Designing controls for e-government in network organizations[1]

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Abstract: Electronic markets are no longer limited to commercial businesses (e.g., B2B); currently, they also spread to the governmental sector. The governmental sector can benefit from collaborating and forming Network organizations (NOs) with businesses, for example in developing new Customs procedures for international trade. The EU is now realizing the potential benefits of G2B collaboration on e-Customs. An existing dilemma however, is that European governments would like on the one hand to increase security and control and on the other hand to reduce the administrative burden for businesses. In this paper, we apply the e^3-control design approach to a case study concerning the export of beer to investigate how Customs procedures can be redesigned while coping with business and administrative challenges. We extend e^3-control by proposing a combined approach including both value-base and process-based modeling during redesign.

Keywords: E-government, e-Customs, inter-organizational control, procedure design methodology, electronic market.

1 Introduction

With the tremendous development of information and communication technology (ICT), many companies set up or joined network organizations (NOs) and electronic-based supply chains. Internet-based network organizations provide competitive advantages (e.g. new markets, cost saving and improved efficiency) that a single company can hardly achieve [PM95]. Electronic markets are no longer limited to the business field (e.g., B2B). The governmental sector can benefit from collaborating and forming NOs with businesses. Potential benefits are already clearly visible. For instance, electronic invoicing in Denmark saves taxpayers €150 million and businesses €50 million a year. If this could be introduced all over the EU, annual savings could add up to over €50 billion [EU06]. However, such NOs are only sustainable when all participants benefit from the network. Especially, when the governmental sector is involved, not only financial costs and benefits are considered, but also control and security issues should be addressed. To achieve the sustainability of NOs in the context of G2B interaction, a good governance structure is essential. Nevertheless, current government procedures create a barrier to this G2B interaction, as very often government documents are still paper based and various government procedures are still not harmonized. To this end, it is necessary to redesign government procedures, using ICT instead of paper-based solutions.

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A good example for such interactions between governments and businesses is e-Customs. We investigate how Customs procedures can be redesigned while coping with business and administrative challenges. For example, for a single container crossing borders in international trade, on average about 30 documents/signatures are involved [Do06]. This is a significant administrative burden for both Customs and businesses. Simplified and paperless Customs procedures, based on innovative information technologies, are desired and will improve the efficiency as well as lower the cost/burden for both Customs and business. Such redesign efforts may lead to changes in the roles and the linkages of the actors in the network [KS94]. When we redesign procedures we must make sure that everything is still in control – duties are collected, smugglings are prevented and security is ensured. To this end, we need a Customs procedure redesign approach that incorporates detective and preventive anti-fraud control mechanisms in international trade.

In this paper, we use an extensive case study in the beer industry to study the e^3-control design approach [KGT05, KT05] in a G2B network context. Our research is in line with action research studies [BP99, HL80], which demonstrates the applicability of a theory in a complex real-world situation, where researchers are actively involved in a business context, influencing it and observing the changes. Some changes are simulated (as the nature of the study is exploratory, involving future technologies), while other changes are actually implemented.

This study yields results and contributions for both theory development and real domain applications. The general use of e^3-control has been discussed by [KGT5]. While so far e^3-control has used a value perspective for designing controls, in this paper we posit that the value perspective is not sufficient, and it must be combined with an operational view: a process perspective. We demonstrate our combined approach in a concrete e-government domain, namely e-Customs. Customs controls are a pre-requisite for the sustainability of network organizations for international trade. To continue our study, we currently engage in implementing innovative information systems and technologies by three major parties: BeerCo NL, TRECPro (acting as a technology provider) and DTA (the Dutch Tax and Customs Administration). The application of new information systems and technologies will reshape the way of collaboration between trading partners and Customs. We show how such innovations can replace human-based procedures, and result in an improved degree of control.

By applying a two-perspective based e^3-control to the beer case we (1) gain insights into the control problems in this study, (2) assess possible new e-Customs procedural solutions to cope with these control problems and (3) demonstrate how business networks change when they are extended with control mechanisms.

The remainder of the paper is organized as follows. First, in Section 2, we discuss how to achieve an acceptable redesign for network organizations in a governmental context. Next, in Section 3 we present our research approach, and argue for extending the value-perspective based e^3-control with a process perspective. In Section 4, a case study on Customs procedure redesign for beer export is discussed in detail. Finally, in Section 5 conclusions and further research recommendations are given.

2 Procedure redesign for e-government in network organizations

The network organization (NO) is an emerging new organizational structure. It can be seen as "a collection of autonomous firms or units that behave as a single larger entity, using social mechanisms for coordination and control" [Bo01]. Many companies have already set up their NOs: they send e-invoices along electronic supply chains and do B2B transactions directly through the Internet [KH98, KS94]. Beside benefits such as transaction cost saving and improved efficiency, ICT-based NOs enable collaborations that were not possible in the past [KS97].

When NOs involve international trade, governments become a key player, collecting duties and handling import/export procedures. However, as most government documents are still paper based and various government procedures are not yet harmonized, the original electronic-based business networks are hampered by governments. Recently the EU has realized that Customs administrations should team up with businesses as partners in international trade: Customs can join NOs with business partners. Efforts in this direction have been made by various e-government projects within the EU. E-government (electronic government) refers to "government's use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities" [LL01]. Nevertheless, these NOs are only sustainable when all participants benefit from the network. Hence, to achieve sustainability of NOs a good governance structure is essential.

A dilemma faced by EU governments is how to reduce the administrative burden and at the same time increase the control and security for international trade. A key enabler for solving this dilemma is the use of innovative information technology. Technological solutions are currently being developed by governments as well as commercial businesses to facilitate cross-border trade.

Although technological solutions have the potential to solve administrative and business challenges, technology itself is not enough. More factors need to be taken into account when redesigning procedures and business processes. [DS90] define Business Process Redesign (BPR) as "the analysis and design of workflows and processes within and between organizations". Information technology is a key enabler for BPR, however "the process of 'reengineering' involves the breaking of old, traditional ways of doing business and finding new and innovative ways" [Ha90]. BPR requires a broader view on activities and IT, and that IT should be viewed not only as a means for automation but also as a mechanism to fundamentally reshape the way of doing business [Ha90; DS90].

Interesting insights on how to arrive to an acceptable (re)design of network organizations are provided by [KS97] who propose a number of steps for redesigning processes. They emphasize the importance of modeling in the redesign process where multiple parties are involved. They argue that modeling plays a key role in both individual analysis (to capture the view of an individual actor on the redesign) and in the participatory requirements analysis (to allow for identification of potential differences in the perceptions of the redesign by the different actors).

[KS97] do not explicitly take into account the complex interplay between public and private organizations in the redesign, which is the case in e-government in the cross-border trade context. While it is not the goal of this paper to make an analysis of the differences between the public and private sector, studies as [RBL76] have observed fundamental differences between the two such as; environmental differences, internal differences and differences in organizational/environment transactions. These differences need to be taken into account in redesigns involving the private as well as public sectors [TYS00].

3 Research approach: combining value and process perspectives

Extensive research has been done in developing theories for designing internal and inter-organizational control mechanisms [e.g. [AL99, BLW99, CL92, CO92, RS03]]. The common focus of former research is on the process level. Gordijn et al. [GA00a] discuss in detail the differences between value-based business modeling and process modeling. They argue that a process model shows how a particular business case should be carried out, while a value-based business model focuses on what is offered by who to whom and why rather than how these offerings are selected, negotiated, contracted and fulfilled operationally. Kartseva et al. [KGT05] propose that the design of control mechanisms should focus on economic value exchanges (transfers) between NO participants. A value perspective helps understand the primary purpose of control mechanisms and ensure that one does not "digitize" existing paper documents without considering fundamental changes of custom practices. Therefore, a value-based "e^3-control" conceptual modeling approach is presented to design inter-organizational control mechanisms [KGT05]. "E^3-control" is an extension of the *e^3-value*[2] business modeling approach [GA01]. It takes into account the economic interests of all the partners of a network, and control mechanisms to safeguard these interests, such that partners can reasonably expect to reap the benefits of their participation in the network. [KGT05] suggest that design of inter-organizational controls should include three steps:

(1) Design of the ideal situation of business networks using a value perspective, assuming that network participants always fulfill agreements and contracts;

(2) Control problem analysis, or the analysis of possible sub-ideal situations with possible control flaws (e.g. fraud and opportunism);

(3) Design of inter-organizational control mechanisms (IOCs), to detect and prevent these fraud and opportunism cases.

These three steps can be iterated in cycles as shown in the Figure 1.

Kartseva et al. [KGT05] adopt a value perspective in "e^3-control" as their starting point. Two arguments support this choice. First, control mechanisms are safeguards, in the sense of Transaction Cost Economics, to guarantee that an exchange of economic values between organizations takes place as agreed upon (e.g., in a contract) without faults (intentional fraud or unintentional mistakes) (see also [Wi79]). In other words, we need control mechanisms in order to ensure that value transfers – exchanges of objects of economic value – take place correctly. Second, as models are used to identify differences in the interests of the parties involved in the procedure redesign, value-based modeling approaches are useful to analyze whether a win-win situation is achieved in a multi-actor setting.

2 For further explanation on e^3-value see Figure 3.

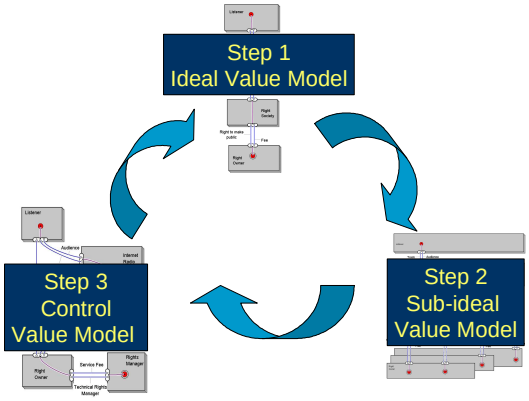

Figure 1: The e^3-control design approach. Adopted from [KT05]

However, we argue that while the value perspective is important and valuable, no single perspective is rich enough to analyze control problems and redesign procedures. We posit that designing control procedures and mechanisms requires that we add a process perspective to the approach proposed by [KGT05]. First, the existing knowledge base on control (scientific research as well as best practices from the auditing and accounting fields) is based on process level [e.g.[AL99, BLW99, RS03]]. Second, in our experience with domain experts, they are more familiar with and have better knowledge at the process level than the value level. Third, the two perspectives address different issues, both of which are required. A value perspective describes *which* value transfers should be safeguarded by control mechanisms. However, as it does not describe *how* these values are exchanged/transferred (which are process elements), it is not suitable for describing and designing operational solutions, i.e., control mechanisms.

We therefore conclude that to apply domain governance and control, we have to look into the detailed process level. Our approach combines analyses at both levels of abstraction: a value perspective (focusing on who provides what to whom and why in a network) and a process perspective (focusing on how the above is realized). First, we assume a value perspective to design an initial business model in an ideal situation. We analyze which economic values are being exchanged by which actors involved in a network, and interview domain experts to identify the *critical* value transfers that should be warranted by means of control mechanisms. In the next step, we focus on the process level analysis. In step 2, with the help of domain experts we investigate the business processes that realize the earlier identified *critical* value transfers (rather than the whole business model). We study how current controls are applied in a network to safeguard these values transfers, and identify flaws in the current situation by applying process-based control principles from the auditing and accounting literature to the current processes. Process based UML activity diagrams are drawn to show specific control problems in the AS-IS situation. Further, in step 3, we add/change control mechanisms according to auditing and accounting control principles at the process perspective, resulting in redesigning the business process. Having introduced new controls may have changed the related business model, as often control mechanisms are offered as commercial services. Therefore we finally draw the new business model, and evaluate it from a value perspective, to investigate financial feasibility. The combined redesign approach is described in Figure 2 below. We will discuss the application of this approach in detail in Section 4.

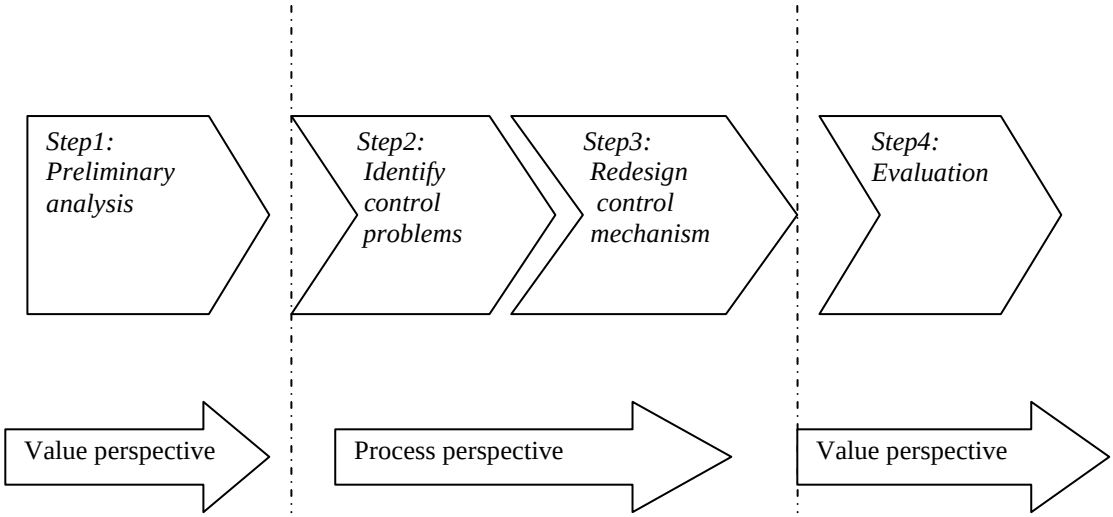

Figure 2: Redesign approach (Value & process perspectives combined)

We use visualizations of business models (value perspective) and process models to communicate with domain experts. We visualize step 1 and 4 with the value based e^3-value business modeling notation [GA01] and illustrate step 2 and 3 with process based UML activity diagrams [FS97]. We assume readers to be familiar with the UML notation[3]. Figure 3 shows an example of an e^3-value model in a case that a buyer who purchases goods from a seller and offers a payment in return. According to the law, the seller is obliged to pay value-added tax (VAT). This can be conceptualized with the following e^3-value constructs (in bold). **Actors**, such as the buyer, seller, and the tax office are economically independent entities. Actors transfer **value objects** (payment, goods, VAT) by means of **value transfers**. For value objects, some actor should be willing to pay, which is shown by a **value interface**. A value interface models the principle of economic reciprocity: only if you pay, can you obtain the goods (and vice versa). 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 presents as **consumer need** of an actor, 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** (end stimulus)**,** which finalizes the scenario.

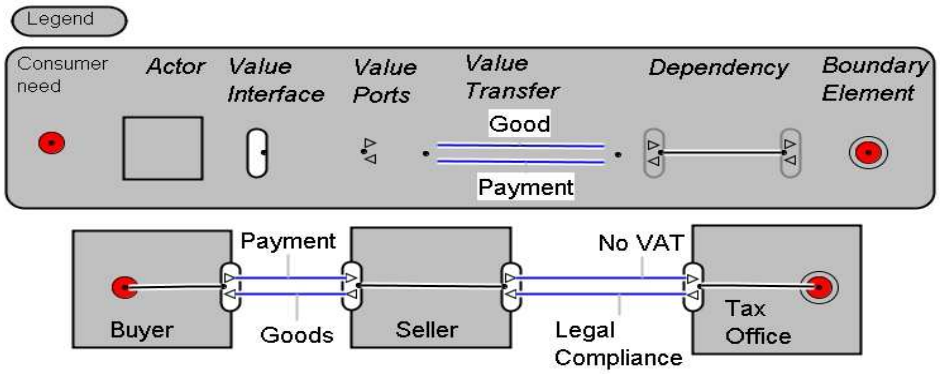

Figure 3: Example of an e^3-value business model of a purchase with tax payment

3 For detailed UML explanations, please refer to Fowler, M. and Scott, K [FS97]

4 Case study: Customs procedure redesign in the beer industry

Our case covers an intensive study in the beer industry, which aims to investigate how to introduce e-Customs for handling procedures concerning excise goods in cross-border trade instead of the current paper-based procedures. For the current paper, we examine the export of beer from the Netherlands to the UK. This case study is conducted in the EU-funded integrated project ITAIDE (www.itaide.org). When excise goods (e.g. alcoholic beverages, cigarettes) are sold, excise duty must be paid. In principle excise only has to be paid in the country where the beer is actually consumed. Hence, a Dutch beer producer can export beer to a retailer in the UK without paying excise in the Netherlands. Yet, to obtain exemption from excise payment in the Netherlands, the Dutch beer producer needs to prove that it has indeed exported the beer outside the country. The questions are (1) how can the Dutch authorities ensure that excise is paid whenever it is due, and (2) how can an evidence of export be provided. Other control problems exist in this beer export scenario; what are they, and how can they be tackled?

The following actors are involved in this scenario:

- BeerCo NL: A large Dutch producer of beer.
- BeerCo UK: The UK branch of the Dutch beer producer. Functions as an intermediary between BeerCo NL and retailers in the UK.
- BeerCo Holding.: The mother company of Beer NL and Beer UK.
- Carrier: A transport company that physically ships the beer from The Netherlands to the UK in containers.
- Customs NL: The Dutch Customs
- Customs UK: The British Customs
- Retailer: A UK-based company that buys Dutch beer from BeerCo UK.
- Excise Warehouse (EW): An excise warehouse is a warehouse which has been certified by the authorities for the deposit without payment of duty of goods liable to excise duty.
- Supermarkets UK: Resellers that buy beer from the retailer, and sell it to end consumers.
- Consumers: Any John Doe who wants to buy beer.

Currently, the core document for excise-free shipment is the paper based Administrative Accompanying Document (AAD). This document is signed by the excise warehouse in UK and then sent to the UK Customs. The UK Customs then signs the AAD document as a proof that the goods have arrived in the warehouse in the UK. Finally, the signed AAD is returned to the Dutch beer producer as proof that the goods have arrived in UK and will be presented to Dutch Customs on request. It typically takes up to three months before the AAD is received back by the shipper, and in many cases the AAD contains incorrect data. These incorrect excise data have to be corrected manually by the business as well as the Customs agencies. Hence, the AAD leads to much administrative burden and possible fraud (in 1998 alcohol-related excise fraud in the EU amounted up to €1.5 billion yearly [EU06a]). Therefore the EU has started an initiative to introduce e-Customs for excise goods, replacing paper-based control procedures for excise handling in cross-border trade by electronic procedures. The European Commission has initiated a new information system to replace the paper AAD, the so-called Excise Movement and Control System (EMCS). The basic idea behind EMCS is as follows. Every EU member state will implement its own EMCS. When a company from one EU member state ships excise goods to another EU member state, the sending party declares the excise free transaction in the national EMCS, and the receiving party declares it in its national EMCS. Both Customs administrations can then compare declarations to validate exemptions from excise duties. However, our analysis shows that EMCS is not a complete paperless solution, as a reference number (printed on another

paper document) is still needed to facilitate physical controls of shipments, which means the paper based AAD will still be used as "stop" function when cargos are stopped and checked en route. We illustrate that the EMCS solution can be made completely paperless and more efficient if it is combined with, or even replaced by ICT-based container security technology.

Achieving such a paperless solution is not as straightforward as it appears at first sight, we will discuss it in detail in the later sections. Furthermore, we show how innovative technologies can replace human-based procedures, and result in a much higher degree of control. Typically, in the current situation (using paper documents and human-performed procedures) about 2% of shipments are physically inspected. In the new situation, that takes into account new technologies to support electronic documents and automated processes, up to 100% control of export evidences is possible. These and similar insights have been gained by applying our modeling approach.

4.1 Step 1. Value perspective - *Preliminary analysis*

We take the value based business model (e^3-value) as our first step of the redesign. The value model shows the essentials of the way of doing business in terms of stakeholders creating and exchanging value objects with each other. The main goal for the value based preliminary analysis is to answer the question "*who* is offering *what* to *whom* and expects *what* in return". The main design questions relevant for the value model are [GA00a]:

1. Who are the value adding actors involved;
2. What value-creating or adding activities do these actors perform;
3. Which offerings are produced and consumed by these activities;
4. To whom are these offerings offered;

With the value based business model it is easy to reach a common understanding between stakeholders regarding *who* is offering and exchanging *what* with *whom* and expects *what* in return. We performed interviews with business experts to explore which value transfers in the business model may be violated, and what the severity of such violations is. By doing so we identified *critical* value transfers; these are value transfers for which control problems should be analyzed and handled. In the current paper we focus on the risk that BeerCo NL will sell beer in the Netherlands, and declare it as exported in order to obtain exemption from excise duties in the Netherlands. In our beer case, when BeerCo NL can prove excise free delivery outside the Netherlands, it is exempted from excise duties in the Netherlands and is considered compliant with the law (see exchange between BeerCo and Customs NL in Figure 4). BeerCo UK sells the beer to a Retailer with EW: a retailer licensed for the excise warehouse function. The retailer with EW sells the beer to UK supermarkets, for a price that includes the excise, and pays excise to Customs UK. The current (AS-IS) business model deviates from the ideal situation because it already includes control mechanisms to safeguard value transfers; in contrast, [KGT05] assume that no errors or fraud can occur in an ideal model, and hence an ideal model does not require control mechanisms. In fact, an EW is a control mechanism, to enforce excise payment. Also the earlier mentioned AAD is a control mechanism. However, to see how these controls are applied we need to move to the next step – a process level redesign.

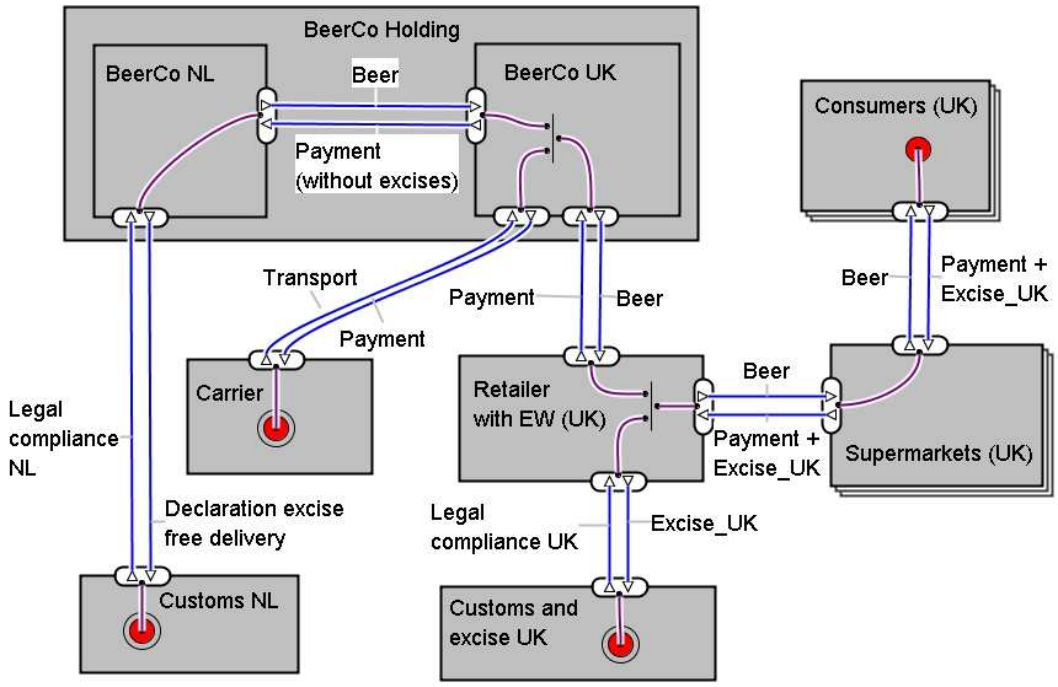

Figure 4: Ideal business model for beer export

[Note, the notion AND and OR connection elements are used here, which are illustrated as below:

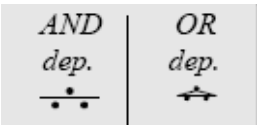

Figure 4.1: AND and OR connection

AND and OR connection elements. An *AND fork* connects a dependency element to one or more dependency elements, while the *AND join* connects one or more dependency elements to one other dependency element. An *OR fork* models a continuation of the scenario into one direction, to be chosen from a number of alternatives. The *OR join* merges two or more sub-scenarios into one scenario.]

4.2 Process perspective – *Problems identification and control mechanism redesign*

A separation of concerns regarding value perspective and process perspective is needed here. Unlike value modeling, process modeling (UML activity) is workflow-oriented, and it shows *how* a particular business case can be carried out. Although value-based business modeling provides us a good starting point for identifying different requirements of stakeholders in the network, it could not give satisfactory answers of how these requirements are selected, negotiated, contracted and fulfilled operationally. Especially, when designing control mechanism for e-government in NOs, we are required to look into the detailed process level identifying control problems and redesigning control mechanism.

4.2.1 Step 2. Identify control problems

Domain experts enumerated several main deficiencies of the current paper-based procedures, including (1) timeliness (procedures require long periods, which is misused by fraudsters), (2) high costs, (3) errors, (4) no sharing of information between national Customs administrations and (5) inability to perform efficient and effective physical checks, resulting in too weak security and too much possibility for fraud. Figure 5 shows a partial process model that corresponds to the AS-IS business model. Currently, the core document for excise-free export is the paper based Administrative Accompanying Document (AAD). There are two roles performed by the ADD as we discussed before, (1) to identify a shipment for a physical check en route (so-called "stop" function), and (2) – once it has been signed in the country of destination – as a proof of export, for exemption from excise payment at the country of origin. However, the current AAD solution leaves much administrative burden for both sides of Customs and Business, yet it can not provide satisfactory Customs control.

Six principles should be followed when control is applied inter-organizationally [BLW99, CL92]:

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 agents responsible for the operational task and its corresponding control task should be socially detached.*

Applying above principles to the export of beer from the Netherlands to the UK (see Figure 5), following rules need to be applied:

1) The supporting documents must be provided by a party *independent and socially detached* of BeerCo NL. The reason for these criteria is to prevent BeerCo NL to manipulate the evidence.

2) The supporting documents have to be based on a *witnessing activity*, executed before the "Verify excise" activity. The most elegant case would be the witnessing of the export is performed by Customs NL, a party who has a direct interest in this control. However, Customs NL is not always able to direct witness the export either apply 100% checking, as the AAD is not returned back to Customs NL (the AAD is returned by shipping company to BeerCo NL), unless Customs NL asks for it from BeerCo NL for audit purpose.

3) Finally, the signed AAD (supporting document) should be transferred directly from the activity which generates it to the activity which intends to use it. Direct transfer of documentary evidence is crucial for avoiding possible tampering by intermediary agents.

From the process based model (Figure 5) we can clearly see that the current AAD solution violates principle 2 and 4 of control principles. The AAD document should be directly transferred to Customs NL without passing though BeerCo NL, who may possibly falsify the document. And

Customs NL should be able to directly witness and have possible 100% check of export activities of BeerCo NL. Instead, Customs UK stamp the AAD, which is in fact an export witnessing activity.

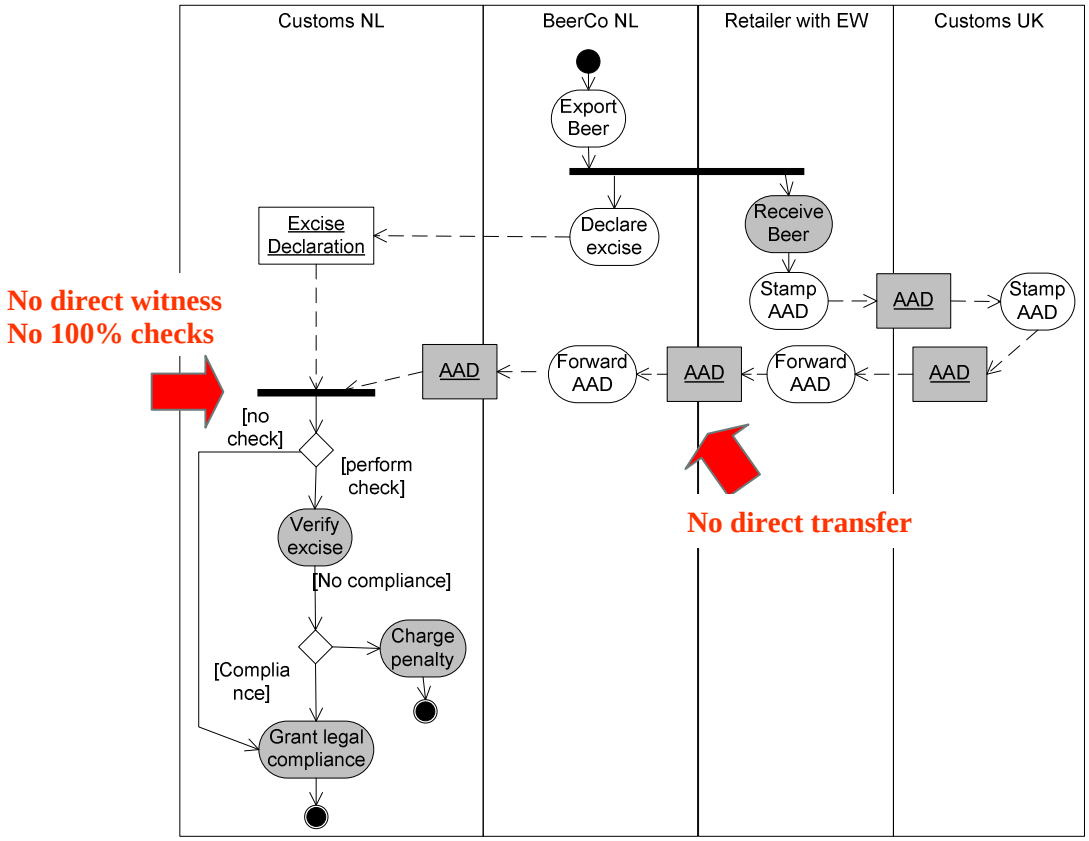

Figure 5: AS-IS model with AAD (Export to the UK)

[Note: for detailed UML explanations, please refer to Fowler, M. and Scott, K [FS97]]

4.2.2 Step 3. Redesign control mechanisms

Governmental and commercial organizations are currently developing IT-enabled solutions to cope with these and other deficiencies and control problems. Examples are the earlier mentioned EMCS, and the TREC technology of IBM. TREC (Tamper-Resistant Embedded Controller[4]) is a container-mounted device that can detect whether and when a container is opened and whether the opening is authorized or not. It is intended to reduce fraud and increase security. By monitoring a container's position coordinates, a message can be automatically sent by a TREC device to the carrier and to Customs NL when the container actually leaves the Netherlands, or deviates from its predefined route. TREC devices could therefore replace the AAD's functionality to provide evidence of export.

We developed a number of scenarios, reflecting various NO designs using different procedures to solve the problems described in the previous section, and discussed them with experts in workshops. One such scenario is the use of the earlier mentioned EMCS to report transactions

4 Further information on TREC is available at http://domino.research.ibm.com/odis/odis.nsf/pages/board.06.html

with excise goods. Another scenario involves the TREC technology, and a third scenario combines EMCS and TREC. Our analysis showed that when TREC technology is used, EMCS is superfluous. We therefore focus here on the scenario based on TREC only.

Using TREC technology, we consider the following procedure for international trade in excise goods. As soon as a container with beer is closed at the premises of BeerCo NL, the TREC device on that container triggers sending a message from the ERP system of BeerCo NL to some database or information system of the carrier, and a notification is sent to Customs NL. This system could be EMCS, but we are currently assessing also a visionary solution, where such a message will be used not just for excise purposes, but also for VAT, export declaration and national statistics declarations. Hence, the data are not just sent to excise systems, but are available for all government systems related to export data processing. In such a case, EMCS becomes obsolete. For the sake of the current discussion, we shall call this database/information system the EPCIS[5] without discussing it in detail. As soon as the container physically leaves the Netherlands, the GPS-based TREC device sends a message to the EPCIS, providing digital export evidence for this shipment. Furthermore, if the shipment is physically inspected en route, Customs officers can use handheld devices to obtain access – via the secure TREC devices – to the commercial information identifying this shipment in EPCIS.

Figure 6 shows a partial process model of this envisioned scenario, which can be used for intra-EU deliveries as well as for export outside the EU. As EPCIS can be seen as part of the TREC application, we omit the EPCIS from this figure for brevity. As shown in the figure, a new actor has to be introduced: a TREC service provider. This is not necessarily the hardware producer; it can theoretically be the carrier or a third party. Crucial for the scenario's success is that the TREC service provider is trusted by the Customs administrations, as required by the control principles of [AL99, BLW99, CL92, CO92, RS03]. Such trust is typically achieved by means of certification.

The idea of "TREC only" application is to replace the paper based AAD with electronic TREC messages exchanged from the TREC device placed on the container. The TO-BE scenario improves the witnessing activity (direct and 100% check – control principles 2 & 4). It allows making a statement about export when the fact of crossing the border actually happens. The TREC device will send an electronic message (with arrival and departure information), which has a role of supporting document, directly to Customs NL when containers actually cross the border. The role of TTP (trusted third party) is now taken by the TREC provider (this provider should be trusted by all the parties in the trade). This scenario alters the location of the "Witness export" activity as well as the way the witnessing is executed.

The TERC device can be accessed by Customs officers en route, using a handheld device. This enables Customs officers to obtain information on the contents of a container in case of a physical check ("stop" function). Besides, the TREC also performs real-time "Witnessing" when sending a message to Customs NL as soon as the container has left the Netherlands. This evidence of export can be directly sent to Customs NL by TREC, without possible manipulation of the intermediate party. At last, it supports 100% check of excise-free declarations of Customs NL. However, in order to make all this possible one issue needs to be specially emphasized: the TREC provider, which acts as TTP, has to be independent and socially detached from BeerCo NL.

5 The EPC Information Service [EPCIS] is a specification for a standard interface for accessing EPC-related information. Because an Electronic Product Code (EPC) gives each object a unique serial number, each individual object can be tracked independently and fine-grained real-time information about each individual object can be collected, stored and acted upon. For further information, please refer to http://www.ifm.eng.cam.ac.uk/automation/research/epcis.html

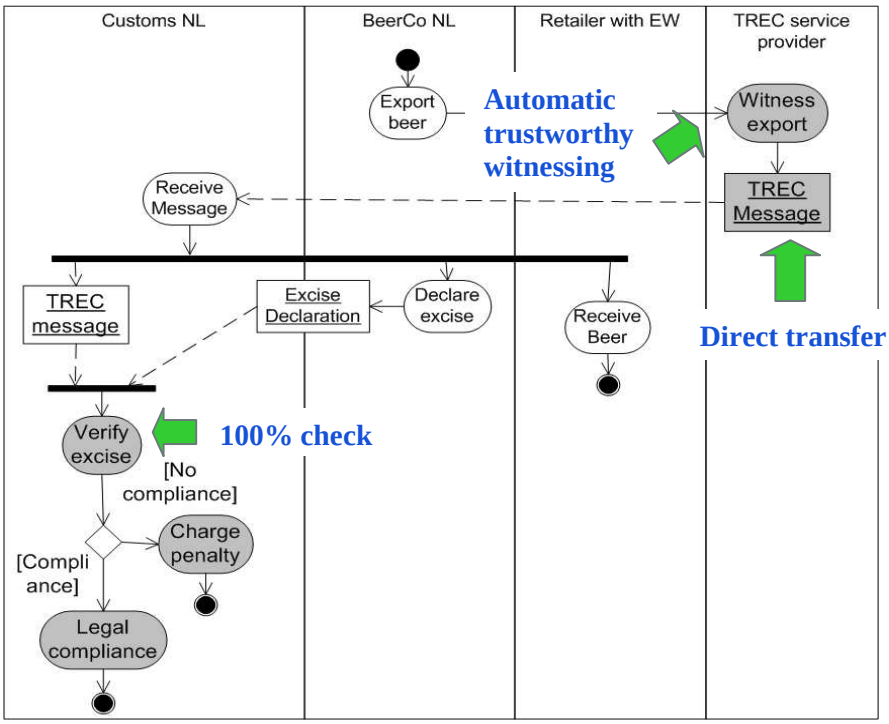

Figure 6: TO-BE process model: with TREC

4.3 Step 4. Value perspective - *Evaluation*

With the above scenario, the AAD and even EMCS lose their function of providing export evidences. TREC technology can deliver the same evidence in a simpler way. The new actor and change of value transfers can be seen in the value-based business model depicted in Figure 7.

The scenario sketched here is far from complete, as is often the case in explorative studies. For example, open questions include (1) to whom would the TREC device send a message when an unexpected event occurs (e.g. unauthorized container opening), (2) who would offer the TREC services, (3) how is the device's security managed and more. In the new business model the TREC device is used to facilitate the access to commercial information concerning the goods, as well as movement information. This is opposed to the current situation, where information flows from BeerCo's ERP system to Customs NL provide commercial information on the goods, while the paper-based AAD provides movement information. EMCS is no longer required, because the TREC pro-actively provides the same export evidence that EMCS would provide. Therefore the same control is achieved without the need to implement the less efficient EMCS. Furthermore, while EMCS is intended to handle excise duties only, the TREC-based procedure facilitates handling any governmental procedures concerning the same goods: excise, VAT, export/import declarations and more.

From the perspective of Customs NL, the TREC technology and related services are used as a control mechanism, to verify BeerCo's excise declarations. The uniqueness of this business network is seen in the fact that when a control is performed by an external commercial party combined with ICT solutions, a much higher degree of control is achieved than when the Customs would perform the control themselves. From BeerCo's perspective, the TREC technology enables more control on the supply chain. Namely, using TREC devices (1) BeerCo can always tell where exactly its shipments are, and (2) theft and smuggling are prevented or detected immediately by detecting unauthorized container openings.

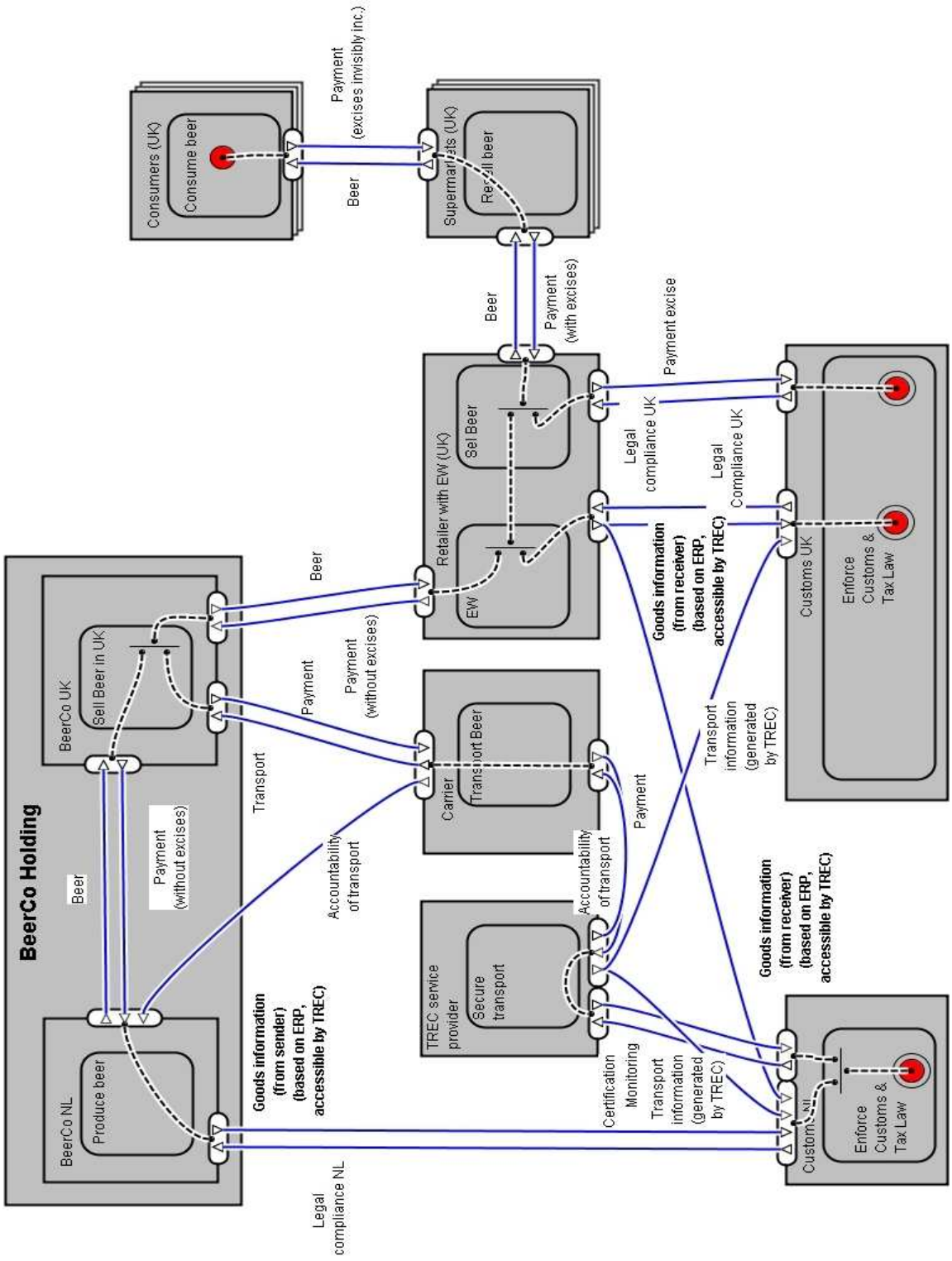

Figure 7: TO-BE business model: with TREC.

The value-based business model in Figure 7 can be used to evaluate the financial feasibility of the above scenario. Feasibility of the redesign means that all actors involved can make a profit or increase their economic utilities. Value-based business models enable us to see how NOs create values through ICT-based solutions. Naturally the services of using TREC devices have a price tag, and BeerCo NL will have to pay a fee for using the device for every shipment. In the new scenario, the new actor –TREC provider– will increase their profit through charging for the services, and Customs NL will enjoy a better control of the excise payment. As to the other main actor –BeerCo– will get the simplified Customs procedure and thus reduced administrative burden. However, BeerCo will still need to pay for (indirectly) services provided by TRECPro. Although the price for using the TREC device per shipment is not yet known, bearing in mind that BeerCo NL exports great volumes of beer per year, it is highly likely that the costs will be significant. Thus some incentive is required for BeerCo to justify these costs. This incentive can be provided by another partner in the network: Customs NL (government). More specifically, currently the EU is shaping the concept of Authorized Economic Operator (AEO). The idea of AEO is that each Customs administration will establish a partnership with the private sector in order to involve it in ensuring the safety and security of the international trade supply chain. The main focus is to create an international system for identifying private businesses that offer a high degree of security guarantees in respect of their role in the supply chain. These business partners should receive tangible benefits in such partnerships in the form of expedited processing and other measures. Typically, companies that use TREC or similar technologies have a better control of their supply chain, and therefore will be allowed by the Customs offices to use simplified Customs procedures, relieving some administrative burden. The introduction of the new actor (TREC provider) may change the roles-linkage among original actors of the NOs and result in change of the structures of the business network [KS94]. Value-based business models increase the understanding of the complexity of the networks and could provide useful information for top level management and policy makers.

5 Conclusions and recommendations for future research

A number of approaches exist for designing business models of network organizations, including BMO [Os04], value webs [TLT00] and e^3-value [GA01]. They all assume a value perspective, namely they focus on issues as value transfer, value propositions and revenues. These are all very typical concerns for a business analysis involving commercial businesses, but when governmental organizations join NOs, they have other concerns than financial gains. Customs administrations are concerned with collecting duties, but also with security and safety. Mainly, Customs administrations control supply chains and international transaction to ensure that their goals are achieved. As a result, we claim that business analyses for NOs involving the governmental sector must explicitly handle inter-organizational control.

Control, however, is typically of operational nature. A value perspective only is therefore not sufficient for performing the required business analysis. We therefore suggest extending value-based business analyses with an operational view, namely a process perspective. The value perspective is used to understand the core business model and to pinpoint the values that must be safeguarded by control mechanisms. Next, the process perspective is used to understand how the above value transfer violations may occur, and build controls into existing or new business processes that realize the underlying business model. Once this has been done, we return to the value perspective to investigate how the newly introduced controls affect the business model in NOs, and to asses the financial feasibility thereof.

We propose to combine both perspectives in the e^3-control approach. In the current paper we investigated how this approach can be applied in a large case study concerning the export of beer.

At the same time, we use this and other case studies to further develop the e^3-control approach into a sound methodology. Our future research efforts will focus on (1) deriving control problems in a given business model, (2) the relation between business models and process models, (3) designing control mechanisms to solve the earlier identified control problems and (4) how the above is different in the public sector compared to the private sector.

From the business domain perspective, our model-based approach showed to be useful for redesigning Customs procedures. Visual models capture business intricacies and show clearly power structures in a network organization. They therefore serve as a facilitating tool in discussions and workshops aimed at eliciting knowledge from business experts and exploring possible procedure redesigns.

From a research perspective, the value-based models enable us to identify where in a business model exist value transfers that must be safeguarded. Next, process level models enable us to analyze and demonstrate how to add control mechanisms into business process. And at last, we assume a value perspective again to evaluate the financial feasibility of the redesign and explore the role/value changes of the network organization.

We are currently implementing in the ITAIDE project the e-Customs procedure sketched here in a real-world setting. We intend to test it by shipping real containers of beer, and to verify whether and how control can be maintained using our e-Customs procedure.

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