

Risk Response Measures for the Management of Theft Risk in Road Freight Transport Chains

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1 Introduction

The risk of cargo and vehicle theft is a serious problem in European road transportation affecting all European countries and all partners of the transport chain. According to several studies and reports (TAPA EMEA 2010, Ekwall 2009, Europol 2009, van den Engel and Prummel 2007, ECMT 2002), cargo theft in European road freight transport chains has increased in recent years and cargo theft has become very diligently organized. Cargo theft in road transportation negatively affects the partners in supply chains in various ways. It leads, for example, to the occurrence of disruptions and failures of goods deliveries, which result in additional costs. Besides, the demonstration and provision of risk reducing activities become a prerequisite for co-operation in supply chains and security requirements in contracts and competitive bids are more often defined (TAPA EMEA 2010).

Therefore, the implementation of a comprehensive transport security management becomes increasingly important for providers of logistical services. The development and application of risk response measures facilitate the management of the risk of cargo theft and supports the enhancement of security in transportation.

In this book section, a set of risk response measures for the management of cargo theft in road transportation is developed and categorized according to their abilities to eliminate, reduce, transfer or accept the risk of theft. As a multitude of different security measures and approaches exists for the reduction of theft incidents and its damage, the measures are further categorized according to their capability to reduce the probability of theft occurrence or the extent of a theft incident. In order to get a deeper practical insight and to ensure the practicability of measures proposed, a thorough literature review and personal expert interviews

with internationally operating logistics service providers as well as insurance companies in Austria and Germany were conducted. This approach allows the alignment of risk response measures that can be found in the risk management literature with the measures applied in practice.

This book section is structured as follows. First, an overview of the current situation of theft of commercial road vehicles and their cargo in Europe is given. Second, the application of steps of the risk management process in general and the risk response measures in particular to cargo theft are explained. Third, risk response measures for managing the risk of cargo theft in transport chains are presented.

2 The Risk of Theft and Organized Crime in Road Transportation – Definitions and Statistics

Especially in an international context transportation chains are to a great extent intermodal with the main leg either by sea, inland waterway navigation, rail or road, whereas pre- and on-carriage is often carried out by road. In this study, the emphasis is placed on road transportation. Besides the actual process of transporting goods on roads, a transport chain comprises additional processes like stuffing, loading, unloading, stripping, transshipment and short-term warehousing (Kummer et al. 2010). The stakeholders involved in transport chains are numerous and range from those who actually perform or organize the transportation to interfacing and influencing actors like insurance companies.

Theft is defined in various ways, depending on the country and their legal frameworks (Aebi et al. 2010). Theft can be defined as “depriving a person/organisation of property without force with the intent to keep it” (Aebi et al. 2010). The association TAPA (Transported Asset Protection Association) defines theft in a more generalised way as “the wrongful taking of property without the owner’s wilful consent” (TAPA EMEA 2010). This study is based on a broad definition of theft as the dishonest deprivation of property with the intention of permanently keeping it (LogSec Consortium 2011). It considers all stealing crimes such as pilferage, robbery, burglary and hijacking (LogSec Consortium 2011, Aebi et al. 2010, Trieschmann et al. 2005, Greenberg 2002, Fennelly 2004).

A major database with crime related data in transportation is administered by the Transported Asset Protection Association for Europe, the Middle East and Africa (TAPA EMEA). Over the last years, the most reported type of road transport related theft attacks is theft from vehicle. Although this indicates that the target of the criminals is the transported cargo and not the vehicle itself, theft of the vehicle has increased over the years (TAPA EMEA 2011). Concerning the type of goods, consumer electronics, food and beverage commodities, tobacco products and computer related products are the theft-prone product groups (IRU 2008; TAPA EMEA 2011). Crime of theft is very carefully organised, especially when high-value goods are the target (ECMT 2002). However, as an interview partner from an international insurance company stated, theft of goods does not necessarily depend on its value. It is dependent on the saleability, usability, disposability and portability of the goods. If goods can easily be sold, they are at

high risk of being stolen. In some cases instead of the entire truck load only targeted goods are stolen. However, the risk of theft is not only concerned with the kind of goods carried, but also depends furthermore on the transport route and the level of security (ECMT 2002).

Theft incidents often occur at night or shortly after business hours. According to the TAPA EMEA database, Great Britain and the Netherlands as well as the coast lines of France and Germany are counted among the heavily affected regions in Europe. According to Ekwall (2010), the opportunity of theft depends on the criminal's ability to use the routines of the target in combination with the lack of security at a certain location. Truck stops at unsecured parking areas represent especially a high risk of cargo and vehicle theft (Europol 2009). Statistics and several interview partners agree that theft attacks in transport processes have become more violent, as threats of force of arms, drugging drivers with narcotics and other modes of criminal action have been reported (TAPA EMEA 2011; Johnson 2010).

3 Application of Risk Management to Theft and Organized Crime in Road Freight Transport Chains

In order to manage theft and organized crime in road transport, the application of the risk management approach is very useful. It is a structured approach and consists of four main steps, namely (1) identification, (2) assessment, (3) response, and (4) monitoring of risks (see Figure 1).

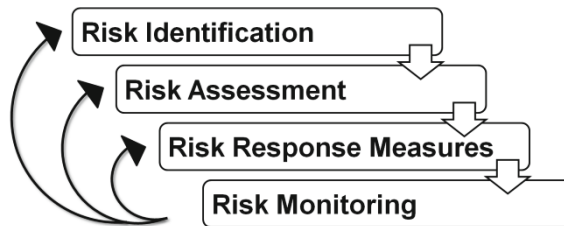


Fig. 1 Steps of risk management

In the first step all kinds of criminal activities associated with theft have to be identified along the road transport chain. In this regard it is very important to pursue a thorough analysis to gain a broad insight into the issue. Analyzing the transport chain both from a process and an institutional perspective is a good way to start. This facilitates the identification of weak points along the transport chain in terms of sub processes as well as companies and organisations involved.

In the second step the identified risks have to be assessed. As not all risk types are equally important for a company, a prioritization or ranking should be made. A common approach is to assess the risks according to their probability of occurrence and their potential severity of loss (Andersen and Terp 2006). Data can be gathered either from external sources, e.g. statistics, or internal sources, e.g. past experiences and forecasts.

In the third step, response measures for the identified and assessed risks are developed, evaluated and selected. The measures can be categorized according to their ability to avoid, reduce, transfer or bear the risk. With regard to the risk mitigation measures, some of them reduce the probability of the occurrence of theft incidents while others reduce the extent of the damage (see Figure 2).

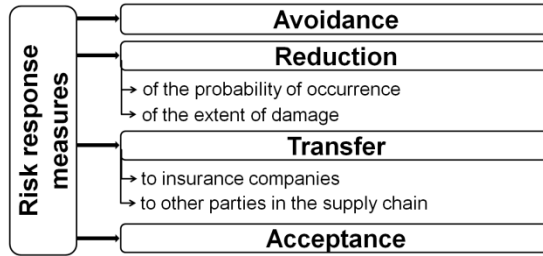


Fig. 2 Risk response measures

The avoidance, or elimination, is the decision not to create a risky situation or to completely eliminate an already existing risk exposure (Andersen and Terp 2006). Thus, by avoiding transportation in certain regions, the risk of theft in these regions can be eliminated. But avoiding, or eliminating, particular risks requires never entering or leaving a certain region and therefore waiving a business opportunity (Andersen and Terp 2006). Risk reduction plays a notably more important role amongst risk response measures (Haller 1981). Two different kinds of measures can be divided: Damage prevention and damage or loss reduction (Haller 1981). While the first group of measures reduces the occurrence of theft incidents, the second group of measures tries to keep the impact of an occurred incident as low as possible. Various locks reduce access to the cargo, whereas seals reduce the time frame for detecting theft and enhance the availability on theft related information. Tracking and tracing of cargo increase the probability of recovering the stolen goods. Risk transfer measures shift the risk of theft to another party in the transport chain who are able to handle the risk exposure better due to certain know-how, core competencies or portfolio balance (Andersen and Terp 2006). This can be done by using contractual clauses, employing subcontractors, outsourcing certain processes to external partners or contracting insurance. However, in most cases, this involves only the transfer of financial risk, whereas indirect effects like lost sales, delayed deliveries or negative publicity remain with the original risk taker (Haller 1981). The extent to which an insurance company covers the risk of theft depends on the terms and conditions. In case of high-risk goods, the risk transfer to the insurer can be quite costly. Another option for risk response is to accept the risk. This means that the risk is consciously taken. Risk acceptance occurs sometimes on an involuntary basis, as the risks which cannot be managed by other risk response measures have to be taken. The provision of sufficient resources to overcome loss or damage without significantly endangering the existence of the company is necessary (Haller 1981).

The objective of the fourth step, the risk monitoring, is to evaluate and adjust the risk response measures on a continuous basis and to provide up-to-date information on current risk exposures and risk response measures to the involved partners (Andersen and Terp 2006).

4 Risk Response Measures and Approaches for the Management of Theft and Organized Crime

When looking at theft and organized crime with regard to road transportation, a variety of risk response measures can be found. As described above, they are categorized according to their ability to eliminate, reduce, transfer or accept the risk.

4.1 Elimination/Avoidance of Theft

Eliminating or avoiding risk of theft is a difficult, if not impossible option. Complete elimination of the risk of theft would imply not carrying out any transportation at all – in business practice an unrealistic alternative. Therefore the measures which minimize the occurrence of theft incidents and/or its damage extent prevail.

4.2 Reduction of the Number of Theft Incidents and Their Damage Extent

In theory as well as in practice, a large variety of measures to reduce the number of theft incidents or – once the incident happened – to reduce the extent of damage can be found. The measures can be categorized according to the asset that should be protected:

- Securing vehicle, trailer and container
- Securing cargo
- Securing facilities
- Securing data
- Organizational security measures

Security devices and anti-theft measures for protecting the vehicle, trailer or container – and therefore also the cargo transported – are numerous and range from locking devices and alarms, tracking and tracing to convoying. The second group of security devices secures the shipment itself and not necessarily the vehicle, trailer or container. Another group of security measures protects the facilities where the cargo is stored or where the vehicles are parked. Data protection of cargo related information plays a critical role in preventing insiders from passing on the information to individuals with criminal intent. Organizational security measures comprise co-operation and partnerships with other companies as well as memberships in security initiatives.

4.2.1 Securing Vehicle, Trailer or Container

An overview of measures for the reduction of theft risk on vehicle, trailer or container level is given in Figure 3.

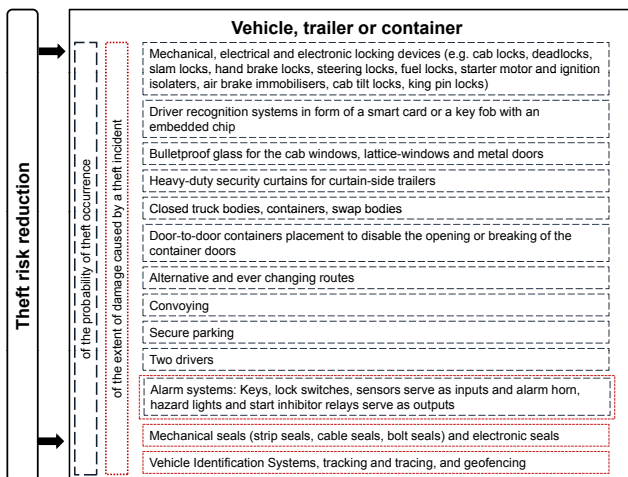


Fig. 3 Measures for the reduction of theft risk on vehicle, trailer or container level

A wide variety of mechanical, electrical and electronic locking devices for securing the vehicle, trailer or container can be applied. The purpose of locking devices is to deny entry to the truck cab, engine, transport unit or load compartment of a vehicle and to prevent a thief from driving away (Erjavec 2005).

Generally, all newly manufactured cabs are equipped with a cab lock that is locked or unlocked by the use of a key or remote control. Even though locking devices decrease the risk of theft (Sutorius 2009), the vehicle will remain exposed to the risk of theft if the driver leaves the door unlocked. To avoid this, the cab lock can be connected to an integrated alarm system by using *deadlocks* or *slam locks* (ECMT 2002). When using slam locks, the cabin door locks automatically when slamming the door. In this case the driver requires a key to unlock the vehicle again and to regain entry. Slam locks are often used for trucks of parcel carriers and other multi-drop delivery vehicles and are usually installed at the time of manufacture (ECMT 2002). Additional security for the cab can be provided by mechanical devices such as *hand brake locks* and *steering locks*. For transports which require high levels of security, access to the cab can additionally be hampered by applying bulletproof glass for the cab windows and lattice-windows or metal doors, thus increasing the safety of the driver (ECMT 2002).

Another group of security devices aims to prevent the truck from being driven away. Examples are *fuel locks*, *starter motor and ignition isolators* as well as *air brake immobilisers*. Driver Recognition Systems in form of a smart card or a key fob with an embedded chip prevent the movement of the vehicle in absence of the chip (ECMT 2002).

In order to prevent access to the engine compartment, *cab tilt locks* are used, which lock the tilt mechanism of a lorry cab. *King pin locks* prevent the coupling of the towing unit.

As far as the load compartment of a truck is concerned, curtain-side trailers are especially vulnerable to theft as the trailer curtains can be easily cut open with a sharp knife (ECMT 2002). Even though closed truck bodies decrease the risk of theft, curtain-side trailers are very common due to the ease of access to the cargo load from all sides of the trailer. To decrease the vulnerability of curtain-side trailers, heavy-duty security curtains of different degrees of attack resistance can be obtained and fitted to the alarm system of the vehicle. If small wires embedded in the curtain are cut, the alarm will be triggered (ECMT 2002). Containers have the advantage of being placed door-to-door on a truck, which hinders the opening of the container doors.

Another risk mitigation measure is the alteration of truck routings in the transportation network (Chopra and Meindl 2007). Convoying is another measure to reduce the risk of trucks getting attacked on the roads. Escorted convoys are usually used in high-risk areas but downsides like higher co-ordination efforts and traffic impacts have to be considered (Byrne 2010).

The use of secure parking areas for rests and other waiting periods is considered as one of the most practical measures to be taken to reduce the risk of theft (Vigilant 2010). As the number of secure parking locations and its capacities is still limited and the geographical distance between secure parking facilities can be very long, the planning of long-distance transportation involving rest periods and other stops only at secure parking areas is almost impossible. Secure parking areas have a higher number of security features in place than non-secured parking areas, e.g. CCTV, guards, lights and fences. Different organizations like TAPA, IRU, the German Insurance Association and the European Union support the development of secure parking areas. They assess parking areas and rank them according to the number of implemented security measures. Even though the parking fees of the secure parking areas are higher, some road hauliers prefer rests and stops at secure parking areas especially for high-risk shipments. In case no secure parking areas are available, two drivers can be deployed to make sure that the vehicle is never left unattended during stops and rest times.

Alarm systems are used to prevent or delay the attempt of vehicle and cargo theft by deterring thieves by audible siren and/or immobilising the vehicle and prevent the vehicle from being driven away (ECMT 2002). Keys, lock switches, monitoring, and movement sensors as well as alarm sensors (e.g. panic buttons) serve as inputs. Alarm horn, hazard lights and start inhibitor relays are the outputs. Alarm can be triggered in various ways, e.g. by door opening, switching on the ignition, or moving inside the vehicle (Denton 2004).

In road transportation, containers or swap-bodies are often used as transport unit. The container doors are usually designed to have both locking devices and seals. Padlocks provide the lowest level of security. Locks may also be linked to an audible sounding alarm system to alarm the driver in case of a theft attempt.

Contrary to locking devices, the main function of mechanical and electronic seals is not locking and protecting against unauthorized access. Mechanical seals

such as strip seals, cable seals or bolt seals can be easily opened with a bolt cutter. Electronic seals may provide identification, documentation of unauthorized access, integrity of the shipment and assignment of liability in case goods have been stolen (Ulrich and Kückelhaus 2010).

Vehicle Identification Systems, electronic tracking and tracing of vehicles as well as geofencing are rather after-theft measures, as the intended purpose of these measures is not the prevention of theft attacks but rather quick response to theft. Detection and recovery of the stolen vehicle and its cargo load are enabled by providing real-time notification of law enforcement authorities and the owner of the stolen vehicle and of the cargo on the location of the truck.

4.2.2 Securing Cargo

Not only the transport vehicle and its trailer or transport unit, but also the shipment itself can be protected against theft with various measures (see Figure 4).

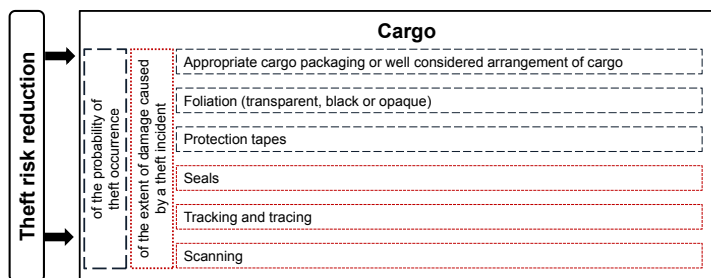


Fig. 4 Measures for the reduction of theft risk on cargo level

Security can be increased by appropriate cargo packaging or well considered arrangement of cargo loads. The story of an interviewed transport insurer serves as an example: Protective gloves of a company disappeared frequently while being in the transport chain. It was not obvious, where and how they disappeared. To solve the problem, the company started to pack the gloves not in pairs anymore, i.e. they shipped the gloves for the right hand and the left hand in separate packages. Short time afterwards, the theft incidents declined abruptly, because: What do you do of no feasible use of only right-hand or left-hand gloves.

The application of pallet foliation (transparent, black or opaque) and protection tapes supports the reduction of cargo theft. The usage of transparent foliation reveals the goods being transported, which prevents cargo insusceptible to theft from being stolen. Black or opaque foliation does not reveal any information about the content of the cargo load. In the case of theft-prone cargo, some experts recommend the usage of black or opaque foliation in combination with protection ties or tapes to secure the cargo. But this measure can encourage thieves to steal the cargo since usually only high value goods are protected in this way.

Similar to the application on vehicle or transport unit level, mechanical and electronic seals are not very useful for mitigating the risk of theft. However, they help in detecting a theft as seals can provide documentation of unauthorized access (Ulrich and Kückelhaus 2010).

Tracking and tracing systems on cargo level are also mostly applied for detection purposes. Various technologies detect misloadings and theft shortly after occurrence. The devices are attached to the goods and send in pre-defined time intervals information about the location of the goods. The system can also detect whether the goods are “off time” (e.g. when the truck is stuck in traffic jams) or if the cargo is “off track” (e.g. in case of misloading or theft).

With regard to theft, scanning of loads can be used to inspect the content of a truck load (Donner and Kruk 2009) and to check if the entire or part of the load got stolen during the journey.

4.2.3 Securing Facilities

Facilities like distribution centres are at high risk of theft (Europol 2009). Days prior to the theft incident, criminals often keep areas around the facility under surveillance. Hence it is important to secure premises to minimize risk of theft (TruckPol 2011). Figure 5 provides an overview of measures for the reduction of cargo theft, which can be applied on facility level, according to their ability to reduce the probability of theft occurrence or the extent of the damage caused by a theft incident.

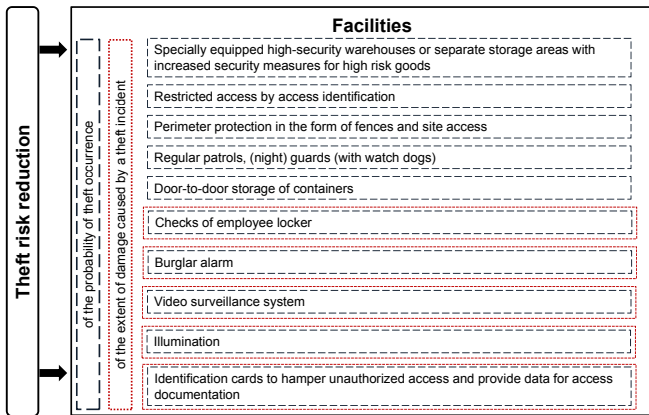


Fig. 5 Measures for the reduction of theft risk on facility level

With a layered security approach, the premises can be classified according to the necessary security level. For high-risk goods, specially equipped high-security warehouses and/or separate storage areas with increased security measures should be generally used. More than one security system should be in place to make sure that in case of the protection system failure, another system is still in operation and/or can report and/or remove the breakdown. Access to the premises where the

cargo is located should be restricted by access control mechanism (Europol 2009). Identification cards hamper unauthorized access to the facilities and provide data for access documentation. Useful measures to avoid or detect intruders are fences, site access and its control with appropriate illumination and video surveillance systems, which constitutes perimeter protection. Regular patrols, (night) guards (with watch dogs) and burglar alarm can provide further security (Europol 2009).

As far as the storing of containers is concerned, placing containers door-to-door can disable the opening or breaking of the container doors.

To prevent employees, visitors or subcontracted staff from getting involved in theft, easy-to-see video surveillance cameras placed in high security areas, in the parcel area or at loading bays can be installed. They are highly effective in deterring people from taking the opportunity to steal. Checks of employee lockers are another precautionary measure that serves as a signal. Practical experience shows that revealing that the premises and the freight are well protected and secured works as a deterrent to potential thieves and helps raise security awareness of employees.

4.2.4 Securing Data

The issue of information leakage is a critical factor concerning cargo theft (Özberk 2010; van den Engel and Prummel 2007). Nowadays, thieves already know in advance which truck they want to attack as important information about cargo and route has leaked from one or more involved parties of the transport chain (van den Engel and Prummel 2007). Therefore, it is necessary to apply theft reduction measures on data level (see Figure 6).

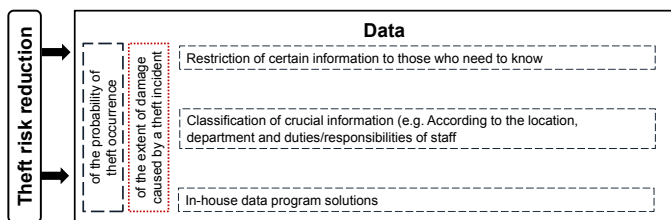


Fig. 6 Measures for the reduction of theft risk on data level

Certain information concerning freight loads should be restricted to those who need to know (TruckPol 2011). Information can be classified, e.g. according to the location, department as well as duties and responsibilities of the staff. Different application levels can be provided and information not being relevant to certain staff (e.g. terminal workers or truck drivers) can be retained (Özberk 2010; van den Engel and Prummel 2007). The interviewed internal auditor of a logistics company stated that – in comparison to open systems – in-house data program solutions also help to keep information restricted.

4.2.5 Organizational Security Measures

Organizational security measures reduce the risk of theft on an overall level. Figure 7 shows the variety of organizational measures that can be applied.

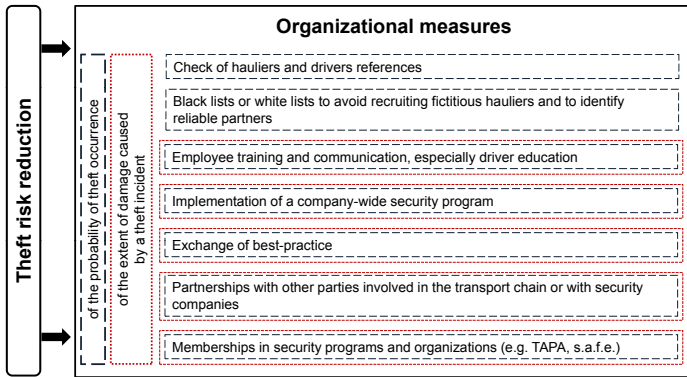


Fig. 7 Measures for the reduction of theft risk on an overall level

Partnerships with other parties involved in the transport chain or with security companies can be seen as a threat reducing measure as the joint design and planning of transport processes support the efforts to reduce cargo theft.

In addition, memberships in organizations aiming at increasing the security of road transportation such as the Transported Asset Protection Association (TAPA) provide several benefits. Conferences and meetings serve as a platform for the exchange of best practice, sharing experiences, mutual learning and information enrichment (Johnson 2010). Memberships can be used as a networking opportunity to gain a deeper knowledge on the tactics of criminals and receive information on new technologies, since basically all members are confronted with similar issues. Various organizations provide databases on theft and crime in road transportation, and offer security trainings for the employees. This availability facilitates the planning of travel routes and stops.

Some national and international organizations offer certificates that offer their members the possibility to communicate their security efforts to customers and other external partners in the transport chain, thus serving as competitive advantage. It raises not only the awareness within the entire transport chain, but also among employees such as drivers, who may be directly affected by theft incidents. Moreover, in tendering procedures, an adequate level of transport security is increasingly requested, particularly for the transport of theft-prone goods.

Some companies implement their own security programs. These programs vary according to the needs of the companies and e.g. focus on specific types of cargo that are particularly exposed to theft.

Other crucial anti-theft measures are employee training and communication. Trainings help to implement security in the daily routine of the employees (TruckPol 2011). The trainings should start immediately after an employee has

been hired and be held on a regular basis. Trainings support the communication among all employees to recall the issue of cargo theft. As far as communication is concerned, multiple channels of communication should be used, e.g. articles in company magazines, folders and flyers or via intranet.

As the truck drivers are directly and particularly exposed to theft, an emphasis should be placed on driver education. Drivers should receive additional trainings, manuals and instructions to raise the consciousness of the issue. The driver instructions provide useful tips on how the risk of theft can be reduced or on how to act and react in case of a theft incident. In this way, truck drivers can be prepared and coached to know how to behave in risky situations. Regular checks should be included to make sure that the drivers understand and know their responsibilities and follow the security instructions.

The check of hauliers and drivers references by using evaluation criteria before recruiting them is another precautionary measure. To avoid recruiting fictitious hauliers, black lists or white lists can be used to identify reliable partners. White lists are reverse black lists, showing reliable hauliers or drivers who offer high quality and secure services. Nevertheless, identification and check of correct shipping documents at any time when trucks and drivers arrive at the gates of the company's premises should be assured (Europol 2009).

4.3 Transfer of Theft Risk

The risk of theft can also be transferred to other parties. Risk of theft is commonly transferred to insurance companies. The calculation of the premium depends on the type of goods and/or transport routes. In case of theft-prone goods and high risk transport routes, some insurance companies insure only with certain restrictions or require the application of appropriate security measures, e.g. a second driver in order to avoid unoccupied truck stops, or no recruitment of hauliers via internet in order to prevent bogus companies. The insurance companies usually advise their customers on the application of security methods since security is also in the interest of the insurer.

Apart from transferring the risk of theft to an insurance company, it is also possible to transfer the risk to other partners in the transport chain. This is for example possible through contractual liability transfer via Incoterms. Incoterms clarify at which point in the transport chain the responsibility is transferred from one partner to the other.

4.4 Acceptance of Theft Risk

Risk acceptance implies that companies take the risk of theft consciously with the willingness to bear the consequences (Haller 1981). Despite numerous security measurement possibilities, it is economically unreasonable to prevent or transfer cargo theft entirely. Which kinds of risks are born to what extend depends largely on the willingness and the possibilities of the company (Kummer et al. 2010).

5 Summary and Conclusions

Because of rising theft incidents over the past years resulting in annual economic losses of billions of Euros, cargo theft is becoming increasingly important for road transportation.

The application of risk response measures is an important step in the risk management process which helps increase security and resilience of road transport chains. Risk response measures manage the risk of theft in road transportation in various ways. Basically, some have a preventative effect and minimize the probability of a theft attack (e.g. locks) and some have a reactive effect in case the theft incident already occurred and help to minimize the extent of the damage (e.g. seals, tracking and tracing, geofencing). The various possibilities are categorized according to their ability to eliminate, reduce or transfer the risk. The security measures can be applied at different levels, namely vehicle and trailer, cargo, facilities, data and transport chains in general.

Expert interviews revealed that companies proactively manage the risk of cargo theft in road transportation by using a multi-layered approach that comprises a set of measures to reduce the probability or the extent of theft on different levels within their company. As an additional measure, insurances to transfer the risk of theft are commonly applied to reduce the negative impact of theft incidents. The risk of theft can hardly be totally eliminated. However, it can be reduced by numerous anti-theft security measures as described in this paper.

The costs of the risk management measures are still an issue, as their benefits are not always obvious and the costs cannot always be transferred to the customer as there is often no willingness on behalf of the customer to accept higher prices.

The costs of theft do not merely consist of the value of the stolen products. The costs include much more like investigation costs, administrative costs, product replacement, high insurance premium, contractual penalty payments, lost sales, lost reputation, and lost customers. These indirect costs arising from theft have to be taken into account (Carroll 2010).

In conclusion, transport companies apply a combined approach of measures of various types of risk response measures. As far as the risk mitigation measures are concerned, interviewed companies emphasized the importance of employee training and education of drivers as well as raising of risk awareness.

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