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Design and Analysis of e-Government Control: the Green Corridor between Finland and Russia

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Abstract
Confronted with the pressure of increased security threats and financial fraud, Customs administrations worldwide changed regulations and added restrictions to international trade in recent years. At the same time, governments also want to reduce the administrative burden for businesses in order to create an economically competitive zone. The EU is now implementing e-government ideas in new procedures. An important issue in designing new customs and trade procedures is whether the new procedures mitigate control risks. In this paper we present a model-based approach to support domain experts in investigating whether (redesigned) customs procedures mitigate control risks. We describe a methodological application of our "AAD", or Actor-Activity-Document approach of control principles from accounting and auditing literature, to analyze trade procedures. As a proof of concept, we apply our "AAD" approach to the case of the Green Corridor between Finland and Russia.

Keywords: e-Government, e-Customs, inter-organizational control, procedure redesign, G2G collaboration, public-private (G2B) partnership

1 Introduction

Global trade is vulnerable to terrorist exploitation and financial fraud. Confronted with increased fraud, health risks and terror threat, customs administrations worldwide added new restrictions to international trade in recent years. A major challenge for European governments is to solve the dilemma of providing increased security and control for international trade, while at the same time decreasing the administrative burden of commercial and public administration organizations. ICT is broadly perceived as a key enabler for solving this dilemma and designing new government procedures. However, the (re)design process should also ensure that the ICT-based e-government procedure is still in control, in another word–manages to mitigate risks.

Customs control is a special case of government procedures. In this paper, we analyze a redesign of customs control procedures, replacing paper-based procedures by ICT-based ones while coping with business and administrative challenges. As a tool for redesign we deploy e^3-control, a model-based design and analysis approach using two levels of

abstraction: value and process perspectives. Kartseva (2005) proposed to design control procedures by focusing on *value exchanges* in a network, because controls safeguard the transfer of values between actors. Liu et al. (2006) proposed to combine the value perspective with a process perspective because control is a process element, and because the value perspective is not rich enough for actual control mechanism design. Here, we describe a systematic approach for performing the process level analysis. Our "AAD" approach, or Actor-Activity-Document approach is based on control principles from accounting and auditing literature, to redesign control procedures. We present our approach and its application using the case of the *Green Corridor (GC)* between Finland and Russia. The uniqueness of this case is that it manifests both pillars of modern customs, identified by the World Customs Organization: government-business (G2B) partnership and government- government (G2G) collaborations (WCO, 2005).

This paper is organized as follows. First, in Section 2 the e^3-control procedure design and analysis approach is presented. Our "AAD" approach for process level analysis is also discussed in this section. In Section 3 we apply this approach to the Green Corridor. Finally, in Section 4, conclusions and further research directions are given.

2 e^3-control: A Modeling Approach for Designing Controls

2.1 Notes on Research Methodology

Our research approach relies on traditional qualitative research methodologies in IS, and at the same time introduces elements that are new to qualitative and quantitative research. First, the nature and role of theory. Our approach is based on semi-formal conceptual models that represent an agreed upon understanding of the domain at hand. Hence we view a conceptual model (represented using some degree of formalism) as a theory, and its validity is assessed in case studies. Second, the definition of scientific aims. Qualitative and quantitative research aim at explanation/interpretation. In contrast, our approach aims at problem solving and innovation in business and industry practice. Thus, our aim is closer to what Hevner et al. (2004) call design science in IS.

2.2 Modeling on Two Perspectives: Value and Process

Kartseva et al. (2005) propose that the design of controls should focus on economic value exchanges among organizations. A value perspective helps understand the primary purpose of control mechanisms. They present the value-based e^3-control approach to design inter-organizational control mechanisms. They focus on the economic interests of network actors, and use the e^3-value notation (Gordijn & Akkermans, 2001) to visualize business models.

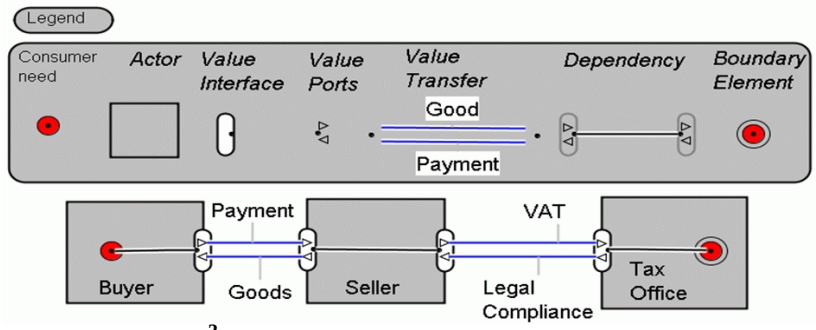

Figure 1: Example of an e^3-value business model of a purchase with tax payment

Figure 1 is an educational example e^3-value model. A buyer obtains goods from a seller in return for a payment. By law, the seller is obliged to pay value-added tax (VAT). **Actors** (e.g., buyer, seller, tax office) transfer **value objects** (payment, goods, VAT) by means of **value transfers**. For value objects, some actor should be willing to pay, as shown by a **value interface**. A value interface consists of **value ports**, which represent that value objects are offered to and requested from the actor's environment. The scenario starts with a **start stimulus**, in most cases presented as consumer need, which, following a path of **dependencies** will result in the transfer of value objects. Transfers may be dependent on other transfers, or lead to a **boundary element,** which finalizes the scenario. For a detailed description refer to Gordijn & Akkermans (2001; 2003).

Kartseva et al. (2005) suggest that design of inter-organizational controls should include *ideal* models (business models with no fraud or opportunistic behavior), *sub-ideal* models (with fraud or opportunistic behavior) and a *control* model (business model where the sub-ideal situations are mitigated). All three steps use a value perspective. We argue that while a value analysis is important to understand the benefits of controls, it is not rich enough to identify control problems and offer solutions. A process perspective has to be added to the above approach. A number of reasons support our proposition. First, control is defined as a process (COSO, 1992). Second, the existing knowledge base of control assumes a process perspective [e.g., Bons et al.(1999); Romney & Steinbart (2003); Arens & Loebbecke (1999)]. Third, in our experience with domain experts (e.g., business mangers, auditors), the process perspective is more natural for them. The two perspectives address different issues, both of which are required. A value perspective describes *which* value transfers control mechanisms safeguard. However, as it does not describe *how* these values are transferred (a process element), it is not suitable for designing operational solutions, i.e., control mechanisms.

We therefore conclude that to apply governance and control, a detailed process level analysis is required. Our four-step approach (Figure 2) adds to earlier work by combining analyses at both levels of abstraction: a value perspective [who provides what to whom in return for what in a network, as suggested by Kartseva et al. (2005)] and a process perspective [how the above is realized, as done by e.g., Bons et al.(1999), Romney & Steinbart (2003)]. Furthermore, we present a methodology for performing the process-level analysis, grounded in auditing and accounting theories.

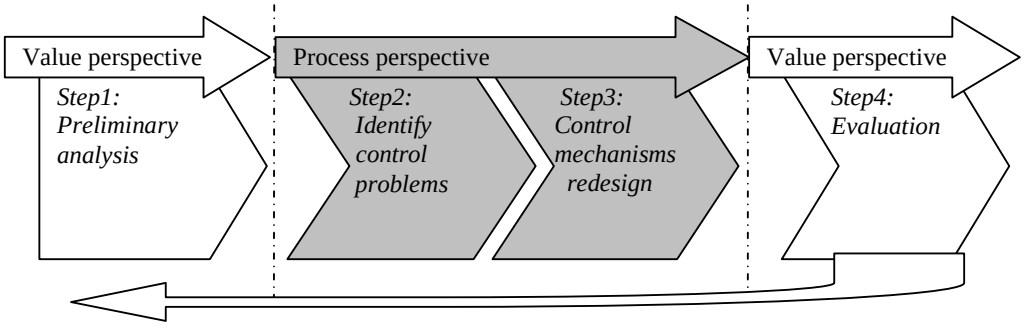

Figure 2. Value & process perspectives combined redesign approach

2.3 (Re)Designing Controls in Four Steps

Our four-step approach is visualized in Figure 2. In step 1 we use a value perspective to describe an initial business model and to analyze which economic values are exchanged

by actors, and we identify the *critical* value transfers that should be safeguarded by controls. At the moment we use no quantitative risk assessment scheme, and rely on domain experts to identify these critical value transfers in interviews and/or workshops. Our approach deviates from Kartseva et al. (2005) already in this stage. We consider the current situation where existing controls have already been taken into account, whereas in Kartseva et al. (2005) controls are considered only in later stages. In the next two steps we perform a process level analysis. By focusing on critical value transfers we reduce the work in steps 2 and 3 to a manageable level. In step 2 we investigate the business processes that realize the critical value transfers (rather than the whole business model). We study how current controls safeguard these value transfers, and identify control flaws by applying control principles from auditing and accounting. In step 3 we add/change control mechanisms according to process-level control principles, resulting in a redesign of business processes. Having introduced new controls may change the business model, as controls can be offered as commercial services and cause value redistribution in a network. Therefore we draw a new business model (value perspective) in step 4, and evaluate its financial feasibility and network sustainability. If the evaluation shows a negative result, we go back to step 1 for a new iteration. Step 1 and step 4 (value perspective) were discussed in Kartseva et al. (2005) and Baida et al. (2007) respectively. Here we focus on the process perspective (steps 2 and 3).

2.4 The AAD (Actor, Activity, Document): Model of Designing Controls at Process Level

The AAD approach systematically applies principles for control (re)design and analysis. It is a supporting tool for executing steps 2 and 3 of e^3-control. As it is based on a *semi-formal conceptualization* of control principles, it can serve as a basis for developing decision support tools to support the human domain experts. Here we do not refer to software tools that completely automate the design of controls, but rather to tools that would apply known rules to complex situations, and will signal control flaws and provide suggestions to the human expert for creating control mechanisms, in terms of actors, activities and documents.

Chen & Lee (1992) apply auditing control principles to design an internal accounting control system, based on seven internal control principles (see Table 1):

1. *If an operational task exists, its corresponding control task should exist as well and should always follow the operational task.*
2. *If a control task exists, it must be furnished by supporting documents. These supporting documents should be the result of a previous control task that directly witnesses the activity to be controlled.*
3. *Supporting documents should be generated by a source independent of the source which generates the document to be verified.*
4. *If a control task uses a supporting document, this should be transferred directly from the control task which verified it.*
5. *An operational task and its corresponding control task should be segregated into two different positions and into two different agents.*
6. *The position assigned to with a control task must not be lower in the formal power hierarchy than the position responsible of the operating task.*
7. *The agents responsible for the operational task and its corresponding control task should be socially detached.*

Table 1. Internal control principles (based on Chen & Lee, 1992)

Bons et al. (1999) transform Chen's principles to an inter-organizational context and analyze controls for trade. They assume independent and non-hierarchical relationships between organizations (thus, ruling out the above principle 6), and pay special attention

to outsourcing activities and to the reciprocal character of contracts. There are several limitations for applying Bons' principles in practice. Mainly, Bons' principles contain the term "trust", which is difficult to quantify and has numerous interpretations (T3-Group, 2005). "Trust" cannot be controlled, thus considering it as control factor creates barriers for understanding and applying controls and for designing IS support.

Former research [e.g., Mautz & Sharaf (1961), Chen & Lee (1992)] showed that people are the deciding factor for effectiveness of internal control, and that the nature of internal control is *people control people* (Chen & Lee, 1992). Yet, control is affected by exchanging information repositories, i.e. documents and records, among tasks. Extending this concept into an inter-organizational context, an effective inter-organizational control procedure should enable a control actor to carry out control activities by means of sufficient and independent documentary evidence[1]. Three facets, namely, *actor*, *activity* and *document* (AAD) can be identified in this observation. These facets have been discussed explicitly or implicitly in literature, including best practices of accounting and auditing (PCAOB, 2004; COSO, 1992; COSO, 2004), organizational theory (Thompson, 1967), transaction cost economics (Williamson, 1985), value chain analysis (Porter, 1985), ISA framework (Sowa & Zachman, 1992; Zachman, 1987), Ontology framework (Leppänen, 2005) and Network management framework (Riemer & Klein, 2006). Yet, only exchanging documents between actors cannot ensure good control; a constraint of independence needs to be noticed. This constraint stems from one of the most fundamental principles of accounting practice – *segregation of duties*: "the separation of assigned duties and responsibilities in such a way that no single employee can both perpetrate and conceal errors or irregularities" (Romney & Steinbart, 2003). A further analysis of control literature [e.g., Starreveld (1985), Chen & Lee (1992), Romney & Steinbart (2003) and Schaad (2003)] shows that we can distinguish three types of each facet: Actor – *Responsible actor*, *Evidencing actor* and *Control actor*; Activity – *Operational activity*, *Evidencing activity* and *Control activity*; Document – *To-be-verified Document*, *Supporting Document* and *Verified Document*. By identifying actors with corresponding activities and documents, effective inter-organizational control can be conducted. The AAD components are given in Table 2.

Actor	An actor is a person, or a group of persons (organizations) that plays a role or performs certain activities to achieve its objectives based on mutual cooperation with other actors in the network. Actors are responsible for and/or responsive to triggering and causing changes in the states of objects. They are aware of their intensions and able to react to fulfill their goals (Leppänen, 2005).
Responsible actor (R-actor):	The actor who performs the operational activity to be controlled and is responsible for the activity being promised (operational activity).
Evidencing actor (E-actor):	The actor who witnesses the execution of the operational activity and testifies the completeness, accuracy and compliance with organizational policies and rules of the operational activity. (The E-actor can be seen as a delegatee of the control actor)
Control actor (C-actor) :	The actor who has a direct interest of controlling the operational activity executed by the responsible actor.
Activity	An activity is undertaken by an actor who is motivated towards solving a problem or achieving certain objectives, and mediated by certain tools (e.g., documents) in collaboration with other actors (Ryder, 1998).
Operational activity (O-activity):	Perform the basic business operations to achieve certain business value or some operational goal, e.g., business transactions.
Evidencing	Witness the execution of the operational activity and testify the completeness, accuracy and

[1] If the control actor can directly witness the execution of the operational activity (e.g. direct exchange of money and goods) then this documentary evidence will not be necessary. Experience shows that in most cases under inter-organizational context (e.g. internet transaction and international trade) such direct witnessing is not possible.

activity (E- activity):	accordance with organizational policies and rules.
Control activity (C- activity):	Reconcile and verify records, documents or messages sent from the responsible actor and evidencing actor.
Document	Document denotes all information contents passing among actors. Each document is directed to a corresponding activity. It includes different forms like paper documents, records, or electronic messages.
To-be-verified Doc.	The document issued by the responsible actor to prove his completion of the operational activity.
Supporting Doc.	The document issued by the evidencing actor after an evidencing activity, which supports the control actor executing control activity if he/she could not directly observe the performance of the operational activity.
Verified Doc.	The document issued by the control actor after verifying/reconciling the To-be-verified Doc. and Supporting Doc., from which a conclusion of an effective control can be drawn.

Table 2. The AAD components

We combine Chen's and Bons' principles using AAD concepts to formulate our AAD control principles listed in Table 3. Figure 3 is a UML-based visualization of the AAD control model. Although the figure does not strictly adhere to the UML Activity Diagram notation, we can see three *swinlanes* (columns) reflecting a responsible actor, an evidencing actor and a control actor. Every actor performs certain activities (rounded rectangles in the actor's swinlane) and transforms documents (rectangles). Arrows denote the order of activities and documents. Similarly, Figure 4 is a *use case* description of the AAD control model in case the C-actor cannot witness the O-activity.

1. *If an Operational activity exists, its corresponding Control activity must exist as well and should always follow the Operational activity.*
2. *If a Control actor cannot directly witness the execution of the Operational activity, the Evidencing (witnessing) activity should be delegated to an Evidencing actor (trusted third party)*
3. *If an Evidencing (witnessing) activity exists, it must be furnished by Supporting documents.*
4. *These Supporting documents should be the results of an Evidencing (witnessing) activity that directly witnesses the Operational activity.*
5. *Supporting documents used by the Control activity should be transferred directly from the Evidencing actor to the Control actor.*
6. *The Evidencing actor who generates Supporting documents should be independent of the responsible actor who generates the To-be-verified document.*
7. *An Operational activity and its corresponding Control activity should be segregated into two different positions and done by two different actors.*
8. *The actors responsible for the Operational activity and its corresponding Control activity (respectively, Responsible actor and Control actor) should be socially detached.*

Table 3. AAD control principles

In order to apply the AAD model we developed a checklist (presented in the next section) which can help domain experts identify control problems and redesign control mechanisms. We refer to the AAD control principles, control model and checklist as the *AAD approach*. The application of this approach in a real-world setting is discussed in the following section.

3 Case Study: Green Corridor between Finland and Russia

Finland has the longest EU border with Russia. 1300 trucks cross this border daily. Due to the slow import clearance and inspection procedure of Russian Customs, truck queues of 15-25 KM are common at the border (Finnish Road Administration, 2007), while whole supply chains are brought to a halt. These long delays cause direct financial losses to involved businesses, especially for perishables. Due to high volumes of trade,

100% physical control at the border is too labor intensive and no longer practical. The traditional procedure needs to be redesigned. We consider the following actors in this paper: (1) Finnish export company; (2) Russian import company; (3) carrier, a transport company that physically transports goods from Finland to Russia by trucks; (4) Finnish Customs; and (5) Russian Customs. We analyze a procedure redesign in four steps as we proposed in Section 2.

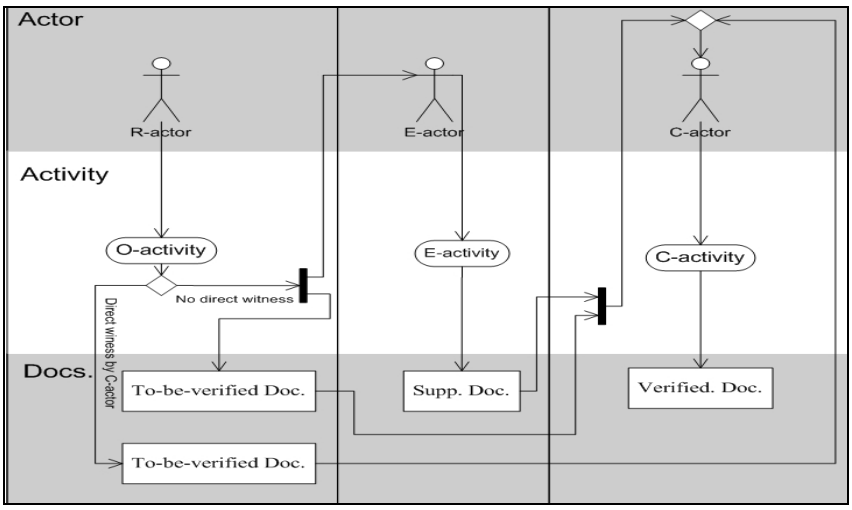

Figure 3. The AAD control model

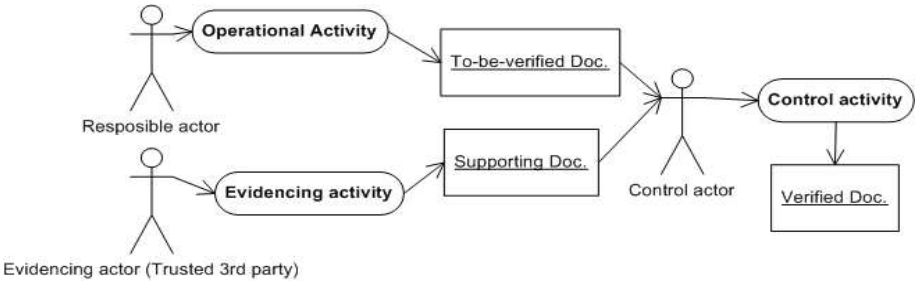

Figure 4. AAD control model: use case description

3.1 Step 1. Value perspective: Preliminary analysis

We take the current business value model as a starting point. This model describes a common understanding among stakeholders regarding *who* is offering *what* with *whom* and expects *what* in return. In the ideal situation (no fraud or opportunistic behavior) the Finnish export company and the Russian importer exchange goods for money. The Finnish exporter pays carriers for transporting goods to Russia, and declares export information to the Finnish Customs to comply with Finnish legislation. Finally, the Russian importer pays import tax in Russia, thereby complying with Russian tax law (the ideal value model is not presented here, but available upon request).

In interviews with domain experts we explored which value transfers in the business model may be violated, and what the severity of violations is. We identified *critical* value transfers: value transfers for which control problems must be analyzed and handled. In this paper we focus on the risk that the Russian importer will not pay proper import tax in Russia. This violation is manifested in the "*double invoicing*" phenomenon. "*Double invoicing*" indicates that Russian companies import goods, and

present the real invoice to the Finnish Customs, but a fake invoice – with a lower amount – to the Russian Customs, so that they pay less import tax. Double invoicing is a common practice in Russian trade. The discrepancy between Finnish export and Russian import statistics was nearly 60% in 2005 (EnterpriseFinland, 2006).

Figure 5 shows an e^3-control model for the sub-ideal scenario of "*double invoicing*", which is indicated by a dashed blue line. In order to see how controls are applied, we move to the next step – a process level redesign.

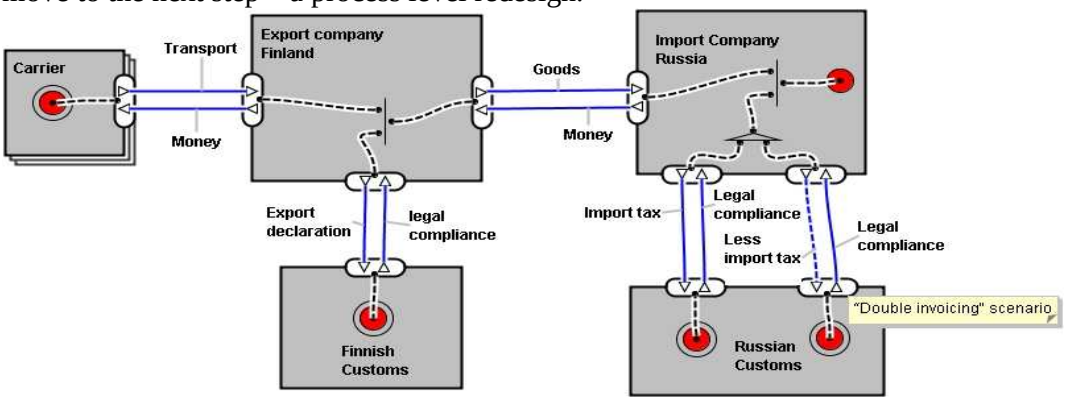

Figure 5. Sub-ideal situation: "double invoicing" problem

3.2 Step 2. Process Perspective: Apply the AAD Approach to Identify Control Problems

In applying the AAD approach to the case study, we first identify AAD components in the scenario (see Table 4). The Russian importer (responsible actor) is responsible for the operational activity (importing goods from Finland and reporting to the Russian Customs to pay the corresponding import tax); Finnish Customs acts as the evidencing actor, to witness goods exported by Finnish companies, based on a purchasing invoice (Purchasing invoice-Finland). As the Russian Customs (control actor) cannot directly (physically) check all imported goods, they perform the control activity based on verifying the Supporting doc. (Purchasing invoice-Russia, which states the value of the goods) and the To-be-verified doc (Import declaration). In the ideal situation, the Supporting doc. provided by the Russian importer should be identical to the Purchasing invoice-Finland, however, the Russian company may give the Russian Customs a fake invoice with a lower value and pay less import tax ("double invoicing"). A difficulty to identify some AAD components is an indication of potential control problems.

Actors			**Activities**			**Documents**		
R-actor	E- actor	C- actor	O-activity	E- activity	C-activity	To-be-verified Doc.	Supporting Doc.	Verified Doc.
Russian import company	Finnish Customs [2]	Russian Customs	Import goods from Finland and pay import tax	Evidence/ witness goods exported by Finnish companies, based on purchasing invoice-Finland	Verify import tax payment	Import declaration	Purchasing invoice-Russia[3]	Import tax Acknowle-dgement

Table 4. AAD components of Finland-Russia trade procedure

[2] Finnish Customs does not act as a good evidencing actor, as it does not provide supporting docs to the control actor.
[3] The Purchasing invoice-Russia used by Russian Customs is actually not a good supporting doc., as it is provided by the Russian import company but not by Finnish Customs.

After identifying the AAD components, the checklist in Table 5 is used to identify control problems. The table consists of three columns: interrogatives of the AAD control principles, specification of components and checking of the compliance. Any "No" in the third column signals a control problem of the Customs procedure.

	Control Principles	**Specification**	**Check (Yes/No)**
P1	*Does the control activity exist and follow the corresponding operational activity?*	Operational activity: Import goods from Finland and Pay import tax Control activity: Verify import tax payment	Yes
P2	*Can the Control actor directly witness the execution of the operational activity? If not, is the evidencing (witnessing) activity delegated to an evidencing actor (trusted third party)?*	No direct witness Control actor: Russian Customs Evidencing actor: Finnish Customs	No direct witness. Yes, the evidencing activity is delegated.
P3	*Is there a supporting document furnishing the evidencing activity?*	Supporting doc. : Purchasing invoice -Russia Evidencing activity: Finnish Customs evidence/ witness goods exported by Finnish companies, based on purchasing invoice-Finland	No, after evidencing export no supporting doc is sent by Finnish Customs to Russian Customs.
P4	*Is the supporting document the result of the previous evidencing activity directly witnessing the operational activity to be controlled?*	Supporting doc. — Purchasing invoice-Russia is not direct evidence by Finnish Customs after witnessing the export of Finnish company	No
P5	*Is the supporting document directly transferred to the control actor from the evidencing actor who witnesses the operational activity to be controlled?*	The supporting doc. : Purchasing invoice -Russia is not provided by the evidencing actor - Finnish Customs , but by the responsible actor, Russian import company	No
P6	*Is the supporting document generated by an actor independent of the actor who generates the to-be-verified document?*	Actor issuing the document to be verified: Russian import company Actor issuing/ testifying the supporting documents: Russian import company	No
P7	*Are the operational activity and its corresponding control activity segregated into two different positions and done by two different actors?*	Operational activity is performed by O-actor: Russian import company Control activity is performed by C-actor: Russian Customs	Yes
P8	*Are the actors responsible for the operational activity and its corresponding control activity socially detached?*	Operational activity is performed by O-actor: Russian import company Control activity is performed by C-actor: Russian Customs	Yes

Table 5. Checklist for applying AAD control principles

The checklist in Table 5 shows that the *AS-IS* customs procedure between Finland and Russia violates control principles 3, 4, 5 and 6, resulting in substantial control problems. Control problems in the current situation are: (1) the evidencing actor (Finnish Customs) does not provide any further supporting documents to facilitate control actor (Russian Customs) after the evidencing activity; (2) the supporting document (Purchasing invoice-Russia) used by the control actor (Russian Customs) is provided by the responsible actor itself, which can be altered and falsified that should not be used as supporting document.

3.3 Step 3. Process perspective: Apply the AAD Approach to Redesign Control Mechanisms

According to the AAD control model, good customs control can be achieved if a supporting document can be provided by the Finnish Customs, acting as evidencing actor, and directly transferred to the Russian Customs as the verification evidence. An example procedure redesign is the *Green corridor (GC)* between Finland and Russia.

3.3.1 Green Corridor

The Green Corridor (GC) is an agreement between Finland, Sweden and Russia. The idea is that Finnish/Swedish companies that sell goods to Russian companies send electronic messages with information about the business transaction to the Finnish/Swedish Customs before the cargo arrives at the border. Then Finnish/Swedish Customs forward this information to the Russian Customs, eliminating the risk of double invoicing. The goods are cleared faster at the border, and involved companies may pay import duties at the customs office at the destination anywhere in Russia. Only certified businesses are allowed to participate in the GC. The Green Corridor procedure is visualized in Figure 6, where flow of information refers to pre-arrival information concerning the business transaction, or acknowledgements thereof.

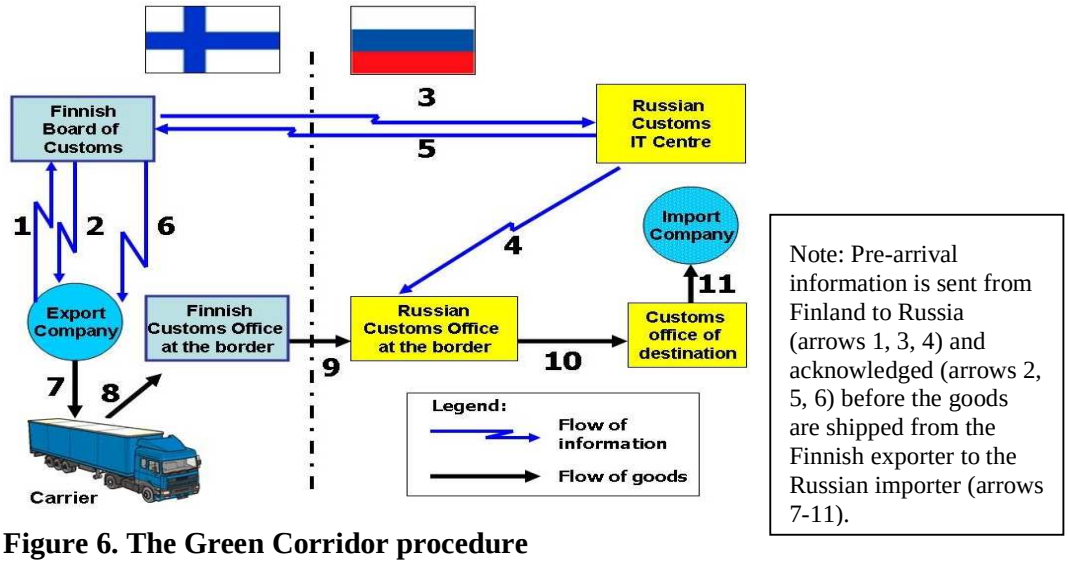

Figure 6. The Green Corridor procedure

The implementation of the Green Corridor does not only change the traditional trade procedures, but also increases value for involved actors and creates new relationships: Customs-to-business (G2B) partnerships and Customs to Customs (G2G) collaboration.

3.3.2 Applying the AAD Control Model to the Green Corridor

We re-identify the AAD components in the GC procedure (see Table 6). The supporting document is now replaced by pre-arrival goods information sent by the Finnish Customs. The evidencing functionality of the Finnish Customs is now being fulfilled, and linked with the control actor (Russian Customs) by this pre-arrival goods information.

Actors			Activities			Documents		
R-actor	E- actor	C- actor	O-activity	E- activity	C-activity	To-be-verified Doc.	Supporting Doc.	Verified Doc.
Russian import company	Finnish Customs	Russian Customs	Import goods from Finland and pay import tax	Evidence/ witness goods exported by Finnish companies, based on purchasing invoice-Finland	Verify import tax payment	Import declaration	Pre-arrival goods information sent by Finnish Customs	Import tax Acknowledgement

Table 6. AAD components of Green Corridor

Mapping the AAD components from the GC procedure to the AAD model, Figure 7 is obtained. We compare Figure 7 with Figure 4 (AAD control model) and find that in the GC, the order of the evidencing activity and supporting document is reversed. By further filling the AAD checklist (not presented here for brevity), we see that the GC procedure satisfies most of the control principles except for principle 4: "*The supporting documents should be the result of an evidencing/witnessing activity that directly witnesses the activity to be controlled*". In the GC, the Finnish Customs assumes the Finnish export companies are trustworthy, and sends the pre-arrival information (supporting document) to the Russian Customs prior to the actual Finnish Customs control (evidencing activity). However, are all the Finnish export companies trustworthy? To conduct seamless customs controls, reversing the order of "sending pre-arrival information" and "evidencing export activity" is prescribed by existing theories. The current GC procedure reinforces trustworthiness differently: by GC certification. To obtain the certification, companies have to fulfill certain requirements and be pre-audited such that certified companies can be considered trustworthy for the GC procedure. So far, however, only few Finnish companies are certified for the GC. All other companies still apply the procedure as described in Section 3.2.

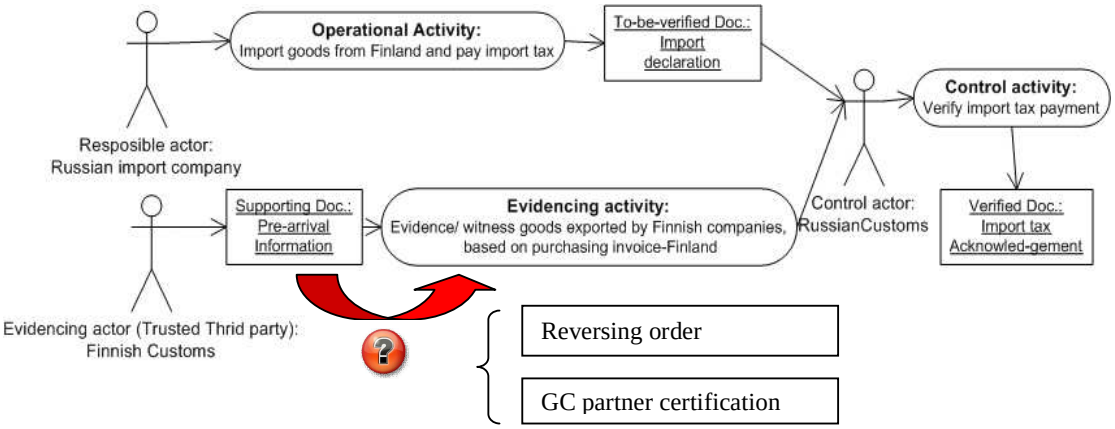

Figure 7. Green Corridor Customs control process

3.4 Step 4. Value perspective – Evaluation

As the focus of this paper is on steps 2 and 3 of e^3-control, here we provide only a short qualitative evaluation. For more details on quantitative evaluation see Baida et al. (2007) and Gordijn & Akkermans (2001). A major difference between the GC scenario

and the traditional procedure is the replacement of the supporting document of purchasing invoice (provided by the Russian import companies) by electronic pre-arrival information (sent by Finnish Customs). To evaluate the successfulness of the redesign, we go back to the value perspective analysis and find how all parties benefit from the GC (a business value model is available upon request):

- Russian Customs: "double invoicing" is prevented, higher tax revenues; less fraud; faster customs clearance
- Finnish Customs: increased economic competitiveness of Finland; trade facilitation
- GC certified businesses (exporter): supply chain efficiency; accelerated procedure, short queues at the border
- Russian importer: faster delivery; tax payment at a later time rather than at the border
- Carrier: faster transportation, security and efficiency; faster turnover

The GC procedure can be seen as an effective and satisfactory customs redesign: control goals are achieved, the total value of the network increases, the network is sustainable and all parties involved benefit. By linking governments and businesses, the innovative GC procedure manifests both G2B and G2G collaboration, the two pillars of modern customs (WCO 2005).

4 Conclusions and Future Research

e^3-Control has been suggested as a methodology for (re)designing inter-organizational controls. Kartseva et al. (2005) suggest that e^3-control should assume a value perspective on control. Liu et al. (2006) argue that e^3-control should add a process perspective to the value perspective, because the literature on control uses business processes as a unit of analysis. In this paper we present a combined approach, and we describe a well-structured and theoretically sound method for performing the process level analysis, namely the AAD approach.

Our study contributes to business practice and research. From a business perspective, our model-based approach is shown to be a useful tool for analyzing customs procedure redesigns; it enables identifying control flaws and validating compliance of procedures with control principles. Graphical models capture business intricacies in a network. They therefore serve as a tool in discussions for eliciting knowledge from business experts and exploring possible procedure redesigns. A structured modeling approach ensures that all concerns are taken into consideration in a redesign. From a research perspective, the contribution of this paper is twofold. First, the *combined* value and process-based redesign is a novel approach for control procedure redesign. The value perspective reduces the complexity of redesign by focusing control analyses on critical value transfers and ensures that the actual value of control mechanisms is addressed. The process perspective offers the details required for designing actual control mechanisms. The whole approach takes into consideration control concerns, economic concerns, network structure and changes that new controls introduce in actor interdependencies, roles and relationships. Second, we *conceptualize* broadly-accepted auditing theories in our AAD control model, as a basis for developing decision support software tools for systematic and structured reasoning by domain experts. Thus, we provide tools to support the human decision-making process in designing control systems. An in-depth e-customs case study provides proof of concept for our approach.

As our study shows, the current Russian import procedure was not designed properly, and as a result double invoicing is a common phenomenon. The Green Corridor is an

attempt to solve this problem. However, as we showed in the case, even the GC has a design flaw. Certification is supposed to cope with this flaw. In a different study, we applied the same auditing and accounting theory to the EU-wide procedure for handling intra community supplies of excise goods (e.g., beer), and found that the EU procedure does not comply with basic control principles, resulting in large scale fraud. Future case studies will investigate whether our approach is generic enough to cope with other control problems in different contexts, and whether our AAD control principles are exhaustive. The current case study shows that a principle concerning certification may have to be added to our control model.

A remark is in place here. As only few companies were actually certified to use the GC, the amount of pre-arrival information that the Russian Customs receives is limited. US Customs also requires carriers to provide similar pre-arrival information before goods arrive in the US. In the US, Pre-arrival information is used for risk assessment. However the amount of information in the US is so large that good risk management becomes very difficult, while this administrative burden has a negative effect on the competitiveness of the US economy (companies may prefer to trade with China and Hong Kong for example).

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