Guest Editorial Preface

An Overview of the State of the Art and Future Trends in ICT Innovation for Business-to-Government Interaction

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This special issue of the International Journal of Electronic Government Research consists of extended invited versions of papers that were presented at the 1st Workshop on IT Innovations Enabling Seamless and Secure Supply Chains (WITNESS 2011) that was held in conjunction with the 10th International Electronic Government Conference 2011 (EGOV 2011) on 19 September 2011 in Delft, the Netherlands. The extended invited papers were duly reviewed which resulted in four accepted papers for this special issue. The theme of this special issue of IJEGR is an Overview of the State of the Art and Future Trends in ICT Innovation for Business-to-Government Interaction, which can be further detailed as follows. Government supervision and enforcement authorities, such as customs, tax, police, and food and product safety inspection agencies, have to carry out inspections at the borders to make sure that global supply chains become safer and more secure. Public agencies on various levels and from various countries are involved, as global supply chains cross national borders.

However, inspections at the border often cause major interruptions and delays in these chains. Hence, both governments as well as businesses aim to make these inspections more efficient and less disruptive for global supply chains, by simplifying and harmonizing cross-border control procedures. This requires a lot of information exchange in which a company typically interacts with, among others, customs, tax, police, and food and product safety inspection agencies. IT-enabled inter-organizational information sharing plays a key role in this simplification and harmonization of cross-border control procedures, where paper-based procedures are replaced by electronic procedures. Recent developments in enabling inter-organizational information sharing across different government agencies and businesses are Integrated Service Delivery and Coordinated Border Management which require government agencies to introduce new governance models how to share information among themselves and with businesses. These governance models should describe both the business and the coordination logics.
of creating the new service offerings, and the logics should be captured by six elements: (1) organizations in the public service network, (2) service offerings, (3) network coordination, (4) business processes, (5) shared resources, and (6) network capabilities.

Coordinated Border Management (CBM) aims to improve the management of the large number of cross-border inspections by sometimes 10-20 different government agencies within ports and airports. Each of these government agencies apply their own procedures and regulations, and typically require that businesses exchange information with them via their own IT applications. In many cases this lodging of data by businesses to government agencies is mandatory for these businesses. Hence, businesses have to implement many different IT applications on top of their ERP systems to share information with all these government agencies. Similar information based on different data structures and technology has to be shared for each transaction with several government agencies with high costs for businesses as a consequence. A great opportunity for coordinated border management would be if this business information could be reused by government agencies for government control purposes. Furthermore, many companies have implemented risk management systems for resilient and reliable supply chain management. These risk management systems could also be reused by government agencies to improve their particular risk analysis of global supply chains. In particular, data can be collected by agencies from enterprise IT systems by means of business intelligence to improve their risk analysis of global supply chains. This way, public agencies can piggy-back on data already collected by businesses which means that sharing this data between businesses and government can improve and accelerate the large number of cross-border inspections. Hence, this reuse of business data for government controls is also called the Piggy-Back Principle (see also Tan et al., 2011). On the European level, the European Commission introduced a risk-based approach to border controls whereby member states are required to divide at their borders global supply chains in safe ones (Green) and un-safe ones (Red), where the green chains benefit from more simplified and harmonized cross-border control procedures than the red ones.

The notion of inter-organizational information sharing plays a key role to realize business data reusability by all government authorities when interacting with private enterprises. It is not only relevant for reducing red tape in international trade, but it is one of the fundamental generic issues in e-government in general. By reflecting on the IT developments made in international trade, integrated service delivery in e-government can be further improved in general. Inter-organizational information sharing offers a real opportunity to share databases of the different actors in the international supply chain and make decisions based on more complete information. It also offers important benefits such as increased productivity, improved quality of decision making, lower administrative burden (information is already held somewhere in government and not duplicated), better enforcement (greater information availability), higher information quality (resulting in fewer mistakes), and integrated service delivery itself. However, inter-organizational information sharing and integrated service delivery are complex and difficult concepts facing a myriad of political, organizational, legal and technical challenges including lack of political support, lack of financial resources, privacy and confidentiality concerns by citizens and businesses, and poor technical skills, among others. On the IT-side, enterprise application integration (EAI) is a necessary ingredient to realize integrated service delivery. With non-EAI approaches difficulties are seen in the reconfiguring and integration of all the applications that run on the various computer platforms. In addition, in non-EAI approaches there is redundancy of data and functionality as applications might store similar data or may run slightly overlapping functions.

Combining and orchestrating various services involved in cross-border information sharing to realize integrated service delivery is
high on many governments’ agendas, because individuals and businesses increasingly expect integrated and customized service delivery. Moreover, the world-wide total costs for cross-border inspections are currently about 100 billion euro each year. Simplification and harmonization of cross-border control procedures is, therefore, needed to lower these huge costs. Many past initiatives have focused on providing a detailed description of business processes and on defining interfaces, which often are ‘thick’ with many information elements. Streamlining these interfaces requires standardization of the processes involved, because otherwise a system would have to analyze and predefine thousands of processes to enable cross-organizational service delivery, which simply is not feasible. Therefore, many initiatives targeting service integration focus on recurring questions rather than on incidental, non-standard, questions or other requests that are difficult to predict. Furthermore, the introduction of new laws and regulations and frequent changes to existing ones require continuous modification of processes and interfaces. This is an overwhelming task, requiring new analyses and often a complete redesign, which hampers modification. Organizations therefore need process execution that is flexible, that can easily adapt to changing circumstances, and that can create customized cross-organizational processes to accommodate complex service delivery.

The first paper by Juha Hintsa, Toni Mänistö, Luca Urciuoli, and Mikael Granqvist is titled “Future Development of e-Customs: A Survey Study with Swiss Companies.” In this study the view of supply chain companies about the future usage of electronic customs services is unveiled. By means of a survey, this paper explores the current state of play regarding cross-border trade and logistics operations in Switzerland and thereafter it highlights possible future developments and potential benefits. In particular, the survey aims to: identify how customs declarations are filed and stored; understand the degree of knowledge of companies about compliance costs; understand future developments expected by companies and, finally; determine the potential benefits of e-Customs platforms. The results unveil the importance of interactive and user-friendly e-Customs services. In addition, design and implementation of e-Customs services need to be driven by tangible benefits for the private sector, including facilitating export procedures, improving flexibility when working with customs, reducing the need to re-enter any customs data during the declaration processes and enabling a seamless flow of data between the parties involved.

The second paper by Bram Klievink, Eveline van Stijn, David Hesketh, Huib Aldeweerd, Sietse Overbeek, Frank Heijmann, and Yao-Hua Tan is titled “Enhancing Visibility in International Supply Chains: The Data Pipeline Concept.” In this paper, the authors present the concept of a Data Pipeline which is a novel ICT innovation to enable the capturing of timely and accurate data at the source of the international supply chain. This concept was first introduced by Frank Heijmann and David Hesketh as a solution to the low quality of the data about cargo available in the supply chain. To solve this data quality problem, data should be captured upstream in the supply chain at the point where the seller packs the goods for transport to the buyer. The paper presents an explorative study of the benefits that government and businesses could obtain from applying a data pipeline. In particular, this study identifies the need for a Public-Private Governance Model (PPGM) for developing such a pipeline, which includes all stakeholders of the data pipeline. Typically, these stakeholders such as government inspection agencies (e.g., Customs, seller, buyer, logistic service providers) have opposing interests with respect to a data pipeline, which should be aligned using the guidelines from the PPGM.

The third paper by Faiza Bukhsh and Hans Weigand is titled “e-Government Controls in Service-Oriented Auditing Perspective: Beyond Single Window.” In this paper, the question is addressed what the impact of Service-Oriented Auditing (SOAu) is on the relationship between government (e-Customs) and business (trading companies), and vice versa. Service-Oriented Auditing (SOAu) is a label for high-tech audit-
ing services based on Service-Oriented Architecture. The authors show how the shift in the distribution of responsibilities (the so-called horizontal supervision) can be leveraged by further developments in SOAu. A particular challenge is coordination, as there is a need for increased coordination of governmental and supply chain controls. The different coordination mechanisms to support this development are explored in the paper.

The fourth paper by Bram Klievink, Marijn Janssen, and Yao-Hua Tan is titled “A Stakeholder Analysis of Business-to-Government Information Sharing: The Governance of a Public-Private Platform.” In this paper, the adoption of a business-to-government information-sharing platform is analyzed from a stakeholder theory perspective. The analysis shows that for stakeholders not the information sharing infrastructure itself is their primary concern, but it is the governance thereof. A successful adoption and stakeholder management strategy was that companies have the sense-of-urgency and clear requirements to develop a public-private governance model. Governments can set the conditions to ensure that public functionality is also developed. The authors argue that stakeholder analysis should be used in developing adoption and implementation strategies.

The four papers deal with different topics within the context of inter-organizational information sharing in international supply chains, but all four papers recognize that especially data quality and availability of data in global supply chains needs to be further improved. The topics of e-Customs services, a Data Pipeline for data sharing and compliance together with a public-private governance model and Service-Oriented Auditing are introduced as the key topics to increase data quality and availability in order to improve inter-organizational information sharing in a global context. Finally, we hope you will enjoy reading this special issue of IJEGR.

We hope that this will help the reader to grasp more easily the more specialized analyses of the four scientific papers of this special issue.

INTRODUCTION – TRADE FACILITATION AND TRADE LOGISTICS

International trade is the cornerstone of our globalised economy. Global trade volume has grown up to almost 15 trillion USD in 2010 (International Trade Statistics, 2011). Trade facilitation aims at simplification and harmonization of international trade procedures. Trade facilitation looks at operational improvements at the interface between business and government and associated transaction costs. Efficient trade facilitation (e.g., increasing the efficiency of border procedures) can help lower trade transaction costs hence reduce the margin between domestic and international prices to benefit consumers and producers alike.

According to the OECD, trade transaction costs comprise both direct and indirect elements. Direct costs include mostly compliance costs related to supplying information and documents required for the movement of goods or related means of payment, and charges for trade-related services (e.g., trade insurance, port management). Indirect costs include procedural delays (time for customs clearance and cargo handling) related to the market life of products, e.g., spoilage of agricultural products, product cycles for technology-intensive products. They also include the lack of predictability in the nature, application or interpretation of regulations, formalities and contracts, and costs of lost business opportunities, such as due to delays in a given country affecting the whole global production chain (OECD, 2006).

Trade facilitation has its intellectual roots in the fields of logistics and supply chain management. Whereas a narrow definition of trade transaction costs focuses on the ease and speed of customs procedures, a broader view also
includes transportation, distribution and communication issues. The last couple of years, this broader view is often referred to as trade and transport facilitation, where the focus is not only on customs procedures, but also covering the logistics procedures and documentation. We call this the facilitation of trade logistics, meaning the management of international flows of goods, and related documentation and payments, with a focus on reducing direct and indirect logistical costs through the simplification/harmonization of procedures and documentation.

INTERNATIONAL CUSTOMS AND SUPPLY CHAIN SAFETY AND SECURITY POLICIES

The international Customs World has changed its scope drastically in the last years, with increased attention to safety and security of both people and goods, following the 09/11 terrorist attacks. This trend was established by the USA by introducing measures like the Container Security Initiative (CSI) (Department of Homeland Security, 2011), Customs-Trade Partnership Against Terrorism (C-TPAT) (Department of Homeland Security, 2012), the 24-hour-rule, and possibly 100% scanning. The 24-hour rule says that all ships boarding for a port in the USA have to report 24 hours before loading the cargo or containers on the ship in the port of origin (outside of the USA) to the US Customs and Border Patrol agency what goods or containers will be loaded. Hence, CBP can then do a risk analysis on these goods or containers, and, if it is found to be suspect, to inform that these goods or containers will not be allowed to enter the USA. Typically, this means these goods or containers will then not be loaded on the ship. The 100% scanning rule means that by 2013 all containers exported to the USA have to be X-rayed in the port of origin. Especially, the 100% scanning rule would incur huge extra costs for ports outside the USA that export large volumes of containers to the USA to implement the required X-ray infrastructure in these ports. The taken measures should not lead to hermetically closed borders, with corresponding obstacles for Trade and Logistics. Instead, parties who have proved to be reliable and transparent can make use of simplified Customs procedures (e.g., Green Lanes), with more or less free passage of goods. The World Customs Organization (WCO) has also adapted these developments.

In 2005 the WCO has accepted the ‘Framework of Standards to secure and facilitate global trade’ (SAFE, 2007). The implementation of the Framework will not only lead to a safer world trade regime, but will also launch a new vision on working and cooperating for both Customs Authorities and trading partners. As early as in 2003 the EU has published two Announcements on this matter, one about simplified and paperless Customs procedures, the other dealing with Customs role in the integrated management of the external borders (FCI, 2009). The starting points of these Announcements are elaborated in the eCustoms Program of the EU. EU Customs services handle nearly 20% of world imports, some 1,545 million tonnes of sea cargo and 3 million tonnes of air cargo each year. In 2007, EU Customs offices processed 183 million declarations (European Union, n.d.). For a detailed model for calculating the costs of trade compliance see Anderson and van Wincoop (2004). In addition to collecting over €12 billion annually, EU member states administrations (MSAs) have to guard against smuggling, fraud, environmental contamination and counterfeiting. They protect endangered species, the area’s cultural heritage, and intellectual capital rights. And they collect trade statistics to help policymakers detect economic trends. Most of these operations have been document and paper-intensive – that is, until the coming of the EU’s eCustoms initiative. The realization of the eCustoms Program goes hand in hand with the modernization of the Customs Code. Both are combined into the E-Customs Multi Annual Strategic Plan (MASP) (MASP, 2008). This plan contains a list of projects to be realized by the Member States and the European Commission. The MASP should be completed
in 2014. These projects will result in a number of custom innovations, including Risk Based Approach, Authorised Economic Operator, System Based Auditing, Single Window and Centralised Clearance. Detailed explanations of these concepts can be found in Tan et al. (2011). Here we provide a brief overview of these concepts.

INTEGRATED RISK ASSESSMENT APPROACH

The EC wants to develop an integrated risk assessment approach for supply chain security and trade between Europe and the rest of the world. A risk-based approach in designing and managing efficient and secure supply chains on the basis of high quality, integral monitoring data on cargo flows and container integrity is more effective and efficient than scanning 100% of all incoming containers. The National Customs Authority of the first port of call in Europe performs the security analysis based on pre-arrival information submitted 24 hours before departure from the port of origin. The results of this risk assessment are being forwarded to the other customs authorities in Europe. Because of this procedure, the EC and its member states want the risk assessment to be performed according to a common methodology and approach. Such an integrated approach for risk assessment will be developed in the EU-funded research project CASSANDRA. An elaboration of this project is presented.

AUTHORIZED ECONOMIC OPERATOR (AEO)

EU member states can grant the AEO status to any economic operator meeting certain standards for common criteria such as customs compliance, appropriate record-keeping, financial solvency and, where relevant, appropriate security and safety standards (European Union, 2005). AEO certified companies will be able to benefit from facilitations for customs controls or simplifications for customs. Recognition will enable businesses to have their consignments fast-tracked through customs controls (so-called green lane treatment). If a consignment is selected for examination, then they will receive priority over non-AEOs, hence they will have less dwell time. AEOs or authorized carriers, freight forwarders or customs agents acting on their behalf may opt to use a reduced data set when lodging entry or exit summary declarations to the Customs authorities. The Modernised Customs Code of the EU also allows the application of simplified procedures if Authorized Economic Operators perform self-assessments regarding their own business risks and if they implement in their organizations measures to reduce these risks.

SYSTEM BASED AUDITING (SBA)

System Based Auditing is a novel audit methodology designed to check upon the adequacy and effectiveness of internal controls in both financial and non-financial systems of a company. It covers all the business process and EDP (Electronic Data Processing) auditing, or IT auditing. This way of auditing can be integrated with AEO and other certification schemes. In such an approach, customs audits the implementation of built-in controls by an AEO. Many of these built-in controls are already certified by other certification schemes (e.g., ISO) within organisations. It can also be viewed as an example of piggy-backing, where operational business data from the enterprise information systems of companies are re-used
SINGLE EUROPEAN AUTHORIZATION/CENTRAL CLEARANCE

A Single Authorisation for a simplified procedure provides the possibility of using the local clearance procedure or the simplified declaration procedure to perform the customs formalities in the Member State where the economic operator is established, for his imports/exports wherever they occur in the Community (European Union, 2009). For example, a German company that exports goods to China via Rotterdam, can lodge the export declaration at their own German single window, which will then transfer these data automatically to the Dutch single window. Hence, the German company would no longer have to send a special export declaration to the Dutch Customs for the export via Rotterdam. A transfer of the goods to the authorised location is possible; subsequently a periodic supplementary declaration is lodged. A number of customs authorities have, on the basis of agreement with each other, authorised centralised clearance involving simplified entry of goods, which are located in another Member State, for the customs procedure concerned, notably for inward processing, customs warehousing and, less frequently, for release for free circulation. However, these arrangements between Member States are difficult and take a long time to be implemented, as they require long bilateral negotiations and considerable compromise between Member States, in order to find the best way of overcoming practical and legal difficulties. In 2005, the Customs 2007 Project Group on Single European Authorisation (SEA) was given a mandate to examine a common approach in order to encourage the use of Single Authorisations, not only for customs procedures with economic impact and end-use, but also for simplified procedures at import and at export, including cases in which a customs procedure with economic impact is followed by release for free circulation. This is a major facilitation measure as the economic operator can:
• Concentrate in-house customs expertise at a single location,
• Deal with only one customs administration and,
• Conduct the formalities etc. in only one language.

IT SOLUTIONS TO REAP THE BENEFITS OF CUSTOMS INNOVATION

Several existing solution providers offer fragmented, non-interoperable closed system solutions to comply with requirements for realizing Single Window, System Based Auditing, and Coordinated Border Management. These include a wide range of supply chain visibility solutions, customs solutions, port community systems, etc. However, there is a lack of an integrated interoperable solution framework built on common semantics and standards, resulting in high costs for businesses to comply with current and future requirements. Compliance to border crossing procedures and regulation requires investment in IT solutions for data exchange and data sharing. Such investment is seen by most trading partners as a cost factor, but there is another side of the coin. Advanced IT solutions based on semantic models and open standards, like the UN/CEFACT and WCO data models, agreements on identifier IDs such as the Unique Consignment Reference (UCR) number, goods Movement Reference Number (MRN), container ID, etc., new technologies like software Platform-as-a-Service (SAAS), cloud computing and choreography in chains (based on open source) enable management, storage and processing of large data quantities. Furthermore, technologies for crawling and indexing of data, comparable to what is done by search engines like Google, in Service Oriented Architectures support effective integrated risk management approaches in enterprise information systems and throughout the entire supply chain. Such advanced IT solutions considerably reduce the cost of compliance, and can also offer new business opportunities for all the customs innovations we discussed. Moreover, the enhanced supply chain visibility required by customs for their risk based approach can also offer benefits for supply chain partners.

RESEARCH PROJECTS CASSANDRA AND EXTENDED SINGLE WINDOW

Two research projects dealing with IT and customs innovations require special attention: CASSANDRA and Extended Single Window. These projects develop the proof of concept for applying semantic web technology and service oriented architectures for interoperability in freight logistics, both from a technical interoperability as from a business interoperability perspective.

CASSANDRA

CASSANDRA is a large collaborative European research project, co-funded by the European Commission, running from 2011 until 2014 (http://www.cassandra-project.eu/). The project is led by TNO and includes 28 partners from knowledge institutes (e.g., Delft University of Technology), port authorities and port community systems (e.g., from Rotterdam, Bremen, Barcelona and Setubal), terminal operators (e.g., European Container Terminals), freight forwarders (DHL, Kuehne and Nagel), logistic service providers, IT and trade solution providers (e.g., IBM, Descartes, Intrasoft, Atos), international standardization bodies (GS1) and consulting companies. The main objective of CASSANDRA is to enable and facilitate the combination of existing and novel information sources in supply chains for containers into new and better visibility that allows better assessment of risks by business and government alike. The proposed solution is to combine new software tools, hardware, visibility platforms and other technical solutions in such a way that business and government are
enabled to fully adopt a risk based approach to their operational activities, and in particular to combine two strategic customs approaches: the Risk-Based Approach with the System-Based Audit approach. As such, it seems a more balanced approach than the 100% scanning rule of exported containers. Currently there is a wide range of information systems in the supply chain collecting and exchanging data and information between different stakeholders (business and authorities), including tracking and tracing systems, supply chain visibility systems, customs declaration systems, maritime/port safety systems, Port Community Systems, supply chain planning and ERP systems, etc. In Europe the development of risk assessment instruments in business is in its infancy, and governments have little insight on risk based approaches in business and reliability of these approaches. In practical terms Cassandra will build the seamless, electronic data ‘pipeline’ linking the seller/consignor and the buyer/consignee and holds the potential to provide accurate data for trade statistics purposes based on a value-for-money requirement by statisticians and supported by legislation (see e.g., Hesketh, 2009; van Stijn et al., 2011).

CASSANDRA will facilitate the adoption of a risk based approach in designing and managing efficient and secure supply chains by businesses. In addition, CASSANDRA will facilitate a dialogue between business and government to gain acceptance of the risk based approach and risk self-assessment by business for supervision by government agencies. This principle of governments’ piggy backing on businesses’ own risk assessment is becoming a central theme in a number of long term strategies among supervision agencies, such as customs and police. The project will demonstrate and implement this approach to risk assessment in three so-called living labs. These are set up around major European tradelanes: Asia – North West Europe, North Europe – US and North Africa – Southern Europe.

Extended Single Window (ESW)

Extended Single Window is a Dutch research project co-funded by the Dutch Institute for Advanced Logistics (DINALOG), led by TNO and runs from 2010 till 2014 (Zomer, 2010). The project involves top researchers from several Dutch universities (e.g., Delft University of Technology), Dutch customs, the two Dutch mainports (Rotterdam and Schiphol Airport) and their community systems Portbase and Cargonaut, Dutch Shippers Association (EVO), air freight forwarders (ACN) and fruit and vegetables traders (Frugiventa), and several individual shippers (Flora Holland, Oce, Arrow, Herbalife, Mattel, Dohler). The vision in ESW is to develop an integrated coordinated border management solution for ports and airports integrating with previous and subsequent procedures for reliable, secure, and cost effective logistic chains as a prerequisite for the Netherlands to serve as an excellent gateway to Europe. This coordinated border management, ‘Extended Single Window,’ requires efficient and reliable information for effective joint supply chain planning by shippers, goods owners, transportation companies, forwarders, terminals and other logistic service providers and to use this information to meet government laws and regulations in a cost effective way, e.g., customs and agricultural procedures and VAT. Re-usability of business data by all government authorities for all types of goods movements is key in this approach. The objective of the project is to create reliable, secure, and cost effective logistic chains throughout the Netherlands supporting all applicable regulations and procedures, by embedding events for government controls in supply chains based on safeguards in processes of certified supply chain partners, re-use of business transaction data by government agencies, and enabling existing Port Community Systems to behave as one Information Service Bus with innovative IT.
The aim is to identify which safeguards for government controls need to be defined and how they can be supported by advanced IT with contribution of business and government authorities and in close cooperation with various demonstration projects (single window, Authorized Economic Operator (AEO)/system-based controls, centralized clearance/Single Authorization for Simplified Procedures). The approach is expected to lead to a significant reduction of physical inspections of goods in the mainports (e.g., Port of Rotterdam, Schiphol) by coordinated planning of government authorities, reliable transport to and from hinterland hubs, and administrative cost reduction. Basic research in advanced information technologies is on the development of an Event Driven Architecture with a Logistic Interoperability Ontology to realize piggy-backing and data pull.

CONCLUSION

IT and customs innovations offer not just an opportunity to considerably reduce the cost of compliance to border procedures, but also enable new custom facilities and related business opportunities like centralized clearance. Moreover, these solutions can also provide the enhanced supply chain visibility required by customs for their risk based approach, which can also be used by other supply chain partners. As such, compliance is no longer seen as a cost, but as an opportunity. In order to reap these benefits, research projects like CASSANDRA and Extended Single Window are necessary to develop the prototype solutions and proof of concept, demonstrate them in practice along different trade lanes, work out the business case and business model considerations and prepare for wide scale deployment. In addition, these projects will address several other related research questions, for instance regarding the benefit logic and business case of these concepts. The scientific papers in this special issue further elaborate on specific aspects of this overall research programme for ICT innovation for safe and secure supply chains.

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REFERENCES


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