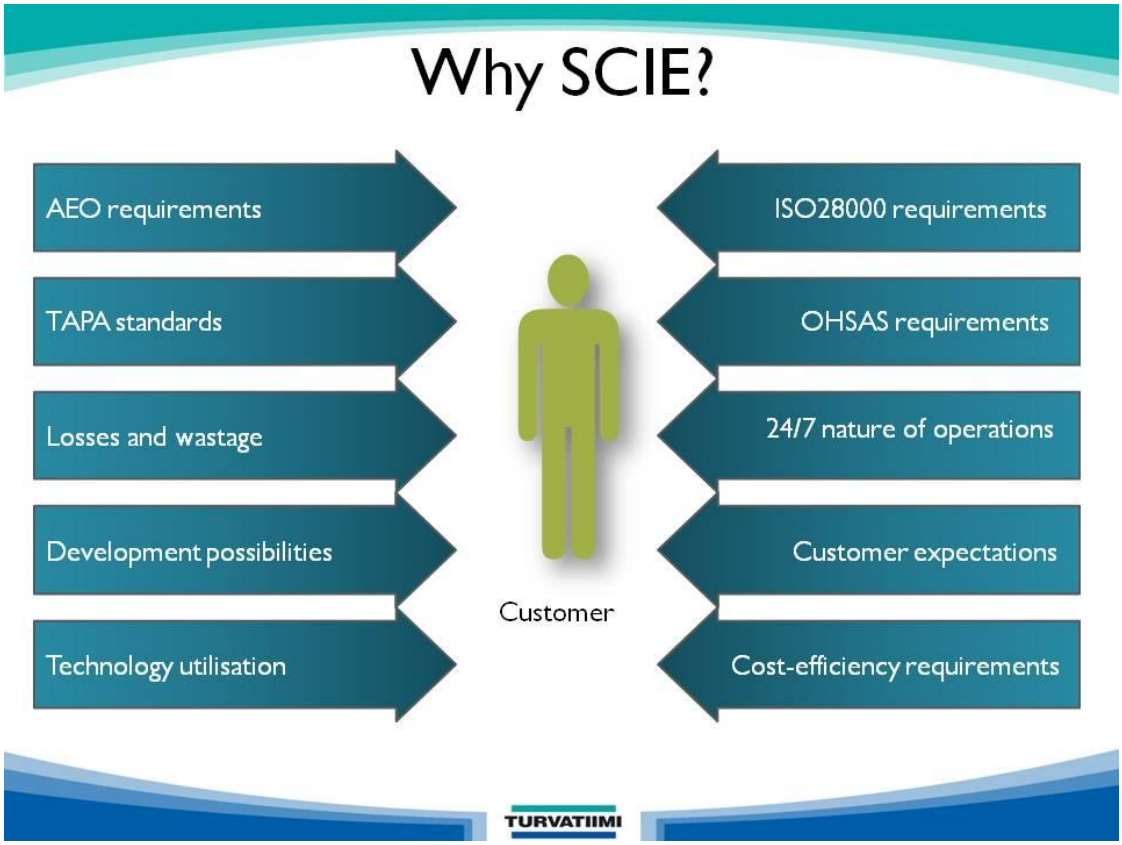


Chart 16. Development pressures faced by supply chain parties

With the close partnership approach the people involved in the service continuously support each other and learn from each other. The latest innovations in the logistics and security sectors are combined to produce a barrier breaking HelpDesk and information centre. Furthermore, the partnership approach enables the parties concerned to develop the efficiency of the supply chains and make them more fluent and cost-effective.

When discussing improved supply chain collaboration, Fawcett et al (2007, 52) point out that well-conceived and well-executed collaborative supply chain relationships create unique value that drives top-line growth and at the same time drive costs out of the chain. With close cooperation and professional 24/7 service it is possible to break the vicious cycles of supply chain problems and turn them into virtuous cycles with various development steps boosting each other.

The benefits and values a service can provide vary from one customer to another. According to Ojasalo & Ojasalo (2008, 215-216) the value can be divided into primary and secondary needs. In SCIE service fulfilling primary needs means securing transportations, while secondary needs could include e.g. HelpDesk and training services, which supplement the service package. Because the amount and quality of the available support service often define the success of services on the market, Ojasalo & Ojasalo recommend getting to know the customers' situation deeply enough in order to understand also their implied requirements and expectations.

8.2 Value to Turvatiimi

In the SCIE project the aim of Turvatiimi is to create for itself a completely new service concept, which expands the existing scope of operations and explores new business possibilities. The new service can be easily replicated to various customers of different sectors. Also, the various technologies used in SCIE can be easily applied to support and enhance other Turvatiimi services.

For a purely Finnish company such as Turvatiimi, a new international service will create a larger network of geographical partners, making it possible to more efficiently serve large customers in their needs. The service will influence the image and brand of the company as a versatile player in the market and a service provider with the latest technologies and service innovations in use.

Every company is constantly looking for ways to achieve sustainable advantages. However, finding competitive edges that competitors cannot follow easily or quickly can be difficult and in many fields practically impossible. Like any company, Turvatiimi promotes innovation

in all its operations and tries to remain open-minded and flexible enough to be able to recognize and apply new possibilities as they are found. This also requires involving innovative people in the key processes and allowing innovations happen. The SCIE service will create sustainable advantages to Turvatiimi, keeping it in the vanguard of innovative service development. Concerning the protection of mobile assets, Turvatiimi's competitors in Finland do not seem to be going to the same direction.

8.3 Value to the security sector

It is in the interest of the security sector to find new applications and service models for security work. The sector is developing rapidly thanks to continuing advances in technology. With services such as the SCIE service, also the reasonably conservative service sector is renewing itself and finds new ways to cooperate with each other as well as with new kinds of partners.

The security companies need to find new and more efficient forms also for the security services and to expand their operations to applicable directions, e.g. the logistics sector. With new value adding services the security sector can find new focus areas compared to the old price-oriented markets.

The development work brings forth new ways of doing things, and they can be again applied in new environments and for new purposes. The expansion of various mobile solutions is a good example of this trend.

8.4 Value to the logistics sector

The current security services provided to the logistics sector are restricted to basic track and trace services and various general guarding and monitoring services that have not been designed to serve the logistical world. The SCIE service brings along the logistical operators to participate in defining the service demands and projecting future changes and risks in order to achieve the best working solutions for each supply chain.

With the development of new services in the logistics sector all concerned are getting more information about customer needs and expectations, market situation as well as challenges and solution options available at the logistics sector.
Readiness to respond in emergencies and problematic situations will improve by pre-planned comprehensive operational models, which also help avoid getting into risky situations and deter criminal activities or other unwanted incidents.

The quickly developing technology continuously brings new possibilities, with which shipment integrity can be improved and data interpretation can be automated and further systemized. By utilizing different sources of information it is possible to get better general view of the supply chain and to be able to develop them in a holistic manner.

One of the driving forces of the SCIE service is to achieve new transparent collaborations that benefit all concerned. With win-win arrangements all partners get value from the new models of cooperation. General knowledge about matters influencing supply chain integrity will increase and hopefully personnel in all companies along the supply chains will become more interested in and eventually committed to maintaining high integrity in their areas of responsibility.

There are many benefits to be gained from using the SCIE service, but the most obvious one is also the most important on: improvement in cost-efficiency and eventual cost savings. By optimizing the costs around the coordinated security management it is possible to gain savings in form of streamlined solutions, technical innovations as well as volume discounts. If SCIE service cost more than its benefits, it would not be worth buying.

8.5 Value to the insurance companies

The insurance companies will appreciate new systematic models for protecting supply chains from unwanted incidents as well as new tools to minimize damage. Insurance companies can directly benefit from the service, if by using the SCIE service their customers can decrease their wastage volumes. Insurance companies can achieve savings, some of which can be channelled to their customers e.g. in form of premium discounts, which consequently will boost their businesses in increased insurance sales.

In the future, when there are new solutions and services available for risk management, the insurance companies will need to adjust their customer instructions. If SCIE became a really thriving and effective service as planned, it could one day even become a precondition for getting business from exporters and importers or getting insurance for international shipments.

9. Conclusions

A new service

The purpose of the thesis and the SCIE project was to develop a holistic service concept for enhancing supply chain integrity. Now, the project is over and the company is ready to serve its customers with a new service and also already further developing the service to be able to face more and more demanding situations. The finished product, i.e. SCIE, is a portfolio of various services for customers in the logistics sector or any other sector, where mobile objects need to be monitored and safeguarded.

SCIE's core function is the track and trace service added with environment and condition monitoring. The service utilizes the latest technologies to locate and serve vehicles, trailers, drivers, individual shipments or individual people. The track and trace services have traditionally been security oriented, and with SCIE the service focus is more in maintaining the overall quality of the shipments (security, safety, shipment condition or any other critical aspects of the transport). Basically, as the SCIE service provider, Turvatiimi is interested in anything that might cause problems along the supply chain. The service management and the customer together chart the elements that are incorporated in the actual service. When an alarm or an incident takes place, the SCIE duty officers initiate appropriate agreed responses or interventions and normalize the situation to enable the shipment or other monitored object to continue its journey.

The service package also includes services that support the security and integrity of the supply chain. The services include security training and security arrangements of static sites along the supply chain (operational, technical and constructional solutions). Turvatiimi can provide many of the services itself, and for the rest it has gathered a network of geographical and operational expert partners to enable the company to provide a comprehensive service to its customers.

The "I" in SCIE refers to the integrity monitoring of selected objects along the supply chains. The "E", on the other hand, points to efficiency development, which can take place through professional consultancy or collaborative development projects. Anyway, the objective is not to be contented with the minimized risks, but also to actively look for possibilities to improve lead time efficiency and to utilize the opportunities of the ever developing technologies to streamline the operations to be as fluent and cost-effective as possible.

Supply chain threats and problem areas

During the project, a survey was conducted to find out more about the need for a service such as SCIE and how similarly or differently logistics and security people view the threats and problem areas along the supply chains. The differences in thinking were not dramatic, but the results show that there is a real need for track and trace and shipment condition monitoring services as well as new ways of maintaining the overall quality of shipments along the whole supply chain.

The responders were asked which elements of the supply chains would be suitable to be included in an outsourced integrity service. In addition to the obvious security services, *cargo condition* ranked number three and *cargo movement during transport* ranked number 6. The survey results also show that the clear majority of both the logistics and security people consider shipment condition monitoring of shipment condition and protection of supply chains from also other than security threats as either necessary of compulsory. The logistics market seems to be increasingly aware of new possibilities in the comprehensive protection of supply chains.

The scattered opinions about the threats related to logistical security indicate the complexity and variety in the logistics sector, which consequently creates new challenges to the service providers.

Collaboration and new levels of transparency

The globalised world requires new thinking with new ways of collaborating within organisations as well as between organisations. This is exactly what SCIE service is meant to promote and enhance. The service fields are inevitably changing towards network-based services, and in order to succeed in any role there, companies need to collaborate closely with numerous parties, sometimes even with the competitors.

In general, the customers in most fields are getting more and more demanding. These demands require new efficiencies and new service levels, and in addition to by genuine cooperation many of those can be achieved with efficient and fluent data exchange between the service providers that together serve particular customers.

Modern customers require tailored reporting methods, where they have easy and realtime access to the exact pieces of information they require. Information is still power, and the companies managing their operational data flow and the customer reporting most efficiently will emerge as winners.

New benefits

The new service package will benefit the logistics sector by making new solutions available to the customers, who can achieve new efficiencies, new levels of security and integrity, new levels of cost-efficiency and concrete cost savings. The security sector finds natural extensions to the existing market, and the insurance companies will have fewer indemnities to pay. Turvatiimi has found a new focus area and an addition to its profile in the market.

An outsourced service is not enough

A new supply chain integrity service can assist Turvatiimi's customers in monitoring of shipments, protecting supply chains in various ways and developing the logistical fluency and security of their operations. However, SCIE service will not suffice alone. All the service benefits will be undermined, if all the essential operational personnel along the supply chains are not aware of and committed to their individual role in achieving security, integrity and fluency in their work.

10. Suggestions for further research & development

Turvatiimi is committed to continuous product development and it is pursuing new initiatives also related to services for the logistics sector. In the summer of 2010 Turvatiimi joined a development group in another TEKES funded project called Logproof-ind. The objective of the project was to further develop the management of trouble proof logistics in multifunctional networks. The funding decision was pending at the time of writing this report.

The technical development work of the SCIE project has created and will continue to create spin-off possibilities that can be adapted and utilized in other security services. Track and trace technology enables companies like Turvatiimi to improve existing services by added transparency and efficiency. SCIE work can lead to new and maybe more specialized mobile services that serve Turvatiimi customers in new ways.

The SCIE service will be a continuously developing service with obvious further R&D possibilities. Future customer requirements and technical advances will undoubtedly steer the service into new territories and towards new challenges.

APPENDIX 1 - SCIE project team

Turvatiimi Oyj
Timo Lahtinen, Key Account Sales Manager (SCIE project Manager)
Jori Grym, Service Manager

4TS Finland Oy
Antti Kaihovaara, CEO
Juha Ståhl, Product Marketing Manager

Outokumpu Oyj
Martti Herman Pisto, Vice President, Risk Management
Maarit Hilakivi, Safety and Security Manager

Pohjola Vakuutus Oy
Ari Martikainen, Risk Manager
Esa Nevalainen, Chief Underwriter

Schenker Oy
Harri Järviseutu, Department Manager

Tuotekehitys Oy Tamlink
Jari Erkkilä, Development Director

Also support from various other persons at the project companies

External partners

VTT Technical Research Centre of Finland
Johan Scholliers, Senior Research Scientist
Sirra Toivonen, Research Scientist

Antti Permala, Chief Research Scientist
Pekka Maijala, Customer Manager – Services and logistics

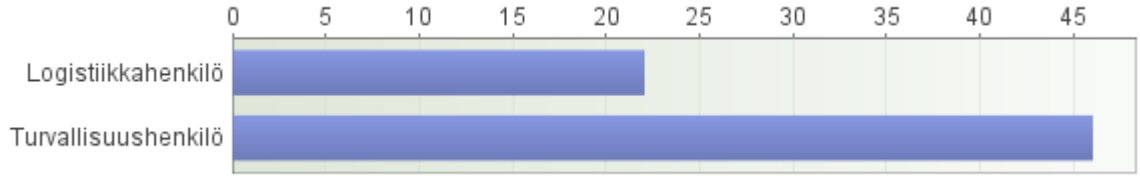
LogiSec Oy
Petri Kelo, Managing Director

APPENDIX 2.1 – QUESTIONNAIRE (THE FINNISH VERSION)

SCIE - logistiikan turvallisuuspalvelu

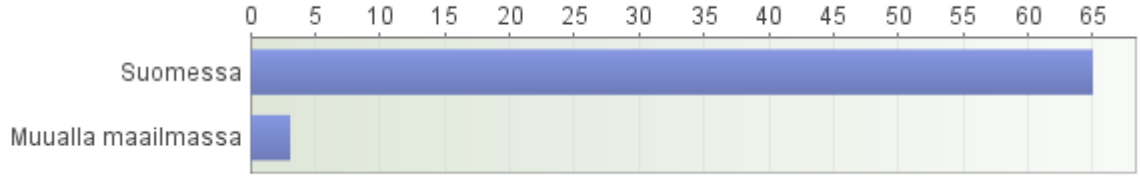
1. Oletteko enemmän logistiikka- vai turvallisuushenkilö?

Vastaajien määrä: 68



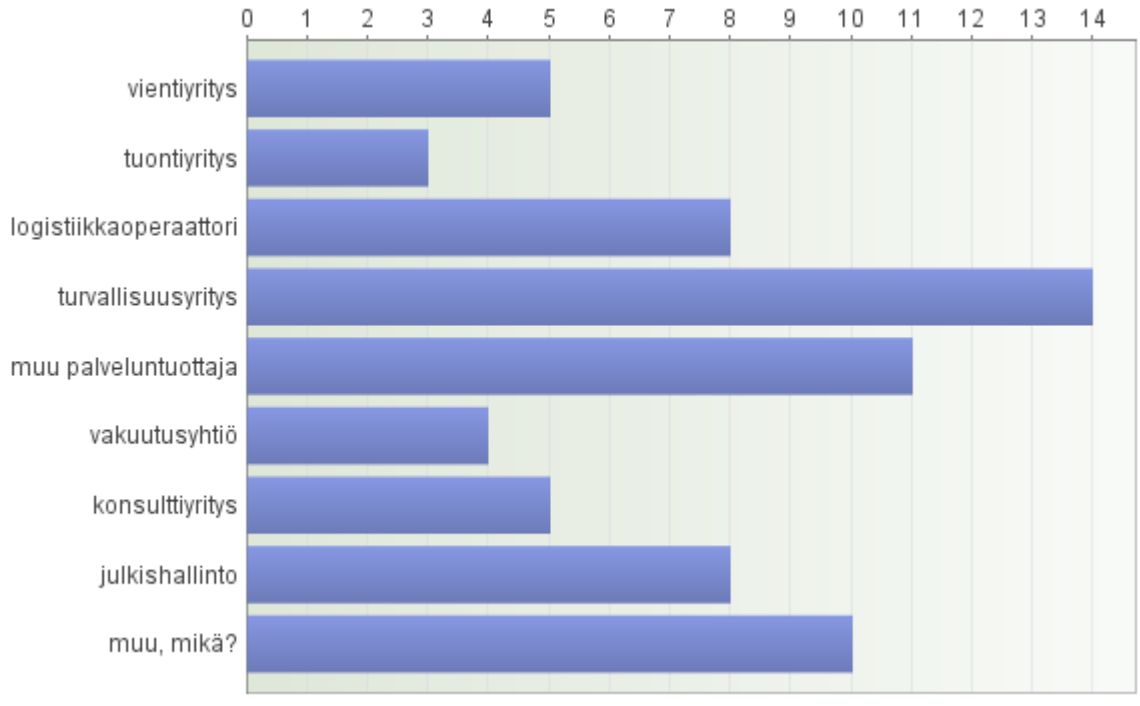
2. Missä työskentelette?

Vastaajien määrä: 68



3. Minkä tyyppisessä liiketoiminnassa työskentelette?

Vastaajien määrä: 68

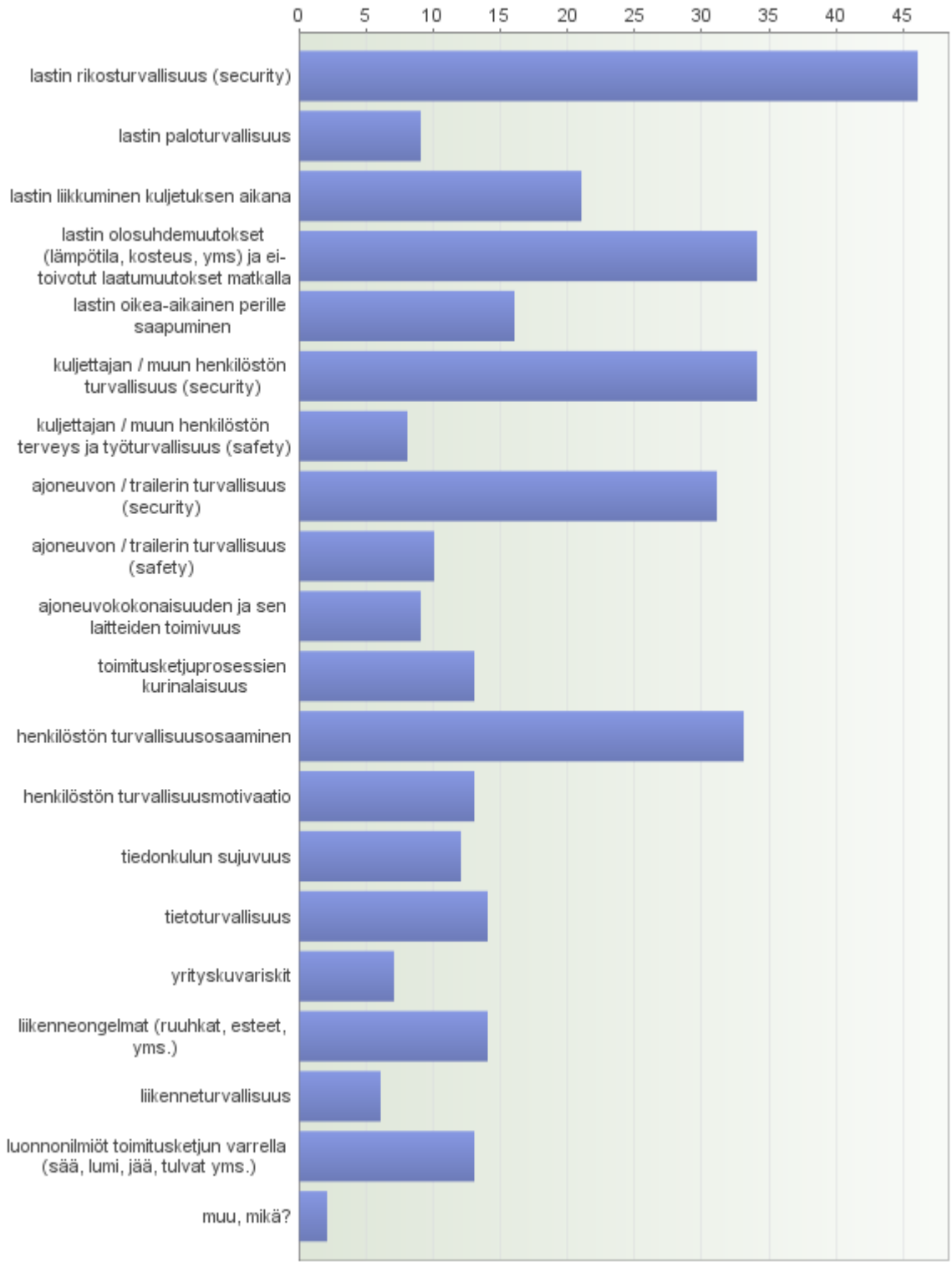


Avoimet vastaukset: muu, mikä?

- tutkimus
- pelastusala
- kaupanala
- etujärjestö
- teollisuus
- varustamo
- koulutus
- oppilaitos
- tutkimuslaitos

4. Mitkä seuraavista ovat mielestänne sellaisia toimitusketjun kokonaisintegriteetin osa-alueita, joiden valvonta voisi sisältyä ulkoistettuun turvallisuuspalveluun? Valitkaa mielestäsi viisi (5) tärkeintä osa-aluetta.

Vastaajien määrä: 68

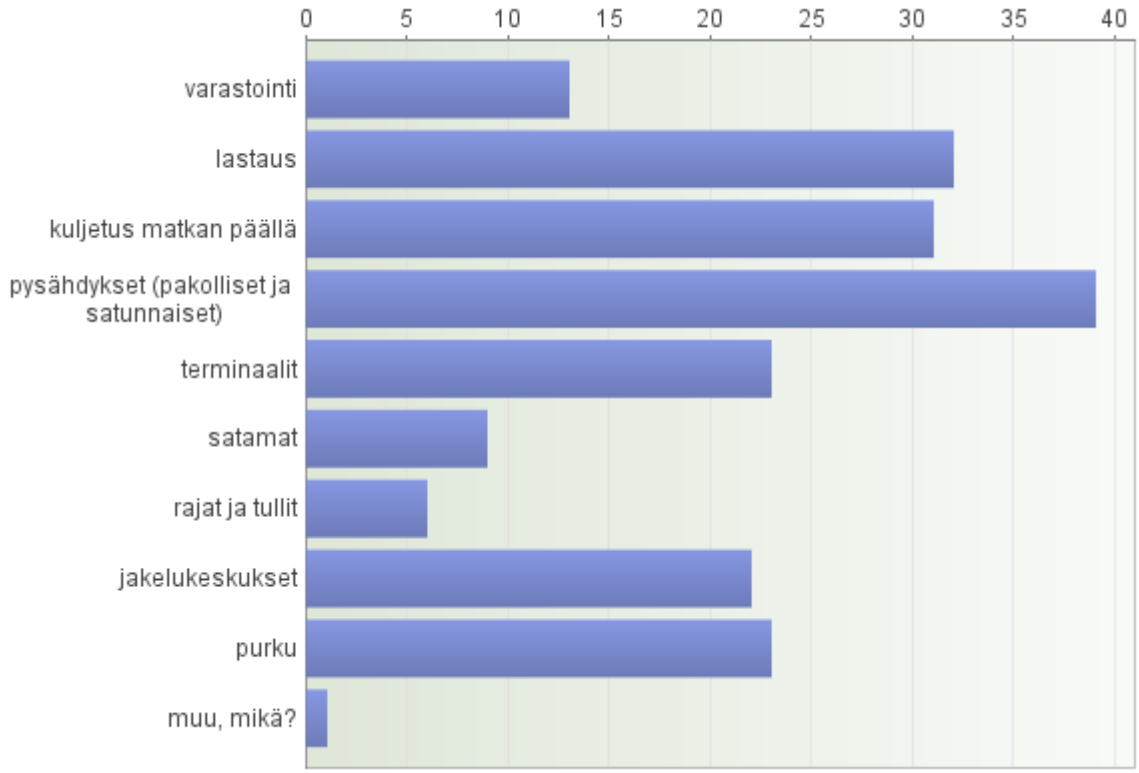


Avoimet vastaukset: muu, mikä?

- toimitusketjun valvonta ja seuranta
- kuljetusyritysten turvallisuusauditointi

5. Mitkä ovat mielestänne toimitusketjujen kolme (3) haavoittuvinta vaihetta?

Vastaajien määrä: 67

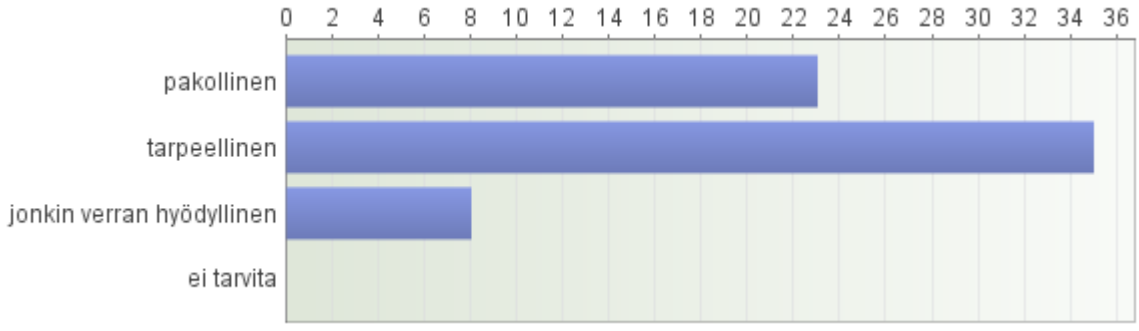


Avoimet vastaukset: muu, mikä?

- henkilön liikkuminen Suomen ulkopuolella.

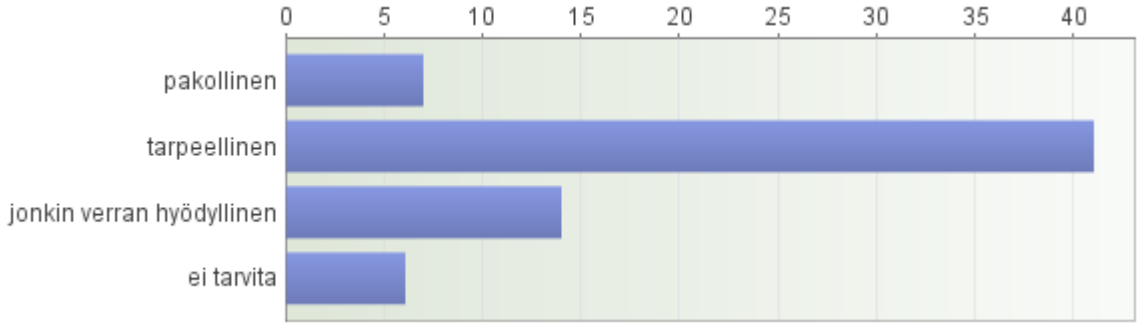
6. Kuinka tarpeellinen paikkatieto on toimitusketjujen valvonnassa?

Vastaajien määrä: 66



7. Kuinka tarpeellinen erilainen olosuhdetieto on toimitusketjujen valvonnassa (esim. lämpötila, kosteus, g-voimat, shokki)?

Vastaajien määrä: 68



8. Mitkä näette suurimmiksi haasteiksi toimitusketjujen kehittämiseen liittyen?

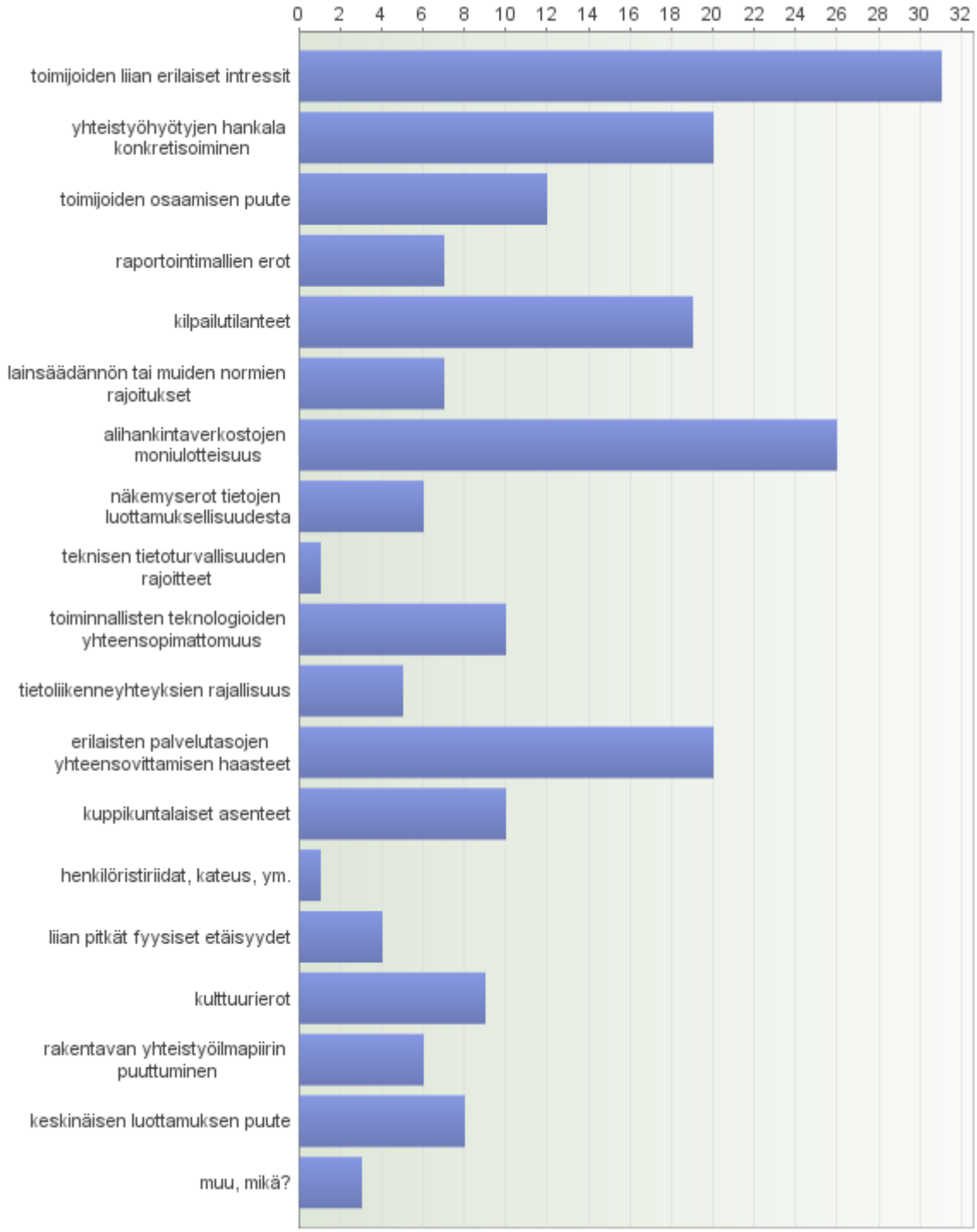
Vastaajien määrä: 39

- Erilaisten toimintatapojen yhteen liittäminen. Yksi tuote voi matkata monenlaisten kuljetusorganisaatioiden ja toimintaympäristöjen läpi.
- Asenteet toimitusketjun laadun suhteen. Liian heikko laatu on ”normaalia”
- Kasvavien kustannusten siirtäminen kuljetushintoihin
- Turvallisuusaspektin ulottamisen kattamaan koko ketjua ja kaikkia sen toimijoita.
  Tekniikan ja uusien toimintatapojen käyttöönotto
- Edelleenkin elektroniikan hankintaan ja varsinkin ylläpitoon liittyvät kustannukset.
- Kuljetusketjuun osallistuvien henkilöiden security minded motivointi
- Logistiikka-alan oma varautuminen ja turvallisuusajattelun kehittyminen.
- Toimitusketjun pituus ja osapuolten suuri määrä.
- Henkilöstön koulutus
- Toimitusketjussa osallisina olevien eri osapuolten yhteistyö, intressit ja tietojärjestelmien integroitavuus sekä halu investoida siihen
- Useat toimijat ketjun eri vaiheissa ja henkilöstön vaihtuvuus eri toimijoilla.
- Eri toimijoiden muodostaman ketjun yhdenmukaiset toimintamallit ja kurinalaisuus sekä toimintamallit erityistilanteissa.
- Palvelun vieminen "bulkki"-tuotteeksi jolloin hinta ja helppous mahdollistaa laajemman myynnin.
- Kvartaalitalouden tuomat kustannus/kilpailutuspaineet vs pitkän tähtäimen avoin yhdessä kehittäminen
- Rahdin seuranta lähetyspäästä toimituspäähän.
- Päättäjien ymmärtämättömyys kuljetushaasteiden ja riskien suuruudesta.
- Yhtenäiset prosessit ja henkilöstön osaaminen.
- Yleinen ymmärtämättömyys riskin suuruuden suhteen sekä ylemmän johdon (johtoryhmän) olematon panostus asiaan.
- Pakkaaminen ja merkintä asiakkaiden toimesta.
  Tuotepakkausten käyttö suoraan kuljetuspakkauksina.
  Merkintöjen pysyminen koko kuljetusketjun aikana.
  DGR / ADR / VAK / IMO / IATA turvallisuus.
  Eriävät määräykset eri kuljetustapojen osalta (kombinaatio).
  Tietovuodot erityiskuljetuksissa (luottamuksellisuus).

- Mahdotonta tarkistaa kaikkien taustoja jne. koko kuljetusputken osalta (kansainväliset kuljetukset).
  Eri toimijoiden vastuu kuljetusketjun aikana.
  Varmaankin saada selville kuka loppukädessä vastaa siitä, että tuote pääsee määränpäähänsä aikataulun mukaisesti vahingoittumattomana.
- Toimijoiden tiukat katemarginaalit ja haluttomuus investoida
- Henkilöstön asenteet
- Lainsäädännön mukautuminen nykyaikaisen kuljetusketjun kehityksen mukana.
- Turvallisuuteen ei olla valmiita investoimaan, vaan otetaan tarpeettomia riskejä.
- Tavaran toimituksen seuraaminen että kaikki sujuu miten pitää, esim. lämpötilat, sijainti
- Monta eri organisaatiota kytkettynä toisiinsa - informaation kulku
- Jatkuvasti tiukentuvat aikatauluvaatimukset asettavat haasteita kustannustehokkaan toimitusketjun rakentamiselle.
- Työmarkkinaselkkaukset ja työtaistelut
- Eri operaattoreiden yhteistyö
- Alihankinnan pirstoutumisen
- Eri järjestelmien integroiminen (toiminnanohjaus ja turvallisuus)
- Kuljetusturvallisuus vaarallisten aineiden kuljettamisessa. Erityisesti alihankkijaketjuissa.
- AEO-turvamääräykset
- pirstaleisuus, useita ratkaisumalleja
  Yhtenäisten kaikkia koskevien säännösten puuttuminen
- Tietojärjestelmien puute, integroinnin puute
- Tekniikan haasteet.
- Kustannuksiltaan riittävän edullisen ratkaisun löytäminen.
  Kömpelö teknologia ja akkujen kesto
- Globaalin verkostoituneen toiminnan.
  Turvallisuuskäytäntöjen toimivuuden Suomen ulkopuolella.
  Varautumisen toimitusketjun loppupään ongelmiin.

9. Mitkä ovat mielestänne eri toimijoiden välisen yhteistyön ja sen läpinäkyvyyden suurimmat esteet toimitusketjuissa. Valitkaa mielestänne kolme (3) tärkeintä tekijää.

Vastaajien määrä: 67



Avoimet vastaukset: muu, mikä?

- sopimusehdot
- koko toimintaketjun yhtenäisen koulutuksen puute ja valvonta
- ei nähdä läpinäkyvyyden hyötyjä

10. Kommentteja?

Vastaajien määrä: 4

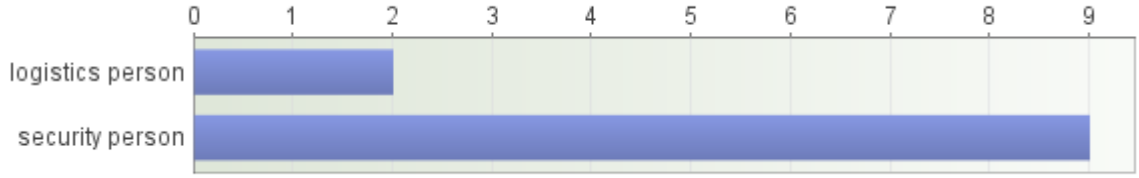
- Viimeiseen kohtaan liittyen: operatiiviset ja turvallisuusjärjestelmät nähdään ja pidetään usein erillisinä asioina ja holistinen näkemys puuttuu siten, että ne osattaisiin soveltaa toisiaan hyödyntävinä ja tukevina ratkaisuina.
- Itse kuljettaminen on suurin yksittäinen riski johon yritysten tulisi panostaa paljon enemmän.
- Olin kohderyhmänä väärä, en ole logistiikkapalveluissa.
- Paikantamisteknologia ei ole vielä sillä tasolla, että palvelu olisi sujuvaa ja tehokasta

APPENDIX 2.2 – QUESTIONNAIRE (THE ENGLISH VERSION)

SCIE project questionnaire

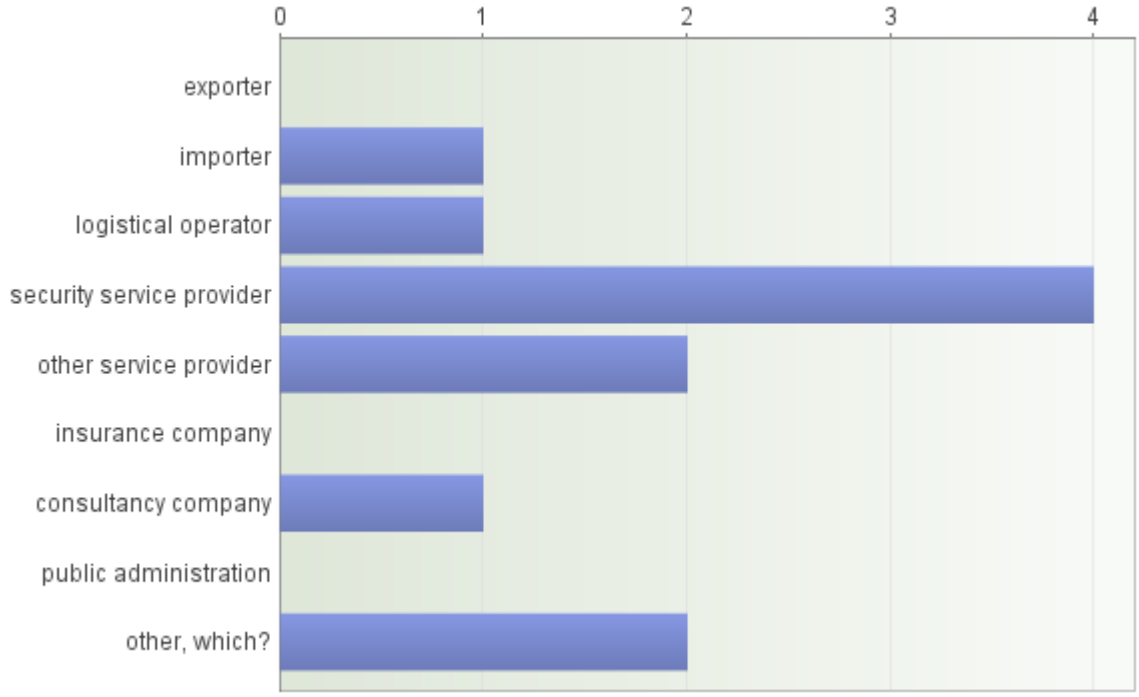
1. Do you consider yourself to be more a security person or a logistics person?

Number of responders: 11



2. In which type of business do you work?

Number of responders: 11

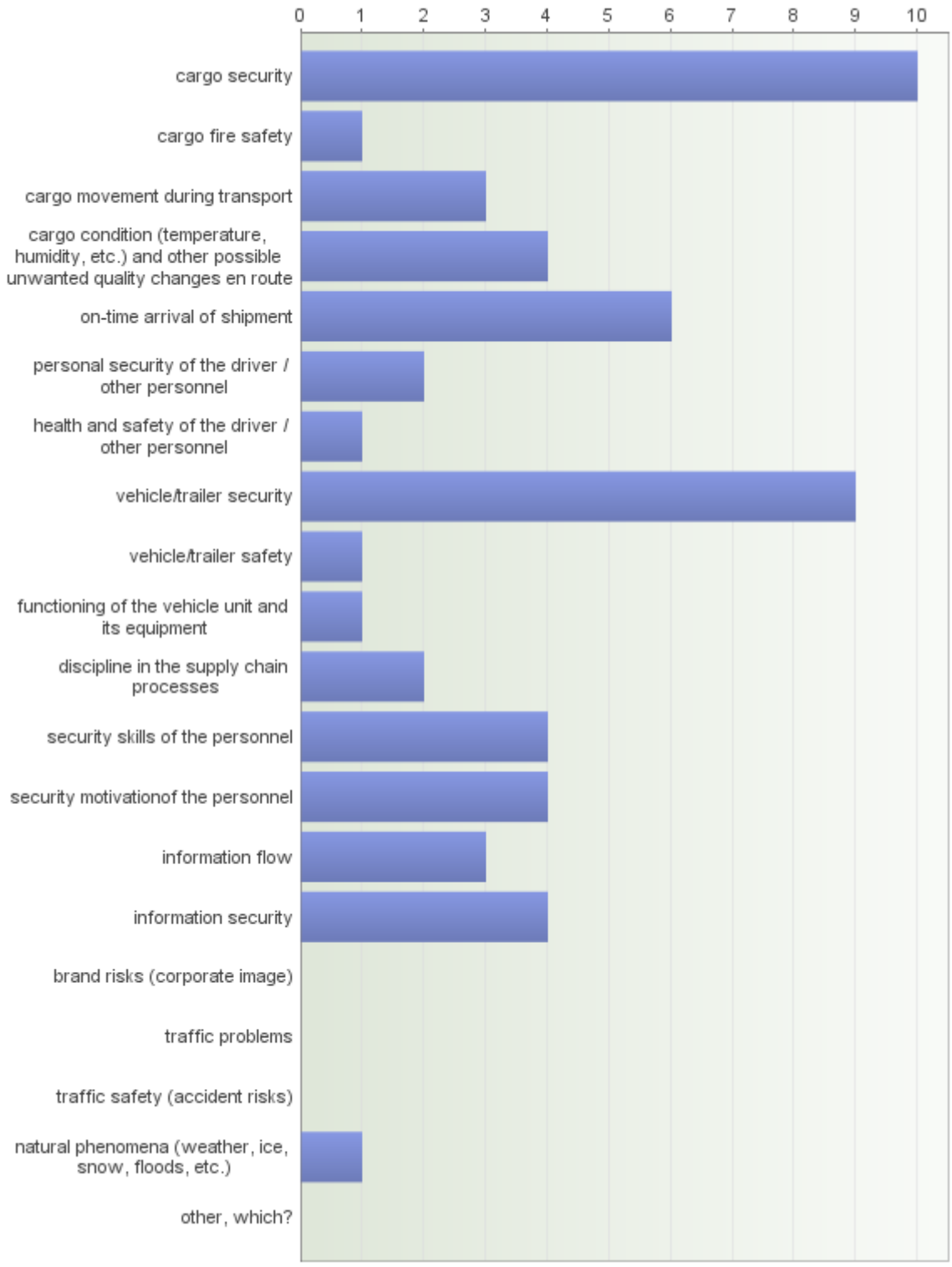


Open questions: other, which?

- Express delivery
- Integrator

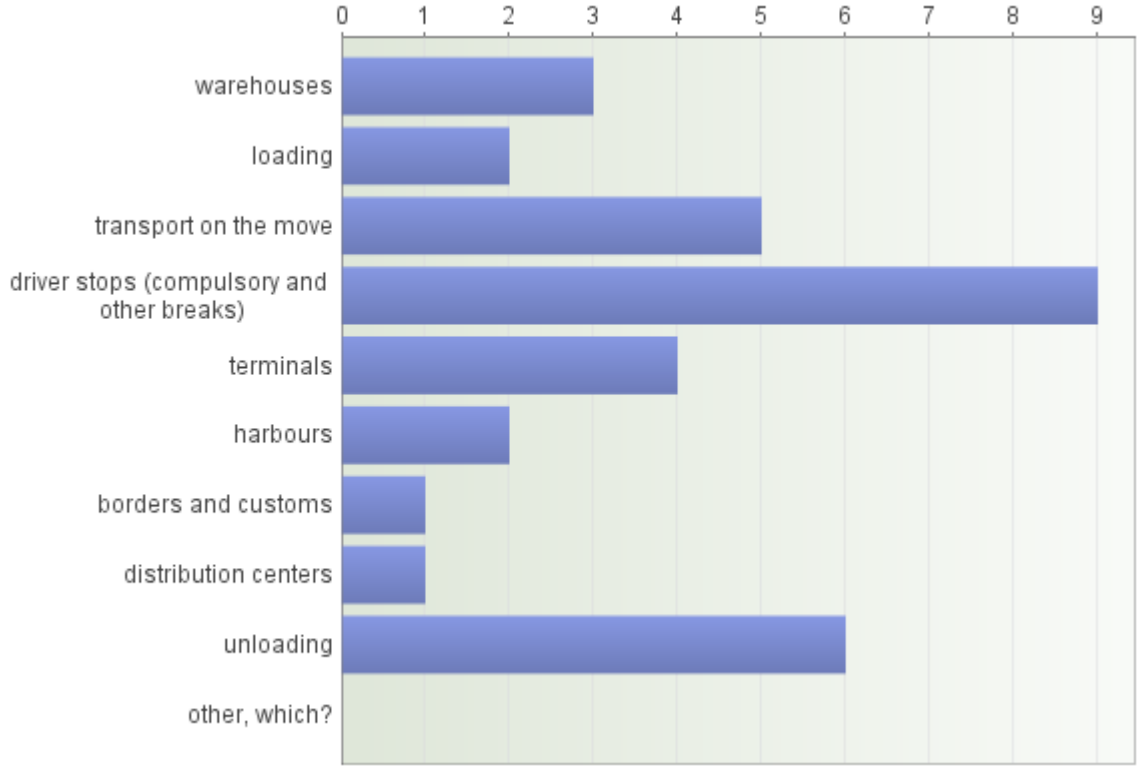
3. Which of these do you consider as suitable elements to be included in an outsourced security service providing overall supply chain integrity? Please choose five (5) most important elements from the list.

Number of responders: 11



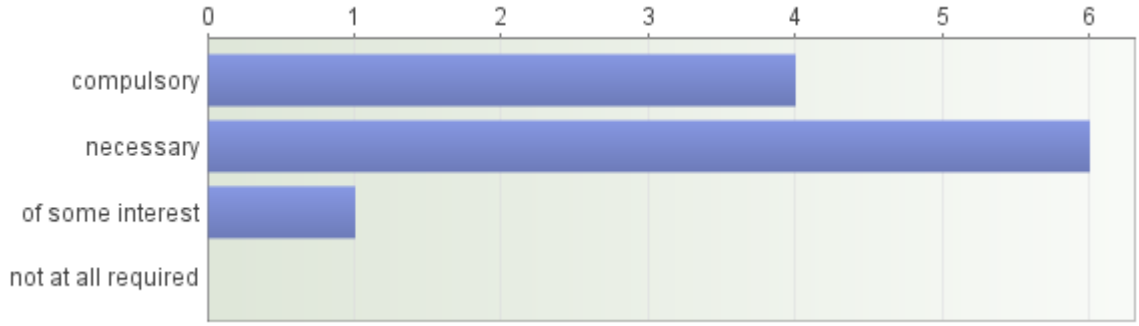
4. Which do you consider to be the most vulnerable stages of a typical supply chain? Please choose the three (3) most challenging stages from the list.

Number of responders: 11



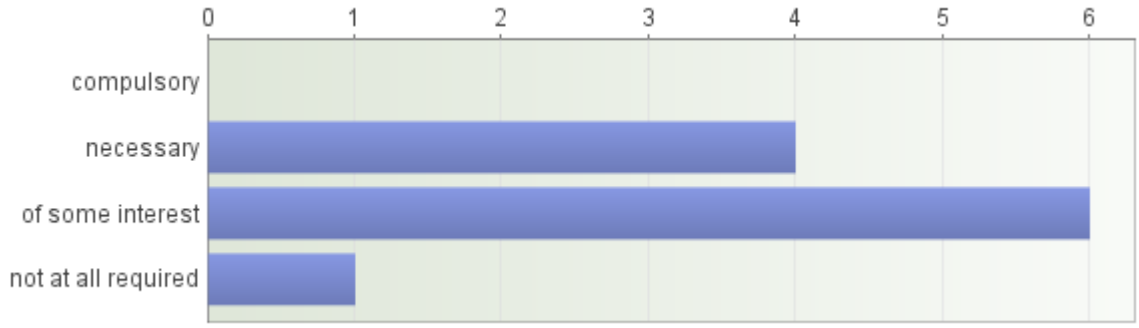
5. How necessary do you consider the exact position information in the monitoring of supply chains?

Number of responders: 11



6. How necessary do you consider the realtime condition information in the monitoring of supply chains (e.g. temperature, humidity, G forces, shock)?

Number of responders: 11



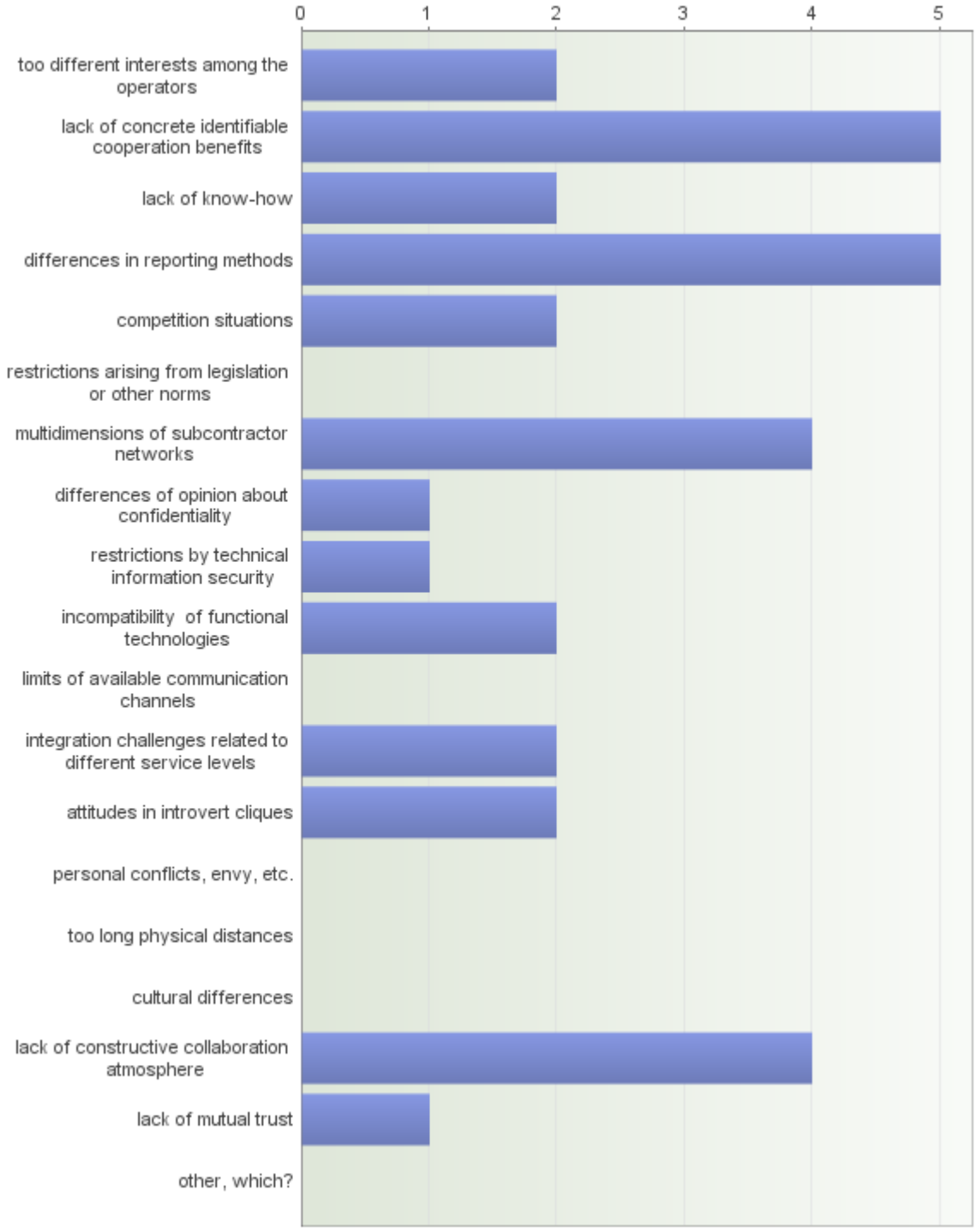
7. What do you consider to be the biggest challenge in developing supply chains?

Number of responders: 5

- Developing ROIs that management can support.
- Coordinated team work
- Trucker compliance
- Monitoring / supervising the process map of logistics processes and procedures in combination with security processes and procedures.
  Different Setups for different clients.
  Combining different service levels in one monitoring centre at the same time.
  Different follow-up-scenarios on various levels.
- Sharing of information in a secure need-to-know way (departure and arrival times and places, vehicle and driver details, route and stops, load manifest, delivery confirmation)

8. What do you consider to be the biggest obstacles in the cooperation and transparency between supply chain operators? Please choose the three (3) most important factors.

Number of responders: 11



9. Possible general comments

No replies.

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TABLES

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