

Controlling Access to Pick-up and Delivery Vans: The Cost of Alternative Measures

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Published online: 11 February 2012
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Abstract Over the past decade - following the disastrous attacks of 9/11 - we have witnessed the introduction of a range of trans-border security programs designed to protect international supply chains against acts of terrorism. In most if not all cases, these programs comprehend the introduction of situational measures, and in many cases operators in the industry are left with limited guidance on how best to implement them. In academic literature on situational crime prevention it is argued that - when introduced without proper reflection and consideration - preventive measures can easily backfire and turn into the negative. It is argued that measures need to be carefully assessed prior to their implementation, and that this assessment should focus on various criteria. In the study reported on in this paper, these observations are illustrated by means of an ex ante consideration of alternative measures to control unauthorised access to pick-up and delivery vans. This study was conducted in 2011 in a Belgian branch of an international express operator, and is limited to the selection process of preventive measures only. The outcome illustrates that - when deciding on what measures best to implement - it may be worthwhile or even necessary not to focus on monetary costs only, but to also take a number of other cost items into consideration; and to make sure that a number of preconditions are in place in order for the introduction of a measure to be feasible and successful. It is argued that an ex ante consideration of alternative solutions will contribute to making the decision on what measures best to implement a more informed and balanced one.

Keywords Consequential costs · Monetary costs · Non-monetary costs · Preconditions · Situational crime prevention · Supply chain security (programs)

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Introduction

Post 9/11 we have witnessed the introduction of a range of trans-border security programs designed to protect international supply chains against acts of unlawful interference. In the European Union, the International Ship and Port Facility Security Code was adopted in December 2002 as an amendment to the SOLAS Convention, describing minimum requirements for security of ships and ports.¹ In the area of civil aviation and air cargo security, Regulation (EC) No. 2320/2002 enabled for a European framework with intense levels of security in the form of rules and measures with detailed, legally binding specifications and checks,² and in 2003 the European Commission communicated two main goals with respect to the future of customs authorities, introducing – amongst other – the European Authorized Economic Operator program.³ Over the past decade, most of these programs have been strengthened following further incidents and changing threat patterns that provoked government and industry intervention.⁴ In most if not all cases, supply chain security programs comprehend the introduction of situational measures, and operators within the supply chain are increasingly being made responsible for the introduction of preventive controls, with no or limited guidance on how best to select and implement them. This raises the concern that, out of ignorance or due to a lack of guidance, operators risk implementing measures without taking full account of its potential consequences. As Tilley (2005: 10) argues, crime prevention is ineluctably complex, meaning that “[...] practitioners need to have a broad grasp of the theory, evidence, circumstances, options, contexts, ethics and possible consequences of varying responses if they are to make informed decisions”. Concerns raised by both advocates and critics of situational crime prevention cover a variety of areas such as the financial and ethical cost associated with the implementation of preventive measures. Some ideal responses may be far too expensive to be acceptable in financial terms (Laycock 2005: 686); and when applied without reflection, or by their very nature, preventive measures can easily backfire and lower the quality of life in our society. Certain members of society may become labelled, feelings of intolerance and distrust may be stimulated, social conduct may be hindered, and human rights violated (Vettenburg et al. 2003: 11-12; Newburn 2007: 296). As argued by Duff and Marshall (2000: 23), the introduction of any measure “[...] imposes some costs, such as the material resources required to implement it, the degree of inconvenience it creates, and its possible deleterious impact on such interests as freedom, autonomy or privacy”. Concerns are also raised with regard to various reverse effects that may⁵ result

¹ This code was incorporated into European legislation with Regulation (EC) No. 725/2004 of the European Parliament and of the Council of 31 March 2004 on enhancing ship and port facility security, OJ, L 129/6, 29 April 2004.

² Regulation (EC) No. 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security, OJ, L355/1, 30 December 2002.

³ Commission of the European Communities, Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee on a simple and paperless environment for Customs and Trade and on the role of customs in the integrated management of external borders, COM (2003) 452, Brussels, 24 July 2003.

⁴ As an example, interceptions of improvised explosive devices originating from Yemen in 2010, have triggered US and EU governments to further enhance air cargo security regulations and introduce additional safeguards to protect civil aviation.

⁵ As argued by Bowers and Johnson (2003: 276), research indicates that crime displacement is not a necessary outcome of crime prevention activity, and it is also possible that crime reduction schemes may have a diffusion of benefits. Furthermore, it has been argued that even where displacement occurs, there may be some benefit to this (e.g. offenders choosing to commit less serious types of crimes than those prevented). A systematic review of 102 evaluations of situational crime prevention initiatives by Guerette and Bowers (2009) further supports the view that crime does not necessarily relocate in the aftermath of situational interventions.

from the implementation of preventive measures. The most common side effects that are referred to in literature are effects of displacement (Eck and Weisburd 1995: 19; Clarke 1997: 38; Bowers and Johnson 2003: 276; Tilley 2005: 6; Newburn 2007: 582; Guerette 2009: 2). This is the phenomenon where the introduction of preventive measures results in crime being displaced elsewhere (i.e. 'geographical' or 'spatial displacement'), to some other time or target (i.e. 'temporal' or 'target displacement'), being committed in another way (i.e. 'tactical displacement'), or being substituted for some other kind of offense (i.e. 'crime type', 'functional' or 'offence displacement') (Clarke 1992: 22; Bowers and Johnson 2003: 276; Guerette and Bowers 2009: 1333). Furthermore, one may actually produce crime and do more harm than good in the course of combating it. As Marx (1990, in Grabosky 1996: 27) argues, 'the frustration that results from blocked criminal opportunities may lead to excessive violence or to an instrumental reliance on more forceful means of goal attainment'. Some initiatives or measures may inspire adaptive behaviour on the part of the offenders that can entail more inventive, devious or violent activity (Clarke 2005: 53; Grabosky 1996: 32); or by dramatising certain aspects of unwanted behaviour, one may actually advertise that behaviour, either by bringing it to the attention of those who would otherwise be oblivious or only vaguely aware, or by enticing the potentially rebellious (Grabosky 1996: 28).

In an attempt to identify the various components that should form part of a cost assessment of situational measures, and based on previous research combined with an extensive literature review, Haelterman (2011) classified the above concerns under two broad categories; and differentiates them from a set of generic preconditions that need to be in place in order for any intervention to be effective (see Table 1).

A first set of cost components comprehends the *financial, ethical and aesthetical costs* of a specific measure that is under consideration. Financial (or monetary) costs cover the fixed and variable costs of investing in crime prevention. Ethical costs relate to the (perceived) impact of the introduction of a measure on civil liberties, convenience and conduct of civilians, staff, customers and other stakeholders; and aesthetical costs relate to the (perceived) impact on the aesthetics of the environment in which a measure is introduced. A second set covers the impact of a range of unintended consequences that may come into effect following the introduction of a certain (set of) measure(s). As outlined in Table 1, this impact may result from *displacement, escalation, creative adaptation*⁶ and/or *enticement effects*. Finally, a number of preconditions need to be in place for any intervention to be successful. These include the *availability* and *practicability* of a measure to end-users, the level of *knowledge* and *expertise* that is required to implement it; the need for end-users to be *aware* of the problem that is being dealt with; their *belief* in the effectiveness of the proposed solution(s); and their *commitment* to (help) solve the problem and to *co-operate* with other stakeholders to reach the desired outcome. Haelterman (2011: 399) further argues that both these preconditions and cost components need to be assessed as part of an *ex ante* consideration of the measures that are deemed effective to mitigate the problem at hand, as this consideration would enable policy makers and

⁶ According to Clarke (2005: 53), the concept of adaptation refers to the process through which 'offender populations' discover new crime vulnerabilities after preventive measures have been in place for a while. It is a longer term process than displacement, which refers to the ways that 'individual offenders' find to circumvent preventive measures.

Table 1 Preconditions, costs and reverse effects (Source: Haelterman 2011: 397)

Pre-conditions (general)	Costs (specific)	Reverse effects (specific)
Availability	Financial/monetary cost	Displacement
Practicability	- Fixed	- Geographical
Required knowledge	- Variable	- Temporal
Required expertise	Ethical / social cost	- Target
User awareness	- Labelling / discrimination	- Tactical
User belief	- Distrust	- Crime type
User commitment	- Civil liberties	Escalating effects
Co-operation	- Inequalities	Creative adaptation
	Aesthetical cost	Enticement effects

practitioners to come to an informed decision of what particular measure(s) best to implement.

In this paper the above is illustrated by means of a study into the selection process of potential measures to control unauthorised access to pick-up and delivery vans, a requirement that forms part of various supply chain security programs, and at the same time addresses an important business need. The study was conducted in 2011 in a Belgian, relatively small branch of an international express operator. The branch that was selected operates 45 pick-up and delivery vans daily, six of them owned by the company and 39 owned by a number of subcontractors.⁷ Being part of an international organisation serving over 200 countries and territories, the express operator has a vast interest in complying with international security standards and regulations; and controlling access to consignments forms part of its standard operating procedures.

The main objective of the study is to identify the various cost components of a number of alternative measures that have been identified as being effective to mitigate the problem at hand, and to illustrate the benefit of taking these into account when deciding on what measures best to implement. The scope of the study is limited to the selection process of preventive measures only, and does not cover the actual implementation and ex post evaluation phase. Its main objective is to illustrate the process of considering situational measures prior to their actual implementation. As such, it should not be considered a detailed study into the potential effectiveness (or reverse effects) of situational measures available to operators to tackle security risks in the pick-up and delivery process, as this would require additional research, a broader study sample and a more in-depth analysis and comparison of relevant incident data.

Following a description of the applied methodology, the structure of the paper follows the various stages that are defined as constituting the standard methodology applied for situational crime prevention projects (Clarke 1997: 15). Part two provides detail on the problem that was selected and on the objectives to tackle it. In part three a range of mitigating measures is identified and listed. Before coming to a summary of the main conclusions, parts four to seven deal with the actual consideration of these measures, assessing the relevant preconditions, their monetary and non-monetary cost, as well as any (potential) consequential costs.

⁷ Figures and further details were obtained from the Operations Manager of the branch.

Methodology

As to identify and define the problem at hand, and as to list a number of risk mitigating measures that are thought of to be effective, an initial focus group meeting was organised with the security representatives of the branch,⁸ moderated by the researchers (Cronin 2001: 165). A focus group methodology was selected as it enables to explore participants' views and experiences in full depth. As to remain free of researcher influence, a low to medium level form of moderation was obtained for (Cronin 2001: 166).

As to assess the non-monetary cost of the proposed measures, and as to verify whether the necessary preconditions are in place to make their introduction a success, a survey was conducted amongst the full population of van drivers. Out of a total of 45 drivers, 23 returned a completed (structured) questionnaire, resulting in a response rate of 51.11 %. The first part of the questionnaire contained a range of questions on the background variables of the respondents. A minority of those that responded are female (8.7%); and 52.2% of the respondents were between 30 and 40 years old at the time of the survey. About two thirds (68.2%) were working as a subcontractor, the other third were directly employed by the operator.⁹ The second part of the questionnaire contained a series of statements on which the respondents were asked to give their personal opinion. Each item was scored on a one to five point Likert scale (Procter 2001: 111-112). The statements used were carefully worded as to make sure that they had a maximum content validity. Prior to presenting the survey to the drivers, a small-scale pretest was conducted by presenting the questionnaire to a colleague familiar with the context. After having incorporated some minor recommendations that came out of the pretest, the questionnaire was presented to the drivers during a group meeting. During this meeting the drivers were presented some basic information on the aims and scope of the study, as well as some instructions for completing the questionnaire. To motivate them for completing the entire survey, their importance to the overall study was accentuated. It was further stressed that cooperation was on a voluntary basis only, and they were given a name of an independent contact person to reach out to in case they wanted additional information on the scope and objectives of the study.¹⁰

The drivers were initially given one week to return the completed questionnaire in a blank and closed envelope. The answers provided by the respondents were then inserted in an SPSS data-file. The individual items on the drivers' opinions were summed up to build a relevant scale. The reliability of these scales was tested by means of Cronbach's alpha, and items were excluded when this brought down the value of alpha (Bijleveld 2007: 232). The scales were also tested on their one-dimensional character. The scores of the respondents on these scales were then interpreted to form the conclusions.

Finally, as to assess the perceived potential for displacement and other reverse effects; a second focus group meeting was planned with the same security representatives that participated in the initial session. This research method was selected due to the limited number of participants and the high level of verbal and cognitive skills of the individuals involved. The participants were informed of the goal of the focus group and then left to interact, with the researchers acting as the moderator. This setup enabled to gather a lot of

⁸ The focus group consisted of four members: the Head of Security, the Aviation Security Manager, the Manager Security Compliance and the Security Manager responsible for the local branch.

⁹ The local Operations Manager, who has a clear view on all his drivers, could confirm that the spread of these background variables reflects the total spread in the targeted population. This means that the data used for further analyses was not substantially biased by a non-coverage problem.

¹⁰ The company's official Confidant Advisor (i.e. 'vertrouwenspersoon') was asked to act as the central point of contact for the drivers.

information in a limited time frame. For each of the proposed measures it was assessed to what type of displacement its introduction might potentially lead, based on past experience and knowledge gained from specialist literature and intelligence sharing within the sector. Following this exercise, the various measures were ranked by each individual participant according to their perceived potential for other reverse effects.

Problem Analysis and Definition

Defining and analysing the (potential) problem at hand is probably one of the most important and often most underestimated stages in any crime prevention effort. As Laycock (2005: 682) argues, if the problem definition is wrong to start with or if important information is overlooked, then the whole crime reduction process may be compromised. The crime problem under consideration in this paper relates to the risk of individuals gaining unauthorised access to (the loading compartments of) pick-up and delivery vans when operated on the public road (i.e. not when parked at the premises of the operator, consignor or consignee). Protecting cargo from unauthorised interference is not only relevant from an anti-terrorism perspective, as offenders may try to introduce prohibited articles inside that cargo, but obviously also from an anti-theft perspective; hence why controlling access to loading compartments (such as vans, containers or trucks) is put forward as a strict requirement in government as industry-driven security initiatives.

Looking at the standard process of the organisation in which the study was conducted, vans are mainly operated on week days between 9.00 AM and 5.00 PM. During that period, drivers make a range of scheduled stops to either pick-up or deliver consignments. On average, each driver services 47 collection and/or delivery addresses per day, resulting in - on average - a total of 2115 scheduled stops daily for the entire research population.¹¹ Apart from the scheduled stops, drivers evidently have to make a number of additional comfort stops, e.g. to take their lunch break, or forced stops in case of illness or technical problems encountered with the vehicle. Although the number of unscheduled stops is extremely limited, it cannot be overlooked when assessing the overall risk.

In order to assess the importance of controlling access to pick-up and delivery vans to the operator, a focus group meeting was organised with a number of its security representatives. The main objective identified by the group, is theft prevention. In this context, theft can relate to the theft of the actual vehicle; the consignments on board of that vehicle; the cargo documentation; and/or cash retrieved from cash deliveries. Other objectives are to prevent the introduction of illegal items such as improvised explosive devices or narcotics in the supply chain; to limit insurance premiums; to ensure the safety and security of drivers; to reduce reputational risks to the company; and – last but not least – to achieve and maintain regulatory compliance (e.g. compliance with air cargo security regulations). Although there is no record of any breaches highlighted by the competent civil aviation authority to date, the latter objective alone makes the protection of air cargo a top priority to the company, as losing its regulated agent status would have a direct impact on business continuity.

Prior to identifying the range of measures that could be introduced to mitigate the risk of individuals gaining unauthorised access to the vans and/or their loading compartments; available data on previous victimisation was gathered and analysed.¹² Of the total of consignments due for delivery between 1 January 2008 and 31 December 2010, 99 were reported (partially) missing, but the data did not reveal enough detail on the exact circumstances

¹¹ Info obtained from the operator's Engineering Department.

¹² Access to this data was granted by the Head of Security.

as to clarify whether or not the incident occurred on the public road whilst on board a pick-up and delivery van.¹³ On one occasion, however, it was clear that a break-in took place while the driver was away from the vehicle making a delivery. The incident was reported to the police and clear signs of forced entry were found on the rear doors. At the time of the incident, the vehicle was locked but not alarmed. Out of the 23 drivers that completed the questionnaire, two reported that a consignment had been stolen from their vehicle while working for the operator.¹⁴ None of them experienced the vehicle itself having been stolen, nor any illegal or prohibited item having been introduced on board.

Potential Measures for Consideration

As part of the same initial focus group meeting, a list was compiled of potential measures that could be introduced to mitigate the risk. For each of these measures it was indicated whether or not it was perceived effective to reduce the risk of theft of the vehicle (or to increase the chances of recovering it after a theft would occur); to reduce the risk of theft of the content of that vehicle; and to reduce the risk of someone introducing illegal or prohibited items in the supply chain through gaining access to the pick-up and delivery vans. The measures that scored positive on all three objectives were selected as measures for further consideration. Although quite often the introduction of a combination of measures proves most effective in a situational project (Clarke 2008: 183),¹⁵ this consideration was conducted for each individual measure that was perceived effective by the security representatives of the organisation in which the study took place.

After having considered the evident precondition of *availability*,¹⁶ the final list contained nine different measures: (1) the installation of automated locking devices on all vans, enabling that the cabin and cargo compartment doors automatically lock when the driver – holding a key card – approaches or moves away from the vehicle; (2) the installation of audible intrusion alarms, attracting attention when doors or windows are forced open; (3) the installation of silent intrusion alarms with remote (GPS) monitoring, allowing remote intervention upon receipt of an alarm; (4) issuing formal instructions to drivers (e.g. to always lock their vehicles when left unattended), combined with random compliance checks and a sanctioning system; (5) providing security awareness training to drivers (e.g. on vehicle security, secure parking, offender's modus operandi, etc.); (6) arranging two individuals (double drivers) for each vehicle, with one person staying in or nearby the van at all times; (7) providing overt security escorts; (8) removing company logos from vehicles in order to conceal the target; and (9) posting specific notifications on vehicles alerting the fact that no

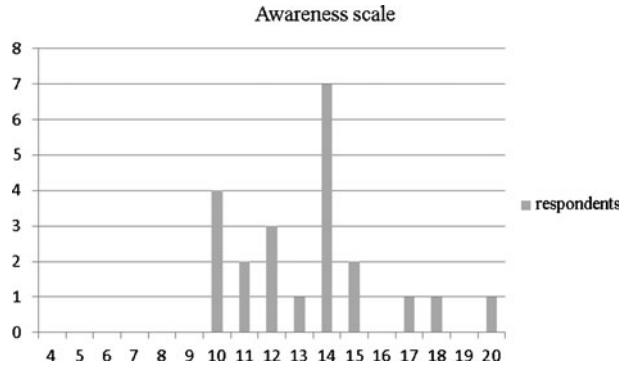
¹³ The fact that a shipment is reported missing, can also relate to the fact that it had been delivered to the wrong address, or mistakenly swapped with another shipment due to some operational error.

¹⁴ When the survey was conducted, 27.3% of the respondents had been working for the operator for less than one year, 36.4% had been working with the company between one and five years, and another 36.4% for more than five years.

¹⁵ E.g. to optimise effectiveness in the example elaborated in this study, one can think of combining a measure that is tailored at making sure that van doors are locked at all times (e.g. card key) with one that is designed to detect intrusion (e.g. audible alarm).

¹⁶ If a measure is unavailable (e.g. because local law does not permit its use or implementation), it simply cannot be introduced.

Fig. 1 Awareness scale
(i.e. driver awareness of the
problem at hand)



valuables are inside, or the fact that the vehicle is alarmed and monitored at all times. No significant interdependencies¹⁷ have been identified between these nine measures.

Further Analysis of Preconditions

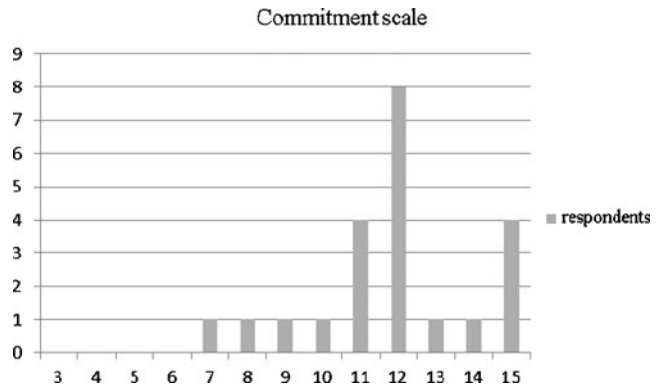
Apart from the availability of a measure to end-users, a number of other preconditions need to be in place in order for any intervention to be feasible and effective (Haelterman 2011: 397-398). This is the case for the practicability of a measure, as well as for the knowledge and expertise that is required to evaluate and implement it. Other preconditions include the need for end-users to be aware of the problem that is being dealt with, to believe in the effectiveness of the proposed solution(s), and to be committed to solve the problem and to co-operate with other stakeholders to reach the desired outcome (Haelterman 2011: 397-398).

None of the measures that had been identified was considered to pose significant problems related to the level of *knowledge or expertise* required for implementation. Specific attention, however, was given to the level of awareness amongst drivers; to their commitment to contribute to mitigate the risk; to the perceived practicability of the proposed measures; and to the extent to which they believe them to be effective. In order to assess the level of *awareness* of the problem at hand (i.e. of the risk of unauthorised individuals gaining access to cargo and cargo compartments), drivers were asked to agree or disagree on a number of predefined statements. Because of the abstract character of the awareness concept, it was decided to establish an ‘awareness scale’ consisting of various items rather than to ask the drivers directly to what extent they are aware or unaware of the problem. Each item was scored on a one to five point Likert scale.¹⁸ Figure 1 illustrates that the scores are unevenly distributed in the advantage of the higher scores as the respondents mostly agreed or fully agreed with

¹⁷ There are no interdependencies if a measure can work on its own (i.e. without introducing additional measures). Examples of measures that are interdependent, are the installation of an electronic access control system and the introduction of access control procedures: just having the system installed without having access levels defined, will have no (or only a limited) effect.

¹⁸ The one-dimensional character of the scale was confirmed with principal axis factoring (a single own value greater than one). This scale tested well on internal consistency with an acceptable Cronbach’s Alfa value. Four items were withheld to build up the scale. See Appendix 1 for more detail.

Fig. 2 Commitment scale (i.e. driver commitment to help mitigate the problem)



the awareness statements. It should therefore be concluded that the respondents show a fair level of awareness.¹⁹

The same methodology was applied to assess the level of *commitment* amongst drivers to (help) mitigate the risk of individuals gaining unauthorised access to cargo (see Fig. 2). For this scale the sum of three items was used to define the level of commitment.²⁰ The level could range from a score of ‘3’ (minimum level) to a score of ‘15’ (maximum level). Again, the outcome shows a predominance of the higher scores, indicating a high level of commitment amongst the group of respondents to help mitigate the problem.

Taking a closer look at the individual questions that were used to establish the ‘commitment scale’, learns that nearly all (90.9%) of the respondents agree or fully agree that the driver is best placed (i.e. “the ideal person”) to protect the vehicle against unauthorised interference; and the majority of them are willing to assist in mitigating the risk. Only four out of the 23 respondents state that they should not be occupied with protecting their vehicle from unauthorised interference while performing their daily tasks.

It goes without saying that users will be less motivated to fully implement a measure if they have no belief in its effectiveness, or when this measure would impact core business processes to an extent that their execution becomes extremely difficult or impossible (and vice versa). As to assess the extent to which the drivers believe in the effectiveness and the practicability of the proposed measures, they were asked to comment on a range of predefined statements for each individual measure.²¹ A ‘belief scale’ was established for each measure, comprising five items, meaning that individual (total) scores can range from ‘five’ (minimum score) to ‘25’ (maximum score).²² In order to compare the different measures, the average scores of the total of respondents were calculated. Table 2 provides detail on the level of user *belief* in the effectiveness of the measures that were deemed appropriate to tackle the risk.

The measures that came out most positive, include the installation of automatic locking devices on all vans (for example: 87% of the respondents agree or fully agree with the

¹⁹ To interpret the scores one must keep in mind that the scale is internally consistent (meaning that individual respondents answered consistently high or low on the four items); that a score of ‘four’ suggests the lowest possible level of awareness; and that a score of ‘20’ suggests the highest level of awareness possible.

²⁰ The one-dimensional character of the scale was confirmed with principal axis factoring (a single own value greater than one). The scale tested good on internal consistency with an acceptable Cronbach’s. See Appendix 1 for more detail.

²¹ Idem.

²² See Appendix 1 for more details on the properties of the scale.

Table 2 User belief (in the effectiveness of the proposed measure)

Rank	Measure	Average score (on scale)
1	Key card	20.73
2	Audible alarm	20.39
3	Awareness training	16.65
4	Double drivers	16.26
5	Silent alarm+GPS	16.22
6	Overt security escorts	16.13 (modus 16)
7	Formal instructions	16.13 (modus 14)
8	Notification on vehicles	15.55
9	No company logos	13.41

statement that the introduction of this measure would make it more difficult for an offender to gain access to the vehicle) and the installation of audible intrusion alarms (for example: 82.6% agree or fully agree with the statement that an alarm would deter potential offenders). The measures perceived as being the least effective, are the removal of company logos (for example: 52.1% of the respondents consider this measure useless) and the provision of specific notifications on vehicles stressing the fact that no valuables are inside, or the fact that the vehicle is alarmed and monitored at all times.

The same methodology was applied to compare the measures on their perceived practicability. The practicability-scale was established for each individual measure, comprising four items, meaning that individual (total) scores can range from 'four' (minimum score) to '20' (maximum score).²³ Table 3 provides detail on the extent to which the respondents perceive the proposed measures to be *practicable* or not. In order to compare the different measures, the average scores for the total of respondents were calculated for each measure.

The installation of automated locking devices comes out as the most practical measure (as perceived by the drivers); 87% of the respondents believe that this measure would even facilitate their job compared to the current situation. Other measures that are perceived favourable are the installation of audible alarms and the installation of silent alarms combined with off-site monitoring. The measures perceived as being the least practicable, are the provision of double drivers for each vehicle (for example: 45% of the respondents state that they would be hindered in their job if this measure would be introduced) and the provision of overt security escorts; 69.5% of the respondents disagree or totally disagree with the statement that the introduction of this measure would make their job any easier.

Monetary Cost of Selected Measures

Financial (or monetary) costs relate to the fixed and variable costs associated with the implementation of a measure that is under consideration.²⁴ These include a range of cost items such as management and overhead costs, personnel costs (e.g. wages of surveillance

²³ See Appendix 1 for more details on the properties of the scale.

²⁴ Fixed costs are expenses that are not dependent on the level of goods or services produced or sold, while variable costs are considered to be expenses that change in proportion to the activity of a business (source: <http://www.accountingtools.com>, accessed 9 November 2010).

Table 3 Perceived practicability of the proposed measure

Rank	Measure	Average score (on scale)
1	Key card	17.09
2	Audible alarm	15.61
3	Silent alarm+GPS	14.04
4	Notification on vehicles	13.83
5	Awareness training	13.04
6	No company logos	12.52
7	Formal instructions / compliance checks & sanctioning	11.52
8	Double drivers	10.65
9	Overt security escorts	09.96

staff, ...), depreciation costs of (security) equipment, costs of services, maintenance costs, the cost resulting from the impact of security measures on certain core business processes, etc. (Welsh and Farrington 1999; Haelterman 2011: 394). For the purpose of this section, the total investment (in equipment, research, development, etc.) and the running costs per year have been assessed (see also Table 4).

For some measures the monetary cost is negligible or extremely limited. This is the case for the removal of company logos or the provision of notification boards or - stickers. The provision of a second person accompanying the driver and the provision of overt security escorts solely result in additional (though substantial) personnel costs or costs of outsourcing a service to an external contractor (i.e. guarding company). The financial cost linked to the introduction of the other measures, results from a combination of equipment, installation and maintenance costs²⁵; personnel costs; management and overhead costs; the cost of external service providers; et cetera.

Conducting random checks to verify compliance with formal instructions imposed on drivers, results in an operational cost of 8320 Euros per year, based on one weekly check to be conducted by a qualified representative of the security department.²⁶

Taking into account the number of pick-up and delivery vehicles (n=45), the investment that results from purchasing and installing automated locking devices on all vehicles totals around 33000 Euros.²⁷ The equipment is subject to a three year depreciation period. Maintenance costs are estimated by the operator's facility department at 15% of the equipment cost per year, which brings the yearly running cost for this option to 16000 Euros.

Installing audible intruder alarms was assessed to amount up to an investment of 456 Euros per vehicle, totaling 20547 Euros for the entire fleet.²⁸ Again, the equipment is subject to a three year depreciation period and the yearly maintenance cost is estimated at 15%. The yearly running cost totals 9931 Euros.

The cost of installing silent alarms with remote monitoring on the entire fleet results from an investment in the purchase and installation of the electronic devices, the maintenance cost (15%), the cost for external monitoring of alarms and consequent interventions, and

²⁵ The yearly maintenance cost for (security) equipment is budgeted by the operator's facility department at 15% of the total equipment cost.

²⁶ Belgian private security legislation requires a private investigator's license for conducting (covert) compliance checks on drivers. Conducting one check takes approximately 4 hours (info obtained from the operator's Head of Security).

²⁷ Info obtained from the operator's preferred supplier.

²⁸ Idem.

Table 4 Monetary cost of the proposed measure

Rank	Measure	Investment	Running cost per year ^a
1	Overt security escorts	-	€ 143000
2	Double drivers	-	€ 43200
3	Awareness training	€ 3750	€ 27375
4	Silent alarms with GPS monitoring	€ 31580	€ 21258
5	Key card	€ 33100	€ 15998
6	Audible alarms	€ 20547	€ 9931
7	Formal instructions & compliance checks	-	€ 8320
8	Notification on vehicles	Negligible	Negligible
9	No company logos	Negligible	Negligible

^a Annual depreciation included.

communication costs. The cost of having the alarms monitored by an external monitoring room, equals an amount of 5994 Euros per year (for the entire fleet).²⁹ The total running cost for this option, amounts up to 21258 Euros yearly, the cost of interventions not taken into consideration.

The 'human factor' approach (i.e. providing staff with recurrent awareness training) presents a yearly investment for developing and upgrading the training package - estimated by the operator's training department at 3750 Euros - and a yearly running cost for delivering the training to the drivers. The latter includes the cost of providing trainers and training facilities; as well as the recurrent cost of replacing drivers who are participating in the training (i.e. 250 Euros per driver). The average cost of providing a security awareness session is estimated at 125 Euros per driver per year (taking into account an average of six participants per session), replacement cost not included. Taking into account an average staff turnover of 18 drivers yearly and the fact that recurrent training is required every year, the yearly (running) cost of training the full population of van drivers amounts up to 27375 Euros.

Non-Monetary Costs

Solutions to prevent crime may be effective and cost-efficient, but that does not automatically make them acceptable without further consideration. Staff members may feel labelled and discriminated, or hindered in their freedom of movement, alienating them from their colleagues and from their employer. Privacy rights may become violated, feelings of intolerance and distrust may be provoked, etc. (Haelterman 2011: 395). As to assess the *ethical / social cost* of the proposed measures, drivers were asked to comment on a range of predefined statements for each individual measure.³⁰ These statements relate to (1) the perceived impact on the driver's feeling of privacy, (2) their perceived feeling of trust or distrust towards their employer, (3) the perceived impact on their freedom of movement and (4) on their feeling of being treated equally. These four items composed the ethical cost-scale for each measure, meaning that individual (total) scores can range from 'four' (minimum score) to '20' (maximum score).³¹ Table 5 captures the overall outcome (i.e. average score on the ethical cost scale).

²⁹ Info obtained from the operator's Surveillance department and from the operator's preferred supplier.

³⁰ Again, responses have been plotted on a (five-point Likert) scale, tested by means of an exploratory factor analysis, and verified for internal consistency.

³¹ See Appendix 1 for more details on the properties of the scale.

Table 5 Ethical cost of the proposed measure as perceived by the drivers

Rank	Measure	Average score (on scale)
1	Formal instructions / compliance checks & sanctioning	15.64
2	Overt security escorts	15.45
3	Double drivers	15.05
4	Silent alarms with GPS monitoring	13.95
5	Awareness training	13.50
6	Notification on vehicles	12.59
7	No company logos	12.14
8	Audible alarms	09.76
9	Key card	09.64

Issuing formal instructions to drivers combined with random compliance checks and a sanctioning system is perceived as the measure with the highest ethical cost. Other measures that appear in the top-four, are the provision of security escorts, the provision of double drivers and the installation of silent alarms combined with remote (GPS) monitoring. The measures perceived as most favourable from an ethical perspective, are the installation of automatic locking devices and the installation of audible alarms. Table 6 provides detail on the various items that were measured.

Table 6 Ethical cost divided by item

Cost	Overall ranking	Privacy*	(dis)Trust*	Freedom of movement*	Equal treatment*
High	Formal instructions	Formal instructions (52.1%)	Formal instructions (47.8%)	Overt security escorts (63.7%)	Formal instructions (54.5%)
	Overt security escorts	Overt security escorts (47.8%)	Awareness training (39.1%)	Formal instructions (54.5%)	Double drivers (54.5%)
	Double drivers	Double drivers (43.4%)	Double drivers (39.1%)	Double drivers (50%)	Silent alarm+GPS (59.1%)
	Silent alarm+GPS	Silent alarm+GPS (34.7%)	Overt security escorts (39.1%)	Silent alarm+GPS (45.5%)	Overt security escorts (59.1%)
	Awareness training	Awareness training (26%)	Silent alarm+GPS (34.8%)	Awareness training (31.8%)	Notification on vehicles (59.1%)
	Notification on vehicles	No company logos (13%)	Notification on vehicles (26.1%)	Notification on vehicles (22.7%)	No company logos (63.7%)
	No company logos	Notification on vehicles (13%)	No company logos (26.1%)	No company logos (14.3%)	Awareness training (68.2%)
	Audible alarm	Audible alarm (8.6%)	Key card (17.4%)	Audible alarm (13.6%)	Key card (77.3%)
Low	Key card	Key card (4.3%)	Audible alarm (13.6%)	Key card (13.6%)	Audible alarm (81.8%)

* ranking based on % of respondents agreeing with statements that the measure poses a (perceived) ethical cost

The measures perceived as having the biggest (negative) impact on the driver's feeling of privacy, are the roll-out and monitoring of formal instructions, the provision of overt security escorts and the provision of two drivers for each vehicle. With regard to the perceived impact on the feeling of being (dis)trusted by their employer, the provision of formal instructions, the provision of awareness training and the provision of two drivers or security escorts score least favourable. The provision of overt security escorts, the roll-out of formal instructions, the provision of two drivers per vehicle and the installation of silent intruder alarms with remote (GPS) monitoring constitute the top-four measures that are perceived as having the most negative impact on the driver's freedom of movement and feeling of equal treatment. For all four items that were measured, the installation of automatic locking devices and the installation of audible alarms are perceived as posing the lowest ethical cost.

Apart from their financial and ethical cost, certain measures may have a negative impact on (the aesthetics of) the environment and, as such, pose an additional cost compared to those that are equally effective but blend in with their surroundings. In this study, no significant *aesthetical costs* were identified, apart maybe from having overt security escorts following each single vehicle every day of the week, which has a potential to invoke negative feelings to the general public living in the collection and distribution area.

Consequential Costs

As Hamilton-Smith (2002: 16) argues, 'measuring displacement [...] is particularly difficult because attributing the occurrence or non-occurrence of one crime to the prevention of another is ostensibly a somewhat speculative pastime'. Nevertheless, the measurement and monitoring of displacement and other reverse effects should form part of the evaluation of any crime prevention project, as they may provide valuable input for future programming or for adapting a program that is still running.³²

Apart from the above, it is also essential to identify the possibility and likelihood of displacement and other reverse effects as part of the design phase of a project, be it to try and manage the occurrence upfront, or to provide input for the monitoring- and evaluation plan. According to Guerette (2009: 5), the fact whether or not displacement is likely to occur, will largely be determined by offender motivation, offender familiarity and crime opportunity. To effectively manage displacement at the outset of a program, one needs to identify what criminal opportunities are left unattended once a measure has been introduced, and try to anticipate how the offender might attempt to circumvent or counter that measure. As Guerette (2009: 11-12) puts it, understanding the local displacement (and diffusion) potential requires a thorough analysis of the characteristics of targeted offenders, locations and victims.

As stated in the introduction, the latter (detailed) analyses do not form part of the scope of this study. The next table (Table 7) merely covers the potential for displacement as perceived by the security representatives that participated in the focus group meetings.³³

When asked to assess the potential for escalating effects, enticement effects or effects of creative adaptation, this potential was identified by a majority of the focus group members for six out of nine measures. A majority of them indicate that the installation of audible

³² Over the past decade there have been valuable contributions in criminological literature on how to measure displacement effects of crime reduction activities (see e.g. Bowers and Johnson 2003).

³³ Displacement to process steps other than the pick-up and delivery process (e.g. offenders turning their attention to depot locations as a result of enhancing security in the transport process) has not been considered in this exercise.

Table 7 Possible displacement resulting from the implementation (as perceived by the focus group members)

Measure	Displacement possibilities
Automated locking devices+key card	<p>Offenders may try to gain access to the load in another way, perhaps by using forceful means to obtain key cards from drivers</p> <p>Offenders may try to invent possibilities to circumvent the technique (e.g. hack key cards / frequencies, manipulate van doors / locks, copy key cards, etc.)</p> <p>Offenders may try to get to the load when the driver is in the immediate proximity of the van, i.e. before the vehicle is locked, or by means of deceiving the driver (e.g. 'round-the-corner deliveries')</p>
Audible intrusion alarms	<p>Offenders may 'hit' on places with little social control</p> <p>Offenders may try to get to the load when the driver is in the immediate proximity of the van (i.e. before the alarm is activated)</p> <p>Offenders may try to circumvent the technique</p>
Silent intrusion alarms with remote (GPS) monitoring	Displacement effects may come into effect once it is widely known that the vans of operator x are alarmed
Formal instructions / compliance checks and sanctioning system	Limited to none
Security awareness training	Offenders may be inventive in trying to find modus operandi that were previously unknown to reach their goal
Double drivers	<p>Offenders may turn to more forceful means of goal attainment</p> <p>Offenders may try to get to the load by means of deceiving the drivers (e.g. 'round-the-corner deliveries')</p>
Overt security escorts	<p>Offenders may turn to more forceful means of goal attainment</p> <p>Offenders may try to get to the load by means of deceiving the escorts</p> <p>Offenders may strike when the escort vehicle is e.g. blocked in traffic</p>
Remove company logos	Limited to none
Post specific notifications	Offenders may turn to more forceful means to attain their goal when noticing the fact that vehicles are alarmed / protected

alarms, the provision of double drivers and the provision of security escorts may result in escalation; and all feel that providing double drivers or overt security escorts, or posting specific notifications on vehicles, may entice potential offenders (i.e. bring the fact that a courier van may be an attractive target to the attention of individuals who were previously not aware). Measures perceived as presenting the highest probability for escalating effects, enticement effects or effects of creative adaptation, are the provision of double drivers and the provision of overt security escorts. Table 8 presents the number of focus group members (out of a total of four) that indicated a potential for the given effect to occur.

Conclusions

In academic literature on situational crime prevention it is argued that – when introduced without proper reflection and consideration – preventive measures can easily backfire and turn into the negative. It is argued that measures need to be carefully assessed prior to their

Table 8 Potential for escalating effects, creative adaptation and enticement effects (as perceived by the focus group members)

Rank	Measure	Escalating effects	Creative adaptation	Enticement effects
1	Double drivers	3	3	4
2	Overt security escorts	3	2	4
3	Notification on vehicles	2	1	4
4	Audible alarm	4	2	1
5	Key card	2	4	0
6	Awareness training	2	2	1
7	Formal instructions	2	1	1
8	Silent alarm+GPS	1	3	0
9	No company logos	0	0	1

implementation, and that this assessment should cover a range of cost factors and generic preconditions. The study reported on in this paper seeks to illustrate the potential benefit of this assessment by means of an ex ante consideration of a number of alternative measures to control unauthorised access to pick-up and delivery vans, a requirement that forms part of various supply chain security programs, and at the same time addresses an important business need. The scope of the study is limited to the selection process of preventive measures only, and does not cover the actual implementation and ex post evaluation phase. The main objective is to illustrate the process of assessing situational measures prior to their actual implementation. As such, it should not be considered a detailed study into the potential effectiveness (or reverse effects) of situational measures available to tackle security risks in the pick-up and delivery process, as this would require additional research, a broader study sample and a more in-depth analysis and comparison of relevant incident data.

The outcome of the study illustrates that, when deciding on what measures best to implement, it may be worthwhile or even necessary not to focus on monetary costs only. Even though they present an extremely limited financial cost, certain measures may be considered questionable because of the fact that end-users have very limited belief in their effectiveness. In this study, this is the case for the removal of company logos. Other measures are perceived by end-users as being impracticable, hindering them in their daily jobs (e.g. the provision of double drivers), or as posing a high ethical cost. The latter is the case for the introduction of random compliance checks to monitor adherence to formal instructions and to sanction non-compliance. Drivers perceive this measure as having a negative impact on their feeling of privacy, their freedom of movement, their feeling of being treated equally, and on the relationship of trust that must exist between employer and employee. In this study, the measure perceived as the most practicable and effective one, and as posing the lowest ethical cost, is the installation of automated locking devices on all vans. Finally, certain measures may have an elevated potential for a range of unintended reverse effects. Based on the small study sample and the limitations of the data employed, this potential should be interpreted as a perceived potential, as a detailed determination of, e.g. possible displacement effects requires much more research which does not fall within the scope of this particular study.

Based on the outcome of the study it is clear that an ex ante consideration of preconditions, monetary costs, non-monetary costs and consequential costs prior to

deciding on what measure(s) best to implement, has the potential to avoid that time and resources would be wasted and negative side effects would come into effect once a measure has been introduced. Taking the recommendations set forth in this paper into consideration, will contribute to making the decision on what measures best to implement a more informed and balanced one. To be able to profit from this, policy makers should allow practitioners a certain freedom of choice between a set of alternative measures when imposing requirements on them, as the various preconditions and cost components will be different within each individual setting. Translated to the topic of this paper, end-users in the supply chain should – to a certain extent – be allowed to introduce measures that best fit the setting in which they operate and, as such, assist regulators in reaching their objectives in the most effective and efficient way. Furthermore, as a proper consideration of alternative measures requires a certain level of theoretical understanding and skills that are not always available to all, it is recommended that end-users are offered additional guidance and support, e.g. by means of disseminating relevant incident data and research findings, by familiarizing them with some key concepts and techniques, or by funding additional research and evaluation studies.

Appendix 1: Driver survey results³⁴

a. Awareness scale

Used items	Factor loading	Cronbach's Alfa
<i>5 point scale ('fully agree' to 'fully disagree')</i>		0.627
"I think there is a great chance that a person with bad intentions will try to access my vehicle".	0.679	
"I think a lot can be done to prevent access to my vehicle".	0.590	
"I think the damage to the company caused by theft is big".	0.567	
"I think my colleagues don't lock their vehicles appropriately".	0.364	

b. Commitment scale

Used items	Factor loading	Cronbach's Alfa
<i>5 point scale ('fully agree' to 'fully disagree')</i>		0.550
"I don't think I should engage myself in trying to prevent unauthorized access to my vehicle during working hours". (R)	0.630	
"I would like to assist with the prevention of unauthorized access to my vehicle".	0.534	
"A driver is the ideal person to prevent unauthorized access to the vehicle".	0.486	

³⁴ Statements are translated from the original (Dutch) questionnaire. Meanings can be slightly shifted due to this operation

c. Belief scale

Belief 5 point scale (‘fully agree’ to ‘fully disagree’)	Factor loading								
	Key card	Audible alarm	silent alarm + GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
“I believe others would be deterred to enter my vehicle with this measure”.	0.843	0.796	0.529	0.717	0.757	0.528	0.455	0.843	0.870
“This measure makes it more difficult for others to enter my vehicle”.	0.759	0.929	0.876	0.807	0.983	0.630	0.567	0.802	0.682
“I think this is a useless measure”. (R)	0.561	0.674	0.838	0.833	0.814	0.792	0.858	0.811	0.834
“I think this measure would not have an effect on the number of successful attempts to enter the vehicle”. (R)	0.557	0.350	0.707	0.825	0.722	0.548	0.560	0.349	0.862
“One cannot fully secure a vehicle against intruders without the use of this measure”.	0.498	0.832	0.506	0.585	0.487	0.746	0.587	0.895	0.809
<i>Cronbach’s Alfa</i>	0.738	0.798	0.821	0.866	0.867	0.744	0.711	0.856	0.902

d. Practicability scale

Practicability 5 point scale (‘fully agree’ to ‘fully disagree’)	Factor loading								
	Key card	Audible alarm	silent alarm + GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
“I would get used to this measure after a few hours”.	0.911	0.665	0.448	0.763	0.756	0.882	0.898	0.742	0.757
“My job could go much easier thanks to this measure”.	0.819	0.847	0.810	0.965	0.843	0.657	0.571	0.640	0.593
“I will need more time to finish my round with this measure”. (R)	0.750	0.958	0.881	0.541	0.445	0.786	0.300	0.835	0.730
“I would be hindered in my job if this measure would be used”. (R)	0.689	0.772	0.844	0.702	0.729	0.766	0.610	0.682	0.782
<i>Cronbach’s Alfa</i>	0.847	0.883	0.828	0.820	0.773	0.872	0.646	0.815	0.751

e. Social cost

Social cost 5 point scale (‘fully agree’ to ‘fully disagree’)	Factor loading								
	Key card	Audible alarm	silent alarm + GPS	Formal instructions	Awareness training	Double drivers	Overt security escorts	No company logos	Notification on vehicles
“I would feel less free in my job if this was applied”.	0.954	0.947	0.981	0.958	0.936	0.801	0.807	0.963	0.934
“This measure would not even be necessary if the company has enough confidence in the honesty of their drivers”.	0.808	0.803	0.577	0.818	0.728	0.502	0.630	0.634	0.549
“I would feel invaded in my privacy by this measure”.	0.777	0.856	0.907	0.934	0.743	0.713	0.746	0.864	0.656
“With this measure every driver is treated equally”. (R)	0.751	0.736	0.655	0.709	0.742	0.520	0.451	0.801	0.899
“I would feel aimed at if this measure was applied”.	0.605	0.613	0.733	0.696	0.527	0.813	0.613	0.976	0.895
<i>Cronbach’s Alfa</i>	0.877	0.884	0.880	0.912	0.846	0.780	0.784	0.927	0.886

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