Towards Trusted Trade-Lanes

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Abstract. Customs administrations are exploring system-based approaches to regulatory supervision, taking the entire set of controls in a process into account. In addition to Trusted Traders, which are recognized by a certification process, customs are considering to identify so called Trusted Trade Lanes: companies that collaborate in a trade lane in a reliable manner. In this paper we explore the concept of a trusted trade lane. We identify essential characteristics of a trusted trade-lane, and develop various scenarios in which trade lanes may develop and find ways to demonstrate to the authorities and commercial partners that they conform to these requirements. The characteristics have been evaluated in a workshop with experts. The scenarios are tested against three pilot projects, that aim to improve supply chain visibility.
Keywords: Regulatory supervision; customs; supply chain visibility

1 Introduction

Customs administrations face two opposing challenges. One the one hand they must improve regulatory compliance, specifically related to safety and security, while on the other hand reducing administrative burden and facilitating trade. To meet these challenges, customs administrations are adjusting their regulatory supervision models. They increasingly rely on the compliance efforts of the companies themselves [1]. This often involves a so called system-based approach to regulatory supervision, which – by contrast to the currently dominant transaction-based approach – takes the entire system of internal controls into account [2]. This includes the way in which companies choose to collaborate in a value chain, their business processes and logistics operations, as well as their information systems and security devices.

In practice, those companies that can demonstrate to be 'in control' of the risks, are recognized as so called trusted traders and receive benefits in terms of reduced inspections [3]. Certification schemes exist to recognize trusted traders, like AEO in the European Union. However, supply chain risks and challenges, such as sustainability or resilience, affect the entire trade lane and can't be solved by individual companies alone. For this reason, recent vision documents suggest a customs supervision approach that is based on the concept of a *trusted trade lane* [4]: a collaboration of supply chain partners who maintain a system of control measures in order to cover the risks of the entire trade-lane, which makes the trade lane trustworthy, both to the authorities and to commercial partners. It is an open question how to characterize a trusted trade-lane. Regulators are actively debating this issue.

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In this paper we discuss what it would mean to form a trusted trade lane and how trustworthiness can be demonstrated. What makes a group of trading companies trustworthy to themselves, their commercial parties and to the authorities? Based on a discussion of the literature on supply chains, regulatory supervision and internal controls, and extrapolating from observations about current trusted trader initiatives like AEO, we propose a set of essential characteristics of a trusted trade-lane.

It is uncertain how the companies in a trade-lane will organize themselves and how they will demonstrate to the regulator that they are trustworthy. In particular, we see several scenarios ranging from a dominant party scenario, in which a company forces its suppliers to join and adopt the necessary controls, through a cooperative scenario, offering services to its members, towards a data-driven scenario in which patterns of behavior can be identified to show trustworthiness empirically.

To validate the proposed characteristics, we have held an evaluation workshop with supply chain experts. In addition, we compare the scenarios with observations from three real-life demonstrator projects that aim to develop supply chain visibility infrastructures, see e.g. [5]. These can be seen as real-life cases.

The remainder of the paper is structured as follows. Section 2 identifies essential characteristics of trusted trade-lanes. Section 3 develops several scenarios for setting up and demonstrating trustworthiness. Section 4 discusses the evaluation workshop. Section 5 contains some early observations made in the context of three demonstrator projects that will serve as initial validation of the characteristics.

2 What are Trusted-Trade-lanes?

In general, why do people obey the law? Economic approaches to regulation assume that parties calculate what is in their best interest. A violation may lead to a sanction, so the decision to violate a norm is made on the basis of the expected likelihood of being caught and the severity of the sanction. However, experimental research shows that subjects are more than economic agents [6]. Citizens, or companies for that matter, have all kinds of additional motivations to obey the law: economic, social, ethical but also practical. An important practical aspect concerns the costs of compliance. New regulatory approaches try to reduce costs of compliance, based on the idea that for a subject to be compliant, he or she must (i) know the regulations, (ii) must be willing and (iii) must be able to comply, see OECD [7]. For this reason, much effort has been put into making it easier to be compliant, for instance by reducing complexity of regulations, or introducing a single-window [8]. In the remainder of this section we briefly review literature on regulatory supervision, that is relevant to the regulatory approach adopted by customs administrations.

Self-regulation. The regulator has delegated some regulatory tasks to the party being regulated: setting the norm, implementing the norm, and monitoring [9]. Only a kind of meta-supervision, to test whether the company is indeed ‘in control’ remains. Self-regulation makes sense when the interests of the company are aligned with those of society, for example in work safety regulations, where companies also benefit from a reduced number of accidents. This also holds for security in international trade.

Responsive regulation. The regulator has a choice how to respond to subject behavior. The response (e.g. education, feedback, warning, penalty) is based on the specific compliance behavior of the party being regulated [10], page 35. For instance, incidental violations may lead to a warning, but do not immediately lead to a penalty. Repeated violations, however, do lead to sanctions. They show a breach of trust.

Risk-based regulation. The regulatory response takes the risk for society into account [11]. A higher risk leads to a more severe response. For example, in the customs domain, risk assessments determine whether a container will be selected at the border for scanning or for physical inspection. The assessments are based on data from the Entry Summary Declaration (ENS), which must be filed by the carrier 24 hours before loading the goods at the port of departure.

System-based regulation. This type of regulatory supervision takes the entire system of controls into account that influence the processes and systems that generate the behavior [2]. This approach is opposed to transaction-based supervision, commonly used for fiscal matters and therefore also for many customs supervision tasks. A particular example of system-based supervision in the supply chain domain is the self-assessment and review procedure to obtain the AEO certificate (see below), but it is also common for supervising specific customs licenses, like a bonded warehouse. Such licenses are only granted after a full IT audit of the relevant systems, processes and organizational measures.

2.1 Customs supervision: mixed methods

These regulatory approaches from the literature are rather abstract. How can these be combined into a practical approach? The key is to distinguish different categories of subjects, or in this case, different streams of goods, and treat each of these differently.

The Netherlands Customs Administration has laid down its vision on regulatory supervision for the future [4], also visible on Youtube. Figure 1 shows a screenshot. The customs administration already makes use of mixed regulatory methods. For all streams, a combination of administrative checks, physical inspections, and X-ray scanning is used, but the relative proportion of methods depends on the type of trader. This is illustrated in Figure 1. White dots show information. On the basis of pre-arrival data, the stream of goods is separated into three kinds.

- Blue: unknown trader (traditional). Only origin and goods description are known. Mostly physical inspections and additional X-ray scans. Administrative verification for fiscal matters. Note that physical checks are more resource intensive and typically lead to logistics disruptions and delays.
- Green: trusted trader (AEO since 2007; customs licenses). Mostly administrative verifications, with occasional audits or physical inspections to verify reliability.
- Yellow: trusted trade lane (future). Mostly administrative verification of data from supply chain visibility platforms (data pipeline). Occasional audits or inspections to verify reliability.

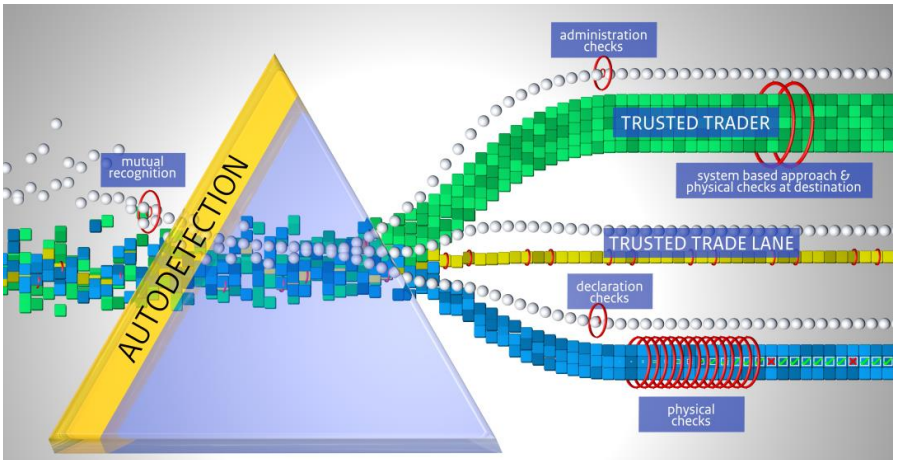

Fig 1. Customs Administration of the Netherlands' vision on regulatory supervision.

2.2 On trust and control

Supply chain parties collaborate in a network. Parties depend on each other. Parties must therefore trust each other. Trust is originally seen as a personal attitude or characteristic of a person (trustor) towards another person (trustee), but it can also be attributed to an organization [12]. Here we will follow the economic literature, which defines trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" [12] p 712. Trustworthiness, on the other hand, depends on properties of the trustee. Traditionally these properties are ability, integrity, and benevolence [13].

How can parties improve their trustworthiness? They have to signal that they possess these properties. But what is the value of a signal from the trustee itself? This explains the need for an independent auditor to assess reliability of reports. To do so an auditor requires certain precautions built into the organization, processes and information systems: internal controls [14]. Consider for example segregation of duties, an audit trail, access control, baseline security, supervision and monitoring, etc. In practice an auditor – or customs officer – must verify whether the system of internal controls of a company is adequate to meet the risks in that line of business, whether it has been properly implemented and has been operationally effective for the duration of the period under investigation. Only under such conditions, the regulator may rely on the records of the company. This suggest a form of self-regulation, where the internal controls are specified, implemented and monitored by the company. Only a form of meta-supervision remains for the regulator [1]. The reason is that controls are highly context dependent. A regulator cannot specify beforehand precisely which controls are necessary in, say, the petrochemical industry.

2.3 Trusted Trader

A trusted trader is a trading company that is officially recognized by the authorities to be trustworthy. The concept was made popular by the SAFE framework of standards, that is influential in customs supervision [3]. In principle, distinguishing trusted from non-trusted traders allows the regulator to redirect its efforts to those subjects, which pose a higher risk to society. In return, the trusted trader may expect benefits in terms of reduced administrative burden (less inspections; less uncertainty).

A well-known example is the AEO framework that operates in the European Union since 2007 [15]. To become Authorized Economic Operator (AEO), a company must demonstrate the following properties: customs compliance, appropriate record-keeping, financial solvency and, where relevant, appropriate security and safety standards. Similar initiatives exist elsewhere, such as Australia, or the US CTPAT.

Countries have developed different ways of granting AEO status. For example, the CTPAT scheme in the US is based on inspections with detailed checklists. Initially, The Netherlands and Sweden were among the few countries that opted for a self-assessment of the risks and controls, followed by an audit. However, the UCC, the upcoming new customs legislation, has now also adopted the self-assessment model. Moreover, AEO status will now be a necessary requirement to obtain other customs simplifications. One could say that the AEO initiative is relatively successful. For example, in 2014 AEO operators were involved in 54% of imports, 68% of exports and in 54% of transits[1]. Is that enough to meet the regulatory challenges of today?

There have also been complaints about AEO. For example, the European Shippers Council (ESC) filed a manifesto (July 2014), to express dissatisfaction with the way the AEO framework is being operated. The perception is that there are not enough benefits in terms of trade facilitation and reduced administrative burden to counter the investments in internal controls. There is no legal certainty attached to the certificate.

2.4 Challenges for supply chains

The trusted trader concept is directed to individual companies. However, companies cannot solve the risks and challenges that face international supply chains by themselves. Some form of public-private collaboration is necessary [16].

- **Supply chain visibility** concerns awareness of and control over end-to-end goods movements in supply chains – including insight in sources of data and whereabouts of goods – enabling agile, resilient, sustainable as well as compliant and trusted supply chains [17]. Stakeholders may have limited control over end-to-end movements. They may have outsourced tasks or only contribute to part of the chain. Supply chain visibility can be achieved by sharing sensor data (e.g. using Internet of things [18]), and by sharing data extracted from trade documents. It requires uniform semantics. A particular approach to achieve data visibility is the vision of a data pipeline [5].
- **Sustainability**. Collaboration in a supply chain was always motivated by the economic need not to waste resources [19]. Later environmental and social

[1] Fact sheet European Union: http://ec.europa.eu/taxation_customs/

concerns were added as objectives in their own right. Collaboration is necessary to achieve these objectives. Consider the carbon footprint of a product. Efforts to reduce transport emissions are useless if production produces ten times as much. In order to detect and address inefficiencies, information needs to be shared.

- **Supply chain resilience.** Resilience is the ability of a supply chain to respond to disturbances by resisting damage and recovering quickly [20] By collecting data with respect to the environment and subscribe to particular events signaled by external providers, an organization will be able to take proper mitigation measures. In general, resilience also requires a way to handle dependencies and reduce complexity. For instance, try to do things locally if possible [21].

Note that information sharing and supply chain visibility also contribute to solutions of the other challenges. Parties need to communicate to overcome these challenges.

2.5 Characterizing Trusted trade-lanes

What makes a trusted trade lane? What are the essential characteristics?

First, the notion of a trusted trade lane is an extension of the trusted trader concept. If we extrapolate on the current practice of assessing and granting AEOs, we can expect a focus on risk and controls, self-assessment and audits. In particular, there are two kinds of controls that matter in the customs domain. (a) Physical controls are needed to secure the goods. Essentially, customs supervision is about integrity of the flow of goods [3]. Measures must be taken to prevent adding goods to the flow (smuggle) or taking goods out (theft). Consider for example container security devices (CSD), RFID devices to establish a causal chain between the goods and their records, or a secure consolidation point as part of the logistics operations. (b) Administrative controls are needed to make sure customs can rely on the records. Compare the objective of 'appropriate record keeping' for AEO. Consider for example a data visibility infrastructure, which provides access to data from packing list, pro-forma invoice, purchase order, certificates, etc. [5].

Second, the notion involves an entire trade lane, so a group of companies which collaborate together. For this reason, the stability of the collaboration itself affects trust [12], see also [16]. Parties who invest in a trade lane, depend on each other. We expect that members will also have to be individually trustworthy.

Third, the task of implementing controls to mitigate global supply chain risks creates a fundamental challenge, as traditionally controls are internal and are the responsibility of central management, and do not cover inter-organizational aspects [22]. In practice, under this view, a trade lane requires some governance structure, to identify risks and assign controls to mitigate those risks to specific partners. There is not much literature on distributing risks and controls in networks, except for [23].

Moreover, because being part of a trusted trade lane will have legal consequences (e.g. benefits in reduced inspections) it is likely that some party will have to act as legal representative of the trade lane, for instance to request to be recognized as such. Some party will also need to do secretarial duties, record which partners have entered and have left, and help to collect revenues, distribute costs, and generally organize and assign tasks, such as internal and external communication.

Thus we identify three essential characteristics of a trusted trade-lane. These properties must be demonstrated, for a trade lane to be considered trustworthy.

(1) Members are known and individually trustworthy.
(2) There is long-term and stable collaboration among members, motivated by a viable business proposition, and coordinated by a governance structure that provides a party who can act as legal representative.
(3) There is an adequately designed, well implemented and operationally effective system of control measures to ensure
    (a) physical integrity of the goods, and
    (b) reliable trade data, to be made available to the authorities.

3 Scenarios

It is unknown in which way trade lanes will choose to demonstrate to the regulator that they are trustworthy. An analogy can be dawn with the early days of the AEO initiative, in 2007, when no guidelines were given on how to adopt the requirements. We envision various scenarios. Some scenarios are based on formal controls, whereas other scenarios could be based on data analytics to analyze behavior and establish trustworthiness empirically. In practice, there will probably be mixtures of both.

Dominant party scenario. In many industries, a commercially dominant party drives innovation by forcing its suppliers to adopt specific technologies. Such a player can take the role of supply chain orchestrator and can act as representative for a trade lane. Steinfield et al [24] call this a private coordination hub.

Suppose a manufacturer extends its efforts of supplier selection to also include customs compliance, in additional to usual selection criteria like cost and product quality. The data that needs to be shared to make this happen is also used for risk analysis by customs and other regulators (piggy backing) [25]. In this case, the business case is based on that of the dominant party. As suppliers are dependent, they have to follow. The information technology is expected to be proprietary.

Data-driven scenario. Partners innovate their supply chain and logistics operations by implementing technology that allows them to collaborate and share data reliably, facilitated by a platform that acts as a kind of information broker. Consider a kind of Uber or AirBnB for logistics services. There is a commercial reason to join the platform, for example to reduce uncertainty and delays. In this way a network of small specialist companies can jointly offer sophisticated services. Steinfield et al [24] call this a shared coordination hub. Data from the platform can be re-used for regulatory purposes (piggy backing) [25]. The host of the platform acts as a legal representative, or helps to elect a representative.

The controls to make the network trustworthy are embedded in the business model of each stakeholder and in that of the platform host; they are not added for the sake of regulatory compliance. Collaboration can be relatively dynamic, with parties entering and leaving the network as they see fit. Because of this dynamics, the software applications for information exchange can only be built on open standards.

Cooperative scenario. Supply chain partners collaborate with each other and with public agencies to improve compliance and reduce administrative burden. Trust is based on acquaintance. Formal agreements are drawn up at a later stage. Business cases are developed, but are based on estimates only. Subsidies may be necessary to overcome an initial hurdle. Technology for information exchange only follows after the agreements have been made, and is therefore likely proprietary.

For example, imagine a cooperative (such as the Flora Holland flower auction house) acting as representative. Member firms are legally independent of the cooperation, but Flora Holland can offer 'assurance' services to its members, and may make membership conditional on certain requirements. Flora Holland would have substantial influence over its members; enough to warrant increased trustworthiness.

These scenarios are characterized by different organizational structures of power or influence (Figure 2). For example, we foresee a hierarchical, peer-to-peer, or a hybrid membership topology. In each case, different kinds of partners will act as a representative. For example, the dominant partner scenario will have a hierarchical topology, with a clear representative, who is also in a position to distribute risks and controls. By contrast, the data-driven scenario has a peer-to-peer topology. There is no dominant partner, and whoever acts as representative is elected. The cooperative scenario has a structure of membership that implies influence, but no formal power.

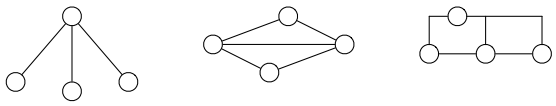

Fig 2. Network topologies: (a) hierarchical, (b) peer to peer, (c) membership

4 Evaluation Workshop

In order to discuss what constitutes a trusted trade-lane we organized a workshop, held in the context of a meeting of the European project CORE [25]. It was held in Leiden on 9 December 2015. The audience consisted of about 20 participants, including representatives from businesses, branch organizations, research institutes and several customs authorities; all were experts on safety and security for international supply chains. An introductory text was distributed among participants with two questions to be discussed in small groups.

(1) How do you define a trusted trade lane? Mention five essential characteristics that make a trade lane trustworthy, to commercial partners and the authorities.
(2) You are working on a specific case. Please consider how your approach helps to demonstrate that a trade lane is to be trusted.

Although there was limited time, groups were actively discussing. In response to question 1, the groups suggested characteristics. All of the mentioned characteristics can be seen as rephrases of the characteristics (1)-(3) above. For example, several groups listed supply chain visibility, which corresponds to 3(b). In response to question 2 several practical suggestions were made, which also helped to further detail the scenarios explained above. In particular, suggestions were made about

dealing with risk and control in networks. Groups were actively discussing the notion of a trusted trade-lane and the expected advantages and disadvantages. The following issues were raised in the discussion.

Issue 1. What trade facilitation will be given to a trusted-trade lane? There is already some dissatisfaction among shippers about the current AEO framework, witness the ESC Manifesto (July 2014). The customs response to this concern, was that a trusted trade-lane should first of all be trustworthy for commercial reasons, because there is a business proposition in being more reliable. Once established, a trusted trade-lane can be recognized by the customs authorities as such, and once demonstrated, reliability can be translated into reduced inspections.

Issue 2. Talking about supply chain visibility requires a common understanding of the way a supply chain is functioning. We have to consider the fundamentals of supply chains, so that standards can be agreed on to share information. Syntactic interoperability is not enough; it also concerns the meaning and practical usage of the data. In addition, we need to standardize how to define and assess risks.

Issue 3. Extrapolating from experiences with the AEO initiative, we expect that the recognition process of a trusted trade lane will be a kind of dialogue between businesses and customs. In this process businesses need guidance on what is expected, otherwise there will be no level playing field. The response by customs was that it is too early for guidance. First companies must take the initiative and develop best practices. We must find out what the characteristics of a trusted trade-lane are.

Issue 4. Do we really need a legal representative and what does it mean to be a representative? Participants agreed that the representative would not have to be legally liable for what members of the trusted trade-lane are doing, but must be responsible in some sense. For example, Flora Holland are not officially importing the goods; the growers do. However, as a cooperative they can take some responsibility for their members. Note in this respect that they import under DDP or CIF incoterms.

Issue 5. To be trustworthy as a trade lane, it is crucial to reduce variability. Delays can be handled, as long as they can be predicted. Variability leads to unpredictability and uncertainty. Reducing variability has large additional benefits, which may be the dominant business driver for a trusted trade lane.

5 Observations from Demonstrator Projects

In this section we describe three initiatives to develop supply chain visibility infrastructures, which are studied as demonstrators or living labs in the CORE project [25]. The demonstrators can be seen as cases of potential trusted trade lanes. In general, the case study method makes sense when research is exploratory and the phenomenon investigated is intertwined with the context [26]. That is the case here.

The cases were selected by convenience: from a total of nine demonstrator work packages we selected active demonstrators where we have access to informants. Note that demonstrators in a large EU project are a kind of subsidized experiments. Properties of collaboration in a project may differ from purely commercial initiatives. Nevertheless, the technical and governance issues that need to be tacked are the same.

Data was collected by participating observation, as the authors are also part of the CORE consortium, and by lengthy unstructured interviews with key participants. In particular, we spoke with representatives of the Netherlands Customs Administration.

Earlier we noted that supply chain visibility is a prerequisite for solving other supply chain challenges, besides customs compliance. That is why these supply chain visibility initiatives are indeed potential cases of emerging trusted trade lanes. We look in particular at three of the essential characteristics of a trusted trade lane: (1) governance structure, (2) business model and reason to collaborate, (3) IT infrastructure. At this stage in the project, it is too early to say much about the controls for physical integrity and data reliability and how these are to be achieved.

Case 1. **SIP.** This case is about the Shipping Information Pipeline (SIP), that is developed by MAERSK. The goal is to position SIP as a 'common good' type of connectivity infrastructure: costs will be shared by MAERSK with the other stakeholders, namely the global ocean carriers, global terminal operators and even freight forwarders. For such large players, standardization and a common infrastructure to share data is potentially very beneficial. (1) Based on the current market position, MAERSK can be seen as a dominant party. We observe a hierarchical structure. However, in the long run, the service could develop into a kind of information broker. (2) Initially, parties will join because MAERSK induces them to do so, but if the platform is successful and becomes a de facto standard, there will be additional business reasons to join. (3) The information technology is based on open standards. However, the data set that will be shared is relatively limited. It will mostly concern data about events, such as data about departure and arrival times, or data about opening and closing the container. So the scope of the project is limited.

Case 2. **Flora Holland**. This case is about the *Flora Holland* auction house, which is responsible for several large trade lanes of cut flowers being transported from Kenya to the Netherlands, either by air, or recently also by refrigerated sea container. The pilot project aims to build a customs dashboard for sharing data from official trade documents to facilitate administrative checks and border controls: export declaration, phytosanitary certificate, pro-forma invoice (which contains much of the data required by customs) and various types of event data. (1) Flora Holland is a cooperative, who want to offer new services to their members, the growers. Hence we find a membership structure. There are also contractual relations to commercial partners. (2) Members have joined the pilot project because they are curious about the results and because they want good relations with the Netherlands Customs Administration, who actively support the project. In the long run, it is expected that commercial benefits of data visibility may be demonstrated, in particular reduced delays, reduced uncertainty and less administrative burden. (3) The information technology is based on open standards, but needs to be connected to proprietary systems. This is not trivial, as we have to coordinate several regulators (customs and plant protection organizations), each with their own standards and practices.

Case 3. **Felixstowe.** This case is about a data pipeline initiative that is supporting four different trade-lanes that run through the port of Felixstowe. Members have implemented data-pipeline software and connected their proprietary systems. The initiative started in the CASSANDRA project that preceded CORE, but has now been

taken on by commercial players. In particular, the Destin8 port community system has taken the role of information broker. HMRC, the British Customs, have not connected to the data pipelines directly, but do want to link their OneGov at the Border initiative. (1) Currently, we find an ad-hoc power structure, based on the governance of the pilot project, and the emerging information broker role of Destin8. (2) Parties have mainly joined for commercial reasons. In some specific cases commercial benefits of improved data visibility have already been demonstrated. Improved control over the supply chain was said in one case to have resulted in a 30% reduction of supply chain costs. (3) The pipelines are run by separate commercial parties, but they all use the same data model and interoperability standards, based on UN/CEFACT and WCO data model. So here too, standardization is crucial [16].

6 Conclusions

In this paper we discuss the concept of a trusted trade lane. Trusted trade lanes will be identified by customs authorities using a system-based approach to regulatory supervision: the entire system of controls in processes, systems and logistics operations is taken into account, including in particular commercially motivated controls. We identified three essential characteristics of a trusted trade-lane: members must be individually trustworthy, there must be a stable collaboration and governance structure, and a system of control measures must ensure physical integrity of the goods and reliable trade data, to be made available to the regulator.

We have held an initial evaluation workshop, which confirmed these characteristics, but also raised issues for discussion. In particular, guidance is needed on how to become a trusted trade-lane. Reduction of variability is likely to be a business driver. To arrive at a trusted trade-lane, we envision different scenarios. We consider a dominant party forcing its suppliers to be more reliable, a cooperative providing services for its members, or a data-driven scenario facilitated by a platform.

Elements of these scenarios were also identified in three demonstrator cases, as they are studied in the CORE project. In particular, we find evidence of a hierarchical scenario, and a cooperative scenario. A data-driven scenario may develop from current commercial initiatives for information brokers.

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