Diffusion of Business-to-Government IT Innovations: The Case of e-Customs

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St. Gallen, May 17, 2010

The President:

Prof. Ernst Mohr, PhD
Alla mia famiglia
Acknowledgment

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Zurigo, maggio 2010

Marta Raus
«Volli, e volli sempre, e fortissimamente volli»

Vittorio Alfieri
Asti, 16 gennaio 1749 – Firenze, 8 ottobre 1803
Dalla *Lettera responsiva a Ranieri de’ Calsabigi*, 1783
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## Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABI</td>
<td>Automated Broker Interface</td>
</tr>
<tr>
<td>AEO</td>
<td>Authorized Economic Operator</td>
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<tr>
<td>AES</td>
<td>Automated Export System</td>
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<tr>
<td>AIS</td>
<td>Automated Import System</td>
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<tr>
<td>B2B</td>
<td>Business-to-Business</td>
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<tr>
<td>B2C</td>
<td>Business-to-Citizens or Business-to-Consumer</td>
</tr>
<tr>
<td>B2G</td>
<td>Business-to-Government</td>
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<tr>
<td>CCTS</td>
<td>Core Components Technical Specification</td>
</tr>
<tr>
<td>CSI</td>
<td>Container Security Initiative</td>
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<tr>
<td>C-TPAT</td>
<td>Customs Trade Partnership Against Terrorism</td>
</tr>
<tr>
<td>EAR</td>
<td>Export Administration Regulations</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ECS</td>
<td>Export Control System</td>
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<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>EVA</td>
<td>Economic Value Added</td>
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<tr>
<td>G2G</td>
<td>Government-to-Government</td>
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<tr>
<td>G2C</td>
<td>Government-to-Citizens</td>
</tr>
<tr>
<td>GA</td>
<td>Goal Area</td>
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<tr>
<td>ICS</td>
<td>Import Control System</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IDEE</td>
<td>Ideale elektronische Exporteurlösung (ideal solution for exporters)</td>
</tr>
<tr>
<td>IgVV</td>
<td>Computer-Aided Common/Community Transit Procedure</td>
</tr>
<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ITAIDE</td>
<td>Information Technology for Adoption and Intelligent Design for E-Government (IST-027829)</td>
</tr>
<tr>
<td>KPA</td>
<td>Key Performance Area</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>MASP</td>
<td>Multi-Annual Strategic Plan</td>
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<td>MNC</td>
<td>Multinational Company</td>
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<tr>
<td>NCTS</td>
<td>New Computerized Transit System</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>NCTS-TIR</td>
<td>International Road Transport Convention for Transit</td>
</tr>
<tr>
<td>NPM</td>
<td>New Public Management</td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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<tr>
<td>PROI</td>
<td>Public Return on Investment</td>
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<td>REDF</td>
<td>Roberts Enterprise Development Fund</td>
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<tr>
<td>ROI</td>
<td>Return on Investment</td>
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<td>SED</td>
<td>Shipper’s Export Declaration</td>
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<td>SME</td>
<td>Small and Medium-Sized Enterprise</td>
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<tr>
<td>SOA</td>
<td>Sarbanes-Oxley Act</td>
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<tr>
<td>SROI</td>
<td>Social Return on Investment</td>
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<tr>
<td>SW</td>
<td>Single Window</td>
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<tr>
<td>Taric</td>
<td>Integrated Tariff of the European Community</td>
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<tr>
<td>TOE</td>
<td>Technology-Organization-Environment model</td>
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<tr>
<td>UML</td>
<td>Unified Modeling Language</td>
</tr>
<tr>
<td>UMM</td>
<td>UN/CEFACT's Modeling Methodology</td>
</tr>
<tr>
<td>UN/CEFACT</td>
<td>United Nations Centre for Trade Facilitation and Electronic Business</td>
</tr>
<tr>
<td>UN/EDIFACT</td>
<td>United Nations Directories for Electronic Data Interchange for Administration, Commerce, and Transport</td>
</tr>
<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
</tr>
<tr>
<td>VAR</td>
<td>Vereinfachte Ausfuhrregelung (simplified set of export rules)</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>VMM</td>
<td>Value Measurement Methodology</td>
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<tr>
<td>WCO</td>
<td>World Customs Organization</td>
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<tr>
<td>WTO</td>
<td>World Trade Organization</td>
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Abstract

Business-to-government IT innovations seek to facilitate all procedures and technologies used by business companies and governmental institutions in order to improve their communication and collaboration. One goal of those innovations is to enable a more effective and efficient trade, not only locally but also on an international level. The increased trade volume of the last decades has forced governments to seek a balanced trade-off: to keep trade secure and competitive but at the same time decrease the administrative overheads put on companies by increasing control mechanisms. In order to reach these goals, the European Union promoted an initiative that foresees, by 2013, the introduction of a European common standardized e-customs system that will substitute paper-based customs procedures and harmonize national e-customs systems. Although the European e-customs regulation states the objectives of the envisioned common standardized e-customs system, functional and technical specifications are provided only on a high level. Therefore, the adoption and diffusion process is relegated to each individual member state. Thus, the analysis on how such a system will be adopted and diffused is of particular interest for all 27 member states. However, only a few authors have dedicated any research to e-customs system innovation and diffusion.

This research aims to investigate how e-customs innovation diffusion may take place focusing on the benefits that it can bring to potential stakeholders, i.e., business companies and governments. Two research models have been developed based on a literature review on diffusion of IT innovations as well as on value assessment methods used for IT innovations implemented in the private and public sector. The first research model aims to illustrate the innovation-development of business-to-government IT innovations, while the second aims to provide a guideline on how to conduct value assessment for such innovations as well as how to classify the identified benefits. Multiple case studies on e-customs have been carried out in order to test the proposed research models involving different business companies and governmental bodies.

The results of this research have been published in nine articles, addressing both academic and business audience.
Sommario

Le innovazioni nell’ambito dell’IT coinvolgono le istituzioni sia del settore privato sia di quello pubblico. Esse sono chiamate business-to-government IT innovations ed hanno come obiettivo l’ottimizzazione delle modalità operative e delle tecnologie utilizzate al fine di favorire la comunicazione e la collaborazione tra le stesse. In particolare, tali innovazioni hanno l’obiettivo di rendere il commercio più efficace ed efficiente non solo a livello locale bensì anche a livello internazionale. Negli ultimi decenni, il volume del commercio è aumentato sensibilmente e ha posto una nuova sfida ai governi di diversi paesi: mantenere le transazioni sicure e competitive ma contemporaneamente semplificare le procedure amministrative e aumentare il controllo all’interno degli scambi commerciali. Al fine di garantire tale risultato, l’Unione Europea ha promosso un’iniziativa che prevede, entro il 2013, l’introduzione di un sistema e-customs standardizzato che sostituirà le procedure doganali su supporto cartaceo e armonizzerà i sistemi e-customs già in vigore nei diversi stati europei. L’iniziativa definisce con chiarezza i risultati da raggiungere, ma la relativa operatività tecnico-funzionale non è vincolante; ciò significa che il processo di adozione e diffusione di tale sistema è lasciato nelle mani degli stati membri. Per questa ragione, l’analisi delle modalità di adozione e diffusione di tale sistema risulta essere di particolare interesse per i 27 stati dell’Unione Europea. Nonostante ciò, fino ad ora, solo pochi autori hanno dedicato la loro ricerca a questo tema.

Questa dissertazione ha come obiettivo quello di investigare come potrà avvenire l’informatizzazione in ambito doganale, analizzando in particolar modo i vantaggi che questa può apportare ai potenziali utenti siano essi aziende private o istituzioni statali. A tal fine, sono stati sviluppati due modelli di ricerca basati su analisi teoriche in materia di diffusione dell’informatizzazione e su metodi di stima valoriale delle innovazioni informatiche implementate nel settore privato e pubblico. Il primo modello di ricerca illustra il processo di sviluppo di innovazioni informatiche che coinvolgono sia il settore privato che quello pubblico, cioè le cosiddette business-to-government IT innovations. Il secondo modello di ricerca fornisce una metodologia di accertamento e verifica circa il valore di tali innovazioni e di come lo stesso possa essere classificato. Entrambi i modelli di ricerca sono stati testati nell’ambito dell’e-customs fornendo diversi esempi di una sua potenziale implementazione nelle aziende del settore privato e nelle istituzioni statali del settore pubblico.

I risultati delle analisi e ricerche, condotte nell’ambito di questa tesi, sono stati esposti in nove articoli adatti ad un pubblico sia accademico che imprenditoriale.
1. Introduction

E-government is defined by the European Commission (2007c, p. 135) as ‘the use of Information and Communication Technologies (ICTs) to make public administrations more efficient and effective, promoting growth by cutting red tape’. The European e-government action plan, developed in 2006 (European Commission, 2006c), set five major objectives that are to be achieved in the near future: (1) No citizen left behind: advancing inclusion through e-government so that all citizens benefit from trusted, innovative services and easy access for all. (2) Making efficiency and effectiveness a reality: significantly contributing to high user satisfaction, transparency and accountability, a lighter administrative burden and efficiency gains. (3) Implementing high-impact key services for citizens and businesses: enabling public procurement to be available 100% electronically, with 50% actual usage, with agreement on cooperation on further high-impact online citizen services. (4) Putting key enablers in place: enabling citizens and businesses to benefit from convenient, secure, and interoperable authenticated access to public services across Europe. (5) Strengthening participation and democratic decision-making: demonstrating tools for effective public debate and participation in democratic decision-making.

Among these objectives, three main e-government stakeholders can be identified: government, citizens, and business. The interactions between the government and the mentioned stakeholders are defined as government-to-government (G2G), government-to-citizens (G2C), and business-to-government (B2G), respectively. D. Evans & Yen (2006) defined these categories as follows: G2G strives to improve the efficiency of delivery when transacting information within the government itself; G2C focuses on the ability of the government and citizens to communicate information to each other in an efficient and electronic manner; B2G focuses on the ability to reduce costs and gather better information, allowing the government to purchase items, pay invoices, and conduct business in a more effective way.

Although e-government services have notably improved over the past few years, much remains to be done, both in implementing new e-government solutions and in developing new concepts and technologies. Indeed, according to the European action plan, e-government services need to be improved in order to meet users’ requirements and be more innovative. E-government innovations seek, among other things, to facilitate trade. Trade facilitation refers to all procedures and technologies used to integrate local trade into international supply chains. IT is becoming progressively more important in trade facilitation aiming to replace paper-based documents, original
signatures, cash payments, and face-to-face meetings involved in obtaining import and export approvals from government agencies. Thus, the modernization of governmental services by offering electronic solutions helps business companies to trade in a more efficient way.

E-government improvements, which aim to enhance electronic transactions between business and government, are IT innovations developed in the B2G domain. Therefore, the goal of B2G IT innovations is to facilitate information exchange between governments and business companies assisting not only their administrations and infrastructures but also national and international trade.

1.1. Motivation

In the last 50 years international trade has increased in a considerable manner, multiplying simultaneously volumes of imported/exported merchandise worldwide (World Trade Organization, 2007). Nowadays, such trade evolution is challenging governments to keep trade competitive as well as secure: a task that recently became more difficult as national security levels intensified. Terrorist attacks, such as 9/11 in New York, induced heightened scrutiny into every kind of international transactions, causing new legal responsibilities for businesses to emerge. For this reason, companies that want to trade internationally have to consider numerous aspects of international business rules and strictly adhere to ever changing regulations. This results in an extensive administrative workload and increased uncertainty in border processes as complex regulations increase errors and complications. Governments are under political pressure to simplify trade procedures and decrease the administrative overheads put on companies but at the same time to increase control mechanisms within international trade.

In view of this trade-off, the EU proposed, among other initiatives and regulations, the introduction of a European common standardized e-customs system. The goal of this regulation is to replace paper-based customs procedures and harmonize national e-customs systems. E-customs is a B2G IT innovation that seeks to facilitate trade procedures while at the same time improve security: according to the EU, it will be introduced by 2013 (European Commission, 2006a). The EU also developed an e-customs plan, the Electronic Customs Multi-Annual Strategic Plan (MASP), which aims to provide the structure and means by which the European Commission, customs administrations, and other border agencies in the EU can exchange electronic information (European Commission, 2008b).

Enabling electronic information exchange supported by a common e-customs
system aims to:

- Control and facilitate the movement of goods into and out of the internal market through efficient import and export procedures;
- Increase the competitiveness of European trade through a reduction of compliance and administrative costs and improvement in clearance times;
- Facilitate legitimate trade through a coordinated approach relating to control of goods;
- Improve the safety and security of citizens with regard to dangerous and illicit goods;
- Offer improved protection of the financial interests of the European Community and its member states;
- Contribute to the fight against international crime and terrorism by providing rapid and relevant information with regard to the international supply chain;
- Allow a seamless flow of data between authorities of importing and exporting countries.

The governments of the 27 EU member states aim to implement the envisioned common standardized e-customs system in order to improve their infrastructure and harmonize different systems and regulations. In order to achieve the above mentioned goals, the European Commission and the member states seek to ensure that electronic data exchange between customs offices and business companies will be possible throughout the Community where required for any customs procedures or any other purpose related to the movement of goods across Community borders. In this way, economic operators will be able to lodge their declarations in an electronic format from their premises, irrespective of the member state in which the goods are entering into or leaving the Community. Traders will have to register only in the member state for customs purposes, even if they perform customs transactions in other member states, so that they will have access to information portals and a single electronic access point for import and export transactions, irrespective of the member state in which the transaction starts or ends. All existing and future computerized systems will be based on an integrated architecture so that all authorities and agencies involved in import and export transactions will be enabled to exchange electronic information.

According to MASP, all the above mentioned objectives will be achieved through: first a harmonized exchange of information on the basis of internationally accepted data models and message formats; second a re-engineering of existing customs and
customs-related processes with the aim to optimize their efficiency and effectiveness and to reduce the costs of customs compliance; and third an offering to economic operators of a wide range of electronic customs services enabling those operators to harmonize interactions with the customs authorities of any member state.

Although the MASP gives the objectives and purposes of the envisioned common standardized e-customs system, functional and technical specifications are provided only on a high level: the adoption and diffusion process is designated to each individual EU member state. The process of e-customs diffusion is, therefore, a topic that concerns all EU member states.

1.2. Research question

While in the field of e-government diffusion and adoption many studies may be found, e.g., Burn & Robins (2003), Lee, Tan, & Trimi (2005), Sagheb-Therani (2007), and Wonglimpiyarat & Yuberk (2005), only a few authors have dedicated their research to e-customs system innovations and diffusion, e.g., Henriksen & Rukanova (2008), Jesserun, Rukanova, & Tan (2008), Rukanova, Henriksen, Raesfeld, Stijn, & Tan (2007). However, diffusion of e-customs needs special attention since, according to the EU, a unique e-customs system concept should be introduced by 2013 (European Commission, 2006a). Therefore, it is necessary to analyze how such a system may be diffused and adopted in the industrial as well as in the governmental environment. Additionally, potential stakeholders may ask which benefits this system might bring. For this reason, it is of significance to understand what the value of this innovation for potential adopters is. Therefore, this research aims to analyze two main aspects of the introduction of e-customs: how its innovation and diffusion will take place and how business companies and governments will benefit from it. Based on the motivation and the research gap presented above, the following research question has been formulated:

*How do e-customs innovation and diffusion take place and what are the benefits of this business-to-government IT innovation?*

The research question includes the following main topics that have to be analyzed: innovation, diffusion, and value assessment of e-customs. Therefore, the research question is divided in two sub-questions:
1. What are the innovation steps of e-customs and under which factors does e-customs diffusion take place?
2. What is the value of e-customs for business companies and governments?

The goal of this research is to answer the two questions considering e-customs as an example of business-to-government IT innovations. The analysis of this particular case can be used as a starting point for further investigations in the field of e-government and specifically of B2G IT innovations.

1.3. Dissertation structure

The thesis is written as a cumulative dissertation and includes nine publications written between 2007 and 2009. Figure 1.1 graphically describes the dissertation structure linked to the publications and the analyzed topics.

![Figure 1.1. Dissertation structure](image-url)
This work is divided into eight main chapters and three appendices. After this chapter, the Introduction, Chapter 2 is dedicated to the research methodology: the concepts on which the research is based, as well as the frame of reference and the research approach are highlighted. All publications are summarized in Chapter 3 in order to give an overview of the thesis’ content. Furthermore, the publications are divided into three main chapters (4, 5, 6) and Appendix I. Chapter 4 is dedicated to the introduction of the topic, i.e., e-customs. In order to provide an accurate description of e-customs, two publications have been written (see Sections 4.1 and 4.2). Chapters 5 and 6 aim to answer both research questions: they analyze the diffusion process and the value of e-customs, respectively. In each chapter, two publications are presented (see Sections 5.1, 5.2 and 6.1, 6.2). After the presentation of the main publications, Chapter 7 summarizes the key findings. Finally, Chapter 8 concludes the thesis giving its limitations as well as the outlook on future research. Additionally, in the appendices, three further publications are presented (Appendices I.1, I.2, I.3). These publications have been used as a test bed for the articles presented in the chapters. They constitute the first attempts for the presentation of e-customs in general, its diffusion process, and its value. Furthermore, the appendices provide the guidelines used for the case studies (Appendix II) and the contact data of the publications’ co-authors (Appendix III).
2. **Research Methodology**

Section 2 begins describing the concepts used in this work: B2G IT innovations, diffusion of innovations, and value assessment (Section 2.1). Next, in Section 2.2, the frame of reference is given. Finally, Section 2.3 provides the illustration of the research approach.

### 2.1. Concepts

**Business-to-government IT innovations**

‘An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. [...] The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation’ (Rogers, 2003, p. 11).

B2G IT innovations are innovations that implicate changes in the field of Information Technology (IT), perceived by both business and governmental organizations. Through these innovations, business companies and governments are able to communicate electronically. Adopters of such innovations are, therefore, private and public organizations.

According to this definition, e-customs can be considered as a business-to-government IT innovation that affects the electronic information exchange, which concerns customs procedures between the private and public sector.

**Diffusion of innovations**

‘Diffusion is the process by which an innovation is communicated through certain channels over time and among the members of a social system’ (Rogers, 2003, p. 11).

Diffusion of business-to-government IT innovations takes place under e-government dynamics and involves a broad social system. It includes several stakeholders coming from private and public organizations. In this work, when talking about e-customs stakeholders, one mainly refers to business companies, customs, and tax authorities since this research focuses on these stakeholders and excludes the analysis of others, such as, e.g., IT providers or further governmental organizations.
Value assessment

There exist many definitions of value, since it is a concept that has been studied in several fields, such as, e.g., economics, mathematics, ethics or law. This research aims to understand the benefits, i.e., the value, of e-customs systems for potential stakeholders. Stakeholders of a business-to-government IT innovation such e-customs are adopters coming from the private and public sector. The term value might be diversely interpreted by such adopters since goals and missions of private and public organizations differ. For this reason, in this thesis, several aspects, which consider the requirements of both sectors, are taken into account. These aspects reflect strategic, operational, social, and financial values. The assessment of these kinds of value can be done quantitatively or qualitatively. Different methods for both assessment types are further considered and studied.

2.2. Frame of reference

The frame of reference of this research resides in analyses carried out among Swiss business companies and investigations conducted within the context of the EU funded project Information Technology for Adoption and Intelligent Design for e-Government (ITAIDE, IST-027829).

Switzerland constitutes a particular and interesting case since it is a non-EU country located in the middle of the European Union that has to adopt its regulations to be EU compliant in order to facilitate international trade for local companies. The study that considers Swiss business companies aims to analyze the Swiss customs situation comparing it to the European case which is described on the basis of ITAIDE.

ITAIDE, funded by the 6th Framework Information Society Technology (IST) Program, started in January 2006 and will conclude in June 2010. E-government research in the 6th Framework Program (FP6) focuses on the modernization of public agencies at all levels and the improvement of services for citizens and businesses which can save them time and money in their dealings with the government. Bringing added value at the European level, e-government services aim to be designed to facilitate the movement of people as well as business goods and services in the EU market. In this broad context, ITAIDE is a business-to-government IT project that seeks to provide new e-customs solutions based on the directives given by the Electronic Customs Multi-Annual Strategic Plan, which has already been mentioned in the introductory section. This project examines the customs situation in different European countries analyzing it from governmental and business viewpoints. In each
analyzed country, ITAIDE set up a living lab. Living labs constitute a research methodology that focuses on ICT innovative services and enables the collaboration of different stakeholders from both the private and the public domain for the development of a prototype in a real life context. The vision of the ITAIDE living labs is to provide solutions for new e-customs systems. ITAIDE has four living labs: each living lab is located in one EU country (Finland, the Netherlands, Denmark, and Ireland) and considers four types of industries (paper, beer, food, and pharmaceutical, respectively); in each living lab three main stakeholders (government, business company, and IT provider) interact and collaborate in order to develop a feasible e-customs concept and prototype which has to be adoptable both by the private and public sector. A detailed description of the ITAIDE research methodology and its structure within the living labs is given in Section 4.1.3 and Appendix I.2.

2.3. Research approach

This section concludes Chapter 2 illustrating how the research has been conducted. The research approach follows four main steps: (1) literature review, (2) research model development, (3) test of the research model by means of case study research, and (4) research model evaluation. Figure 2.1 combines the research approach with the applied theories, the developed research models, and the conducted case study research referring to the used methods and its frame of reference. In the following, each research step is highlighted.

![Figure 2.1. Research methodology diagram](image-url)
Literature review

In order to answer both research questions, this study starts with a literature review that lays the foundations of the research models’ development.

The first research question concerns diffusion of innovations and, more specifically, diffusion of business-to-government IT innovations. Literature provides several studies on diffusion of innovations that analyze how technology can be diffused and adopted by different stakeholders. Many researchers have applied the diffusion of innovations’ model proposed by Rogers (2003) in the field of e-government diffusion. The Rogers’ diffusion of innovations’ model gives the framework for the innovation-development process and the innovation-decision process by providing innovation attributes and adopter categories. However, this model has been criticized by other authors, e.g., Lyytinen & Damsgaard (2001), who argued that Rogers’ theory cannot satisfactorily describe the diffusion of complex and networked technologies such as business-to-government systems and needs, and therefore needs to be reconsidered. For this reason, in this work, a further model has been taken into consideration: the TOE model introduced by DePietro, Wiarda, & Fleischer (1990). This model proposes three elements for understanding technology adoption in an organizational context: technology, organization, and environment. The authors argued that, considering all of these factors, it is possible to define a context of change that describes the contiguity related to the diffusion of a specific innovation. The theoretical background for answering the first research question resides in the combination of these models. A more detailed explanation on how and why both models have been chosen and how they have been applied in the context of this dissertation is given in Section 5.1.2.

The second research question is related to the value assessment of business-to-government IT innovations. This kind of innovation involves two different sectors: the private and the public. Thus, when talking about value assessment of such innovations, two different perspectives have to be taken into account since the considered sectors have different understandings of the notion of value. Literature provides examples of value assessment frameworks in the private (Aladwani, 2002; Murphy & Simon, 2002; Shang & Seddon, 2002) as well as in the public sector (Cole & Parston, 2006; Cresswell, Burke, & Pardo, 2006; Emerson, Wachowicz, & Chun, 2000; Foley, 2006; Kelly, Mulgan, & Muers, 2002; M. H. Moore & Moore, 2005).

According to the statements above, in order to identify and assess e-customs value, an analysis and understanding of both value notions is needed. For this reason, all cited value assessment frameworks have been taken into consideration. The value
perception in the private and public domains, and in particular in the e-government context, as well as the description of all considered value assessment frameworks are given in Section 6.1.2.

Table 2.1 resumes the research topics and their related theories.

<table>
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<tr>
<th>Research Topic</th>
<th>Theory</th>
<th>Reference</th>
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<td></td>
<td>Organizational innovativeness</td>
<td>DePietro, Wiarda, &amp; Fleischer (1990)</td>
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Research model development

Since this dissertation addresses two research questions, two research models have been developed: one for the diffusion of innovations and one for the value assessment.

The first research model aims to represent the diffusion of business-to-government IT innovations. By developing this new framework, as pointed out above, two models have been taken into consideration, i.e., Rogers’ and the TOE model. The proposed research model is a result of the adaptation of Rogers’ model in the specific context of business-to-government IT innovations with a focus on e-customs. The TOE model has been used in order to provide not only the technological but also the organizational and environmental perspective by categorizing facilitators and barriers of diffusion as well as the employed research approach. The results that led to the first research model are described and discussed in Section 5.1.4 and 5.1.5, respectively (further discussions can be found in Appendix I.2).

The goal of the second research model is to give a framework for value assessment of business-to-government IT innovations. This framework is the result of the combination of various existing models, introduced before, that are used for the value assessment of new technologies in the private as well as in the public sector. The framework aims to fulfill the requirements and needs of both sectors. It is composed of
two parts: a procedure model, which guides the value assessment step-by-step, and a matrix that aims to categorize the identified values. The description of the development of this second research model is given in Section 6.1.4 (additional argumentations to the topic are presented in Appendix I.3).

Case study research

According to Yin (1994), a case study is an empirical inquiry that analyzes a contemporary phenomenon within a real-life context. In his work, the author argued that case study inquiry relies on multiple sources of evidence and benefits from the prior development of theoretical propositions to guide data collection and analysis. There exist three strategies on how to conduct case study research that can be used separately or together: exploratory, descriptive, and explanatory.

In this thesis, case study research has been used in order first to describe the case of e-customs and second to test and evaluate the proposed research models that have been developed based on literature review. For this reason, descriptive as well as exploratory case study research have been applied.

Different methods can support case study research; in this work, semi-structured interviews, workshops, and an online survey have been used. The guidelines on how case study research has been carried out are given in Appendix II where all methods are described.

Figure 2.2 shows how the analyzed research topics and their related publications are linked to the case study research: each case study and the used methods are mapped to the publications. Publications 4.1 and 4.2 present practical cases that have been studied in Switzerland. These case studies are based on an online survey and several semi-structured interviews. Both publications contribute to the introduction of e-customs systems. The rest of the publications (5.1, 5.2, 6.1, 6.2, I.1, I.2, and I.3) are the result of case studies conducted within the ITAIDE project where semi-structured interviews as well as workshops have been used in order to collect the presented data. The first research model has been presented and tested in publication 5.1 based on a case study conducted within the Food Living Lab. In publication 5.2, a further case study, carried out within the Paper Living Lab, integrates the results of publication 5.1. In regards to the second research question, a case study in the context of the Paper Living Lab has been studied in order to support the development of the second research model (see publication 6.1). Publication 6.2 describes a case study conducted in the Food Living Lab that aims to test the second research model.

Finally, the publications presented in the appendices seek to give a broader
overview on e-customs system innovations and their benefits for the private as well as the public sector. Appendix I.1 and I.2 are based on the Food Living Lab while Appendix I.3 refers to a case study conducted in the Beer Living Lab.

Figure 2.2. Publications linked to the case study research

Research model evaluation

Both research models have been tested by means of case studies. Their evaluations have been discussed in Section 5.1.5 and 6.1.5, respectively. Additionally, Section 6.2 is entirely dedicated to the evaluation of the value assessment research model. In Section 7 the key findings are summarized and the main conclusions related to the development of the research models and the answers to the research questions are drawn.
3. Publications Overview

This thesis is based on nine double-blind reviewed publications that have been either presented at international conferences and published in the conference proceedings or published in international journals and book sections (Table 3.1).

<table>
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<th>Table 3.1. Publications list</th>
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<tr>
<td><strong>Chapter 4</strong></td>
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<td><strong>Chapter 6</strong></td>
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<td><strong>Appendices</strong></td>
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In Table 3.1 the publications are linked to the chapters where they are presented: Chapters 4, 5, 6, and the Appendices. The publications that constitute Chapter 4 are dedicated to the introduction of e-customs while those that build Chapters 5 and 6 aim to answer the research questions by proposing the first and second research model, respectively. Besides the main chapters, the publications presented in the Appendices contribute to the research being the test bed of the articles that form Chapters 5 and 6.

In the following, each publication is summarized. The analyzed topics, the methods used for the case studies as well as the research time frame are highlighted.

**Introduction to e-customs**

*Publication 4.1*

*Challenges of Global Trade and the Transfer to e-Enabled Business Models in the Swiss Socks Market*  
(Boutellier, Flügge, & Raus, 2007)

This publication is the first that has been written in the context of e-customs systems innovations. It aims, first, to make the reader familiar with the topic of e-customs and, second, to present the research methodology of ITAIDE as well as its structure.

In order to reach these goals, a case study that considers two Swiss companies is presented. The two Swiss companies, Rohner AG and Blacksocks SA, are two leading companies in the Swiss socks market. The first company was established in 1933 while the second in 1999. Both companies are successfully operating in the socks market although they have a completely different business model. However, interviews with both companies reveal the potential need of customs procedures electronization. The interviews aim to present the supply chain process of both companies with a focus on customs procedures and to analyze potential scenarios if e-customs is introduced. The interviews with both analyzed business companies were conducted in February 2007 and their guidelines are outlined in Appendix II.2.

The ITAIDE business model is applied in both contexts allowing both companies and their ecosystems to adopt research findings and transfer them into applicable and scalable business models: it is shown how the research methodology used within ITAIDE can be applied not only on its particular case but also on external companies.
Publication 4.2

*Facilitating e-Commerce Adoption: An Electronic Customs System*  
(Raus & Boutellier, 2010)

In order to give an overview of both customs procedures and e-customs, a review on European and Swiss customs regulations is presented. This publication focuses on the importance of e-customs from the industrial perspective. It is argued that the development of international electronic trade, i.e., e-commerce, might easily improve if adequate governmental regulations support it. Based on literature review and EU/OECD reports, it is demonstrated how legislation is important for the success of international e-commerce. In particular, it is shown how e-customs and its related legislations influence e-commerce. The aim of this work is to present e-customs as a tool for e-commerce adoption facilitation by analyzing e-customs systems advantages and demonstrating how e-customs may help international e-commerce trade.

The study is conducted based on literature review in the field of e-commerce adoption, EU/OECD reports, EU and Swiss customs regulations, e-commerce best practices reports, and a case study. The case study considers Switzerland as a non-EU country that has to adapt its regulations to be EU compliant. The Swiss government promoted an initiative that encourages electronic customs implementation by June 2009. In this context, in October 2008 an online survey was conducted among 36 Swiss SMEs. The survey aimed to understand companies’ willingness to adopt the new e-customs system and its perceived benefits. The structure and the questions of the online survey are presented in Appendix II.3. As a result, e-customs related factors and EU customs regulations are proposed as e-commerce adoption enablers.

This paper concludes the introductory part highlighting the international importance of e-customs.
Diffusion of e-customs innovations

Publication 5.1

Electronic Customs Innovation: An Improvement of Governmental Infrastructures
(Raus, Flügge, & Boutellier, 2009)

This article analyzes the topic of diffusion of innovations. It starts with a literature review based on Rogers’ theory of innovations considering the technological, organizational, and environmental context (TOE model). It is argued that, in order to analyze the diffusion of complex IT innovations such as e-customs, an adapted diffusion model is needed. Therefore, a model for IT innovations diffusion is proposed based on Rogers’ model. It constitutes the basis of the first developed research model and aims to answer the first research question.

The research includes a case study conducted in the Food Living Lab that took place from June 2007 to October 2008. The proposed research model is therefore tested and evaluated in the context of this living lab. It results in the identification of facilitators and barriers related to customs management. The case study took place in June 2007 and is based on a workshop conducted with the method of the syntegration process. This particular workshop method is described in Appendix II.2. Additionally, semi-structured interviews have been conducted with representatives of the private and public sector as indicated in Appendix II.1.

This article contributes towards the research of diffusion and adoption of e-government standards and in particular of standardized e-customs solutions as well as the political and societal impact of e-customs policies.

Publication 5.2

Diffusion of e-Government IT Innovation: A Case of Failure?
(Raus, Kipp, & Boutellier, 2008)

The main goal of this article is to give a theoretical framework to the implementation of e-customs systems in order to identify elements that may lead to the rejection of such systems. It examines the adoption and diffusion of e-customs solutions. The primary aim is to understand why adoption and diffusion of e-customs systems can fail in the context of business-to-government IT innovations. This study is based on the case of the Paper Living Lab that took place from June 2006 to December 2007 and includes six workshops and eight semi-structured interviews based on the guidelines
provided in Appendix II.1.

The theoretical background resides in Rogers’ innovation-decision process with focus on the decision stage in which adoption variables proposed by Frambach (1993) and a model illustrated by Woodside & Biemans (2005) are considered. By developing a specific framework for the adoption of organizational innovation in living labs, this paper contributes towards the analysis of the elements that may lead to the refusal of business-to-government IT solutions such as e-customs. This framework integrates the first research model by providing the context under which e-customs innovation takes place.

The article closes the section dedicated to the diffusion of e-customs systems: not only the diffusion process but also the factors of its potential rejection are analyzed.
Value of e-customs

*Publication 6.1*

*Evaluating IT Innovations in a Business-to-Government Context: A Framework and its Applications*  
(Raus, Liu, & Kipp, 2010)

The aim of this paper is twofold: first it provides an exhaustive literature review on value assessment considering existing value assessment frameworks for the private as well as the public sector. After the presentation of the literature review, it is argued that a value assessment framework applicable in both sectors is missing. Therefore, the second contribution of this paper is the development of a new value assessment framework that combines the value understandings from both private and public stakeholders. The developed value assessment framework builds the second research model proposed in this dissertation.

By highlighting the challenges of assessing the value of business-to-government IT innovations, the proposed value assessment research model is applied, tested, and evaluated in a real-life case, i.e., in the Paper Living Lab. This living lab took place from June 2006 to October 2007 and has been studied through several workshops and semi-structured interviews. The case study is therefore based on the results of workshops and semi-structured interviews conducted with representatives from both private and public sectors; case study guidelines are given in Appendix II.1.

The application of the developed value assessment framework is thus discussed in the case of the introduction of e-customs systems in the Paper Living Lab and results in the identification of potential benefits that this introduction may bring to the different stakeholders.

*Publication 6.2*

Value Assessment of Business-to-Government IT Innovations: A Case Study  
(Raus, 2009)

This paper closes the section dedicated to value assessment analysis. It aims to test and evaluate the developed value assessment research model presented in publication 6.1. Therefore, this paper does not give a theoretical contribution but focuses on the application of the new proposed value assessment framework for business-to-government IT innovations.
Further, this paper analyzes the case of the implementation of a common standardized e-customs solution in the Food Living Lab. Within the framework of this living lab, the study is conducted collecting data from several semi-structured interviews and three workshops, carried out between June 2007 and October 2008, which involved stakeholders coming from private as well as public organizations. Guidelines to these interviews and workshops are given in Appendix II.1. By applying the value assessment framework, different main areas of improvement due to common e-customs solutions’ implementation have been identified.

This article shows how the developed value assessment framework can be successfully applied in the case of the implementation of a common standardized e-customs solution analyzing its impact on the private and public sector.

This study gives answers to the second research question contributing towards value assessment research in the context of business-to-government IT innovations.
Additional publications

Appendix I.1

Cross Border Supply Chain: Operational Benefits of e-Customs and e-Taxation
(Nieto, Reiner, & Raus, 2008)

This work contributes to the analysis of benefits of e-customs solutions. It focuses on operational benefits and discusses the impact of e-customs and e-taxation on operational supply chain performance. Since administrative workload reduction is only part of the possible benefits and potential improvement, the operational supply chain process level also has to be evaluated. To support this evaluation, a framework is proposed that considers the potential improvement of customs as well as the supply chain specificities to define the relevant performance indicators. In addition, an example based on a real supply chain is presented. This example resides in investigations conducted in the Food Living Lab between 2007 and 2008. Appendix II.1 describes how investigations have been conducted: semi-structured interviews and workshops have been the main research tools.

Simulation is used to estimate benefits of e-customs and e-taxation on the operational supply chain performance. The paper highlights how operational benefits might be relevant and have therefore to be included in the assessment of new IT solutions.

Appendix I.2

Innovation Steps in the Diffusion of e-Customs Solutions
(Raus, Flügge, & Boutellier, 2008)

This paper has been the first publication that presents preliminary results in regards to e-customs diffusion. As publication 5.1, it proposes a diffusion model of business-to-government innovations based on Rogers’ and the TOE model. It presents the case study of the Food Living Lab based on semi-structured interviews carried out between June and October 2007. Additionally, the analysis of this paper considers a workshop, conducted in June 2007, based on the syntegration method which is described in Appendix II.2. The main results of this work correspond to a set of facilitators and barriers that can positively or negatively influence diffusion of e-customs solutions.

This paper constitutes, therefore, the first contribution within this thesis to the diffusion of business-to-government IT innovations.
Appendix I.3

_E-Government Project Evaluation: An Integrated Framework_
(Liu, Derzsi, Raus, & Kipp, 2008)

This paper has been published before publication 6.1 and analyzes value assessments. After a detailed categorization of existing value assessment frameworks, this study is the first publication that aims to present a new value assessment framework, i.e., the second developed research model.

The proposed framework is applied on a case study that resides in the Beer Living Lab context. It is based on workshops and semi-structured interviews conducted between January 2006 and June 2007 (described in Appendix II.2). Within this living lab, the presented new value assessment framework is applied for the first time.
4. Introduction to e-Customs

4.1. Challenges of global trade and the transfer to e-enabled business models in the Swiss socks market

Roman Boutellier, Barbara Flügge, Marta Raus

2007

Published in Proceedings of the 20th Bled eConference, Bled, Slovenia, June 3-6.

Recent research has acknowledged the need to shift from the traditional one to one e-enabled business model to a many-to-many one. With the introduction of the Internet in the 1990’s, companies such as Blacksocks SA and Jacob Rohner AG suddenly found a means and the environment to think about e-enabling their business models or even start a company purely based on that experience. Building on a wide range of analyses of the terms business models and e-business models, e-business models in our understanding depict company’s capability to apply, use or even exist through an e-enabled environment. The Internet itself is being seen as a family of tools, methodologies and concepts to represent the e-enabled environment. Meanwhile, Currie and others are drawing attention to value creation from e-business models and Joyce and Winch discuss the evolvement of a business model to become e-enabled (Currie, 2004). In contrast to their key findings, the EU research project ITAIDE and the underlying business cases in this paper go further. The argumentation and the conclusion we will infer in the paper show that e-enabled business models are much more than the application of tools and methodologies through the simple existence of the Internet. Further than the reach of companies, collaborative and decent research environments such as ITAIDE allow companies and ecosystems to adopt lessons from the research findings and transfer those into applicable and scalable e-business models.

Keywords: Business model; e-business model; global trade; ecosystem; e-customs; transferability.
4.1.1. Introduction

Globalization is concerning suppliers, consumers, distributors as well as governmental institutions. Benefiting or suffering drawbacks from globalization with regard to business activities can be considered as the decision of individual business companies; however, a set of external factors add to that decision making process. Customs management is an essential part in dealing with globalization. The challenge affects business and governmental actors as well as technology providers and Information Systems (IS) solution providers.

This paper is grounded on the actual situation of global trade development assessed by the World Trade Organization (2007). From an IS solution provider point of view, SAP conducted various studies on global trade evolvement and enterprise specific requirements on IS support for export and import processes (SAP AG, 2006). From an enterprise’s perspective, companies can assess the consequences of global trade onto strategic and organizational decisions through various market studies, sales, and manufacturing specific analysis of product supply and distribution streams. These are only two examples of a wide range of publicly accessible and internally discussed implications of global trade from any trade partner’s perspective.

Major events in companies’ orientation to expand nationally, regionally or globally were based on the introduction of IS. A number of research efforts have been undertaken in the last decades to push IS research reaching out for implications, motivators, failures, and successes of IS related deployment cross organizations; one example is the IS related research programme of the European Union.

Envisioning the field of potential research activities for global trade, companies’ involvement in any research activity will lead to the overall question what is in it for the company. The paper aims to analyze the concept of e-business model transferring research results of an EU funded project (ITAIDE) to enterprises not involved in the research environment. ITAIDE is providing a qualitative research environment focusing on electronic customs management. Drawing essential elements of research explicitly concentrating on transferability concepts, methodological considerations yield an approach of how transferability might be conducted. The approach of business models is highly linked to IS research environments. Any company that is deploying IS has the opportunity to reconsider strategic decisions on adopting electronic business model elements or even to reconsider and set up a complete new enterprise strategy. An overview of different definitions of business model is being provided based on the studies of Rappa (2000), Petrovic, Kittl, & Teksten (2001), Timmers (1998), and

The transferability efforts from ITAIDE to enterprises will be demonstrated exemplarily on two Swiss enterprises working in the socks manufacturing and distribution business.

The remainder of the paper is structured as follows: Section 4.1.2 provides the background on the two main drivers of transferability for companies: it outlines the evolvement of trade and its implications on export and import activities; in addition, it provides an analysis of business model approaches in literature. Section 4.1.3 dives into the methodological considerations of qualitative research as being applied at ITAIDE. It also introduces the qualitative research approach by making the audience familiar with the external cases of the two Swiss companies. The analyzed companies are Jacob Rohner AG, an experienced firm established in 1933 in Switzerland, and Blacksocks SA, a young small Swiss enterprise founded in 1999. Both SMEs are involved in the socks market and have customers not only in Switzerland but also abroad and have to deal every day with foreign customers and stakeholders. Section 4.1.4 incorporates the research elements and research field from the previous sections into the case study approach proposed by Eisenhardt (1989) concluding into a feasible transferability exercise. It aids the researcher in envisioning what comes after the initial field work and it demonstrates to business partners in research environments that it is worthwhile to contribute in one way or another to research endeavours. A joint journey of researchers and companies contributes to both angles of applied qualitative research. The paper concludes in Section 4.1.5 with a summary of the key findings and an outlook into future studies considering the limitations of this work.

4.1.2. Background on drivers of transferability

In this section we provide the background for the case being described in Section 4.1.3. First of all an overview of the actual situation of the global trade is given. Next, the global trade is described showing the data of its growth in the last 50 years and the enormous changes in the last decade. Especially, this section points out the need of new electronic customs tools that may enable a more efficient and safer trade. Furthermore, we present various definitions of the concept of business model that is intended to describe and to define our case study.
Global trade

Global trade has drastically changed in these last years. In order to ensure international commerce, the main issue that has to be overcome is the security of global businesses. After 9/11, four main changes can be identified in the global trade: globalization, regulatory pressures, government IT modernization, and increased complexity (SAP AG, 2006).

Globalization is defined as the process of creating links between organizations and individuals that transcend national boundaries and are not subject to political interferences. There are four main forms of globalization: market, production, finance, and communication. Information technology, and particularly the Internet, is considered to be an important catalyst in the globalization process. In the last 50 years the global trade increased and is still growing rapidly as demonstrated by the value of World Merchandise Trade in 2003 (Figure 4.1), which was approximately USD 15,000 billion, recorded by the World Trade Organization (2007).

![Figure 4.1. Growth in value of world merchandise trade](image)

The importance of the global market has also increased and nowadays there is a trend towards selling in new territories and sourcing from overseas suppliers. However, several times, the structure of the supply chain is not ideal and errors within it may occur. The question that has to be answered is how to better manage the supply chain considering all the rules and regulations of different countries involved in the trade. Only after finding a solution of this challenge it is possible to have a more
consistent supply chain that leads to more productive businesses and better bottom line results.

After 9/11 in the US and other terrorist attacks such Madrid 3/11 in 2004 or London 7/7 in 2005, more scrutiny in every kind of business or transaction is required. The national security has become tighter and new legal responsibilities on business have emerged. Therefore, companies need to strictly adhere to changing regulations or they risk costly fines. Examples of trade regulations and security initiatives are Export Administration Regulations (EAR), Customs Trade Partnership Against Terrorism (C-TPAT), Container Security Initiative (CSI), and Sarbanes-Oxley Act (SOA, financial control). Considering all these anti-boycott and anti-terrorism regulations, it has required a consistent effort on the part of worldwide businesses as they are driven by a large and considerable number of different rules.

The customs process has always been a paper driven business. In the last decade there was a significant change in the manner of conducting commerce and nowadays all over the world governments are modernizing their systems and expect businesses to communicate electronically, thus increasing the demand for automation. Three main areas, where these changes are visible, can be recognized: Europe, US, and Australia. In the European Union there exists an e-customs initiative that has as main vision the implementation of a paperless environment for customs. This initiative started in 2004 and has a 7-year time span: in 2004 the NCTS (New Computerized Transit System) was introduced, in 2006 the AES (Automated Export System) was introduced, in 2008 the AIS (Automated Import System) will be introduced, and in 2010 there will be one common electronic customs system for all 27 EU member countries. Not only does Europe aim to have a standardized e-customs system, but the US is also heading in that direction, via the AES, the mandatory SED (Shipper’s Export Declaration) and the ABI (Automated Broker Interface). Last but not least, Australia possesses and has already introduced the Integrated Cargo System (ICS), which is an electronic import system used for customs clearance and provides access to other governmental agencies through a single window.

All the changes presented above have increased the complexity in conducting commerce demonstrating that a global trade corresponds to a large number of involved parties, document requirements, and charging regulations. Companies that want to trade globally have to consider diverse aspects and, before starting to conduct overseas businesses, have to clarify many factors. For example, it is fundamental to know which laws and regulations have to be considered or how products are classified and duties are calculated. Other issues are essential before trading globally, such as to know how
electronic communication with customs authorities is ensured, how to keep track of the inventory in a bonded warehouse, whether the goods qualify for a trade preference program, and how the mitigation of financial risk is possible.

After mentioning the above discussed issues in global trade and analyzing the current situation in three big areas (Europe, US, and Australia), it is evident that the customs handling process is becoming electronic and aiming towards a standardized solution. This standardized solution has not yet reached completion but many European and non-European funded projects are working on it.

**Definition of e-business models**

In 1997 the European Commission defined electronic commerce as *doing business electronically*. After ten years this definition is still valid but the technologies behind this concept have enormously increased. In his work, Rappa (2000) provides a list of 29 different business models and divides it in nine categories. Rappa also points out that there is no single and unique definition for the concept of business model. Petrovic, Kittl, & Teksten (2001) simply describe a business model like a model of business. A business model provides the description of the logic of a *business system* in order to generate value that is intrinsic in the business process. Therefore, a business model describes the core logic of a business. This is also presented by Linder & Cantrell (2000). The authors define an operating business model as a model representing the organization’s core logic of creating value.

The business model of a profit-oriented enterprise explains how it makes money. Since organizations compete for customers and resources, a sustainable business model supports the relevant activities and approaches of a company. It enables a company in succeeding by attracting customers, employees, and investors and delivering products or services in a profitable manner. Only those business model components that are part of the essential logic are included, thus enterprises’ operating models may look dramatically different from each other.

In their work Petrovic, Kittl, & Teksten (2001) divide a business model into seven categories. These categories are described in Table 4.1.

Additionally, Timmers (1998, p. 4) defines a business model as ‘an architecture for the product, service, and information flows, including a description of the various business actors and their roles; as well as a description of the potential benefits for the various business actors and a description of the sources of revenues’. In his work, Timmers identifies ten different types of e-business models (Table 4.2).
Table 4.1. Business models categories

<table>
<thead>
<tr>
<th>Business models categories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Model</td>
<td>Describes the logic of what core product(s) / service(s) / experience(s) are delivered to the customer.</td>
</tr>
<tr>
<td>Resource Model</td>
<td>Describes the logic of how elements are necessary for the transformation process, and how to identify and procure the required quantities.</td>
</tr>
<tr>
<td>Production Model</td>
<td>Describes the logic of how elements are combined in the transformation process from the source to the output.</td>
</tr>
<tr>
<td>Customer Relation Model</td>
<td>Describes the logic of how to reach, serve, and maintain customers.</td>
</tr>
<tr>
<td>Revenue Model</td>
<td>Describes the logic of what, when, why, and how the enterprise receives compensation in return for the products.</td>
</tr>
<tr>
<td>Capital Model</td>
<td>Describes the logic of how financial sourcing occurs to create a debt and equity structure, and how that money is utilized with respect to assets and liabilities, over time.</td>
</tr>
<tr>
<td>Market Model</td>
<td>Describes the logic of choosing a relevant environment in which the business operates.</td>
</tr>
</tbody>
</table>

Table 4.2. E-business models definitions

<table>
<thead>
<tr>
<th>Business models types</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-shop</td>
<td>Promotion, cost-reduction, additional outlet (seeking demand)</td>
</tr>
<tr>
<td>e-procurement</td>
<td>Additional inlet (seeking suppliers)</td>
</tr>
<tr>
<td>e-auction</td>
<td>Electronic bidding (no need for prior movement of goods or parties)</td>
</tr>
<tr>
<td>e-mail</td>
<td>Collection of e-shops, aggregators, industry sector marketplace</td>
</tr>
<tr>
<td>Third-party marketplace</td>
<td>Common marketing fronted and transaction support to multiple business</td>
</tr>
<tr>
<td>Virtual communities</td>
<td>Focus on added value of communication between members</td>
</tr>
<tr>
<td>Value chain service provider</td>
<td>Support part of value chain</td>
</tr>
<tr>
<td>Value chain integrator</td>
<td>Added-value by integrating multiple steps of the value chain</td>
</tr>
<tr>
<td>Collaboration platforms</td>
<td>Collaborative design</td>
</tr>
<tr>
<td>Information brokers</td>
<td>Trust providers, business information, and consultancy</td>
</tr>
</tbody>
</table>
All definitions and types of business models mentioned above only refer to business-to-business processes and only take into consideration enterprises.

From our point of view, the concept of business model can be also used for governmental relations and include all the stakeholders who take part in a governmental process. Also, in our case it seems to make sense to formulate a more specific definition of business model, and therefore e-business model, one that includes not only the pure business activities but also the governmental aspect. Thus, for our specific case, we define an e-business model as an *e-model based on an e-enabled collaboration platform*. A model delivers products and services to the customers who are both enterprises and authorities. A collaboration platform is a platform accessible by every stakeholder. Usually a collaboration platform has a defined focus on specific functions, such as collaborative share of information or interest in a specific business sector. Our collaboration platform should share information about the customs process to the stakeholders involved in the process, i.e., the exporting enterprise, the shipper enterprise, the customs office, and the tax office.

4.1.3. Methodological considerations

**Qualitative research**

Researchers and IS research related associations have been investigating implications and motivators for e-business scenarios for business-to-business, business-to-government, and government-to-government (European Commission, 2005a; Kraemer & Perry, 1979; United Nations, 2005). Failures and successes have been added to the researchers’ checklist as validity criteria especially in academic and public funded studies to get closer to possible answers about how IS is being adopted (Henriksen, 2002; Iacovou, Benbasat, & Dexter, 1995; Ridley & Ridley, 1999). Researchers surrounded and examined these factors by applying various research disciplines. In the following we focus on three disciplines: (1) qualitative research methods, (2) research field, and (3) research contexts.

(1) Researchers adopted, applied, commented, and studied the proper research methods; research methods did grow with the evolvement of information systems and their richness in addressing multi-dimensional needs and acceptance criteria. Applying qualitative research as a method, it varies from action research to case study research and ethnography. Qualitative research adopted concepts from social sciences and included social and cultural experiences.

(2) Drawing our attention to key elements of IS research, the research field is
affected by individuals, organizations, and information technology. The researcher should consider time spent in the research field in relation to the depth of participants’ observation. Depth and closeness to participants’ environmental elements such as business partners and organizational units are influencing elements that determine a participant’s behaviour and activity level during the undergoing research. The researcher collects data through interviews, questionnaires, documents, and texts as well as observations in various instances, cycles and iterations (Myers, 2007). As Susman & Evered (1978) pointed out, qualitative research such as action research is a dynamic cyclical process with five phases: diagnosing, action planning, action taking, evaluating and specifying learning. Baskerville & Wood-Harper (1998) adds the researcher’s (social) interaction with the observing participants and field as an environmental setting.

(3) Another discipline is focusing on IS research and broadening the view by considering social, cultural, and inter-organizational as well as inter-institutional contexts: cultural diversity in integrating IS in somebody’s daily work, and supporting the needs of individuals as well as organizational units while expecting distinct IS related support levels in the same business context for diverse and collaborative environment (Myers, 1999, 2007). Motivators to the individual as well as the organizational or institutional participant in the research field can be categorized in performance (drivers), pressures (limiters) and policies (enablers) related motivators amongst others (HenrikSEN, 2002).

The combination of the above outlined research disciplines leads to the following assumptions.

Qualitative research grounds validity based on the observed field topic and the data collection process, applying various means and techniques as well as determining whether interpretation of data is appropriate or not. Due to time spent in the field, closeness and proximity to the observation related activities of the participants, it is up to the researcher to decide upon techniques, models of analyzing and interpreting qualitative data. Medical researchers are discussing the validity aspect of research from a philosophical point of view (Malterud, 2001). Validity is also a crucial element in the concept of transferability of research results (Baskerville & Wood-Harper, 1998; Susman & Evered, 1978).

Both validity and transferability are tightly linked and interact with each other along the timeline of the research activities. The longer the researcher spends time in the field, the more the researcher might benefit from the depth of data, the duration of collection cycles and the ability to extend the evaluation period. The researcher
benefits by including additional aspects and facets to the research and its analysis, giving him time to transfer results back to the research field. Malterud (2001) calls this process internal transferability. In the concept of external transferability, the researcher should consider how results are going to be transferred to other research environments as well as when. Appropriate means need to be determined by the researcher through discussions, testing cycles and the concept of iterations and feedback loops in the research cycle. Research projects such as ITAIDE allow intense business and field involvement to study IS concepts contemplating one or many aspects from above.

The research approach at ITAIDE

ITAIDE will address the problem of technological and political fragmentation of information systems for cross-border trade and international supply chains, which is due to lack of interoperability and collaboration between organizations. It will develop methods to create a network configuration of key actors (business, government, technology providers) to facilitate integrated e-customs solutions. These methods include interoperability between private and public sector, software tools for procedure redesign, and a collaborative network model for network configuration.

ITAIDE empowers the researchers to bridge external enterprises to those directly involved. The same applies for governmental institutions that are not part of the ITAIDE consortium, but connected to those governmental authorities such as Dutch Tax and Customs being directly involved in ITAIDE.

The research at ITAIDE is characterized by a cyclical process where the elements work consecutively and allow a feedback from one element to the others. The research field at ITAIDE is defined along industry specific settings, called living labs. The living lab concept originated from the high-tech industry and has been adopted as a research instrument to construct the research setting in a qualitative research environment such as ITAIDE. It allows the researcher to position himself in the research environment and take various viewpoints such as the one of an enterprise, a governmental institution, a technology provider or an individual participant in the research field. With respect to the applied methodology, ITAIDE is applying the UN/CEFACT methodology for standardized business process and business information exchange. The methodology is the underlying methodology in the research cycle for data and process modeling (Stuhec, 2006)

UN/CEFACT itself is the United Nations Centre for Trade Facilitation and Electronic Business - the international body whose mandate covers worldwide policy and technical development in those areas. UN/CEFACT is a subdivision of UNECE.
UNECE works closely together with other international standardization organization. UN/CEFACT developed and promoted tools for the facilitation of global business processes such as UN/EDIFACT, the United Nations Directories for Electronic Data Interchange for Administration, Commerce and Transport, and the CCTS Methodology, and UMM.

The research approach at ITAIDE triggers business process analysis through the UMM methodology by examining, documenting, and standardizing collaborative business processes in which the business information is commonly used and correctly interpreted by multiple research participants. The research participants are aligned along four living labs representing the research field at ITAIDE. Figure 4.2 represents the research skeleton applied on the four living labs (Beer, Paper, Drug, and Food Living Lab).

![Diagram](image-url)

**Figure 4.2.** Research field at ITAIDE represented through the living labs
The research setting at ITAIDE gives the opportunity to provide internal and external cyclical research processes:

- Learning from and transferring research back into the field from one living lab to another or multiple ones;
- Learning from one living lab, focusing on a specific industry, and transferring research to an external environment;
- Learning from the participant category (governmental institutions, enterprises or technology providers) and transferring research across the living labs based on the category;
- Learning from the participant category and transferring research to an external environment;
- Applying and integrating transferability results back to the research field and exploring further research questions;
- Applying research results in the area of collaborative business process management and business model design for governmental and business partners.

ITAIDE offers a wide field of research studies through its research concept of the living labs, like ethnographic studies of groups involved in the adoption of IS, industry specific research-related which differ from one country to another one or pan-European studies of trade specific IS solution developments. The following paragraph describes in detail the organizational structure, the supply and distribution chains of two Swiss companies from the manufacturing industry. Both companies are categorized as SMEs.

Introducing the external research environment

Before the companies are described in more detail, we would like to answer the following two questions: (1) How did the selection take place? and (2) How did the data collection process take place?

(1) The companies that have been used for this study are Jacob Rohner AG and Blacksocks AG. Both companies are not involved in ITAIDE, have their headquarters in Switzerland, and conduct export and import processes from EU member states and from non-EU member states.

(2) A minimum of two interviews with employees and decision makers of each of the companies have been conducted. The interviews were based on a set of structured questions that guided the interviewees through the process, containing for parts, i.e.,
(1) demographic part: information such as organizational structure and function of the interviewee, (2) descriptive part: supply chain and distribution chain, (3) normative part: assessment of critical success factors to the company relevant to export and import, and (4) comment part.

In addition to the conducted interviews, both companies provided documentation on company strategy, process descriptions, additional organization related information, and data files, i.e., material on purchase order process, shipping process, customs notification process, export declaration process, loading process to export products, completion of loading and export initialization, transportation to importing country, goods receipt process at importing country, goods receipt process at end customers, statistical process for reporting and VAT collection process.

Both cases are described below.

**Jacob Rohner AG** is a Swiss enterprise founded in 1933 in Balgach, Switzerland. Nowadays, the enterprise has 180 employees working to develop and manufacture socks. In average, the yearly production reaches 8 million pair of socks which are distributed in Switzerland and other 22 countries. The customers of Jacob Rohner AG are SMEs but also larger retailers such as MIGROS or Jelmoli. Company growth is not only the result of qualitative products but also of an efficient supply chain which permits a shipment within Switzerland in only 24 hours. In foreign countries it takes longer (48 hours). The company has 150 knitting machines in its own production hall in Balgach and processes 300 tons of yarn per annum. The socks with open toe section are dispatched (weekly 50,000 socks) direct from the knitting machine to a subsidiary company in Oliveira de Frades (Portugal) where this section is added. Once finished and packaged, the socks are returned to the high bay shelving warehouse in Balgach. The warehouse holds around 2.2 million pairs of socks, a quantity that is required to guarantee a prompt delivery. Jacob Rohner AG shows a very rapid growth. However, things have not always been as they are nowadays. In March 2000 the company was totally insolvent and bankrupt. The management of the firm did not understand that it was time to walk away from their old established business model. Until 2000 the company was antiquated, without any IT implementation, and everything was done manually. After going bankrupt, the company was bought by Ylatex Holding AG (Lion Group) and drastic changes were made. The actual CEO of Jacob Rohner AG, Mr. Benno Gmürr, came from Ylatex Holding AG and in 2001 started a deconstruction of the whole structure of the firm. With the arrival of the new CEO, the business
model of the company completely changed and after the initial deconstruction of the old model, a reconstruction took place: the production was centralized in Balgach, a new high rack system was built providing space for 3.5 million socks, and a new IT system was implemented.

Jacob Rohner AG now exports to 22 different countries, even overseas such as to Canada and Asia. The production takes place in the factories of Balgach, in Switzerland, and the socks go to Portugal where they are knitted and packaged. In the warehouse every pallet is identified with computerized customs documentations. The documents for the identification are printed out at the warehouse and stuck to the pallet. The logistic partner who transports 50,000 socks to Portugal weekly receives all the pallets identified with barcodes. The transportation company is in charge of the customs handling. Once the socks are packaged and ready for sale, they will be sent back to the Swiss warehouse.

We focused specifically on the export process to Germany as example of export to an EU member state. For the export to Germany the logistic partner, the Deutsche Post (the German Postal Service), is responsible for the customs procedures and insures a transparent control at the Swiss borders of Basel. The identification of the pallets takes place using the barcode scanning assuring that the declared goods correspond to the effective goods on the pallets. As affirmed by the CEO Mr. Gmürr, there is no IT integration between Jacob Rohner AG, the supply chain provider, and the customs office. Figure 4.3 presents the example of the export from Switzerland to Germany.

Figure 4.3. Jacob Rohner AG: supply chain and export flow
Blacksocks SA started its operation based on a simple smart idea which consists in trading black socks for the male customer segment via the Internet. The company, founded in 1999, is applying a single sales channel to date. The current ecosystem is characterized through a discrete business model. The customers themselves decide upon a pre-selected number of products. Blacksocks SA grew its customer base to about 30,000 customers, where 80% of them are Swiss customers; besides Switzerland, Blacksocks SA also delivers to 72 other countries. The customers order via a subscription service on the Internet. Payment is done via credit card transaction. The production, solely based in Italy near Milan, is characterized by mass production (black socks). Workmanship characterizes a test cycle and production procedure before any pair of socks leaves the manufacturing site: the highest quality yarns are used to produce the socks. They are dyed exclusively in certified Oekotex colors to ensure the dye will not harm the skin. The final product is then knitted as one piece, sewn together in the upper-toe area and ironed. From every shipment of yarn that arrives at the factory, 2 or 3 pairs of ‘test’ socks are produced. The rest of yarn shipment is then stored, until the test socks have been extensively examined. The testing is simple: the head of production himself wears the socks until they've gone through approximately 20 washes. Those socks are then compared to socks from previous series for chafing and color-fastness. If the socks do not pass the test, the yarn goes back to the mill. Blacksocks SA is focusing on a pre-selected range of products: mid-calf socks and knee-high socks.

The packaging material is produced in Switzerland and delivered to the assembly line, located in Switzerland as well. The end products are delivered directly to the end customers in a pre-order format. Subscription based deliveries increased over the years to about 100,000 deliveries per year in 2006. High delivery reliability and high quality products are reflective of the comparably high price segment where Blacksocks SA is positioning itself. Marketing wise there are two main characteristics of Blacksocks SA. First, Blacksocks SA is seeking direct customer response in its approach to marketing the product, facilitating a way to remind the company that a new purchase might be needed: this process can also relieve the customer – by subscribing to a standardized product – who needs his socks to be renewed (regularly). Second, Blacksocks SA is focusing on a clear customer segment that is being addressed worldwide.

Electronic invoicing is conducted via online payments for end customers. Invoicing for marketing services and any other supply purchases are handled manually. From a tax and customs point of view, Blacksocks SA will consider how to tackle administrative efforts in the tax and customs handling; such as VAT identification.
number, exception handling for cotton imports to the USA if Blacksocks SA needs to promote 100% cotton socks or cotton underwear shipped in a larger quantity than is used today.

In the future Blacksocks SA is considering offering male underwear and it is already known that the product source will not be Italy. Import processes will start from India, the current delivery process from Italy to Switzerland might change to combined delivery, as a product bundle will increase the market share for Blacksocks SA. The assembly process might be located in Italy or in Switzerland.

By adding a new product segment, Blacksocks SA is extending its ecosystem and involving more business and governmental partners. The data and information handling is only IT related to a certain degree. Purchasing occurs 12 times a year handled manually by Blacksocks SA. The calculation is based on forecast automatically derived from delivery volume. The shipment handling is manually done as well. The simplistic process works in the current situation. The export process is conducted by the Swiss Postal Service and Local Postal Service to deliver goods to end customers. Regarding import processes, import shipments are coming from Eastern Europe via Germany (truck shipments) and for new product segments from India for example. 25% of Indian shipments are airfreight shipments and 75% are sea shipment. Goods receipt at the end customer cannot be tracked, data cannot be proved. Complaints handling is currently handled via Hotline on a manual basis. Due to the current business model of delivering a pre-defined set of low cost and low volume products directly to end customers, Blacksocks SA is not requiring a specific need for customs handling for the current status-quo. Figure 4.4 presents the current export from Switzerland to the end customers. The recycling flow for outdated products and the packaging materials might look like outlined below.

Once Blacksocks SA starts executing new product lines, like the promoted underwear segment, and developing a higher international reach, the company will need to consider customs handling that fits to its e-business model. Increasing volume in a larger number of countries will still require delivery reliability and a high satisfaction rate for first-time customers. The recycling process has been excluded for various reasons. First, involving TexAid for the new product segment might not be applicable. Second, if Blacksocks SA introduces direct delivery from a production site, the TexAid support needs to be revised. The physical supply chain will be challenged in many ways to meet the data flow that is reaching new customers and subscribers before the actual product is being delivered. As speed is crucial, any obstacles in customs management will slow down the business and risk new market opportunities.
According to the above statements, Figure 4.5 shows how the supply chain flow could look like.
4.1.4. Transferring research by applying Eisenhardt’s framework

Transferability, as outlined in Section 4.1.2, can be conducted in a number of ways. The framework adapted for the outline purpose of this paper is the one proposed by Eisenhardt (1989). The framework is composed of five phases and their related activities. A simplified version of the framework is presented in Table 4.3 indicating its application on the ITAIDE case. This approach is used in order to analyze the case studies.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activity</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Getting Started</td>
<td>Definition of research question</td>
<td>Comprising the challenges and multiple perspectives of e-customs development, the project aims to overcome difficulties in cross-border trade</td>
</tr>
<tr>
<td>2 Selecting Cases</td>
<td>Neither theory nor hypotheses</td>
<td>The cases relevant for e-customs derive from the living labs</td>
</tr>
<tr>
<td>3 Crafting Instruments and Protocols</td>
<td>Multiple data collection methods</td>
<td>The data collection and investigation approach is carried out by a highly integrated team of academic researchers accompanied by technology, business and governmental partners</td>
</tr>
<tr>
<td>4 Entering the Field</td>
<td>Overlap data collection and analysis, including field notes</td>
<td>The project is integrating academic research with on-site investigations, exploratory studies, action research and case studies</td>
</tr>
<tr>
<td>5 Analyzing Data</td>
<td>Within-case analysis; cross-case pattern search using divergent techniques</td>
<td>This phase is currently in process. Investigation and data analyze is being conducted in the first twelve months for the involved business partners, governmental partners and standardization partners</td>
</tr>
</tbody>
</table>

After the application of the Eisenhardt’s framework on the ITAIDE case, we concentrate on the Swiss companies transferring them to the ITAIDE approach. Considering phase 2, Blacksocks SA and Jacob Rohner AG constitute another industry focus in respect to the four living labs. The manufacturing industry specialized in the socks segment is distinct from the existing industries. Belonging themselves to the same industry sector, both SMEs distinguish in sales and distribution channels as well as in methods. Having in common the need to meet economic and financial objectives, the two selected companies need to focus on their managerial value. That value is related to competences of the organization to steer, interact, and cooperate in a business related network. Thus, besides differentiating sales and distribution methods, they are still facing the same challenges, including those of global trading.
Phase 3 has been applied to the extent that qualitative evidence is being derived from interviews being carried out by a team of researchers. Quantitative data complements the view on the range of the supply and delivery chains of the two enterprises.

Mapping Phase 4 of Eisenhardt’s theory to the Swiss cases, semi-structured interviews have been conducted to assess Blacksocks SA and Jacob Rohner AG. The mapping of the cases is based on the most relevant elements of a collaboration platform: business operational view, functional views, and the interoperability concept.

From the business operational view, the e-customs arena is applicable to both enterprises. The business operational view based on the e-customs concept describes the semantics of business data in business transactions and associated data exchanges. This includes the rules for business transactions such as collaborative transactions (agreements, mutual obligations, and operational conventions) with suppliers, shipping companies and service providers as well as governmental partners. While the customer data management and payment processes are managed differently in the two enterprises, the rules for business transactions, as outlined before, still apply. From a reporting point of view, externally required reports do not differentiate. Internally both companies will still execute reporting based on their strategy.

The functional services views address the supporting IS related services to meet the mechanistic needs of interoperability. Both companies need to think about how they approach cross-organizational business processes, data, and message exchange. Two major interoperability topics affect each of the business partners in the as-is situation: (1) The semi-integration among distinct IS solutions and applications and the missing integration of e-mail, MS Excel and other detached packages limit the effects of IS investments already issued like at Jacob Rohner AG. Cost intensity is caused as well on multiple data entry such as manual data transfer from one document to a PC application for example. Data needs to be checked and approved in several stages of the business transaction. (2) Both enterprises experience limitations in using governmental e-services. Accessibility of data such as the content of the single administrative document from a European supplier is not easily provided to the supplier or the customs office. Technically, paper has to be exchanged, checked several times and re-submitted manually or via fax to the involved business partners.

Current non-interoperable IS solutions and manual efforts have led to the overall impression that IS is not facilitating but hindering business. Non-correct, semantically false identification of the relevant elements increases however the risk of missing semantically the related interpretation by the business partner and the transaction. The
completion cycle of a business transaction will take too long within the two company ecosystems. Besides, especially in the case of Jacob Rohner AG and its business partners, they are confronted with major efforts in interfacing with various applications and IS systems.

The underlying most relevant characteristic of an e-customs collaboration platform is the provision of easy-to-deploy and easy-to-access functionality for data, process workflows, and documents. The concept behind that functionality is based on interoperable IS solutions. As the research team at ITAIDE is currently working on deployable prototypes, Blacksocks SA and Jacob Rohner AG will be able to participate in that transferability exercise too. The benefit to Blacksocks SA and Jacob Rohner AG will be measured against the following performance indicators:

- Decrease the average development time from concept via implementation to ramp up and runtime of a collaborative customs business process;
- Decrease the average planning and negotiation of interfaces and collaborative business processes to participate on the collaboration platform;
- Adopt faster new requirements and be able to respond more efficiently to unforeseen changes in the demand of a new business circumstance (like a new sales region, new supplier environment or changes in the distribution channels);
- Build a dynamic environment with dynamic partners based on just-in-time supply and demand principles.

4.1.5. Conclusions

The cases of Blacksocks SA and Jacob Rohner AG illustrate how in these last years IS technologies and e-customs initiatives have gained in importance. The massive penetration of the Internet into every kind of business transaction has changed the vision and the structure of business models. Taking into consideration the supply chain structure of two Swiss socks producers, we illustrated the differences in conducting business and commerce of the two companies.

The research field at ITAIDE provides substantial data and concepts that can be applied to external research environments regardless of the industry, company size or region they are located in. The invitation process does not yet accommodate collaboration related research involved companies or other partners. There is still a ways to go before it will be precise enough in the conceptual design of transferable IS solutions.

Assessing two companies that are not part of the industry and country setup of
ITAIDE gave us the opportunity to compare at this point in time our first key findings and transfer those to Jacob Rohner AG and Blacksocks SA. While being totally different in the market approach, the common public processes relevant for customs handling and shipping are similar in both cases. To meet critical success factors like high quality products delivered in a given period of time, sharing common information without multiplying data entry and data checks and being as effective as possible to meet financial and economic objectives are relevant for both companies (as well as others).

The e-business model to facilitate global trade that will be elaborated within ITAIDE is supporting the growing need to integrate processes, data and messages seamlessly with business and governmental partners like in the case of Jacob Rohner AG. It also eases the way for product innovation and new market entry considerations like in the case of Blacksocks SA.

We outlined relevant research elements that support the transferability and validity of research to external environments in the end.

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4.2. Facilitating e-commerce adoption: an electronic customs system

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2010


International trade conducted electronically is seen as a major driver of globalization. We argue that the development of international electronic trade might grow faster if adequate governmental regulations support it. Based on a literature review and EU/OECD reports, we demonstrate how legislation is important for the success of international e-commerce. In particular, we focus on EU e-customs regulations and related IT systems. We show how e-customs systems might be used as a tool for e-commerce adoption facilitation. As an example we consider Switzerland as a non-EU country having to adapt its regulations to be EU compliant and therefore facilitate international trade for local companies. We analyze the situation of small and medium-sized enterprises (SMEs) in Switzerland, and study eight factors that can change after e-customs implementation and possible advantages yielded by such implementations. Finally, we propose factors related to e-customs implementation: increased control of the customs office, less entry errors, electronic notice of VAT assessment, data and communication standardization, declaration possible 24 hours a day and more transparent export process; as well as three EU customs regulations: Integrated Tariff of the European Communities, Modernized Customs Code, and Community Customs Code that can enhance e-commerce adoption.

Keywords: e-commerce in SMEs; e-commerce implementation; e-commerce research; e-commerce adoption; e-commerce legislations; internet commerce; e-customs; e-customs implementation; e-customs adoption; e-customs legislations; case study; e-government; governmental IS.
4.2.1. Introduction

In the last eight years, i.e., from 2000 to 2008, Internet usage grew tremendously worldwide. According to data provided by Internet World Stats (2008), 384 million Europeans use the Internet. Internet population penetration among the 27 member states has already reached 48%. In actual fact, during the mentioned time period, European Internet usage grew by an astonishing 266%.

Internet diffusion changed the way of doing business in general and commerce in particular. The quick growth of e-commerce has already been noted by many authors towards the end of the 1990s (Cheung, 1998; Froehlich, Hoover, Liew, & Sorenson, 1999; Leebaert, 1998; Maes, Guttman, & Moukas, 1999). According to OECD statistics (OECD, 2007a), Internet penetration in different businesses all over the world reached almost 100% as early as 2006. In the same year, selling and purchasing through the Internet became a reality for many industry groups in several countries. For example, in Germany, the wholesale and retail industry reached 18.2% for selling and 48.3% for purchasing, respectively (OECD, 2007b). Not only big enterprises but also small and medium-sized enterprises use Internet for their business (see Figure 4.6). We refer to small and medium-sized enterprises (SMEs) according to the definition given by the European Commission in Article 2 of the Annex of Recommendation 2003/361/EC (European Commission, 2003, p. 4): ‘The category of micro, small and medium-sized enterprises is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding € 50 million, and/or an annual balance sheet total not exceeding € 43 million’.

SMEs represent a large share of the business sector economy and generate most of business turnover. According to an OECD study that took place in 2002, SMEs represent between 96% and 99% of the total number of enterprises in most economies (OECD, 2002). Despite this high percentage, which highlights the importance of SMEs in the world market, SMEs are under-represented in world trade (OECD, 2005). However, SMEs show willingness to go international and already have a differentiated approach to internationalization. Indeed, SMEs try to optimize their international competitiveness by exporting new business opportunities in the value chain, encouraging trade, cross-border clustering and collaboration, alliances or subsidiaries, branches, and joint ventures abroad. Participating in international markets can offer a range of opportunities to firms, for example, new niche markets or possibilities to lower costs and access finance. A study of the European Commission (2004b) identified seven motivators for the internationalization of SMEs: (1) Access to know-
how and technology; (2) High production costs on the domestic market; (3) Access to new and larger markets for products/services; (4) Strict laws and regulations on the domestic market; (5) Additional production capacity; (6) Access to capital; (7) Access to labor. However, SMEs face many barriers to their internationalization: the high costs of the internationalization process, e.g., adaptation of products to foreign markets, travel expenses, or business and financial risks; existing law and regulations; product standards; intellectual property rights protection; lack of capital or finance; lack of support and advice; cultural and language differences; lack of information.

Over the last few years, technological advances in Information and Communication Technologies (ICTs) and in particular the Internet, e.g., web-based sales, Internet marketing, or communication networks, have facilitated information flows and made it easier for SMEs to participate in the international economy. Therefore, e-commerce is an even more important instrument for SMEs’ international growth.

Froehlich, Hoover, Liew, & Sorenso (1999) confirmed that e-commerce is not just the substitution of paper-based business through the use of computers; indeed, it implies more, such as using non-proprietary open networks, not requiring client software, and services available 24 hours a day, 7 days a week. The authors also stated that e-commerce enables customers and suppliers to be geographically distributed worldwide. This also includes goods’ cross-border.

E-commerce implies new legislations that regulate international trade handled electronically; for this reason, governmental involvement is needed. Governments usually encourage e-commerce development through legislation and directives designed to support and regulate online business transactions (Blakeley & Matsuura, 2001). Blakeley & Matsuura emphasized that the government itself is changing its viewpoint, i.e., from being a regulator to becoming a player. Governments are thus interested in adopting legislations and regulations that will facilitate their own online activities. In this way, i.e., by providing rules that ease governments’ e-transactions, governments also help to facilitate the growth of industrial e-commerce transactions.
4.2.2. E-customs

An example of how governments may help e-commerce transactions by developing new concepts, which also ease governmental tasks, is given by the introduction of electronic customs. In the European Union, national electronic customs declaration systems are already used in many countries, e.g., Atlas in Germany, Aida in Italy or Sagitta Entry in the Netherlands. However, a common standardized electronic customs system is still missing but it is topic of research promoted by the EU. The goal of a common customs system is to overcome interface barriers between national systems. The EU has already started the implementation of standardized systems (European Commission, 2007a); together with the already existing Community Customs Code (European Commission, 1992), this implementation will facilitate European trade. The implementation is composed of four key stages:

1. The first stage builds on existing work; namely the New Computerized Transit System (NCTS) and risk management tools. It creates the foundation for an electronic customs declaration environment by adding systems for Import (ICS) and Export (ECS), applying the International Road Transport Convention for Transit (NCTS-TIR), and including the Economic Operators Registration and Identification System;
2. The second stage is seen as providing aspects of the electronic customs vision which primarily addresses trader concerns: the Economic Operators Registration and Identification System and the Authorized Economic Operator, together with the Common Customs Information Portal and the Single Electronic Access Point;

3. The third stage is based on the Modernized Customs Code concept, (European Commission, 2007b) and is focused on more ambitious aspects of the electronic environment. These projects would lead to the completion of a fully Automated Export and Import System (AES and AIS), as well as the completion of the Common Customs Tariff and Integrated Tariff of the European Communities (Taric), which came into force in 1987 (European Commission, 1987);

4. The fourth stage is related to the Single Window project as described in the Council’s proposal for a paperless environment for customs and trade (European Commission, 2006b).

The goal of the EU customs project is to enable a paperless environment for customs and trade, i.e., to develop a common standardized e-customs system. The envisioned e-customs system will be based on Single Window (SW) and Authorized Economic Operator (AEO). Single Window is a methodology for standardized business processes and business information exchange; in Recommendation no. 33, the United Nations Centre for Trade Facilitation and Electronic Business, defines a single window as ‘a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once. This may also provide a platform for coordinating controls among the agencies involved and payment of relevant duties, taxes, and fees’ (United Nations Economic Commission for Europe, 2005, p. 3). Authorized Economic Operator is a certification given by the customs office of a European country that enables an industry to simplify trade. Legislation stipulates that customs authorities shall grant to European reliable traders the status of ‘authorized economic operator’ (World Customs Organization, 2006). The idea is to grant the AEO status to reliable operators including those that are also compliant with respect to security and safety standards and can, therefore, be considered as ‘secure’ traders. Those traders should have a specific status, which would grant them the status of secure members of the supply chain and would identify them as the most reliable trading partners.
In this work, we consider the phenomenon of e-customs, arguing that it is a driver for e-commerce adoption that facilitates SMEs’ internationalization. We analyze the customs situation in Europe paying particular attention to Switzerland. We focus on the specific case of Switzerland since it is a country with a high potential of e-commerce diffusion for three main reasons:

1. It is a small country: according to the European Commission (2004a), smaller countries are more internationalized and therefore more prone to use e-commerce than others;
2. The percentage of Swiss SMEs with foreign suppliers or exports is high: according to the European Commission (2004b), 28% and 54% of Swiss SMEs export and have foreign suppliers, respectively. Therefore, e-commerce can bring many advantages to Swiss SMEs, such as, e.g., time optimization;
3. Switzerland is a country with a very high Internet penetration: according to Figure 1, 98% of SMEs with 10-49 employees and 99% of SMEs with 50-249 employees already use Internet.

In the following, we first provide an overview on e-commerce and its use by SMEs emphasizing the role of European directives in the diffusion of e-commerce among EU member states. We further concentrate on e-customs giving an overview of existing European regulations. We thus focus on Switzerland presenting firstly its e-customs initiative and secondly a case study. The case study took place in October 2008 and involved 36 Swiss SMEs. As a result of the case study, we will provide a set of changes that e-customs will bring and their related benefits. In the discussion section we summarize our findings and propose a set of six factors related to e-customs implementation and describe three EU customs regulations that can facilitate e-commerce adoption. A particular section is dedicated to future research. The conclusion follows in the last section.

4.2.3. Background: e-commerce and e-customs legislations

Many researchers have already studied the e-commerce phenomenon in respect to its penetration into SMEs daily businesses. For example Taylor, McWilliam, England, & Akomode (2004) highlighted that various factors may affect e-commerce development and adoption. They built a skill set that, according to their research, is required for e-commerce projects in the SMEs sector. This set comprises of both technical and business viewpoints: design, programming, testing, linking website to database,
website promotion, security, content management, business terminology, and legislation. They argued that legislation is an important requirement from a business viewpoint. Based on Turban, Lee, King, & Chung’s (2000) statements, they affirmed that there is a potential wide range of legal issues related to e-commerce. Because legislations and regulations are promoted by governments, governments may directly influence development of e-commerce. After an empirical study that took place in Shanghai and involved 1,211 firms, Zhang, Cui, Huang, & Zhang (2007) confirmed that government IT-related policies affect firm’s IT usage positively, and therefore e-commerce, as long as e-government initiatives help firms to improve their IT usage.

In Europe two main directives regulate e-commerce: the Electronic Commerce Directive (European Commission, 2000b) and the Digital Signature Directive (European Commission, 2000a). In Article 1.2 of the Electronic Commerce Directive, a set of harmonized rules is established in relation to internal market, establishment of service providers, commercial communications, electronic contracts, liability of intermediaries, codes of conduct, dispute settlements, court actions, and cooperation between member states. The Electronic Commerce Directive is the first European mandatory transnational recognition of electronic contracts. In addition to this, the Digital Signature Directive establishes the requirements for electronic signature certificates throughout the European Union including mechanisms for cooperation with third countries on the basis of mutual recognition of certificates, bilateral, and multilateral agreements.

Despite all the regulations mentioned above, according to a report of the European Commission, the proportion of online consumers shopping cross-border has not increased since 2006, while the proportion of online retailers selling cross-border has declined (European Commission, 2008d). The report of the European Commission states that if harmonized consumer regulations were put in place across the European Union, only 41% of the retailers would choose not to sell cross-border. This would be a significant improvement compared with the 75% not selling cross-border. Many (60%) retailers who are not selling cross-border are concerned about varying fiscal regulations, compliance with varying national laws, cross-border delivery, and the increased risk of fraud. The biggest concern relates to the higher risk of fraud and non-payments in cross-border sales. More than two-thirds (68%) of retailers not selling cross-border see this as an important obstacle.

Therefore, in some cases companies do not trust e-commerce because of different national laws and regulations. Specifically, although SMEs increasingly use information systems for a variety of commercial and production-related purposes,
there is generally a lack of awareness of e-commerce so that trust and transaction security remain two big barriers. Additionally, according to OECD (2002), the major part of electronic transactions is dominated by established networks among medium-sized and large firms in which few small suppliers or micro firms participate; for this reason, the volume of electronic transactions over the Internet is very small even in countries where e-commerce is considered to be fast growing.

In the past few years several researchers paid attention to e-commerce adoption and involvement of SMEs considering specific countries, such as, e.g., the US (Karagozoglu & Lindell, 2004), Sweden and Australia (MacGregor & Vrazalic, 2005), or UK (Simpson & Docherty, 2004). The authors stated that e-commerce adoption among SMEs could be promoted in different ways, e.g., by analyzing successful strategies to follow for providing a more suitable environment. Accordingly, the government is one important player since it could facilitate SMEs’ e-commerce adoption by offering a better economic and legislative environment. According to declarations of the World Trade Organization (WTO), governments may help development and adoption of e-commerce among SMEs, by building a triangular partnership for performance that includes customs, banks, and SMEs (Labbé, 2007). However, customs duties and regulations are often difficult to understand and may impede e-commerce; indeed, e-commerce often takes place in regional markets only, excluding potential international consumers, since it is not clear how international e-commerce is regulated and how much it costs the consumer (Boyd, Hobbs, & Kerr, 2003). A study of the European Commission (2008d) confirmed that online consumers continue to be more confident shopping in their own country than abroad.

Thus, customs regulations play a key role not only in international trade but also in international e-commerce. Already in 1987 the EU was aware of the importance of common customs regulations and developed the so called Combined Nomenclature that is the tariff and statistical nomenclature of the Customs Union (European Commission, 1987). The Common Customs Tariff is the external tariff applied to products imported into the Union. The Integrated Tariff of the European Communities is referred to as Taric, which incorporates all Community and trade measures applied to goods imported into and exported out of the community. It is managed by the Commission, which publishes a daily updated version on the official Taric website. Furthermore, in 1992, the EU promoted the Community Customs Code that comprises of the rules, arrangements, and procedures applicable to goods traded between the European Community and non-member countries (European Commission, 1992).

More recently, in order to facilitate customs systems, the EU started in 2004 a
customs initiative that aims to achieve a paperless trade using IT systems, i.e., electronic customs systems. According to the European Commission (2008c), the electronic customs initiative essentially involves three pieces of legislation: two proposals and an existing regulation.

The first proposal regards a decision on the paperless environment for customs and trade, Electronic Customs Decision (European Commission, 2008a), and sets the basic framework and major deadlines for the electronic customs projects. The second proposal is related to the modernization of the European Customs Code (European Commission, 2007b); this should lead to the completion of the computerization of customs. The existing regulation is the Security and Safety Amendment to the Customs Code (European Commission, 2005b): it is a regulation which came into force in May 2005 and provides full computerization of all procedures related to security and safety. A detailed description of the two proposals and the existing regulation follows.

Electronic Customs Decisions. It aims to establish secure, interoperable electronic customs systems for the exchange of data in order to: (1) Facilitate import and export procedures; (2) Reduce compliance and administrative costs; (3) Improve clearance times; (4) Coordinate the approach to the control of goods and application of the legislation; (5) Ensure proper collection of Community duties and charges; (6) Enable a seamless flow of data between the parties involved and allow re-use of data.

Modernized Customs Code. A political agreement was reached by the European Council of Ministers on 25 June 2007 on a Modernized Community Customs Code, which will simplify legislation and streamline customs process and procedures for the benefit of both customs authorities and traders. The agreement needs to be confirmed by the European Parliament in a second reading which is expected to come in 2009. The Modernized Customs Code will focus on four different tasks: (1) To introduce electronic lodging of customs declarations and accompanying documents as the rule; (2) To provide exchange of electronic information between national customs and other competent authorities; (3) To promote the concept of ‘centralized clearance’, under which authorized traders will be able to declare goods electronically and pay their customs duties at the place where they are established, irrespective of the member state through which the goods will be brought in or out of the EU customs territory or in which they will be consumed; (4) To offer a basis for the development of the ‘single window’ and ‘one-stop-shop’ concepts, under which economic operators give information on goods to only one contact point (‘single window’), even if the data should reach different administrations/agencies, so that controls on them for various
purposes (e.g., customs, sanitary) are performed at the same time and at the same place ('one-stop-shop' concept).

Security and Safety Amendment to the Customs Code. Regulation (EC) 648/2005 and its implementing provisions require pre-arrival and pre-departure information (in form of summary declarations lodged before the goods are brought into or out of the Community customs territory) to be filed electronically and envisage exchange and sharing of the information between the member states administrations, when possible.

All these changes aroused the interest of several researchers, such as, e.g., Baida, Liu, & Tan (2007), Baida, Rukanova, Liu, & Tan (2007), Bjørn-Andersen, Razmerita, & Henriksen (2007), Boyd, Hobbs, & Kerr (2003), Henriksen, Rukanova, & Tan (2008), Kuiper (2007), and Raus, Flügge, & Boutellier (2008). In these articles the authors present the e-customs situation in different European countries emphasizing problems, best-practices, and diffusion processes of e-customs systems.

Besides the 27 EU member states, Switzerland also aims to have an electronic customs system. Indeed, in order to be compliant to EU regulations and specifically to the e-customs initiative, Switzerland started in June 2007 a project called IDEE (IDEE = Ideale elektronische Exporteurlösung, ideal solution for exporters). According to this project, promoted by the Swiss Federal Customs Administration, from 1st July 2009, Swiss companies have the possibility to declare their exports electronically. This change will especially affect SMEs since big companies are already used to use e-customs systems. In order to understand how this change will affect small and medium firms, we interviewed 36 SMEs. In the next section, the Swiss e-customs initiative is described and the case study is presented and discussed.

4.2.4. Swiss e-customs initiative

Because of political, legal, technological, and economic developments of the past years, the Swiss Federal Customs Administration has nowadays a very broad palette of services, all of which have the same objective: the customs clearance of goods. These services include diverse form-based and IT-based solutions for import, transit, and export of goods. This multiplicity of customs clearance systems increasingly results in service offerings that are perceived by both clients and the Swiss Federal Custom Administration as too broad and thus difficult to use. In addition, the offered customs clearance systems are often isolated solutions that are not sufficiently harmonized. This leads to efficiency deficits and higher costs for all parties involved. For these reasons and in order to be compliant to EU regulations (new customs code), the Swiss
Federal Customs Administration launched the IDEE project. Switzerland has big interests to be EU compliant and to trade with it in an efficient way because of the considerable Swiss-EU goods traffic: in 2006 it amounted to about €155,000 million; €70,000 million in exports and €85,000 million in imports (Swiss Federal Customs Administration, 2008c).

The goal of this project is to introduce a new electronic customs system called e-dec that is going to replace the old customs system, the VAR system (VAR = Vereinfachte Ausfuhrregelung, a simplified set of export rules). With e-dec, the Swiss Federal Customs Administration is developing a central system for customs clearance that will gradually replace existing solutions, such as the electronic customs clearance system M90 and the form-based transit procedure. E-dec has a modular structure so that the Swiss Federal Customs Administration aims to offer the clients the possibility of performing electronic clearance of import, transit, and export goods using largely uniform guidelines. Thus, more uniform and streamlined processes are created for both parties, resulting in lower costs. E-dec is the outcome of two projects carried out by the Swiss Federal Customs Administration. These projects are named IgVV (Computer-Aided Common/Community Transit Procedure) and RM90. E-dec Import is being developed within the RM90 project. The IgVV project covers the Transit and Export Modules (Swiss Federal Customs Administration, 2008a). E-dec Export relies on Export Control System (ECS) and Automated Export System (AES). It allows electronic signatures that confirm the authentication of e-documents and e-invoices.

The e-dec Export process is composed of eight steps. Since we aim to analyze the particular situation of SMEs, we adapted the e-dec Export process to SMEs. Based on the guidelines provided by the Swiss Federal Customs Administration (2008b), the eight steps are (Figure 4.2):

1. Send export data: The SME has to send the export data to the customs office by e-mail or using web-services provided by the Swiss Federal Customs Administration;
2. Plausibility check: The IT system of the Swiss Federal Customs Administration conducts a plausibility check of the data and sends back to the SME an export list with bar codes in form of a XML or PDF document;
3. Export documents: The validity of the export list is limited, i.e., the SME has to export the declared goods within 30 days. If this does not occur, the export documents will be cancelled and the SME has to start the process anew (back to step 1);
4. Export: By exporting goods out of Switzerland, the SME exhibits the export documents to the customs office at the border. The customs office reads the document with a bar code reader. After reading the provided export documents, the customs office at the border states whether the export declaration fulfills all requirements or not. This process is called ‘selection’ so that the export can be set as either enabled or disabled;

5. Selection: If the selection results to be positive, the customs office at the border prints out a delivery document which certifies that the export declaration has been enabled and the goods can leave Switzerland;

6. Formal check or physical control: If the selection results to be negative the customs office states the export declaration to be disabled. As a consequence of this, the customs office controls all export accompanying documents and usually checks the goods physically;

7. Clearance: After the formal and physical control, the customs office at the borders approves the export and inserts the corresponding data in the IT system. Thus, the goods can leave Switzerland;

8. Excise receipt for VAT: After the clearance has taken place, the corresponding excise receipt is certificated electronically (XML and PDF) so that other authorized organizations, such as the trade statistics office, can use it for their purpose.

In order to understand how small and medium-sized firms perceive the e-dec Export initiative, an online survey was conducted involving 36 Swiss SMEs. The SMEs were asked to answer several questions regarding their willingness to adopt the new e-customs system and their perceived benefits. Additionally, we interviewed face to face a big Swiss logistics provider and a customs agent. The case study took place in October 2008. Next section is dedicated to the case study and its results.
4.2.5. Case study

34 of the 36 interviewed SMEs have not yet implemented e-dec Export. This outcome was anticipated as full implementation is not expected to be completed until the end of June 2009. 30 of the 34 SMEs, which did not implement e-dec Export yet, declared the intention to implement it at the beginning of 2009 while only four SMEs planned to delegate the export process to a logistics provider. According to this result, all interviewed SMEs will have implemented e-dec Export by the end of June 2009. Most of the interviewees not only export to European countries but also to Asia (89%), Africa (53%), the US (86%), and Australia (61%), declaring about 100 exports every day.

Table 4.4 shows what SMEs currently think about the changes that the new e-
customs system will implicate. The eight analyzed factors are: (1) Time needed to complete export declarations; (2) Number of daily export declarations; (3) Price of an export declaration; (4) Waiting time at the borders; (5) Control of the customs office; (6) Number of entry errors; (7) Transparency between SMEs and customs office; (8) Control of the goods along the supply chain. The SMEs were asked to estimate whether the mentioned factors will increase, decrease, or remain unchanged. Since these questions required more estimation and some interviewees were not able to answer, n.s. (not specified) was included as a possible option.

Based on these data, most of the SMEs do not know how the e-dec Export implementation will affect the export process and cannot make a prediction since they have not implemented it yet. For this reason, many interviewees chose the option ‘not specified’. However, some SMEs gave their opinion enabling the formulation of first statistics. In order to fulfill this gap, we further interviewed face-to-face one big Swiss logistics provider and one customs agent.

Table 4.4. Changes after e-dec Export implementation

<table>
<thead>
<tr>
<th>Factor</th>
<th>Will increase</th>
<th>Will decrease</th>
<th>Will not change</th>
<th>n.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time needed to complete export declarations</td>
<td>39%</td>
<td>3%</td>
<td>6%</td>
<td>52%</td>
</tr>
<tr>
<td>Number of daily export declarations</td>
<td>6%</td>
<td>0%</td>
<td>56%</td>
<td>38%</td>
</tr>
<tr>
<td>Price of an export declaration</td>
<td>28%</td>
<td>0%</td>
<td>11%</td>
<td>61%</td>
</tr>
<tr>
<td>Waiting time at the borders</td>
<td>11%</td>
<td>38%</td>
<td>11%</td>
<td>40%</td>
</tr>
<tr>
<td>Control of the customs office</td>
<td>27%</td>
<td>6%</td>
<td>14%</td>
<td>53%</td>
</tr>
<tr>
<td>Number of entry errors</td>
<td>0%</td>
<td>31%</td>
<td>17%</td>
<td>52%</td>
</tr>
<tr>
<td>Transparency between SMEs and customs office</td>
<td>28%</td>
<td>0%</td>
<td>11%</td>
<td>61%</td>
</tr>
<tr>
<td>Control of the goods along the supply chain</td>
<td>19%</td>
<td>0%</td>
<td>22%</td>
<td>59%</td>
</tr>
</tbody>
</table>

(1) In respect to the *time needed to complete export declarations*, 39% of the SMEs think that it will increase. The idea of an electronic system is to reach the opposite, i.e., to decrease the time needed to complete export declarations. However, it is predictable that in the first months SMEs employees have to get used to the new system and have to learn how to use it. For this reason, a time increase during the first implementation period is expected. A decrease in time will occur when the employees begin to understand how to use the system and get familiar with it. In order to get deeper understanding of this factor, we further conducted a face-to-face interview with a Swiss customs agent. The interviewed customs agent stated that two or three months
are necessary for employees to understand how to use the e-dec Export system in a proper and efficient way. We can therefore deduce that the 3%, who answered that the time needed to complete export declarations will decrease, are already familiar with the system or have had similar experiences with other IT implementations: therefore they can judge the time investment of the introduction of e-dec Export.

(2) The number of daily export declarations does not seem to be affected by the introduction of the e-dec Export system since 56% of the interviewed SMEs think that it will not change. This contrasts the expectation of the Swiss Federal Customs Administration, which believes the number of daily declarations will significantly increase. In order to get more information about these data, we additionally interviewed a big Swiss logistics provider that already implemented e-dec Export a year ago. In effect, the logistics provider stated that the number of daily export declarations increased in a considerable manner: before 1990, only 15 export declarations a day were accomplished; after the introduction of M90, an electronic system introduced in 1990 and already mentioned in the beginning of this section, it was possible to declare 100 exports daily; nowadays, e-dec enables 1000 export declarations per day. The interviewed logistics provider affirmed that five minutes are needed in order to electronically fulfill the export data (step 1). After fulfilling the export data, the logistics provider sends it to the IT system of the Swiss Federal Customs Administration for plausibility check (step 2). The IT system of the Swiss Federal Customs Administration sends the export documents back to the logistics provider after a maximum of ten minutes after receipt of the export data (step 3). It has to be noted that a big logistics provider, such as the interviewed one, is usually more specialized in exports than a SME. For this reason, we can deduce that the interviewed SMEs still have to become more familiar with the system in order to reach a faster export process execution. In addition, according to the online survey, most SMEs do less than 100 export declarations a day. However, this is not caused by the declaration system but by their export volume. Therefore, even if the new electronic system would enable 1000 daily export declarations, SMEs would not perceive this as an important change as there are no more than 100 exports to be declared a day; in other words, the number of daily declarations would essentially not change for SMEs.

(3) The price of an export declaration that a SME has to pay depends on who is going to be engaged in it. If a SME decides to delegate the export process to a logistics provider, the price that the SME has to pay will increase in respect to the actual price. Indeed, logistics providers have imposed the so called ‘e-dec fee’, i.e., 10-15 Swiss Francs (ca. € 6-10) per declaration, in order to amortize the IT implementation
investments of e-dec Export. In this case a SME avoids the e-dec Export implementation investment but it pays every single export declaration.

(4) According to the interview with the logistics provider, the truck is able to leave the borders within a few minutes. The truck driver does not even have to leave the truck as long as the bar code reading of the export documents at the borders fulfills all the needed requirements. Therefore, the waiting time at the borders is decreasing. This is also confirmed by the opinion of most of the interviewees (38%).

(5) According to 27% of the interviewees, the control of the customs office will increase. The customs office will indeed conduct a more accurate control through the IT system. This is possible since the export data can be reviewed by the customs office up to five years after the export took place. Using an IT system this control will be easier and faster since the needed data are stored in a database.

(6) The number of entry errors should decrease but not in a considerable manner. According to the data provided by the interviewed logistics provider, entry errors do not constitute a major issue since they do not occur frequently. For this reason, their reduction is not perceived as a considerable change. Despite of this, 31% of the interviewed SMEs recognized that entry errors may be reduced.

(7) The transparency between SMEs and the customs office will increase (opinion of 28% of the participants). Every export declaration is stored in a database: customs office and SMEs can access to it whenever needed. In this way, both parties can check the actions of the other party and view the export declaration status or location.

(8) Because of security issues, control of the goods along the supply chain is a factor that concerns all exporters. The interviewees had different opinions about how the control of the goods will change: 19% think that the control will increase while 22% believe that it will not change. An electronic customs system can improve goods’ control along the supply chain since it enables the electronic registration of exported goods at the point of origin, the borders, and the delivery point in a foreign country. We already illustrated the export process from the point of origin to the Swiss borders. From the Swiss borders, the goods are transported to the delivery point: the data are registered again and the information is given to the national customs office of the import country. The customs office of import sends a notification to the Swiss customs office confirming the delivery of the goods. Nowadays, this advice is not sent by a common IT system, since Switzerland and the 27 EU member states do not possess a common electronic customs system; resolving this is the goal of the EU customs initiative cited before.
After reflecting the changes that e-dec Export implementation will bring, SMEs were asked to think about potential advantages. The questions were formulated based on factors that were stated by the Swiss Federal Customs Administration to be advantages for exporters. The SMEs had to give their opinion about the proposed factors indicating whether they think them to be advantageous or without influence (Table 4.5). The eight analyzed factors are: (1) Electronic notice of VAT assessment; (2) No media breaks; (3) Data and communication standardization; (4) Declaration possible 24 hours a day; (5) Unique data collection; (6) Export certificate also used for internal controls; (7) More transparent export process; (8) Elimination of the monthly export list.

Table 4.5. Advantages of e-dec Export implementation

<table>
<thead>
<tr>
<th>Factor</th>
<th>It is an advantage</th>
<th>It has no influence</th>
<th>n.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic notice of VAT assessment</td>
<td>28%</td>
<td>34%</td>
<td>38%</td>
</tr>
<tr>
<td>No media breaks</td>
<td>31%</td>
<td>19%</td>
<td>50%</td>
</tr>
<tr>
<td>Data and communication standardization</td>
<td>53%</td>
<td>20%</td>
<td>27%</td>
</tr>
<tr>
<td>Declaration possible 24 hours a day</td>
<td>45%</td>
<td>33%</td>
<td>22%</td>
</tr>
<tr>
<td>Unique data collection</td>
<td>42%</td>
<td>28%</td>
<td>30%</td>
</tr>
<tr>
<td>Export certificate also used for internal controls</td>
<td>34%</td>
<td>39%</td>
<td>27%</td>
</tr>
<tr>
<td>More transparent export process</td>
<td>44%</td>
<td>33%</td>
<td>23%</td>
</tr>
<tr>
<td>Elimination of the monthly export list</td>
<td>45%</td>
<td>27%</td>
<td>28%</td>
</tr>
</tbody>
</table>

(1) E-dec Export enables the electronic notice of VAT assessment. 28% of the interviewed participants think that this change will be an advantage. After the clearance of the goods, the VAT assessment is generated automatically (step 8) so that errors are avoided. Indeed, nowadays the export data for the VAT declaration have to be provided separated from the export, often resulting in inconsistency between the VAT declaration and the effectively exported goods. However, 34% think that the electronic notice will not have any influence on the efficiency of the export process while 38% do not know how to judge it.

(2) The old customs system, the VAR system, has already celebrated its 30th birthday. Due to its simplicity, it is a successful solution. However, it has become too old and its structure no longer complies with new EU standards, such as NCTS. For this reason, a media break occurs if exporters still use the VAR system. On the contrary, the electronic customs solution proposed by IDEE makes it possible to avoid media breaks (no media breaks). 31% of the participants think that this is an advantage
since it avoids possible manual entry errors caused by the transition from system to system and it makes export process execution faster.

(3) Thus, also the exchanged data and the communication between the exporters and the customs office will be standardized. In other words, the exporters directly insert their data into a system which is the same system used by the customs office. Indeed, the goal of the Swiss Federal Customs Office is to achieve complete electronic goods traffic before the end of 2010 so that each exporter uses the same IT system. Thanks to this system, inconsistencies between different IT solutions or difficulties due to different standards will not occur anymore. 53% of the participants affirmed this to be a factor that will increase the efficiency and speed up the export process.

(4) The new electronic system enables the exporters to declare 24 hours a day. 45% of the interviewees declared this to be an advantage since it gives them more flexibility. Flexibility plays an important role along the export process for two main reasons. First of all, the exporters do not depend on the opening time of the customs office. Secondly, the exporters can be easily compliant to the new European regulation regarding the prior notification; following the terror attacks of 11th September 2001 and subsequent efforts by the US and the World Customs Organization (WCO) to enhance the security of the supply chain, the European Union decided to require prior notification of goods crossing its external borders as of 1st July 2009. This involves both imports and exports. The prior notification period is 24 hours for goods crossing by sea, two hours for rail transport, and one hour for road transport; the provided data of notification have to have an electronic format and be compliant to EU standards. If the summary declaration is not lodged in electronic format the prior notification period is at least four hours. Therefore, the e-dec Export system can avoid the slowdown of export processes and enable the completion of the prior notification 24 hours a day.

(5) E-dec Export will enable a unique data collection. Nowadays, exporters have to provide the same data three times: to the customs office for the export declaration, to the finance department for the VAT assessment, and to the department of statistics for the corresponding statistics. Entry errors may occur and fraud is possible. E-dec Export will provide a unique database so that exporters have to submit the same data only once. 48% of the interviewees considered it as an advantage for two main reasons: it reduces fraud and it enables the exporters to save time since they have to provide the data to a unique system.

(6) The e-dec Export certificate can also be used for internal controls. Exporters can use it, e.g., for inventory control and warehouse management. This factor is not seen as a big improvement since the majority of the participants think that it is not influent
to their daily tasks and processes. However, 34% think this to be an advantage while 27% remain without an opinion to this question.

(7) As mentioned before, the export process will be more transparent. This is seen as an improvement by 44% of the 36 interviewed SMEs. However, at this stage it is not possible to quantify how much more transparent the process will be. For this reason, 23% of the interviewees do not know what to answer and 33% do not consider it as an advantage.

(8) The last analyzed factor is the elimination of the monthly export list. Nowadays, exporters have to send an export list to the customs office in Bern by the end of a month with all export details of the month. This will not be needed anymore since the customs office will collect export details automatically in the IT system. Nearly half (45%) of the participants judge the elimination of the monthly list to be an improvement since they do not have to spend additional time for its compilation.

After presenting the results of the study, we can draw some conclusions that show how e-solutions are accepted. First, most of the SMEs do not know how the new e-dec Export implementation will affect their daily business. They cannot give estimation of concrete data related to the execution of the export process, such as, e.g., time needed for an export declaration or waiting time at the borders. However, we have to take into consideration that the case study took place in October 2008 when only two SMEs had already implemented e-dec Export, since the full implementation is foreseen to be done by the end of June 2009. Therefore, it is to be expected that most of the interviewed SMEs do not know how their business will change.

Second, although only two SMEs have already implemented e-dec Export, it is common opinion that at least four factors will not decrease but either increase or remain unchanged: number of daily export declarations, price of an export declaration, transparency between SMEs and customs office, and control of the goods along the supply chain.

Last but not least, although the majority of the participants could not give a consistent opinion about potential changes, most of the SMEs expect advantages of the new e-solution.

4.2.6. Discussion

In the introduction and background section, we learned that potential e-commerce adopters, especially SMEs, do not trust in e-commerce because of security and legislation deficiency. Based on the Swiss examples, we can identify six e-customs
Factors related to security increase and legislation improvement: (1) Increased control of the customs office; (2) Less entry errors; (3) Electronic notice of VAT assessment; (4) Data and communication standardization; (5) Declaration possible 24 hours a day; (6) More transparent export process. All these improvements can therefore ease e-commerce implementation. If exporters felt more confident in the export process and e-commerce could be regulated by electronic customs, e-commerce could be taken into account as a valid option to traditional trade.

In the introduction section, it was mentioned that 60% of online retailers, who are not selling cross-border, worry about varying fiscal regulations, compliance with varying national laws, cross-border delivery and the increased risk of fraud (European Commission, 2008c). Thanks to e-customs it is possible to overcome obstacles to cross-border sales. Based on the findings of the Swiss case study and on EU customs regulations, we relate the obstacles to online cross-border sales to the improvements that e-customs will bring in order to understand if these improvements will also affect cross-border online activities.

(1) The first obstacle mentioned by 60% of the retailers corresponds to the varying fiscal regulations in different European countries. Taric, described in the background section, comprises all customs duty rates and Community rules applicable to Community's external trade. It allows goods clearance by the EU member states. It also provides the best means of collecting, exchanging, and publishing data on community external trade statistics. Taric does not solve the problem of different fiscal regulations of the member states but makes possible to understand which tariff will be applied to exported goods since the nomenclature is harmonized and standardized. Another regulation that could help in overcoming this first obstacle is the suggested Modernized Customs Code. In this regulation, the EU proposes the concept of a ‘centralized clearance’ so that exporters could be able to declare goods electronically and pay the customs duties in the country where they are established (European Commission, 2007b).

(2) The second issue that worries exporters is the compliance with varying national laws. In fact, EU countries have different laws. However, the Community Customs Code codifies Community customs law. It replaces many acts of law, improving transparency. It entered into force in 1992 and mainly concerns: general provisions on people's rights and obligations with regard to customs legislation, import and export duties, customs tariff, tariff classification of goods and their origin, presentation of goods to customs, customs declaration, non-Community goods which are moved under a transit procedure, customs-approved treatment or use, introduction of goods into a
free zone or free warehouse, re-export, destruction of goods and their abandonment to the exchequer. In particular, the amendments added in 2005 are aimed at tightening security requirements for movements of goods across international frontiers. Economic operators are now required to provide the customs authorities with details of goods before they are imported into the EU or exported from it. This will entail the setting up of a one-stop-shop for importers and exporters. The new concept of Authorized Economic Operator (AEO) simplifies trade. The EU member states may grant AEO status to any economic operator meeting common criteria. These criteria concern control systems, financial solvency and operator's track record in complying with the rules. The code therefore helps exporters so that common customs regulations are into force among the EU member states.

(3) The third issue concerns delivery problems that exporters could experience. These problems are related, e.g., to delivery errors so that the delivery could take place with delay or even not take place at all. A more transparent process can therefore help exporters to have a better overview on the export process and more control on the whole supply chain. Delays could also be avoided or reduced by the possibility to declare 24 hours a day: exporters can deliver as soon as they have the goods ready to leave, i.e., when they have gotten the permission from the customs office. The standardization of the data and the communication between exporters and customs offices could also avoid or reduce delivery errors since the export declaration will be standardized and therefore misunderstandings could be overcome.

(4) The last factor that exporters recognized to be an obstacle to cross-border delivery is the risk of fraud. Increased controls of customs offices together with the increased export process’ transparency could reduce this risk. The Community Customs Code takes into consideration security and fraud issues. Therefore a joint collaboration of EU member states could lead to a reduction of fraud. For this reason, it could be more difficult to defraud. The electronic notice of VAT assessment will also reduce frauds with regards to VAT payment. This is related to exporters or importers with respect to their VAT declarations to the tax and customs office so that attempts to defraud could be reduced and the correct VAT amount will be paid.

Table 4.6 summarizes the results giving an overview on how e-customs systems can help in overcoming obstacles to cross-border online sales, i.e., to e-commerce.
Table 4.6. E-customs and e-commerce

<table>
<thead>
<tr>
<th>Obstacles to e-commerce</th>
<th>E-customs improvements</th>
</tr>
</thead>
</table>
| Varying fiscal regulations | *Taric:* It helps to understand which tariffs will be applied on exported goods;  
*Modernized Customs Code:* It will promote the concept of ‘central clearance’ so that exporters will pay customs duties in the country where they are located. |
| Compliance with varying national laws | *Community Customs Code:* It helps exporters so that customs regulations are into force among the EU member states. |
| Cross-border delivery | *More transparent process:* It helps exporters to have a better overview on the export process so that delivery errors can be reduced;  
*Declaration possible 24 hours a day:* It gives the exporters the flexibility to deliver without waiting too long for customs approval;  
*Data and communication standardization:* It reduces delivery errors since all data are interpreted by all export players in the same way. |
| Risk of fraud | *Increased control of the customs office:* It helps to reduce the risk of fraud since the export process will be controlled more efficiently;  
*More transparent process:* It helps to reduce the risk of fraud since exporters have a better overview on the whole export process;  
*Less entry errors:* The elimination of media breaks makes more difficult attempts to defraud;  
*Electronic notice of VAT assessment:* It helps the tax and customs office to receive the correct VAT amount. |

4.2.7. Future research directions

Future research is needed. In this work we gave a detailed overview on European e-commerce regulations but we did not consider worldwide legislations. Therefore, it is necessary to further analyze the connection between e-commerce adoption and related worldwide directives. In addition to a worldwide study, special attention has to be paid to new EU member states; a study on new member states’ e-commerce adoption and their regulations can clarify if e-commerce implementation is impeded by legislations issues or other related problems, such as, e.g., low Internet penetration or infrastructures’ deficiency.
SMEs are the core of worldwide trade and therefore it is vital to support their international growth. We stated e-commerce to be a tool for SMEs internationalization. We analyzed a particular field, e-customs, which can enhance e-commerce and therefore SMEs internationalization. Studies of SMEs e-commerce adoption are needed in order to give best practices not only to academic researchers but also to industrial stakeholders. Further case studies on e-customs applications and their related SMEs benefits could clarify whether the factors provided in this study can be validated. Especially, future studies could take this work into consideration in order to analyze the customs situation in other countries. Factors which can increase the trust in security and legislations can be analyzed more deeply based on other case studies. This could lead to an extended and more detailed set of advantages, which can facilitate e-commerce adoption.

4.2.8. Conclusions

E-commerce is all about selling goods and services via the Internet. The trader and customer do not deal face-to-face at any point conducting business remotely, regardless of location. A number of legislative initiatives regulate and influence business conducted online. Legislations aim to ensure that online contracts are legally binding. However, legislations can be complex and confuse e-commerce traders impeding rapid e-commerce diffusion. On the contrary, simplified legislations can push e-commerce adoption. In order to support this statement, in this work we analyzed how facilitating legislations and especially customs procedures can help international e-commerce, based on the European example and by focusing on the Swiss situation. Switzerland may be exemplary in showing the importance of facilitated legislations and e-customs systems since it is a small non-EU country inside the EU and therefore needs customs regulations for every trade within Europe. Based on European and Swiss regulations, OECD reports and statistics, e-commerce best practices reports, and case studies, in this contribution we studied how Switzerland is adapting its procedures and customs policies to European regulations in order to bring forward Swiss companies trading internationally. Since big companies often find a solution by themselves, e.g., opening a subsidiary enterprise in the EU, we focused on SMEs. Based on the Swiss examples and EU declarations, we identified six factors related to e-customs implementation and three EU customs regulations that can enhance e-commerce adoption.

The Swiss analysis showed that e-customs systems implementation will bring a set of changes, such as, e.g., the decrease of the time needed for export declarations or the
reduction of entry errors. This research also confirmed the assertion of the Swiss Federal Customs Administration that stated e-customs will bring a set of advantages to Swiss companies, such as, e.g., electronic notice of VAT assessment or data and communication standardization.

Finally, this study shows how governments can positively influence e-commerce adoption and diffusion among SMEs by providing a facilitated legislative environment contributing to the large e-commerce adoption research giving a new perspective on the importance of legislations and procedures.
5. **Diffusion of e-Customs Innovations**

5.1. **Electronic customs innovation: an improvement of governmental infrastructures**

*Marta Raus, Barbara Flügge, Roman Boutellier*

2009

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This article examines the diffusion of an e-government innovation, a common e-customs standardized solution, which is currently subject of research in the European Union. One of the goals of the European Union is to achieve trade facilitation as well as secure import and export. In order to achieve this goal, the European Government aims to have a common e-customs standardized solution. For this reason, the European Government provided an e-government model. However, while the e-government model regulates the boundaries of the e-government elements and provides high-level functional and technical specifications, the adoption part is in the hands of the individual EU member states: procurement of information technology and implementation of e-customs solutions are not specified. The main goal of this study is, therefore, to identify facilitators and barriers that can influence the adoption of standardized e-customs solutions. The research is based on Rogers’ theory of innovation considering the technological, organizational, and environmental context. Within the framework of a European funded project, we conducted our study collecting data from interviews and workshops involving an inhomogeneous group of participants, i.e., stakeholders coming from academy, industry, and governmental institutions. By demonstrating the existence of four generic facilitators and three barriers related to customs management, the article contributes towards the research in diffusion and adoption of e-government standards and in particular of standardized e-customs solutions as well as political and societal impact of e-customs policies.

Keywords: Diffusion of innovations; e-government; e-customs; standards; customs policies.
5.1.1. Introduction

One of the challenges of the European Government is to achieve trade facilitation as well as secure import and export. Customs, VAT, and duty are currently all processed by separate information systems, despite data being virtually identical. Electronic customs management is rarely seen as innovative as product design or manufacturing automation. It is mostly associated with administrative processes, filing documents, multiple data entry on paper, and electronically processed forms. Organizations are also expected to keep up-to-date with regulations and trade agreements. Governmental initiatives support organizations in form of export development programs, facilitating trade procedures, easing electronic process, and information exchange. An initiative is the Multi-Annual Strategic Plan (MASP) of the European Commission (European Commission, 2007a). Figure 5.1 provides an overview on the procedural part of the innovation-development process for the MASP. One of the results of the European Community Treaty is the e-government model.

![Figure 5.1. Regulative process for innovation-development in the European Union](image-url)
The main goal of MASP is to pass on vision, objectives, strategic framework, and milestones to implement the electronic customs initiative involving all member states. This European customs-initiative has as main goal the implementation of a single window-based system in order to facilitate the government infrastructure. A common single window-based e-customs solution would lead to harmonization of both different systems and regulations. In addition, due to the automation, the export execution process would be faster and the entry errors would be fewer so that both government and business companies could collaborate in a faster and more efficient way. Governments of different European countries aim to have a standardized common e-customs system in order to improve their infrastructure, not only for a better data exchange between them and business companies, but also for a better communication among themselves. Indeed, nowadays EU customs offices communicate by telephone, emails, and fax or by having periodical meetings.

However, while the e-government model regulates the boundaries of the e-government elements and provides high-level functional and technical specifications, the adoption part is in the hands of the individual EU member states: procurement of information technology and implementation of e-customs solutions are not specified. For this reason, the EU funded project ITAIDE (Information Technology for Adoption and Intelligent Design for E-Government) is currently researching on e-customs solutions that can enhance business-to-government collaboration. ITAIDE is a research project for e-government innovation among universities, governments, and business partners. This project considers the customs situation in four different European countries, namely Finland, Netherlands, Denmark, and Ireland, analyzing it from governmental and business viewpoints.

Considering the Danish experience, in this paper we apply the first step of the innovation-development process (Rogers, 2003). However, we do not focus on the problems and needs that stimulate the innovation since the electronization of the customs procedures belongs to an EU initiative and is therefore part of legislation. For this reason, we consider the identification of facilitators and barriers, which can influence the adoption of e-customs standards, as more relevant. In particular, we consider identification and further classification of facilitators and barriers as the first step of the diffusion of e-customs standards.

Therefore, the paper has two main objectives: (1) To review the conditions under which the innovation of customs procedures takes place, i.e., to identify facilitators and barriers of such innovation; (2) To apply and adapt the innovation-development process as introduced by Rogers (2003) categorizing the findings with the help of
innovation characteristics in the field of Information Systems. In order to collect information for our analysis, we first used the Team Syntegration Theory developed by Beer (1994) and second semi-structured interviews and informal discussions.

In the rest of this paper, we introduce the diffusion model of Rogers and related work on methods for the adoption and implementation of e-government solutions (Section 5.1.2). This section also includes a set of characteristics that will be applied on the case study findings. In Section 5.1.3, we illustrate the research approach used in the background given by the case studies provided by ITAIDE. In Section 5.1.4, we show the main results of this study introducing facilitators and barriers of adoption of e-customs systems dedicaing a section to a policy review of relevant policies that govern the adoption and implementation of e-customs. In Section 5.1.5, the discussion, the key findings of the case study will be set into context to the innovation characteristics introduced in Section 5.1.2. Conclusions follow in Section 5.1.6.

5.1.2. Theoretical background and related work

Literature provides many overviews on diffusion of innovations both in past (Brown & Cox, 1971; Cooper & Zmud, 1990; Gold, 1981; Soete & Turner, 1984; Utterback, 1971, 1974) and in more recent (Baskerville & Pries-Heje, 2001; Keller, 2004; Mustonen-Ollila & Lyytinen, 2003; Swanson, 1994) studies. Various ways of how a technology can be diffused are analyzed. Several authors have applied the diffusion models on IT innovations in the field of government’s IT adoption, e.g., Kumar, Maheshwari, & Kumar (2002), and e-government, such as Burn & Robins (2003), Lee, Tan, & Trimi (2005), Sagheb-Theran (2007), Wonglimpiyarat & Yuberk (2005). In particular, the specific case of e-government and e-commerce diffusion in the Danish environment has been studied by some authors (Bjørn-Andersen & Andersen, 2003; Dedrick & West, 2003; Henriksen & Damsgaard, 2006) showing that Denmark is a country where electronic transactions are used both by the business and by the government. Several authors have studied diffusion of innovations theory from different perspectives. For example, Katz & C. Shapiro (1986) and Fichman & Kemerer (1993) studied the economic value of the diffusion of innovations, i.e., the economic value for the adopters. There are also authors who considered game theory to interpret the adoption and diffusion of IT standards (Belleflemme, 1999; Xia, Zhao, & Shaw, 2003). Fichman & Kemerer (1993) argue that a single theory of innovations adoption and diffusion is difficult to build due to the high variety among potential scenarios.
According to Rogers (2003, p. 10), diffusion is a process by which ‘an innovation is communicated through certain channels over time among the members of a social system’. We can, therefore, identify four main elements: innovation, communication channels, time, and social system. The first element of the diffusion process is the innovation. ‘The innovation-development process consists of all of the decisions, activities, and their impacts that occur from recognition of a need or problem, through research, development, and commercialization of an innovation, through diffusion and adoption of the innovation by users, to its consequence’ (Rogers, 2003, p. 135). As stated by this definition given by Rogers, we can recognize six main steps that build up the innovation-development process: (1) recognizing a problem or need, (2) basic and applied research, (3) development, (4) commercialization, (5) diffusion and adoption, (6) consequences. The innovation-development process is illustrated in Figure 5.2.

![Figure 5.2. Innovation-development process]

Diffusion of innovations of IT system has been studied by many authors using Rogers’ theory. As analyzed by Prescott & Conger (1995), 70 IT articles published between 1984 and 1994 relied on Rogers’ diffusion of innovations theory. However, Rogers’ theory has also been criticized. For example Lyytinen & Damsgaard (2001) pointed out that Rogers’ theory is not adequate for the diffusion of complex and networked technologies. For this reason, they suggest that a reconsideration of Rogers’ model in the context of networked and complex technologies is needed.
Business-to-government systems in general could be complex not only from the perspective of the technical innovation and development but also from the perspective of potential users since it is necessary to take into account different requirements and needs. Indeed, e-customs systems are complex (Rukanova et al., 2007) and need special attention.

Considering the statements mentioned above, we aim to apply Rogers’ model and to adapt it to the specific case of e-customs system innovation. In order to give a more specific framework, we also take into account the TOE model introduced by DePietro, Wiarda, & Fleischer (1990), cited in (Dedrick & West, 2003; Thomas, Probets, Dawson, & King, 2008), that considers three elements for understanding technology adoption in an organizational context: (1) technology, (2) organization, and (3) environment. The authors argue that, considering all these factors, it is possible to define a ‘context of change’ that describes the contiguity related to the diffusion of a specific innovation. According to DePietro, Wiarda, & Fleischer (1990), the main focus of the technological context is on how technology characteristics themselves can influence the adoption process. The organizational context considers and describes the characteristics of an organization (e.g., size, structure, quality of human resources, etc.) and looks at the structure and processes of an organization that constrain or facilitate the adoption and implementation of innovations. The environmental context corresponds to the field in which an organization conducts its business, i.e., it includes industry, market, regulations, and relationship with the government. IS researchers have used the TOE framework to analyze, e.g., EDI, open systems, and e-business adoption (P. Y. K. Chau & Tam, 1997; Iacovou et al., 1995; Zhu, Kraemer, & Xu, 2003). In particular, Zhu, Kraemer, & Xu compares the TOE model to Rogers’ theory affirming that both models are consistent to each other.

In order to categorize the findings of this study, in this article we refer to TOE model using seven characteristics that put e-customs system innovation in relation to the technological, organizational, and environmental perspectives. These characteristics, proposed by Rogers (2003) and already used for classification by other authors (Byrne & Golder, 2002; Egyedi & Loeffen, 2002; Goossenaerts, Dreverman, Smits, & Exel, 2006; Mustonen-Ollila & Lyytinen, 2003; Nilakanta & Scamell, 1990), are: (1) relative advantage, (2) compatibility, (3) complexity, (4) standards, (5) technological edge, (6) trialability, and (7) observability.

Table 5.1 gives an overview on the mentioned characteristics giving their definitions.

According to the classification proposed by Mustonen-Ollila & Lyytinen (2003),
other attributes defining the technology adoption context exist (e.g., user resistance, interpersonal networks, management hierarchy, etc.). However, because of the topic of our research and restrictions, we decided to consider the seven attributes mentioned above.

Table 5.1. Innovation specific characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>The degree to which an innovation is perceived as better than the idea it supersedes</td>
<td>Rogers (2003)</td>
</tr>
<tr>
<td>Compatibility</td>
<td>The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters</td>
<td>Rogers (2003), Egyedi &amp; Loeffen (2002)</td>
</tr>
<tr>
<td>Complexity</td>
<td>The degree to which an innovation is perceived as difficult to understand and use</td>
<td>Goossenaerts, Dreverman, Smits, &amp; Exel, (2006), Rogers (2003)</td>
</tr>
<tr>
<td>Standards</td>
<td>Manufactures and clients begin to use a standard forcing the user to follow</td>
<td>Byrne &amp; Golder (2002), Rogers (2003)</td>
</tr>
<tr>
<td>Technological edge</td>
<td>Superiority to other innovations</td>
<td>Mustonen-Ollila &amp; Lyytinen (2003), Rogers (2003)</td>
</tr>
<tr>
<td>Trialability</td>
<td>The degree to which an innovation may be experimented on a limited basis</td>
<td>Byrne &amp; Golder (2002), Rogers (2003)</td>
</tr>
<tr>
<td>Observability</td>
<td>The degree to which the results of an innovation are visible to others</td>
<td>Nilakanta &amp; Scamell (1990), Rogers (2003)</td>
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</table>

5.1.3. Research approach

In their work, Dedrick & West (2003) stated that in order to understand adoption decisions it is helpful to develop a framework through a qualitative study of a specific standards adoption case. In addition, while many believe that building theory from a limited number of cases is susceptible to researchers’ preconceptions, Eisenhardt (1989) argued persuasively that the opposite is true.

Considering the above mentioned assumptions, we used a case study approach in order to collect qualitative data. We collected the data using informal discussions, semi-structured interviews, and one workshop. The day-long workshop was conducted based on the Team Syntegrity Process introduced by Beer (1994) and further extended by Truss, Cullen, & Leonard (2000). The purpose of a syntegration is to enable the
effective contribution of a wide variety of stakeholders to the discussion of an issue of major concerns. This purpose has been kept as we have used the syntegration process to exchange knowledge on barriers and drivers in e-customs systems. The workshop took place in June 2007 and was carried out with non-homogenous stakeholder groups (26 participants), i.e., representatives of the public and private sector, IT sector, and academy. The public sector, i.e., customs and tax authorities, was involved from three EU member states (Finland, Denmark, and the Netherlands), represented by seven participants of department heads as well as functional and IT areas; functional areas included customs offices, tax administrations, border security, and control personnel. The private sector was represented by personnel (four people) from one multi-national dairy company whose products are sold in more than 100 countries. The IT sector was represented by two software and technology providers (five people) who work on the development of standards for e-government, business-to-business, and business-to-government solutions. Ten participants from four universities have also taken part in the workshop. The universities are situated in the Netherlands, Germany, Denmark, and Ireland. The process of the workshop was divided in five steps. (1) The participants were asked to answer the trigger question ‘what are barriers and facilitators for adoption of e-customs systems?’; (2) Each participant was asked to write a maximum of three concepts or keywords that they felt were relevant to the trigger question. This resulted in 79 and 75 concepts related to barriers and facilitators respectively. (3) The participants clustered the concepts in 12 topics refining the wording. (4) Several groups were formed. In these groups participants were allocated as ‘proponents’ and ‘critics’, i.e., within each group some participants had to propone one of the 12 topics and others had to criticize them. (5) For each session two reporters were also appointed. They concluded each meeting with a statement summarizing key results.

The results of the workshop were discussed through semi-structured interviews from June to November 2007 with individual experts from governmental institutions, representatives of the private sector, and IT sector. In addition, secondary sources of data were used in form of meeting and interview transcripts we archived, specification and documentation material concerning the e-governmental model publicly made available on the websites. The collected data was categorized and clustered accordingly to the characteristics of innovation (see Table 5.1). During the elaboration of the workshop’s results, i.e., during the post-workshop interviews, we drew special attention to the policy implications of the introduction of e-customs solutions since this issue arose during the several discussions with the interviewees.
**Case background**

The framework of this study resides in the European funded project Information Technology for Adoption and Intelligent Design for E-Government (ITAIDE). In this project many stakeholders coming from academy, industry, and governmental institutions are involved. The main goal of ITAIDE is to provide a concept for a new e-customs system contributing first to the Single Window (SW) and second to the Authorized Economic Operator (AEO). Both topics are addressed by the EU initiative that aims to reduce the administrative burden of trade transactions and increase security and control mechanisms. ITAIDE is applying the UN/CEFACT methodology for standardized business process and business information exchange. Basing its work on SW and AEO, ITAIDE is researching utilizing four different countries as test bed, the Netherlands, Denmark, Finland, and Ireland. In each of those countries the ITAIDE project members strongly collaborate with both business partners and governmental institutions, i.e., customs and tax offices.

5.1.4. Results

In our research, we collected a series of characteristics and categorized these along key facilitators of adoption and barriers to adoption (see Table 5.2). We also aimed to identify policies implications derived by the adoption and implementation of e-customs solutions. The next sections explain in detail both facilitators and barriers.

<table>
<thead>
<tr>
<th>Facilitators of adoption</th>
<th>Barriers to adoption</th>
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<tbody>
<tr>
<td>Benefit potential of the public sector</td>
<td>Slowdown in regulations execution due to missing procedural templates</td>
</tr>
<tr>
<td>Procedural improvements and streamlined business processes</td>
<td>Increased complexity in the standardization process itself</td>
</tr>
<tr>
<td>Avoidance of misinterpretations of standardized regulations</td>
<td>Electronification of operations</td>
</tr>
<tr>
<td>Standardization of processes, messages, and data model</td>
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**Facilitators of adoption**

The facilitators described below have been realized in the implementation test cycle along the research project. Four topics were revealed as facilitators:

1. *Benefit potential of the public sector.* Benefit potential was identified in multiple
areas. ITAIDE rationalizes upfront efforts in harmonizing and simplifying daily operations. Areas to benefit from e-customs solutions were seen in the area of time and financial savings as well as higher accuracy in data processing. Time savings have been realized due to executing procedures faster and diminishing multiple as well as manual data entries. Financial savings were the result of streamlined operations and electronized processes of repetitive tasks. Rather than spending hours in aligning paper-based documents with procedural information linked to IS transactions, electronically processed export declarations were processed faster and with higher accuracy among the participating organizations. The reduction of error-sensitive data entry is already realized in the first stage of the MASP execution in the majority of the participating countries. Improved technical connectivity between the European customs offices reduces costs of data exchange regarding export, transit or import activities.

(2) Procedural improvements and streamlined business processes. Simplifying administrative procedures, like in certificate handling, and applying the same rules for export regulations of different countries were stated as significant by governmental and business representatives. Procedural improvements included the elimination of irrelevant process steps and redesign of processes. Traditionally, due to sequentially conducted tasks and non-transparent data, process steps need to be carried out one after the other. In addition, customs officers need to wait for products and the accompanying export documentation before executing the audit of the exporting organization. The manufacturer also needs to transfer the products to the customs location for checking. However, by implementing pre-certification of organizations and accessing data prior to the arrival of the shipment, tasks could be carried out in parallel. The proof to be regulation compliant, like in the Danish case (Bjørn-Andersen & Andersen, 2003), allows manufacturers to eliminate the process of delivering products to the customs locations for getting export-ready. Compliance requirements, however, ask to consider the 4-eye-principle by requesting visible control check points across organizations; paper-based and stamped document checks may be replaced by digital signatures as, e.g., demonstrated in the case of Swedish customs procedures (Tullverket, 2006).

(3) Avoidance of misinterpretations of standardized regulations. Formulating new laws or changing the current ones were seen as a key requirement by the participants to stimulate environment for the development of IS economies in the countries. However, regulations have been interpreted differently since the change of regulations led to varying implementations. The SW initiative may avoid these misinterpretations
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since it is the part of the e-government model in MASP in which a one-stop registration and acceptance of enterprises in one EU member state is regulated for the other EU member states. The access of registration related information will also benefit other customs activities world wide. Therefore, the implementation of SW allows an enterprise to forward identical information to the authorities only once, regardless of the number of countries or political entities involved in the supply chain. An example of how a single window access can be successfully implemented in an EU country is given by the Danish eExport customs system (Bjørn-Andersen et al., 2007). It serves for government and enterprises to check the data only once and provides direct access to IS solutions. It also indicates procedural updates automatically in the system. Besides the SW part, the electronic exchange of data, the common risk procedures, and the audit mechanisms across countries are also subject to the regulation framework of MASP. Indeed, the interviewees of the governmental group noted that tighter cooperation between governmental authorities on national level and among EU member states is required in order to specify in greater detail the execution of regulations. In addition, the business representatives also asked for procedural templates that accompany regulations, regulation changes or updates to achieve a higher adoption rate of regulations.

(4) Standardization of processes, messages, and data models ease the development of e-customs solutions. The interviewees’ findings showed the need of standardization by defining common process patterns. Key participants, such as customs officers, freight forwarders, manufacturers, and export control bodies, were involved in the analysis. One characteristic of appropriately standardized elements is that they are applicable and accessible by distinct stakeholders. Therefore, any stakeholder along the global supply chain would execute export or import related activities in the same way. Considering the variety of stakeholders involved in the export process, the standardization of the process steps, such as ordering, export declaration, and delivery, would ease the supply chain flow.

The exchange of data and messages is another field of standardization. For example, an exporting organization, which applies an ERP system on a worldwide basis, still exchanges data with the suppliers on the basis of proprietary interfaces. By defining data structures on the basis of common semantics, additional information that has to be exchanged, like risk related data, should not lead to extra effort in the interface settings. Project participants from governmental site and software solution providers research on standardizing data models including the data model of the World Customs Organization (WCO) and the one as defined by UN/CEFACT.
Barriers to adoption

Three main barriers have been identified in our case study:

1. **Slowdown in regulation execution due to missing procedural templates.** The e-customs solution roadmap of MASP (Figure 5.3) gives greater detail to the e-government model mentioned in Section 5.1.1. Innovation development and execution are regulated by the EU. However, the details related to adoption, i.e., how to implement and by which means, are to be managed and conceptualized individually by each of the member states. This missing link from innovation development to innovation adoption is one of the most critical points stated by the involved participants. One interviewee from the business site asked governmental representatives how governmental bodies and subsequently regulations ease businesses. In particular, the criticism was referred to the details of process descriptions after regulations are changed.

   In the case of the AEO concept, customs authorities, as well as businesses, struggle with missing procedural details referring to the decision making process and voting structures for European customs authorities. The following questions have not been answered yet: do customs authorities have the right to accept or deny an application for the AEO certificate if the applying organization is not based in their countries? How is the transfer of data and the accessibility for non-EU customs authorities managed? Will customs authorities have access to data of AEO certified partners?

   During the interviews and discussions, participants started to argue about the means that should be used to visualize procedures and process flows. The discussion was more tool-based rather than about the impact and execution of the regulative change in the organization. While organizations are kept responsible in interpreting and visualizing procedural flows, the expected execution of regulations may have to be blocked.

2. **Increased complexity in the standardization process itself confuses organizations.** Not all regulative changes can be expressed electronically in the same manner. Nevertheless, a common denominator is required for a smooth transition from traditional to electronic customs management. The demand for standards directives was also stated by those participants who contribute to the standardization organization for trade facilitation and e-commerce (UN/CEFACT). The research on technical readiness of a number of standardization organizations using a top-down approach for standardizing regulations overlaps with the standardization efforts in cross-industry groups such as UN/CEFACT. Which one is to be followed?
Interviewees asserted that the diffusion of regulations and the implementations of e-customs solutions will be limited if standards are not applicable to different industries. In addition, small and medium-sized enterprises (SMEs) seek guidance for standardization and access to standards. In particular, successful business collaboration for a SME is dependent on the reliability that the other business partners can be connected easily. A participant stated that SMEs cannot afford to implement and maintain different standards or systems. For this reason, concepts such as the AEO require a common agreement across all participating parties. One concern that has been pointed out by the interviewees was that implementations, such as the AEO, might lead to 27 different versions in Europe. However, the EU has already started the implementation of standardized systems for the facilitation of the European trade (European Commission, 2007a). This implementation is composed by four key stages (see also Figure 5.3): (1) The first stage builds on existing work, notably the New Computerized Transit System (NCTS) and the work in the field of risk management. It creates the foundation for an electronic customs declaration environment by adding systems for Import (ICS), Export (ECS), applying the International Road Transport Convention for Transit (NCTS-TIR), and including the Economic Operators Registration and Identification System. (2) The second stage is seen as providing aspects of the electronic customs vision which primarily addresses trader concerns: the Economic Operators Registration and Identification System and AEO, together with the Common Customs Information Portal and the Single Electronic Access Point. Some work has begun in all these areas but the planning should ensure that it builds on stage one, with full implementation being in 2010. (3) The third stage is based on the Modernized Customs Code concept (European Commission, 2007b) and it is focused on the more ambitious aspects of the electronic environment. These projects would lead to the completion of a fully automated export and import system (AES and AIS), as well as completion of the Integrated Tariff Environment (the latter being built on continuing work). (4) The fourth stage is related to the Single Window project as described in the Council’s proposal for a paperless environment for customs and trade (European Commission, 2006a). This would put in place the final elements foreseen in the electronic customs initiative for a paperless environment for customs and trade. The outlined implementation plan from stage one to four is also connected in one way or the other to the country specific deployed IS systems (European Commission, 2007a; Kuiper, 2007).
Therefore, the EU e-government model will lead to common standardized systems. However, the e-government model does not provide an answer to the following questions: (1) How would standardization efforts accommodate companies and customs authorities? (2) Would the effect of deploying the ICS system in two governmental institutions (such as two customs offices in Denmark and the Netherlands) lead to the same effect in both customs offices? (3) Will the deployment of the ICS system be rooted in one standardized data model? For this reason, the e-government model does not choreograph the deployment among all EU member states nor does it inform about the implementation deployment. Although the time plan of the e-customs project contains deadlines for the deployment, an overall cross-country implementation plan for the e-customs adoption phase does not exist. In addition, as data concepts are not shared, the tendency to first invest in proprietary solutions exists. Thus, some countries might not deploy the outlined roadmap to its full extent. According to a customs and tax representative, the tighter alignment among member states might lead to discuss the sharing of proprietary standards; those, however, will not always be applicable to every organization. Recognizing the need of going beyond individual concepts and data models would then be too late. That led to another question in the discussion: would the effect of deploying a standard in two companies, e.g., one located in Denmark and the other one located in the Netherlands, be the
same?

For all the above mentioned reasons, organizations do not understand what they have to do well enough. The standardization process seems to be effective but also very complex. Organizations therefore feel confused.

(3) **Electronifying operations will affect the role of individuals as well as organizations.** Successfully deployed e-customs solutions have the potential to dramatically increase the governmental offering to organizations. Electronified service offerings change the current paper-driven or counter-based activities; while citizens and businesses benefit from more convenient and accessible services (Burn & Robins, 2003), governmental activities might change or become obsolete. However, it is necessary to conduct this change carefully. Indeed, some participants explained that the fear of loosing jobs or not having the right skills-set to cope with the new technical environment constitutes a crucial issue. The affect was also seen on the organizational level that needs to change (Teofilovic, 2002). As one participant stated, the traditional role of customs officers and customs as such shifted to technology enabled activities concerning control and border security. Additional training, job rotation, and a future plan that considers both organizations and individuals are crucial. Being aware of change, the need of clear and ongoing communication should be addressed as soon as possible. The implementation of a thought-through technical solution is dependent on the involved parties. The risk of causing resistance within the involved organizations will be amplified due to the cultural diversity across the European member states. The aspect of conducting activities differently in different countries due to cultural habits was part of the discussion.

**Facilitators and barriers of e-customs adoption under the lens of policies**

In the previous sections we have identified facilitators and barriers to the adoption and implementation of e-customs solutions. In two facilitators, i.e., ‘procedural improvements and streamlined business processes’ and ‘avoidance of misinterpretations of standardized regulations’, and in two barriers, i.e., ‘slowdown in regulation execution due to missing procedural templates’ and ‘increased complexity in the standardization process itself’, we may identify new regulations and policies as key factors. According to the European Commission (2008c), the electronic customs initiative essentially involves three pieces of legislation: two proposals and an existing regulation. The first proposal regards a decision on the paperless environment for customs and trade, Electronic Customs Decision (European Commission, 2008a) and sets the basic framework and major deadlines for the electronic customs projects
(Figure 5.1). The second proposal is related to the modernization of the EU Customs Code (European Commission, 2007b); this should lead to the completion of the computerization of customs. The existing regulation is the Security and Safety Amendment to the Customs Code (European Commission, 2005b): it is a regulation which entered into force in May 2005 and provides for full computerization of all procedures related to security and safety.

(1) **Electronic Customs Decisions.** The electronic customs initiative aims to establish secure, interoperable electronic customs systems for the exchange of data in order to: (1) Facilitate import and export procedures; (2) Reduce compliance and administrative costs; (3) Improve clearance times; (4) Coordinate the approach to the control of goods and application of the legislation; (5) Ensure proper collection of Community duties and charges; (6) Enable a seamless flow of data between the parties involved and allow re-use of data. The Electronic Customs Decision details the interoperable systems to be introduced, deadlines for their establishment and responsibilities relating to the human, budgetary, and technical resources of the Community and of the Member States.

(2) **Modernized Customs Code.** A political agreement was reached by the EU Council of Ministers on 25 June 2007 on a Modernized Community Customs Code which will simplify legislation and streamline customs process and procedures for the benefit of both customs authorities and traders. The agreement now needs to be confirmed by the European Parliament in a second reading which is expected to come in the next months. The Modernized Customs Code will focus on four different tasks: (1) To introduce electronic lodging of customs declarations and accompanying documents as the rule; (2) To provide exchange of electronic information between national customs and other competent authorities; (3) To promote the concept of ‘centralized clearance’, under which authorized traders will be able to declare goods electronically and pay their customs duties at the place where they are established, irrespective of the member state through which the goods will be brought in or out of the EU customs territory or in which they will be consumed; (4) To offer bases for the development of the ‘single window’ and ‘one-stop-shop’ concepts, under which economic operators give information on goods to only one contact point (‘single window’), even if the data should reach different administrations/agencies, so that controls on them for various purposes (e.g., customs, sanitary) are performed at the same time and at the same place (‘one-stop-shop’ concept).

(3) **Security and Safety Amendment to the Customs Code.** Regulation (EC) 648/2005 and its implementing provisions requires pre-arrival and pre-departure information (in
These new policies are necessary for the adoption and implementation of e-customs systems in the European Union. As outlined by the second barrier, new regulations may confuse organizations. Harmonization of all these regulations is vital for the success of the European e-customs initiative. That implies new common regulations and adaptations of current country-related policies such as the three mentioned in the beginning of this section. Because of a high number of stakeholders involved with divergent needs and prerequisites and a high degree of interdependence between electronic customs (e.g., legal, procedural, IT, communication) and related areas (e.g., risk management, tariff, customs controls), governments have to work together in order to find common solutions for the implementation of e-customs solutions. In order to achieve this goal, the Taxation and Customs Union of the European Commission developed a governance and management frame as governance scheme in 2006 in which the tasks and responsibilities of the different groups and organizations, e.g., the Customs Policy Group, are indicated (European Commission, 2006d).

5.1.5. Discussion

After having identified facilitators and barriers that form the conditions for innovative e-customs solutions, we apply and adapt the innovation-development process in our research setting (Figure 5.4). According to Rogers, the innovation-development process of a product is composed by three steps before commercialization, diffusion and adoption, and consequences. In our case, we do not aim to develop a final product but a software prototype, a demonstrator, which can be tested by the stakeholders. We started the innovation-development process with the identification of facilitators and barriers that may inhibit the adoption of the software. Then, we will provide a theoretical concept that will be tested in different business scenarios and we will develop an e-customs demonstrator.

In order to better understand how facilitators, barriers, and research environment can inhibit the innovation, we categorize them along the characteristics proposed by Rogers (2003). Thus, in the following we group facilitators, barriers, and research environment along the seven characteristics described in Section 5.1.2 (see also Table 5.1).

(1) The relative advantage is given by the e-government model of the EU: it is the
only possibility considered instead of developing local national IS solutions. This advantage can be perceived as demonstrated by the first facilitator, benefit potential of the public sector. Due to the long-term characteristic of the solution, individual elements, such as the NCTS implementation, are completed for the current EU member states. However, future member states might sense a complexity overload as they do not necessarily have to migrate from already existing export or transit management solutions. The review results presented by Jeyaraj, Rottman, & Lacity (2004) support our findings affirming that the relative advantage will be perceived if the innovation can be adapted to the individual situation of the adopters. In addition, the author explained that the behavior of individual adopters to accept an adoption or not is very much linked to the social network the adopter is embedded in.

In our research, social networks are on the one hand characterized by the types of organizations, such as authorities and enterprises, and on the other hand by individual groups based on the functions they perform along the global supply chain (e.g., customs officers, export controllers or audit personnel cooperating across countries
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and organizations). Considering the concept of relativity according to Jeyaraj, Rottman, & Lacity, the third dimension of social networks that we consider is based on similarities, such as industry species. Given the example of dairy products manufacturers, those are competing in global trade. However, they are demanding benefits from IS innovation development comparable and similar to other organizations. Thus, initiated by a superior political unit, such as the European Commission, when does the innovation pay off for competing organizations? An answer to this might be given based on the entry point when adopters start getting involved in a certain stage of innovation development; being involved early in innovation development, like in the research environment at ITAIDE, a Danish or Finnish company benefits earlier from innovation adoption than competitors entering later. Barriers of the innovation concept can be addressed and resolved earlier. Other types of adopters, such as recently joint member states might perceive advantages once the effort to participate is minimal and the innovation is ready to implement.

(2) Compatibility, understood as being consistent with needs of potential adopters, is given in our case (fourth facilitator, standardization of processes, messages, and data models ease the development of e-customs solutions). Depending on certain conditions, such as duration of membership, new EU member states might perceive compatibility of the e-customs solution differently than EU member states that already have an operating customs solution. Concerning efficacy of change as another condition, previous efforts in the Dutch case to direct change in procedural handling serve as a role model for present change due to the e-government framework. The same applies to governmental institutions and the private sector and how they sensed consensus development in the past. Finding common ground in former innovation, diffusion projects will steer the acceptance of newly introduced innovations, regardless of the origin of consensus and cooperation being mandatory, government imposed or voluntary (Farrell & Saloner, 1985). Change in e-government initiatives was developed by Guha, Grover, Kettinger, & Teng (1997) and adapted by Burn & Robins (2003) based on the assertion of Kalakota, Oliva, & Donath (1999) who stated that any significant business process change requires a strategic initiative where top managers act as leaders in defining and communicating a vision of change. The need of managing change is one of the major outcomes of our analysis in the case of diffusion and adoption of e-customs system innovations. The participants of our study are aware of the change: changes in job profiles and the shift to control and security specific tasks have been addressed as well as asking for more clarity on what is being expected from individuals and their organizations (third barrier, electronifying operations will
affect the role of individuals as well as organizations).

(3) Complexity in the innovation development is highly present as outlined. The technological impact on performing operations and procedures on governmental, national, and company levels is high. Complexity results also from different habits in performing business operations and executing procedures. A major trigger to ease the impression of complexity can be derived from simplified procedures that are reduced to a minimum set of required manual steps: pre-defined workflows enable newly trained personnel to get used to the new e-customs solution. The underlying principle of resolving complexity is also highly linked to standardization efforts in IS development. In particular, managing increased complexity asks for standardization concepts to compensate for more complex supply chains. Another main focus on IS adoption is based on providing access to the e-government model for business partners or governmental institutions. To achieve this, organizations seek for simplified means to adopt IS solutions resulting from organizational or procedural changes. Interoperable solutions, as confirmed by Shapiro & Varian (1999), are a critical factor to ease adoption and reduce complexity in IS innovation. Workload, caused by maintaining non-interoperable interfaces, needs to be reduced. Organizations need to conduct trade in a cross-national scenario without worrying about additional data setup and data exchange with governmental institutions.

(4) The notion of standards also evolves in IS diffusion based on its role as information carrier among trading partners (Lecraw, 1984). Standards may lead to several advantages, like the procedural improvement, and also ease the development of e-customs solutions. However, if the standardization process does not consider every aspect, it is possible that the process itself does not work efficiently or that expected savings in entire operations cannot be executed. The role of standardization goes beyond potential cost reductions. A number of research studies focused on the effect of switching from one standard to another (Reimers & Li, 2005; Shapiro & Varian, 1999; Zhu, Kraemer, Gurbaxani, & Xu, 2006). In case of complex IS solutions and cross-organizational standardization organizations, especially UN/CEFACT, the committee on trade of the Economic Commission for Europe of the United Nations (UNECE) envisions to develop recommendations, norms, standards, and other instruments for trade facilitation, electronic business, and regulatory cooperation (European Commission, 2006e). Two concepts in standards development namely ‘universal’ and ‘good enough’ derive from that mission.

(5) Technological edge, according to Rogers (2003), is based on the motivation of organizations to switch from an inferior to a superior standard (second and third
facilitator, procedural improvement of streamlined business process and avoidance of misinterpretations of standardized regulations).

What are the main attributes we collected based on our research? First, ‘universal’ as a characteristic in any means reflects a heavy-weight assumption of worldwide, globalized subjects. Comparing, for example, IT driven standards with products design, the measurements and weights of containers are standardized. Serving as product carriers they are designed to fit on any cargo ship type and cargo airplanes; local and international cargo personnel world wide is trained to use, maintain, and handle them regardless of the origin of the container. IT standards should be capable to be spread on a global basis too. In order to reach a large community, the determination, definition, and specification of standard characteristics are key factors: the ability to get adapted without losing the common semantics approach and to be implemented across industries and organizational sizes. Second, ‘good enough’ is meant to be efficient and effective in the way the standard is being used. Investments, such as human resources, a large number of cost-intense (dissemination) activities or additional co-financing activity are reduced to a minimum. Both attributes of standards account for successful regulation execution in addition and therefore refer back to the impact of policies on e-customs adoption. The role standards play can also be derived by taking a closer look onto the work and interaction of standardization organizations with policy makers. One fundamental question deriving from the exposed observations is about the involvement and possibilities of standard development organizations in regulation design and definition. We refer hereby to a number of contributions on legal modeling with IS specification design (Antón, Bertino, Li, & Yu, 2007; Antón, Dempster, & Siege, 2001; Otto & Antón, 2007; van Engers, Kordelaar, den Hartog, & Glassée, 2000) and to our own research fields.

(6) In the research environment, where the innovation-development process was being tested, trialability can be achieved based on the research approach (Figure 5.5). Trialability is given due to the fact that the development of e-customs demonstrators is supplied with real business scenarios and the input from the involved stakeholders. Indeed, the development phase will be conducted in the so called living labs. Those are characterized by pre-defined industry specific or cross-industrial trade scenarios with one exporting and one importing country. The development phase is subdivided into a development, testing, and evaluation phase. A similar approach is described by Rogers, Takegami, & Yin (2001).

(7) The extended development phase also supports the characteristic concerning observability before deploying the innovation. Part of the deployment is currently
ongoing in the EU due to the individual development plans of the involved member states.

Having successfully applied and adapted the innovation development process in our case study, the political and societal impacts of e-customs solutions need further elaboration. We hereby apply the concept of a policy field. Our discourse about facilitators and barriers in e-customs can be embraced by four determinants; the determinants follow the approach of Lynggaard (2005): (1) the European Customs Union system that is concerned about the evolvement and deployment of e-customs, (2) a set of stakeholders (or agents) that should (3) operate according to a set of policies, regulations, and succeeding processes and standards, and the possibility to (4) distinguish facilitating and limiting factors in e-customs in one country or organization with relevant e-customs initiatives in other countries or organizations.

![Figure 5.5. Extended development phase in IS innovation cycles](image)

The European Customs Union system is a term we hereby introduce. Composed of a set of regulations, directives, and supplemental guides to regulatory processes, the Modernized Customs Code evolved along the common concern of the European Union member states and European Union establishments to respond to trade specific and operational modernization needs in the EU. The evolvement started with a number of foregoing proposals and regulations and set forth the official outline in the Modernized Customs Code regulation from June 2007. As introduced in our discussion, a number of stakeholders are involved: policymakers (European Union, individual legislatures),
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intergovernmental organizations (WCO, UN/CEFACT), and different types of policy users (governmental institutions, businesses). The binding elements, which hold stakeholders together, are policy driven (policies themselves); they also emerge from standardization activities and business need to respond to policies accordingly. Stakeholders, on organizational and individual level, sense effects of these elements in form of increasing skill development demands and familiarizing themselves more with IT and operational details. The effects are also sensed by the individual constituent who is recipient and customer of shipped goods, and who is then affected by increased safety and regulatory measures. The mean of a policy field will support further investigation in the field of political and societal impact. It is our intent to further investigate in the transferability of the Modernized Customs Code as a policy field to other organizations and other countries, thus legislatures. The European Customs Union provides a unique opportunity to elaborate directives issued in form of supranational law and its degree of transposition on EU member states level (Lux, 2007) and furthermore to compare those to federal legislature and the degree of transposition on states or municipality level.

Given a successful alignment of policies and information technology, from a societal perspective, we like to raise two important questions: (1) What kind of instruments need to be constructed to develop human and social capital and stimulate knowledge transfer and advancement on governmental, business, and individual level? (2) How to include more empirical research in social science departments on use and impact of information technologies in governmental environments? Both questions aim for a better integration of distinct research disciplines (social sciences, information technology, and political science) and ask for innovative and creative means. Applying means, such as policy fields, will help to structure the inclusion of business practices and information technology in the field of governmental research. In addition, policy fields will help to identify and compare cross-organizational and cross-national use cases.

5.1.6. Conclusions

The topic that has been analyzed in this paper concerns the diffusion of IT standards in the field of customs management. The first step of the innovation-development process is to identify the problems and the needs that stimulate the research. In order to recognize those problems and needs, we analyzed barriers and facilitators of e-customs implementation. The need for innovation has been set by governmental regulations as outlined in the MASP upfront.
We demonstrated that a complex IS initiative, such as the pan-European one, can be analyzed based on Rogers’ innovation-development process. We also assessed main barriers that inhibit the innovation-development process and limit organizations to deploy commonly agreed IS solutions. The role of governments constitutes a key factor for the adoption of innovations. Major drawbacks can be expected if proprietary standards are defended and specifications in regulations are missing. Government and policy-makers therefore have to take into consideration different needs and existing national regulations of the 27 EU member states. In order to do this, the EU government has to understand the requirements of the individual EU member states and industry-specific needs. For this reason, only a strong collaboration between the EU government and business companies could lead to a feasible solution that can be accepted by every stakeholder. An example of how EU government and business companies can collaborate is given by the research project ITAIDE. Although this research project gives best practices of possible solutions, further research is needed in order to investigate and leverage the collaboration potential between EU government and business companies.

This research paper constitutes the first step of a broad analysis that will consider the three first phases of the innovation-development process. Further research should focus on the second step, research, and the third step, development. Incorporating the concept of re-invention and the extension of Rogers’ innovation-development process can also be subject of further research in the area of cross-sectoral and cross-organizational standardization. Indeed, the joint efforts of the UN/CEFACT working groups combined with our research objectives will allow us to further experiment on complex IS innovation and diffusion and the role of policy-makers and policy results to IS specifications.

Finally, our work demonstrated the potential of forming integrated research teams that concentrate on the interplay of political, societal, and technical measures from disparate stakeholder groups (users, governmental institutions, businesses, and practitioners) and disparate viewpoints (international, cross-national, national, local, and individual). A fast diffusion of e-customs should have a double impact. First, it will improve efficiency and thus increase competitiveness of European level. Second, there should be a possible side effect as well: we know that Internet technologies in general reduce corruption through transparency and harmonization of rules. The reduction of corruption in the field of customs solutions thanks to Internet technologies can also be subject of further research.
5.2. **Diffusion of e-government IT innovation: a case of failure?**

*Marta Raus, Alexander Kipp, Roman Boutellier*

2008


This article examines the adoption and diffusion of an e-government innovation, an e-customs solution, which is currently subject of research of a European funded project. The main goal of this study is to understand why adoption and diffusion of this e-customs solution did fail in the specific case of a living lab. The research is based on Rogers’ innovation-decision process with a focus on the decision stage, in which adoption variables proposed by Frambach and a model illustrated by Woodside & Biemans are considered. By developing a specific framework for adoption of organizational innovation in living labs, this paper contributes towards the analysis of the elements that may lead to rejection of new IT solutions in the business-to-government domain.

Keywords: E-government; e-customs; living labs.
5.2.1. **Introduction**

Innovation and diffusion of IT solutions in the field of e-government is facilitated by the collaboration between private and public organizations (Stewart & Ranson, 1988). Especially, the often diverging interests among the particular parties, e.g., efficiency for industry in contrast to security and control for administrations, necessitate participation along all testing, assessment, and improvement stages. One concept for involving stakeholders with different backgrounds is the living lab, where practical and theoretical foundations can be combined in order to obtain new solutions (Niitamo, Kulkki, Eriksson, & Hribernik, 2006; Pierson & Lievens, 2005). In the EU funded project ITAIDE four living labs have been built where partners from academia, government, and IT collaborate in order to develop and implement proof-of-concept solutions for new e-customs systems. Living labs are considered as research and development context: they bring together multiple stakeholders from different domains with the purpose of aligning particular interests and perspectives (Kipp & Schellhammer, 2008). In the ITAIDE project each living lab runs in a different country: Finland, The Netherlands, Denmark, and Ireland, and has a different focus that reflects a specific industry.

In this paper we consider the case of the living lab which took place in Finland, i.e., the Paper Living Lab. Within this lab, main stakeholders worked together with the scope to develop a new concept for an e-customs solution for paper industry.

However, the diffusion of the new IT solution faced some difficulties. The aim of this paper is to describe the diffusion and adoption process of the new technology in the Paper Living Lab, which turned out to be problematic after a promising beginning, and to understand why diffusion efforts failed. In order to achieve this goal, we first studied both the variables proposed by Frambach (1993) and the model of Woodside & Biemans (2005), and second developed a framework for organizational innovation adoption in living labs.

In Section 5.2.2, we introduce the concept of living labs, then describe diffusion of innovations and its adoption variables (Frambach, 1993) related to a framework for organizational innovation adoption (Woodside & Biemans, 2005), and finally develop a living lab-specific framework for organizational innovation adoption. In Section 5.2.3, we describe our research approach used in the case study of the Paper Living Lab. In Section 5.2.4, we illustrate the main results in the context of the variables and the framework proposed in Section 5.2.2. Conclusions follow in Section 5.2.5.
5.2.2. Theoretical background

In this section we first define and describe the concept of living labs and second we focus on diffusion of innovations.

Living labs definition and description

A definition of living labs is: ‘Living labs are collaborations of public-private partnerships in which stakeholders co-create new products, services, businesses, and technologies in real-life environments and virtual networks in multi-contextual spheres’ (Feuerstein, Hesmer, Hribernik, Thoben, & Schumacher, 2008, p. 2). This rather broad definition of living labs is one indication for a typical characteristic regarding the notion of living labs: multiple but not necessarily mutually exclusive understandings co-exist. Souminen (2005, p. 1) defines living labs as ‘a research methodology for sensing, prototyping, validating, and refining complex solutions in multiple and evolving real-life contexts’. Another definition is given by Ballon, Pierson, & Delaere (2005, p. 15) who consider living labs as ‘an experimentation environment in which technology is given shape in real-life contexts and in which (end-) users are considered as co-producers’. Mulder, Velthausz, & Kriens (2008) emphasize the ‘living’ part of the living lab. The integration and central meaning of the users in the research and design process in a real-life context facilitates the inclusion of experiences and dynamics among technology, users, and social everyday-context. In addition to this conceptual work on living labs, empirical analyses of existing living labs in Europe show some common characteristics among this type of collaboration environment. They typically focus on the creation of innovative services featuring ICT and involve stakeholders both from the public and private domain (Shamsi, 2008). In addition to governmental and commercial stakeholders, academia is another typical stakeholder in a living lab (Almirall & Wareham, 2008).

From our perspective, we interpret the concept of a living lab similar to the understanding of Kipp & Schellhammer (2008). They emphasize the living lab as a research environment for multiple stakeholders: each stakeholder has particular interests and perspectives on the problem.

Focusing this first understanding of living labs on the innovation process, especially in business-to-government contexts, we refer to Jesserun, Rukanova, & Tan (2008). The authors propose to categorize the phenomenon of living labs as part of the Rogers’ innovation-development process (Rogers, 2003). They study the case of a business-to-government living lab. In this specific case they add another phase that is dedicated to
the complex stakeholders’ acquisition process. They argue the gaining commitment to be the most crucial and at the same time the most delicate part. This perspective is similar to the argumentation of Reimers & Li (2005) who described three different stages in a process of enabling collective action and highlighted the initiation phase as being rather important (as personal and organizational commitment is created in this phase). In the case of Jesserun, Rukanova, & Tan (2008), where a business-to-government innovation setting is described, the authors identify among others two factors related to a successful commitment in the context of a European living lab:
1. The results from the living lab need to be translated into strong business cases in order to gain commitment of both authorities and business partners;
2. There is a crucial role for the gatekeeper in order to create a profound basis for organizational commitment.

Therefore, gaining commitment may decide how successful a living lab will be. Choosing the right partners is a difficult step so that an accurate analysis of potential partners is crucial and may take much time.

**Diffusion of innovations**

Literature provides many opinions on diffusion and adoption of innovations that have been studied both in past, e.g., Davis (1989), Davis, Bagozzi, & Warshaw (1989), and in recent studies, e.g., Burton-Jones & Hubona (2005), Chau (2001). In particular, the specific case of IT adoption in e-government has contributions like, e.g., Burn & Robins (2003) and Sagheb-Therani (2007).

According to Rogers, the innovation-decision process consists of five stages: knowledge, persuasion, decision, implementation, and confirmation. In this paper we focus on the third stage, i.e., the decision. Decision, occurs when ‘an individual/organization engages in activities that lead to adoption or rejection the innovation’ (Rogers, 2003, p. 20). In particular, we analyze the rejection of innovations in the case of living labs.

Frambach (1993) proposes eight elements that build a framework of potential innovation diffusion and adoption: adopter characteristics, information, information processing characteristics, innovation characteristics, competitive environment, network participation, innovation development, and marketing strategy. The first five elements are related to the decision process of the adopter while the last three to the decision process of the supplier. Since in our case we analyze the rejection decision of an adopter, we concentrate on the five elements related to the decision process of the
adopter.

Besides the variables illustrated by Frambach, we also take into account the model proposed by Woodside & Biemans (2005). In their work the authors developed a framework for organizational innovation adoption where the organization, considered as a buying centre, is seen as potential adopter. Five elements influence the adopter: environment, perceived innovation characteristics, social network, buying centre structure, and adopter characteristics. Table 5.3 illustrates the elements proposed by both studies.

Table 5.3. A comparison of organizational adoption characteristics

<table>
<thead>
<tr>
<th>Frambach’s characteristics</th>
<th>Woodside &amp; Biemans’ characteristics</th>
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<tbody>
<tr>
<td>Adopter characteristics</td>
<td>Adopter characteristics</td>
</tr>
<tr>
<td>Information</td>
<td>Environmental influences</td>
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<tr>
<td>Information processing characteristics</td>
<td>Perceived innovation characteristics</td>
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<tr>
<td>Innovation characteristics</td>
<td>Buying centre structure and dynamics</td>
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<tr>
<td>Competitive environment</td>
<td>Social network</td>
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</table>

Three of these elements, namely environmental characteristics, perceived innovation, and adopter characteristics, are more or less the same in both frameworks.

Since we aim to understand why the main stakeholders of the Paper Living Lab decided a posteriori to reject the proposed innovation, we adapt the two concepts of Frambach and Woodside & Biemans to the case of living labs.

Consequently, we regroup all elements proposed into five generic elements, i.e., adopter characteristics, information (clustering information and information processing characteristics), innovation characteristics, environmental influences, and social network. Figure 5.6 illustrates the framework.

In the specific case of living labs, the environmental influences correspond on the one hand to the competitive environment in which the main stakeholder, i.e., the industry partner, is in and on the other hand to its market situation. Information is in this case a vital factor since without a high degree of information it is not possible to make potential stakeholders aware about new projects. Besides information, the social network plays in living labs a special role since it is easier to involve people in a project if there is a certain degree of trust between the potential adopters and the project partners. Naturally, innovation itself and adopter characteristics are key elements for the final adoption decision.
We consider this framework appropriate for the analysis of living labs since a living lab is composed by different organizations, each focusing on particular interests and perspectives. Therefore, in a first stage, the diffusion and adoption of a technology has to be analyzed in each organization involved in a living lab, considering each organization as a single one. Further, in a second stage, it is important to consider network-related effects. We, therefore, used this framework in order to categorize and analyze our findings.

![Figure 5.6. Framework for organizational innovation adoption in living labs](image)

### 5.2.3. Research approach

According to Dedrick & West (2003), in order to understand adoption decision it is helpful to develop a framework through a qualitative study of a specific adoption case. In addition, Eisenhardt (1989) argues in her work that building theories from a limited number of cases is effective. Yin (1994) differentiates between three types of case study research: exploratory, explanatory, and descriptive. In addition, he distinguishes between single case studies, focusing on exploring particular circumstance and challenging existing theories or frameworks. In our context, we used the Paper Living Lab as a single case study in order to explore the failure of adoption of new e-customs solutions. We conducted six workshops and eight semi-structured interviews in the time between June 2006 and December 2007.
Case background

This study is part of the European funded project ITAIDE. In this project, actors coming from academy, industry, and governmental institutions collaborate with the scope to provide a concept for a new e-customs system. There are four different living labs (Beer, Paper, Food, and Drug Living Lab) that take place in four European countries involving four different industries. The Beer and Paper Living Labs are already completed while the Food Living Lab started in June 2007 and the Drug Living Lab in January 2008 both with a time-span of 18 months. A successful example is given by the Beer Living Lab that took place in the Netherlands and involved a Dutch beer company (Baida, Rukanova, Liu et al., 2007; Baida, Rukanova, Wigand, & Tan, 2007). The Food Living Lab, which takes place in Denmark together with a Danish dairy company, is showing promising results (Henriksen & Rukanova, 2008; Raus, Flügge et al., 2008). On the other hand, the Paper Living Lab, which began in January 2006 and closed in July 2007, showed some challenges and limitations. Its main stakeholders were the Finnish government, a large Finnish multinational company (called MNC in the ongoing paper) operating in pulp and paper industry, a technology provider, and several small and medium-sized enterprises (SMEs) that are suppliers to the company either with services or raw materials.

The central stakeholder was the Finnish MNC (with production sites in 14, mainly European, countries; 26,000 employees and a turnover exceeding € 10 billion in 2007; one of the Finnish production sites was the main partner in the Paper Living Lab with employing approximately 1000 people).

The focus of the Paper Living Lab was on the redesign of solutions for business-to-business and domestic e-government integration. These consisted of business processes, network interfaces, electronic documents, but also related administrative processes, and organizational structures. The primary goals were first to reduce administrative burden for the paper industry domestically and second to facilitate cross-border trade. The investigations also considered information accurateness and security of information from all Paper Living Lab stakeholders’ perspectives, e.g., to meet the control requirements of customs declarations, etc. As an outcome, the living lab has resulted in a complete redesign solution, including different business processes (quotation, order, delivery, and invoice) and incorporating the needs of the MNC and its suppliers in terms of SMEs or public administrations.

In contrast to the positive results of the conceptual part of the Paper Living Lab, the practical application and implementation of the new system experienced some
difficulties. Due to increasing retentiveness of the central stakeholder, the final implementation and real case testing has not been done until the end of the living lab time-frame. Although many SMEs mentioned in the interviews their readiness and interest in using the system, they were dependent upon the MNC in applying the new system.

As there was no official communication regarding the reasons for not applying the system by the MNC, two main motivations were assumed: ongoing internal organizational restructurings and increased competitive challenges in the paper industry. The next section discusses these results considering the proposed framework by Frambach (1993) and Woodside & Biemans (2005).

5.2.4. Results and discussion

In our research we analyze the case of the Paper Living Lab using the adapted model of Frambach and Woodside & Biemans. Following, we analyze each element of the framework in the case of the Paper Living Lab considering the MNC as main stakeholder.

**Adopter characteristics.** According to Frambach, the probability to adopt an innovation increases with size and innovativeness of the company. According to the figures presented in the former section, the MNC fulfills the size parameters. Also the innovativeness characteristic is fulfilled: the statements of the company mention explicitly the willingness to vertical integration of suppliers and customers, efficient production facilities, comprehensive logistics networks, etc. Also its involvement in this type of research-related projects like ITAIDE shows its innovative attitude. We interpret another adopter characteristic as being relevant for missing adoption behavior in the later phase of the project: due to internal reorganizations, the significance of the project for the organization decreased. Other projects, more related to core business, became more important and so resources and attraction was withdrawn from this project. In addition to the adopter characteristics stated by the two authors, this might be another kind of characteristics helpful to explain especially failures of adoption and diffusion.

**Information.** The informational degree was high since all partners involved made many efforts to provide the relevant information to develop the new solution. Workshops and on-site-studies were conducted to get information about business processes, redesign potential, requirements of the stakeholders, etc.

**Innovation characteristics.** The innovation characteristics have been already studied in the case of the Food Living Lab (Raus, Flügge et al., 2008). In this work it is
showed that these characteristics have a positive impact on the adoption willingness. Since the concepts proposed both in the Paper and in the Food Living Lab aim to propose a new e-customs solution, we assume that the case studies do not differ in a considerable manner. Therefore, we do not go through all the innovation characteristics in this paper because they have already been studied in the mentioned article (see Section 5.1.2).

*Environmental influences.* Frambach originally stated positive relation of diffusion and adoption behavior and the level of competitiveness in the industry. Nowadays, the paper industry is facing an increasing level of competition among the paper and pulp producers. Two exemplary reasons are new industry entrants from emerging markets, like China, and less paper demand in total. This is caused, for example, by the increased usage of other media like the Internet which has taken place of traditional information media like daily newspapers, magazines or books. Competition is, according to Frambach (1993), an indicator for increased adoption. However, we observed the opposite. Facing the rising pressure from the market and other competitors, the MNC reduced its efforts spent in this type of research and development project significantly; therefore, it impeded the whole implementation of the system according to their hub-like position in the living lab. The internal decision to spend its resources on other projects and to reject the adoption at this stage was clearly related to this industry pressure.

*Social network.* Woodside & Biemans (2005) discussed the relationship between social networks in terms of interconnectedness and word-of-mouth in an organizational adoption context. In our case, we have to distinguish between two stages of participation in the project. At the beginning, the responsible individuals from the local manufacturing site were actively involved in the research and development process. They attended several workshops and analyzed the internal processes. At the second stage of the Paper Living Lab, when implementation and testing of the new system required an organizational adoption of the system, it became more difficult. The organizational participation was reduced due to internal reorganization projects. The relevance of the project on an organizational level had been decreased in contrast to the relevance on the individual level. Our interpretation for the diffusion and adoption model is, therefore, to distinguish between individual and organizational level (according to Woodside & Biemans). In addition, the social network seemed to be more important for individual participation decision, whereas the decision to adopt on an organizational level is usually more influenced by other parameters. To analyze the barriers for organizational adoption and to facilitate the
transfer of personal involvement into organizational involvement, approaches from marketing might be useful. Especially in the area of business-to-government marketing, e.g., for industrial commodities, the issue of relating personal involvement into organizational activities has been discussed from many perspectives. For a general discussion see, e.g., Backhaus & Voeth (2007); further, more focused issues are discussed in Johnston & Lewin (1996). The transfer of personal involvement into organizational momentum and its potential barriers in the context of innovation and diffusion is an open issue and an important research opportunity for future work.

5.2.5. Conclusions

In this article we aimed to analyze why adoption and diffusion of a new e-customs solution faced some difficulties. The case study has been researched within the EU funded project ITAIDE and is supported by the experience of a living lab. The research based on the innovation-decision process proposed by Rogers (2003) with focus on the decision stage. In order to analyze the decision stage, we considered the studies of Frambach (1993) and Woodside & Biemans (2005) and developed a specific framework for organizational innovation adoption for the case of living labs.

As outlined in Section 5.2.4, many elements showed the potential of a successful adoption by the MNC. However, two elements, social network and environmental influences, had a negative impact on the MNC, the main stakeholder. Indeed, on the one hand competition resulted as negative factor; on the other hand the commitment process did not take place in a proper way. A personal social network could help at the beginning of a commitment, while it could turn out to be a negative factor in a second stage: organizational commitment is also necessary in order to ensure that the whole team, rather than just a single person, sees the benefits of a new project and agrees on the participation.

As a result, we may conclude that from the adopter point of view it is necessary to deeply analyze the social network and environmental influences since they may be not positive factors as stated by Frambach and Woodside & Biemans but, on the contrary, negative factors that may lead to adoption rejection. This research paper only considered one case study and, therefore, future research is needed to analyze similar cases in order to formulate a broader set of possible adoption rejection factors.
6. **Value of e-Customs**

6.1. **Evaluating IT innovations in a business-to-government context: a framework and its applications**

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2010

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This paper highlights the challenges of assessing the value of business-to-government IT innovations for both private and public stakeholders. Due to the different backgrounds of inhomogeneous stakeholders, potential adopters of business-to-government systems have varying requirements; in particular, they address understandings of value attributed to the implementation and the usage of such systems. Incorporating specific perspectives of each stakeholder in its own domain for evaluation is vital for supporting diffusion of IT innovations. The main contribution of this paper is the development of a value assessment framework that combines the value understanding from both private and public stakeholders. Applying this framework does not only allow the value assessment of business-to-government IT innovations incorporating different needs and requirements of various current stakeholders but it also provides potential adopters from both domains common and objective evaluation criteria on similar business-to-government IT innovations. We discuss the application of the proposed value framework in the case of e-customs systems redesign based on an example of the introduction of e-customs IT solutions in a Finnish multinational company.

Keywords: Value assessment; public value; private value; IT innovation; business-to-government; e-government; e-customs.
6.1.1. Introduction

Today e-business concept is used by a vast scope of business types, from traditional business-to-business (B2B) and business-to-consumer (B2C) to most recently business-to-government (B2G) transactions. The development and diffusion of information and communication technology (ICT) and its underlying information systems (IS) supporting these inter-organizational contexts increasingly incorporate not only stakeholders from business but also from public sectors. ICT innovations in the business-to-government context are primary reflected under electronic government (e-government) subjects, which require intensive interactions between government and businesses. Combining business and government perception, e-government is defined as:

‘The application of information and communication technology to improve, transform and/or redefine any form of resource and information exchange (transacting and contracting) between involved actors like companies and governmental agencies and their customers, suppliers or other partners by developing and maintaining dedicated inter-organizational systems, virtual organizational arrangements and (inter) national institutional arrangements’ (Wassenaar, 2000, p. 289).

Scholl (2003) argued that e-government is a special case of ICT-enabled business process change. Hazlett & Hill (2003) further examined how e-government is being used in the delivery and improvement of public services in the UK arguing that government’s two central aims, high quality customer service and value-for-money, could potentially be in conflict: there is lack of evidence to support that the use of ICT in service delivery results in less bureaucracy and increased quality. Furthermore, e-government is seen as an innovation because it redefines and improves transaction processing via an IT platform (Esteves & Joseph, 2008).

In the context of business-to-government innovations in the e-government context, current initiatives of the European Union aim at building a strong pan-European economic area with simplified community trade procedure by providing, e.g., a common standardized e-customs system. Although multiple efforts and initiatives at national level exist to enable electronic communication between companies and government bodies, common standards among all member countries of the EU as well as unified processes are still missing. The reduction of the administrative burden related to these issues is one of the core European strategies to strengthen the
European economy. It foresees a complete integration between all European countries in terms of import, export, and transit (European Commission, 2007a). The integration of stakeholders from private (like commercial companies or technology providers) and public sectors (like customs and tax authorities) in the development of this type of IT systems exemplarily elucidates the challenges of a broader set of IT innovations in business-to-government contexts.

Potential stakeholders may ask why they should adopt such IT innovations with cost and investment especially under the B2G context: the two distinguishable parties may have completely different understandings on what the value of these innovations may be. For example, the understanding of value in public administrations and the resulting requirements to the system may differ from the value which private companies expect from a new system. Due to these different understandings of value, also the contexts of potential adaptors might be different. Without such common understanding, further adoption and diffusion of IT innovations may be tampered under the B2G context. One of the major challenges is to measure and assess the value with the same method covering stakeholders from both public and private domains. However, a literature review indicates a lack of development on this issue (Section 6.1.2). Therefore, in this paper we aim to propose a value assessment framework of business-to-government IT innovations, which is applicable for both private and public domains. The framework we developed consists of two main parts. The first part provides a value matrix which establishes a comparable structure of different assessment categories and grants flexibility on particular specifications by identifying stakeholder-specific goal areas, key performance areas, and indictors. The purpose of this part is to have a common understanding what has to be assessed. Since we recognize that the first part is high-level and needs to be filled with stakeholders’ specific information, the second part of the proposed framework consists of a five-step procedure model. The purpose of this five-step model is to guide the stakeholders through the challenging tasks of deriving specific assessment criteria, fulfilling the actual value assessment, and elaborating and communicating the results. The combination of the two parts enables the framework to be applied in an effective and efficient way.

The rest of the article is structured as follows. Section 6.1.2 provides an overview on literature review of different perspectives on value in private and public domain; in this section we also present relevant assessment frameworks under both domains, with special focus on the e-government evaluation. Section 6.1.3 is dedicated to the research methodology and the case background. In Section 6.1.4 we present an integrated value assessment framework for IT innovations in the context of business-
to-government. It combines both interpretations providing the content of the value assessment conceptualization and practical guidelines on how to conduct the assessment. Next, in Section 6.1.5, we apply the proposed value assessment framework based on the case study of the implementation of e-customs IT solutions in a Finnish multinational company. The case study resides in a European funded project presented in Section 6.1.3. Lastly, in the discussion and conclusion section (Section 6.1.6), we highlight strengths and weaknesses of the approach, set a research outline for future work, and discuss possible improvements of the proposed value assessment framework.

6.1.2. Review of value understanding in private and public domain

In this section we provide a literature review of existing value propositions and current assessment frameworks in both private and public sector. We aim to review different value understandings in the two different sectors. Based on our practical experience and the literature review, we found that there is a notion and understanding difference of value between the private and public domain. However, with respect to all the differences, we argue that there exists a common understanding on value in both domains so that it is possible to build a common value assessment framework. While the notion of value for private companies builds on a very long tradition (Mukhopadhyay, Kekre, & Kalathur, 1995; Renkema & Berghout, 1997), the understanding of value in the public domain is not that prominently discussed. For this reason, after a review of value in private sector, we focus on elaboration and comparison of different notions of value and their corresponding frameworks under the public domain.

Value in the private sector

When talking about private sector value, we normally relate to business value or firm value. Most people’s first reaction to business value is to link to financial terms, e.g., cash flow, earnings or turnover. Indeed, money is the main equalizer of private sector valuation. Businesses use a sophisticated set of techniques to measure and manage value. Profit, revenue (turnover), cash flow, economic value added (EVA), net present value (NPV), and return on investment (ROI) are possible forms of business valuation (Brewer, Chandra, & Hock, 1999; McDonald & Siegel, 1986; Pindyck, 1988; Rogerson, 1997; Young, 1997). In a private market, value is created when a business uses resources (labor and intellectual, physical and financial capital) to deliver returns to shareholders, as the ultimate goal of a business is profit/shareholder value
maximization. Moreover, we know the way in which such goal can be achieved: by producing goods/services that can be sold above the cost of production. Thus, most private sector valuation forms are inevitably related to economic value and measured in monetary terms. In general, the economic value of something is how much a product (product should be interpreted as physical good) or service is worth to someone relative to other things (often measured by money). It can be either an evaluation of what it could or should be worth or an explanation of its actual market value (price).

In the management literature, e.g., Drucker (1995), Tapscott, Lowy, & Ticoll (2000), and Tsai & Ghoshal (1998), a firm is seen as a part of a larger network consisting of intra- and inter-organizational relationships. Especially in the commercial context, these networks are sometimes called value network or value chain (Allee, 2002; Drucker, 1995; Porter, 1985). Within such a network context, a broader notion of value is required, expanding the original financial value and integrating, for example, employee value, customer value, supplier value, managerial value, and societal value.

Recent and past studies emphasized the need to analyze different factors that may influence the overall benefits of a company, i.e., not only from the economical viewpoint but also considering other perspectives. For example, Aladwani (2002) proposed a model that examines the role of social integration in system development projects. With this model he empirically proved that social integration has a positive impact on system development and project performance. Therefore, this model analyzes the success of a project from the social point of view. Also other authors dedicated their studies to the evaluation of company benefits considering different types of value (Dyer & Singh, 1998; Knox, Maklan, & Thompson, 2000; Murphy & Simon, 2002; Shang & Seddon, 2002). Shang & Seddon (2002) aimed to assess and manage the benefits of business company systems from the business manager’s perspective. In order to achieve this goal, they classified the benefits in five dimensions and built a framework; the five dimensions represent the operational, managerial, strategic, and organizational perspectives and the IT infrastructure. The authors empirically tested their framework analyzing 233 cases that consider 42 industries in 61 countries; they classified their results, i.e., the benefits of the implementation of business company systems, using the above mentioned five dimensions. Another example is given by Murphy & Simon (2002) who studied the case of a large computer manufacturer that aimed to assess not only tangible but also intangible benefits of IT investments focusing on enterprise resource planning (ERP) systems. In their work, information systems benefits have been classified with respect
to several frameworks: tangible vs. quantitative, temporal, external vs. internal, hierarchical (strategic, tactical, and operational) based on organization factors and technology infrastructure standardization. For the benefits classification they took the five dimensions proposed by Shang & Seddon (2000) and added the category ‘tangible’ and ‘quantifiable’.

Table 6.1 resumes the three above mentioned frameworks for private value assessment. Due to the long tradition of value studies in the private sector, more frameworks and classifications are available in the literature. We selected only these three as they cover a large variety of value notions and perspectives on value in the private domain and since they are the most recent and include old studies. The literature review shows that some authors have already aimed to propose a framework that may classify the value in private sector to evaluate IT investments not only from the monetary terms. However, these valuable studies only considered the value from the business company perspective, i.e., they only consider the private sector perspective.

<table>
<thead>
<tr>
<th>Framework</th>
<th>Reference</th>
<th>Brief summary of main conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aladwani’s model</td>
<td>(Aladwani, 2002)</td>
<td>Social integration has a significant positive impact on system development project performance; management support strategies designed to promote social integration in the form of integration-oriented training; rewards are positively related to social integration.</td>
</tr>
<tr>
<td>Shang &amp; Seddon’s framework</td>
<td>(Shang &amp; Seddon, 2002)</td>
<td>Five dimensions are considered for the classification of company systems benefits: (1) operational, (2) managerial, (3) strategic, (4) organizational, (5) IT infrastructure.</td>
</tr>
<tr>
<td>Murphy &amp; Simon’s framework</td>
<td>(Murphy &amp; Simon, 2002)</td>
<td>Classification of information systems: tangible vs. quantitive, temporal, external vs. internal, hierarchical benefits based on organization factors and technology infrastructure standardization.</td>
</tr>
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</table>

Value in the public sector

The concept of public value is mostly discussed in the public management / administration literature. Traditional public administration provides a particular set of solutions to the challenges of governance. It relies heavily on Weber’s (1947) political thought: three institutions (political leadership, party, and bureaucracy) are seen as
essential to coping with the ever growing complexity of modernity and delivering order to the governance process (Held, 1987). The attention of public value was first drawn in the 1980s during the worldwide wave of public sector reforms. Since then, a new management philosophy is used by governments to modernize the public sector, which is referred as the New Public Management (NPM). Hood (1991) defined NPM as a move to more hands on professional management in the public sector, more explicit standards and measurement of performance, greater emphasis on output rather than input controls, a shift to disaggregation of units in the public sector, a shift to greater competition and contract based delivery of services, a stress on private sector styles of management practice and greater parsimony in resource use.

NPM, compared to traditional public management theory, is more oriented towards outcomes and efficiency through better management of public budget. New Public Management addresses beneficiaries of public services much like customers (or private sector) and conversely citizens as shareholders. However, the practice of New Public Management often emphasizes narrow concepts of cost-efficiency over other considerations. Those things that are easy to measure tended to become objectives and those that could not are neglected or ignored. A common problem for NPM is that it usually measures public services ‘efficiency’ with the average cost of processing a given output rather than an expected outcome that matters to the public (e.g., measuring how cost-effective a government website provides quantity of information rather than the usefulness and relevance of the information to the citizen). In this narrow sense, the improvement in efficiency does not contribute to the increase in the public value. In general, NPM could be understood as the transfer of private value understanding and the related controlling and measuring approaches into the public sector.

To cope with the limitations of NPM and give a better view of government performance, the concept of public value was developed. According to Moore & Moore (2005), there exist three quite different conceptions of public value: (1) One is the standard proposed by utilitarianism and welfare economics: public value equals the sum of individual satisfactions that can be produced by any given social system or governmental policy. It is this standard that we apply when we size up public policies in terms of the greatest good for the greatest number. (2) A second conception of public value is the idea that public value is whatever a duly constituted government acting as an agent of its citizenry declares to be an important purpose to be pursued using the powers and assets of government. This is the standard used when we claim that public officials ought to be concerned with achieving the purposes they have been
mandated to achieve through legislative action. (3) A third conception of public value lies somewhere between these first two: public value consists of important purposes that can enhance the degree of individual satisfaction enjoyed by members of a policy that will not necessarily be achieved by competitive markets operating by themselves, and which the polity has assigned government to help them achieve collectively for their individual benefit. In this conception, government is specially authorized and required to deal with a particular set of conditions where markets will not function well to maximize the sum of individual satisfactions.

According to Moore & Moore (2005), the goal of private managers is to create private (economic) value, while the goal of government agencies is to create public (social) value. The authors argued that the strategic problem for public managers is to imagine and articulate a vision of public value that can command legitimacy and support, and is operationally doable in the domain for which you have responsibility. In order to determine what constitutes public value and to act to produce it, a concept of ‘strategy in the public sector’ is developed. This idea is presented in the diagram The strategic triangle, which consists of the following three factors: task environment, authorizing environment, and operating environment. (1) Task environment refers to the social conditions managers seek to change. The strategy must be substantively valuable in the sense that the organization produces things of value to overseers, clients, and beneficiaries at low cost in terms of money and authority. (2) Authorizing environment refers to the actors from whom public manager needs authorization and resources to survive and be effective. The public enterprise must be able to continually attract both authority and money from the political authorizing environment to which it is ultimately accountable. (3) Operating environment refers to the assets and capabilities entrusted to public manager plus those that the manager can influence, and are required to achieve the desired results. It must be operationally and administratively feasible in that the authorized, valuable activities can actually be accomplished by the existing organization with help from others who can be induced to contribute to the organization’s goal.


In 1996 the Roberts Enterprise Development Fund (REDF) published a retrospective cost benefit analysis of the social purpose enterprises run by a non-profit agency in the San Francisco Bay Area. The study introduced the SROI framework,
where the ‘S’ denotes some sort of social mission activity; the ‘ROI’ denotes the use of a business investment analysis. REDF’s SROI framework was specifically designed for social purpose enterprises run by non-profit organizations. According to Emerson, Wachowicz, & Chun (2000), the SROI framework looks at value creation from the investor’s perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely economic, to socio-economic, and to social. Economic value is created when there is a financial return on an investment. Social value is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individuals or society as a whole. However, it is very difficult to agree upon or to quantify the actual social value created. Socio-economic value measurement builds on the foundation of economic value measurement by quantifying and monetizing certain elements of social value, and incorporating those monetized values with the measures of economic value created. SROI framework incorporates measures of economic value with monetized measures of social value to calculate socio-economic value.

In 2001 the American Social Security Administration and General Services Administration undertook the task of developing a methodology to assess the value of e-services. Their report (U.S. Federal CIO Council, 2002) built the foundation for the Value Measurement Methodology (VMM). VMM is based on public and private sector business and economic analysis theories and best practice, and provides the structure, tools, and techniques for comprehensive quantitative analysis and comparison of value (benefits) cost and risk at the appropriate level of detail. Three elements – value, cost and risk – are analyzed from different perspectives in VMM. It provides a framework and information for making trade-offs among different alternatives, and for striving to optimize value, minimize costs, and diminish risk. Moreover, VMM identifies five essential value factors such as direct customer value, social/public value, government financial value, government operational/foundational value, and strategic/political value (Foley, 2006).

In the UK, to assess the successfulness of the public service reform, the cabinet office developed an analytical framework. In this framework, Kelly, Mulgan, & Muers (2002, p. 4) defined public value as ‘the value created by government through services, laws regulation, and other actions’. They argued that in a democracy this value is ultimately defined by the public themselves. Value is determined by citizens’ preferences, expressed through a variety of means and refracted through the decisions of elected politicians. Three categories, services, outcomes, and trust, are addressed as main components of the public value.
In 2003 a group of Accenture executives in cooperation with Harvard Kennedy School of Government developed the Public Service Value model (PSV model) from the global government practice. The PVS model provides ‘a baseline for comparing performance of a particular government agency over time and/or compared to other agencies’ (Jupp & Younger, 2004, p. 20). They consider public value in public service organizations as the public service value and suggest that ‘public service value is about more than simply attaining outcomes or just reducing cost; it is about doing both in a balanced fashion, and understanding the strategic trade-offs available along the way’ (Cole & Parston, 2006, p. 63). They suggested that government managers should look at value from the perspective of the citizen who is the primary stakeholder and most important beneficiary of government activities. According to them, the public value is created based on two criteria: the outcomes they deliver and the cost-effectiveness they achieve. By focusing also on cost-effectiveness, high-performance government organizations strive not only to do the right things but to do them in the right way.

Cresswell, Burke, & Pardo (2006) presented the Public Return On Investment (PROI) framework for evaluating IT investments of the government. Contrary to most methods for assessing return on investment that focus on financial or economic metrics, the PROI framework includes a much broader view on how IT investments producing results of value to citizens or to the society as a whole. In this framework, the government is an asset to the community or nation that delivers a wide range of values. Two sources of public returns are mentioned: (1) value to the public that results from improving the government itself from the perspective of the citizens and (2) value that results from delivering specific benefits directly to persons, groups or the public at large. The framework thus presents a more comprehensive way of describing public value, compared to the previously analyzed frameworks. The public value proposition is composed of six parts based on different impacts that government IT can have on the interests of public stakeholders, including financial, political, social, strategic, ideological, and stewardship impacts.

Table 6.2 resumes the frameworks described above.
Table 6.2. Value assessment frameworks for the public sector

<table>
<thead>
<tr>
<th>Framework</th>
<th>Reference</th>
<th>Brief summary of main conclusions</th>
</tr>
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<tbody>
<tr>
<td>Moore&amp;Moore’s framework</td>
<td>(M. H. Moore &amp; Moore, 2005)</td>
<td>Six points for describing public value from managerial point of view.</td>
</tr>
<tr>
<td>Social Return On Investment (SROI)</td>
<td>(Emerson et al., 2000)</td>
<td>SROI framework looks at value creation from the investor’s perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely economic, to socio-economic, and to social.</td>
</tr>
<tr>
<td>Value Measuring Methodology (VMM)</td>
<td>(Foley, 2006)</td>
<td>Five factors describe public value: direct customer value, social/public value, government financial value, government operational/foundational value, strategic/political value.</td>
</tr>
<tr>
<td>UK Cabinet</td>
<td>(Kelly et al., 2002)</td>
<td>Public value is the value created by government through services, laws regulation, and other actions.</td>
</tr>
<tr>
<td>Public Service Value (PSV) Model</td>
<td>(Cole &amp; Parston, 2006)</td>
<td>Public service value is about more than simply attaining outcomes or just reducing cost: it is about doing both in a balanced fashion and understanding the strategic trade-offs available along the way.</td>
</tr>
<tr>
<td>Public Return on Investment (PROI)</td>
<td>(Cresswell et al., 2006)</td>
<td>Framework for evaluation of government’s IT investment.</td>
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</tbody>
</table>

Summarizing from the above six evaluation frameworks, we can conclude three major points:

- Similar to the private sector, the public sector can also be seen as service provider to its customers: the citizens. Its ultimate goal is to satisfy the needs and demands of citizens and to increase the total social welfare in general.
- The existing evaluating methods for private sector can be applied by public sector as well. Economic (i.e., financial) value is an important aspect for public value assessment, however, not the only concern: other values like social and strategic/political value need to be taken into account as well.
- Not as direct as in the input-output analysis in the private sector, value assessment in the public sector focuses on input-outcome analysis. Outcome differs with output (direct products) focusing on the actual impacts/benefits/changes to the organization. However, outcome evaluating is abstract and often difficult. ‘Cost-effectiveness’ is one of the most import criteria for such evaluation.
Bridging the gap of value assessment between private and public sector

The existing differences (Halachmi, 1995; Lachman, 1985; Stewart & Ranson, 1988) between private and public sectors limit the application of current business knowledge and best practices in the public sector. The pending issue is to build a bridge that can transfer knowledge across the two sectors, which can enable us to apply business knowledge to improve public sector performance, in other words, to create value in the public sector.

In her work, Halachmi (1995) argues that it is improper to apply a pure economic value view when redesigning processes of public sectors. Three reasons are described: (1) Value in public sector is certainly not the price of the service (many public services are exchanged at zero price to clients in high need), nor it is the cost of the inputs (although this is how the value of the public sector services is accounted for in the national income accounts). If we accept the view that value is what is considered to be valuable by the stakeholder, i.e., what brings satisfaction to the stakeholder, then we are faced with the reality that value in the public sector must be multi-faceted and must encompass elements never to be found in private sector value analysis. (2) Even when a definition of value has been agreed upon in the public sector, organizational functions and procedures that do not add to value when performed in the private sector may have an inherent legal or symbolic value in the public sector. (3) While in private sector the only objects of consumption, which are recognized as important by the dominant stakeholders are, in most cases, the outputs or the outcomes of a service, in public sector some key stakeholders essentially derive their value from consumption of the processes (e.g., groups representing minorities who wish to ensure equal opportunities at work in public organizations) or the inputs (e.g., professional associations which wish to maintain requirements for professional accreditation or qualifications in certain processes). It is necessary to pay particular attention to the widest possible definition of value when analyzing value added in procedure redesign effort.

As outlined in the introduction, e-government is an application of ICT between actors like business companies and governmental institutions. Therefore, the notion of value of e-government projects combines both the private and the public sectors’ perspective. In the past years, e-government has been the research topic of many authors. Some researchers dedicated their studies to the future of e-government and its diffusion prediction. For example, Coursey & Norris (2008) compared five models of e-government (Baum & DiMaio, 2000; Hiller & Bélanger, 2001; Layne & Lee, 2001;
Ronaghan, 2001; Wescott, 2001) by conducting a study in USA in 2000 and 2002. Based on this study, the authors affirmed that the proposed e-government models do not accurately describe or predict the development of e-government since they miss or ignore that barriers to e-government adoption, such as, e.g., lack of information, lack of collaboration among departments or security issues, exist. Furthermore, Dawes (2008) presented a study among 383 experts in 54 countries that has the goal to understand what the vision for future e-government research and its investments is. As result, Dawes categorized future themes in four main categories that are seen as key future e-government fields: innovation, interoperability, confidence, and relevance.

These two examples of recent studies show how e-government and its research gained importance. In addition, Lenk & Traunmüller (2002) stated that the evaluation of e-government initiative is a significant topic of research. However, according to Kunstelj & Vintar (2004), the lack of formal methods for monitoring and assessing e-government projects has led to a significant slowdown of country-level e-government development.

Thus, methods for e-government evaluation are necessary in order to ensure its development. Several studies have been already conducted in the field of e-government evaluation. For example, Gouscos, Kalikakis, Legal, & Papadopoulou (2007) developed a conceptual framework for modeling quality and performance in the field of e-government, i.e., combining private and public stakeholders. In this work the authors provided an overview on major stakeholders of e-government services and modeled a framework for analyzing quality and performance dimensions. Another example is given by Jones, Irani, & Sharif (2007): the authors studied e-government evaluations basing their findings on three case studies. They proposed an e-government evaluation framework defining four themes as emergent in the e-government provision: decision making, evaluation methods, performance assessment, and practitioner concerns. The authors developed a diagram that relates the notions of the above mentioned four themes to quantitative factors of responsibility, sponsorship, evaluation, and prioritization; and to qualitative factors of ownership, adoption, evaluation, and social factors. In addition, they affirmed that, in order to be appraised, evaluation should consider both direct and indirect assessment of the investment. The authors concluded affirming that e-government evaluation is an under developed area and needs more research. Furthermore, Esteves & Joseph (2008) presented a three-dimensional ex-post framework for the assessment of e-government initiatives. The three dimensions are e-government maturity level, stakeholders, and assessment levels. The assessment levels consider the technological, strategic, organizational,
operational, service, and economic aspects.

All these examples demonstrate that e-government evaluation is a very complex process and strongly depends on organizational and social dimensions. In the mean time, e-government evaluation provides a natural bridge for ICT evaluation under the B2G context. Our paper aims to further contribute in this research area, by providing an integrated value assessment framework for ICT innovation evaluation involving both private and public sector.

6.1.3. Research method and case background

According to Dedrick & West (2003), in order to understand adoption decisions it is helpful to develop a framework through a qualitative study of a specific adoption case. In addition, Eisenhardt (1989) argues in her work that building theories from a limited number of cases is effective. According to these assumptions, we used a case study approach in order to collect qualitative data. The case study resides in the European funded project Information Technology for Adoption and Intelligent Design for e-Government (ITAIDE, IST-027829). In this project many diverse stakeholders coming from academy, industry, and governmental institutions are involved. The main goal of ITAIDE is to provide a concept for a new e-customs system contributing first to the Single Window (SW) (United Nations Economic Commission for Europe, 2005) and second to the Authorized Economic Operator (AEO) (European Commission, 2006b). Both topics are addressed by the EU initiative ‘Electronic Customs Multi-Annual Strategic Plan’ that aims to reduce the administrative burden of trade transactions and increase security as well as control mechanisms (European Commission, 2007a).

ITAIDE considers the customs situation in four different European countries, namely Finland, Netherlands, Denmark, and Ireland, analyzing it from governmental and business viewpoints. In each country, ITAIDE set up a living lab.

‘Living labs are a situated research methodology for sensing and, prototyping at various different scales in real life contexts’ (Souminen, 2005, p. 1). Living labs focus on ICT innovative services creation and involve stakeholders from both the public and the private domain (Shamsi, 2008). The scope of the ITAIDE living labs is to provide a concept for a new e-customs system.

We based our work on the Finnish living lab, which took place from January 2006 to July 2007, considering it as single case study. The main stakeholders of this living lab were a Finnish multinational company (MNC) and the Finnish tax and customs authority. The MNC is operating in pulp and paper industry with production sites in 14 countries, 26,000 employees, and a turnover exceeding € 10 billion in 2007. The MNC
and tax and customs authority reflect private and public sector, respectively. The focus of this living lab was on the redesign of solutions for business-to-government and domestic e-government integration. These consisted of business processes, electronic documents, administrative processes, and organizational structures. The primary goals were to facilitate cross-border trade and to reduce administrative burden for the paper industry domestically. The investigations considered information accurateness and security of information from both stakeholders’ perspectives in order to meet, e.g., the control requirements of customs declarations. The living lab resulted in a complete redesign solution, including different business processes (quotation, order, delivery, and invoice) and incorporating the needs of the MNC and the public administrations.

During the redesign process, benefits, which the new e-customs system can deliver to the two main stakeholders, were topic of research. In this work, we therefore aim to answer to the following research question: ‘How do private and public sectors benefit from a business-to-government IT innovation such as a new e-customs system?’. In order to answer this question, we conducted a literature review (Section 6.1.2), developed a value assessment framework (Section 6.1.4), and applied the developed framework to the Finnish case as single case study (Section 6.1.5). The application of the developed framework consisted in the elaboration of data collected during six workshops and eight semi-structured interviews in the time between June 2006 and December 2007.

6.1.4. Integrated value assessment framework

E-government can be categorized into four groups: government-to-citizens, business-to-government, government-to-government, and intra-government (D. Evans & Yen, 2006). In order to focus our work, we concentrated on e-government evaluation for business-to-government innovations. Business-to-government is currently defined as:

‘A category of delivery that focuses on the ability to reduce cost and gather better information. This allows the government to purchase items, pay invoices, and conduct business in a more cost-effective method. This also assists the government in obtaining data to analyze to assist in decision making. Some of the goals for this quadrant are the availability of online regulations for agencies and increasing electronic tax capabilities for business.’ (D. Evans & Yen, 2006, p. 209)

Based on the literature study described in Section 6.1.2 and our experience in the research project, in this section we present the value assessment framework that we
developed for the assessment of IT innovations in the context of business-to-government systems. This methodology can be used by experts who are going to assess the value for stakeholders of private or public organizations created by the implementation of new IT solutions promoted by a business-to-government collaboration. The proposed framework aims at combining both notions of value in the private and public sectors.

Next, we introduce four different value categories based on the literature review presented in Section 6.1.2. Furthermore, we present the three levels we use to do the stakeholder-specific value assessment analysis: goal areas, key performance areas, and key performance indicators. These two foundations result in the value matrix, which is the first constituting part of the value assessment framework. Finally, the second constituting part of the framework, the procedure model, is presented, providing a detailed guideline on how to establish the value assessment within the framework of the structure of the value matrix.

Value categories

The literature review on value assessment in both private and public sectors provides us with a rich resource of perspectives on value categories to formulate an integrated framework that is applicable under the business-to-government context. Based on our research, we can see much overlapping between various frameworks and definitions of value propositions, although different frameworks use different value compositions. The common denominator of various approaches is the following set of value categories for value assessment: strategic, operational, social, and financial value. These four categories represent a common view of various researchers and practitioners. Especially, Shang & Seddon’s framework (2002), Murphy & Simon’s framework (2002), VMM (Foley, 2006), and PROI framework (Cresswell et al., 2006) provide the base ground for these four value categories. Next table maps the relation between the proposed value categories and the studied private and public value assessment frameworks: it specifies which value categories are considered by the frameworks.
Table 6.3 highlights that none of the studied frameworks includes all value categories. However, for a comprehensive and accurate value assessment framework that takes into consideration both private and public sector, we argue that it is necessary to include all of them. We arrived at this statement based on the literature review provided in this work and the experiences done in the living labs: stakeholders showed interest in all these value aspects in regards to e-government.

Thus, the value categories we consider contain financial, social, operational, and strategic/political perspective and reflect the value of ICT innovation. In other words, we do not add a separate category ‘ICT innovation’ for the evaluation, but we argue that ICT innovation drives the realization of the four value categories we propose in the framework. The categories aim to combine different values that may arise both in public and in private context, especially in inter-organizational contexts such as business-to-government collaborations. Therefore, we think that the proposed value categories are adequate to cover most the concerns: strategic planning for the business and political challenges for governments (strategic/political value), operational benefit from the procedure/process redesign in case of the implementation of new business-to-government solutions (operational value), social consideration of the public sector (social value), and private and public financial interest (financial value). Strategic/political value implies impacts on personal or corporate influence on
government actions or policy or influence on political parties or prospects for current of future public offer, including impacts on political advantage or opportunities, goals, resources for innovation or planning. Operational value improvements realized operations and processes and in laying the groundwork for future initiatives. Social value impacts on society as a whole or community relationships, social mobility, status, and identity. Social and psychological returns include increased social status, relationships, or opportunities; increased safety, trust in government, and economic well-being. It also includes typical issues from the private sector like, e.g., employee satisfaction. Financial value impacts on current or anticipated income, asset values, liabilities, entitlements, and other aspect of wealth or risks to any of the above.

We believe that these categories are able to capture and combine both (public and private) understandings of value and their meaning in business-to-government contexts in a sufficient way. The four value categories we identified reflect the theoretical understandings of public and private value. For the practical application of the proposed framework, we suggest to extend these categories by using a second dimension containing goal areas, key performances areas, and key performance indicators. The hierarchical structure of the goal areas, key performance areas, and key performance indicators is detailed in the following.

Three levels of analysis

The identification of values to assess is done top-down by going through three levels of granularity. First, goal areas, the key goals of the stakeholders, have to be identified. Next, key performance areas (KPAs) have to be defined for each goal area. Finally, every KPA can be measured (on a quantitative basis) or assessed (on a qualitative basis) by one or more key performance indicators (KPIs). These goal areas represent the stakeholder perspective and are the basis for the assessment. Companies and public administrations, managers and employees are much more used to think in goals and business areas. Projects and assessments are typically done by measuring the level of fulfilling particular goals using performance areas and indicators. While the goal areas (and the related KPAs and KPIs) reflect the single stakeholder assessment of the project, the assignment into the value categories makes them comparable among multiple stakeholders and multiple projects. The basic idea of this three-level approach is first to provide a value matrix that is comparable among different settings and second to give an assessment with key performance indicators that facilitates stakeholder-specific considerations of value for each organization. The three levels of analysis have to be seen as a pyramid (see Figure 6.1): at the top there are goal areas
and in the bottom very specific key performance indicators that are used to assess the value.

![Diagram of three levels of value analysis](image)

**Goal areas (GA)** are areas where key goals of the stakeholders are described in a rather generic way. The reason why we begin with the GA is that, based on our project experience, most of the IT innovations under the B2G context are driven by specific business objectives as well as government strategic goals and initiatives. This finding is in line with former researches on objective oriented evaluations, e.g., Goethert & Fisher (2003) and S. Evans, Roth, & Sturm (2004). As IT innovations under the B2G context requires high involvement from both the business and the government, to reach a common understanding in the initial stage is of great importance for further collaboration between the two parties. The scope of the definition of these goal areas is, therefore, to provide a top level of analysis. These areas help the assessment keeping in mind the ultimate goals of the stakeholders. For each goal area the four value categories presented before are analyzed and a set of key performance areas and further key performance indicators is provided. **Key performance areas (KPAs)** are areas for business success factors and improved performance of an organization. A KPA can be assessed by providing one or more key performance indicators (KPIs) which are all related to this specific area. This hierarchy enables a transparent and aggregated view of a large number of KPIs especially for big organizations with complex structures and heterogeneous business. For a strategic organization planning, the first step is to define goal areas and success factors on KPA level. Afterwards, goals and factors can be defined and refined by different KPIs. **Key performance indicators (KPIs)** are quantitative or qualitative measurements which originally reflect business success factors and strategic performance of an organization. While the KPI
concept stems from finance, where KPIs are quantitative and measurable, we found in case studies involving public sector organizations that KPIs can also be qualitative, e.g., acceptance of standards (Burke & Cresswell, 2006; Cresswell & Burke, 2006a, 2006b; Cresswell et al., 2006; Dawes, Burke, & Dadayan, 2006; Pardo & Dadayan, 2006). Often more than one KPI is related to the same success factor. In that way different areas of interest can be evaluated to achieve specific organizational goals. Depending on the character of the organization, i.e., public or private, KPIs may differ. They are usually long-term considerations or refer to a specific period during which their values will be collected, measured or assessed. To get comparable results, the way KPIs are assessed and measured has to be kept the same during the period of analysis.

Value matrix

In the previous sections four value categories (strategic, operational, social, and financial) and three levels of granularity in value assessment have been presented (goal areas, key performance areas, and key performance indicators). The aim of this section is to illustrate how these concepts can be combined together creating a value matrix. The value matrix clarifies the understanding of the complexity of value assessment aiming to give a comprehensive overview of potential benefits derived from a new IT solution.

A value matrix has to be created for every stakeholder for whom value has to be assessed. The matrix is structured as follows: the columns represent the goal areas of the stakeholders and put them in relation to the value categories (rows) giving an overview of the key performance areas for each stakeholder (per combination of row and column, see Table 6.4). Once the matrix has been created, key performance indicators for key performance areas are defined in the matrix. As an assessment of the full value matrix may be very time consuming, stakeholders can define KPAs and KPIs that they wish to prioritize.

It is important to notice that the value matrix has to be created for every stakeholder, i.e., for private and public sectors. The goal areas may be not the same since different stakeholders can have different goals. Therefore, for a valuable and accurate analysis it is important to consider the diverse nature of the stakeholders with their different requirements.
Table 6.4. The value matrix

<table>
<thead>
<tr>
<th>Goal areas (GAs)</th>
<th>GA1</th>
<th>GA…</th>
<th>GAₙ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value categories</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>KPAs</td>
<td>KPAs</td>
<td>KPAs</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>KPAs</td>
<td>KPAs</td>
<td>KPAs</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>KPAs</td>
<td>KPAs</td>
<td>KPAs</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>KPAs</td>
<td>KPAs</td>
<td>KPAs</td>
</tr>
</tbody>
</table>

**Procedure model**

The value assessment framework proposed in this paper combines the strengths of different existing frameworks. The content of this value assessment is given by different frameworks and integrated in the value matrix. The guideline on how to carry out the assessment is presented in the procedure model, the second part of the value assessment framework. The five-step model is the result of the combination between Cresswell Burke, & Pardo’s approach (2006) and Value Measuring Methodology (VMM) (Foley, 2006): both frameworks provide a systematic application approach. The procedure model is the method which has to be followed in order to apply the first part of the value assessment framework. The procedure model aims to guide step-by-step the stakeholders in assessing value derived from the introduction of new IT business-to-government solutions that result from collaboration between private and public sector.

The proposed model is composed of five phases which build up a chronological and methodological approach:

1. Definition of value assessment scope
2. Definition of value assessment criteria
3. Development of case-specific assessment frameworks
4. Assessment
5. Conclusions and communication of results

In the graphical representation (Figure 6.2) the five phases are listed following the chronological and sequential order.
Phase 1: Definition of value assessment scope
This five-phase approach begins with the definition of the value assessment scope. To define the scope it is necessary to understand for whom the value has to be assessed and which goal areas they are interested in. Therefore, the specific stakeholders and the relevant goal areas have to be identified. Since it is not always clear which goal areas cover which notion of value, it is required to set up interviews and workshops in order to get in contact with the stakeholders and to find out their business areas of interest. After the set up of a project plan and the interviews with the stakeholders, the scope of the value assessment is clear and it is possible to move to the second phase.

Phase 2: Definition of value assessment criteria
In the second phase the criteria for the particular value assessment categories are defined. As a basic framework we have identified four value categories; for each of them a set of value parameters (KPAs and KPIs) related to the goal areas will be specified. Value categories reflect four types of value, i.e., strategic, operational, social, and financial value. KPAs and KPIs have to be defined as an initial set. In phase 3 initial value assessment criteria are further validated and updated. KPAs relate to the four value categories and to the earlier defined goal areas (phase 1) and result in a value matrix. The matrix aims to give an overview of goal areas, value categories, and a first set of KPAs which are applicable in this context. It is used as a starting point for the next phases.

Phase 3: Development of case-specific assessment frameworks
Data collection is necessary in order to validate the initial set of KPAs and KPIs and to sharpen case-specific KPAs and KPIs. Interviews and workshops have to be conducted to understand whether the already defined KPAs and KPIs are applicable or changes
are needed. To derive case- and stakeholder-specific KPIs, the framework developed in phase 2 is used as a template. It has to be customized for the particular context and stakeholder. In order to achieve this goal, it is necessary to conduct interviews and workshops so that a set of final and case-specific KPAs and KPIs can be established. The output of this phase is a value matrix that is specific for every stakeholder building in this way a case-specific framework.

**Phase 4: Assessment**
In phase 3 case- and stakeholder-specific value assessment matrices are established, indicating relevant goal areas of the stakeholders and a set of KPAs and KPIs. By measuring quantitative KPIs and assessing qualitative KPIs, the value assessment for each stakeholder is done. The value assessment itself requires detailed knowledge of the stakeholder at hand and it requires close interaction with the stakeholders in order to elicit knowledge from them. The goal is to strongly collaborate with the stakeholders giving them an active guidance not only in identifying KPAs and KPIs but also in assessing their value. Benefits of the to-be situation (the new IT solution) can be assessed by comparing KPIs in the to-be situation to the same KPIs in the as-is situation (the current situation). The assessment of the to-be situation might require further techniques like scenario development to assess different potential outcomes or, as an ideal way to assess the effects, an assessment of the context before and after implementing the proof-of-concept.

**Phase 5: Conclusions and communication of results**
The last phase is dedicated to the conclusions and the communication of the results. The conclusions consider the value for every stakeholder related to each value category and the specific goal areas that the experts have assessed. In particular, the communication on a higher level is an important part of the value assessment framework. The value assessment framework also enables comparison among similar but different contexts, for example, by considering goal areas or KPAs in particular settings. Especially, this type of assessment might be of interest for large scale developments, which are the basis for regulative changes (e.g., on European level).

6.1.5. **Application and results**
The value assessment is composed by two main building blocks: a value matrix and a procedure model. Figure 6.3 illustrates the relationship between the two building blocks. Based on the value matrix elaborated in phase 1 and 2 of the procedure model
and in collaboration with the particular stakeholder, a stakeholder- and context-specific
value matrix is elaborated (phase 3). This customized value matrix contains a set of
KPAs and KPIs which are relevant for the stakeholder. With this given structure, the
assessment can be conducted utilizing different methods that depend on KPAs and
KPIs, e.g., with different modeling techniques, measuring process improvement or
interviewing techniques (phase 4). The results from the assessment are then
summarized into conclusions and communicated among the partners involved (phase
5).

![Diagram of the building blocks of the value assessment framework](image)

Figure 6.3. The building blocks of the value assessment framework

We applied the proposed framework to the case of the implementation of an e-
customs system in Finland based on the case study of the ITAIDE project and aimed to
assess the value for two stakeholders: a Finnish multinational company and the Finnish
tax and customs authority. It was not possible to measure the assessment using key
performance indicators since concrete data and figures were not available. However, a
first step towards the value analysis of such IT change in the customs field took place
giving a categorization of potential benefits. Interviews and workshops’ results led to
the expectations further presented.

**Phase 1 and 2: Definition of value assessment scope and value assessment criteria**

Together with the interviewed stakeholders, we defined the scope of the value
assessment as the identification of potential benefits that the implementation of an IT
innovation such as e-customs can bring. The workshops participants representing the
private and public sector identified one common goal area as area of improvement:
reduction of **administrative burden**. Furthermore, the MNC and the tax and customs
authority recognized other goal areas, i.e., **compliance** and **security**, respectively.

Additionally, the stakeholders defined the value categories proposed in Section
6.1.4 as the most relevant aspects that they want to analyze: strategic, operational, social, and financial perspective. Based on participants statements, literature study and case studies, such as, e.g., Baida, Rukanova, Liu, & Tan (2007), Bjørn-Andersen, Razmerita, & Henriksen (2007), Henriksen & Rukanova (2008), and ITAIDE reports (www.itaide.org), a set of potential key performance areas was developed (Table 6.5).

<table>
<thead>
<tr>
<th>Value category</th>
<th>Key performance areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic</td>
<td>Policy, governance, strategic position, fulfilling the organization’s mission, public opinion.</td>
</tr>
<tr>
<td>Operational</td>
<td>Productivity gains, service quality, improved infrastructure, convenient access, governance, compliance.</td>
</tr>
<tr>
<td>Social</td>
<td>Safety, health, environment, increased confidence in government, increased trust in government, employee satisfaction.</td>
</tr>
<tr>
<td>Financial</td>
<td>Cost savings, cost avoidance, budget increase, cost effectiveness.</td>
</tr>
</tbody>
</table>

**Phase 3: Development of case-specific assessment frameworks**
In this phase two specific assessment frameworks were developed: one for the MNC and one for the tax and customs authority. The MNC stated that the implementation of an e-customs system is very important in order to reduce all the bureaucracy related to customs documentations and to be compliant to EU regulations. As mentioned in phase 1, MNC representatives identified two goal areas as key objectives of the implementation of an e-customs system: reduction of administrative burden and compliance. The value matrix for MNC is based on the suggested KPAs proposed in Table 6.5. The main focus was to reduce the administrative burden of a complex supplier network; most of the chosen KPAs fit to this goal area. Regarding the strategic perspective, strategic position is an area for assessing the value. This KPA can be also applied in the goal area compliance. Process automation improves the relationship of the MNC to its supplier network; this can have two impacts on its strategic position: to tighten the existing relationships and to react more flexible on strategic impacts from the industry sector (e.g., high pressure from new entrants). This has a significant influence on its position not only in the supplier network but also in the global paper industry. Additionally, by participating in the project, which also aims at reducing the red tape in international trade, the strategic position for establishing links to foreign suppliers can improve. Developing in collaboration with Finnish tax and customs, first solutions of innovative business-to-government process handling
can therefore be considered as being valuable for MNC in terms of being compliant to the requirements of electronic trade across borders. Considering the operational value, three KPAs have been recognized by interviewees. Productivity gains as one performance area is an outcome of process automation and is located in the area of reduction of administrative burden in a business-to-business context. Convenient access to the suppliers is another area where the value for MCN can be assessed. The third area is improved infrastructure. The term infrastructure is interpreted not from a pure engineering perspective but also from a business perspective. The supplier network is considered as the required infrastructure for successful economic handling. By tightening the relationship to the suppliers and increasing the potential number of suppliers, this type of required infrastructure can be improved. Potential KPIs to assess this perspective can be, for example, the potential number of suppliers or time needed to connect electronically to a new supplier. In the context of social KPAs, the automation of standardized business process can enrich the jobs of employees. If they do not have to handle all these process manually, they can spend more time on more interesting tasks. Increased employee satisfaction is therefore the main KPA from the social category. Financial KPAs consider the automation of multiple processes among stakeholders. Two KPAs have been identified by MNC: cost savings and cost avoidance. From the perspective of handling multiple processes automatically, which had to be handled manually, the realization of cost savings might be one of the most important goals for MNC. Cost avoidance is also suitable, especially for the proposed e-customs solution. By establishing an interoperable platform to connect a multitude of suppliers which differ in terms of size and services/products they provide, costs in terms of establishing single solutions for each supplier or each sector can be avoided. The remaining KPAs, budget increase and cost effectiveness, do not fit for the MNC.

Table 6.6 resumes the value matrix indicating the specific KPAs for each goal areas and value categories of the MNC.

<table>
<thead>
<tr>
<th>Goal areas (GAs)</th>
<th>Administrative burden</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value categories</strong></td>
<td><strong>Strategic</strong></td>
<td>Strategic position</td>
</tr>
<tr>
<td>Strategic position</td>
<td>Productivity gains, convenient access, improved infrastructure</td>
<td></td>
</tr>
<tr>
<td>Operational</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Employee satisfaction</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Cost saving, cost avoidance</td>
<td></td>
</tr>
</tbody>
</table>
The public sector, represented by personnel of the tax and customs office identified two goal areas as areas of improvement: reduction of administrative burden and security. Strategic KPAs are relevant especially by increasing security, e.g., for cross-border trade with Russia. The organization’s mission can be fulfilled. Further parts of the mission statement, related for example to taxations, can play a role but they do not constitute a primary focus of the strategic value category. The Finnish tax and customs authority has mostly been interested in promoting different e-government services to reduce the own administrative burden and the administrative burden for the companies. From the operational point of view, automating and reorganizing administrative services for companies, for example, for declaring VAT, in- or export related taxes, can imply an improvement in service quality giving to the users, i.e., the companies, a more convenient access to the system. Additionally, productivity gains can be realized. Considering the social aspect, being able to spend more work on sophisticated tasks can increase the employee satisfaction. Similar to the previous stakeholder, cost avoidance and cost savings are two financial key performance areas, where the value of the solution can be significant. Handling the services automatically can reduce many manual checks and also avoid costs related to increasing security standards. Table 6.7 represents the value matrix of the customs and tax authority.

Table 6.7. Finnish public sector value matrix

<table>
<thead>
<tr>
<th>Goal areas (GAs)</th>
<th>Administrative burden</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic</strong></td>
<td></td>
<td>Fulfilling organization’s mission</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Service quality, productivity gains, convenient access</td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Employee satisfaction</td>
<td></td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Cost saving</td>
<td></td>
</tr>
</tbody>
</table>

Phase 4 and 5: Assessment, conclusions, and communications of results
The assessment was only partially conducted because of lack of information so that a detailed assessment is not presented in this work. However, both sectors answered to a series of questionnaires accompanied by face-to-face interviews. For example, the MNC detailed described various processes, such as ordering, delivering, invoicing process, indicating the differences between manual and automated scenarios in terms of costs, time, and employed personnel. The goal of phase 4 is to compare the as-is
and the to-be situations based on the key performance areas defined and described in phase 3. Both sectors identified one area as primary area of improvement: reduction of administrative burden. In the case of private sector, e-customs, as business-to-government innovation, leads to the reduction of administrative burden improving the strategic position of MNC, its productivity gains as well as its infrastructure. Additionally, it provides a better access to the customs system improving the employees’ satisfaction and reducing costs. The stakeholders stated that e-customs can benefit improving the quality of services, fulfilling the organization’s mission and, as in the case of the private sector, improving its productivity gains as well as its employees’ satisfaction. The financial aspect is also affected since an automated system can reduce the costs of the customs declaration process.

6.1.6. Conclusions and limitations of the study

The topic that has been studied in this work concerns the value assessment of business-to-government IT innovations. We proposed an integrated value assessment framework that aims to identify goals areas, key performance areas, and indicators and to map them into their corresponding value categories creating a value matrix for different stakeholders. Additionally, the framework provides a step-by-step guidance to lead the stakeholders go through the whole evaluation procedure. The goal of the framework is to facilitate value assessment of new IT systems for both the public and private sectors in a business-to-government context. We applied the proposed methodology to the case study of e-customs system implementation in a Finnish multinational company.

Although the application of the framework presented by the case study has taken place successfully, there exist some limitations to the approach. Albeit we aim to attract and sustain stakeholders in order to develop and test new IT systems in a business-to-government context by presenting a way to assess their benefits, the assessment is partially based on the scenarios analysis and only within a limited timeframe. Therefore, the results could be biased. In addition, the assessment of qualitative indicators and areas might be difficult to carry out, in particular assessing them in a comparable way among different stakeholders. The vast variety of stakeholders and therefore their multiplicity of goal areas make it difficult to analyze and negotiate among different stakeholders in order to find a common solution to fulfill all these areas. However, aforementioned limitations also provide further space for improving the proposed assessment framework and opportunity for future studies.

Despite of these limitations, we see advantages for potential stakeholders applying
this framework. By extending the classical methods of financial assessment, new benefits and evaluation criteria are integrated into the assessment framework, which makes decision making to adopt new IT innovations under the B2G domain more sensible. Additionally, under the proposed common framework, after assessing the value for early adaptors of the system, later users can have easy comparable results of the assessment and evaluate their redesign procedure. In the context of e-customs as business-to-government innovation, further applications can deliver a more detailed set of generic KPAs as well as more methods to assess the quantitative and qualitative set of KPIs. Additionally, an extension to other business-to-government contexts builds a broader basis for conducting assessment of innovative IT systems. The general pattern of the value assessment framework introduced in this work provides a structure for application in other further contexts.
6.2. Value assessment of business-to-government IT innovations: a case study

Marta Raus

2009

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This article studies value assessments of IT solutions in public as well as in private contexts and aims to identify benefits of business-to-government innovations. The work analyzes the case of the implementation of European common e-customs solutions. Over the last few years, e-customs has become a widely studied topic within the European Union. However, only a little research has been conducted in order to identify benefits of such IT innovations. For this reason, this paper is dedicated to the value assessment of e-customs solutions. Within the framework of a European funded project, the study was conducted collecting data from interviews and workshops involving stakeholders coming from public as well as private organizations. By applying a theoretical value assessment framework, four main areas of improvement due to common e-customs solutions’ implementation were identified: increased security, reduction of administrative burden, facilitated compliance, and better communication. This article contributes towards value assessment research and in particular to a standardized e-customs solution as an example of business-to-government innovations.

Keywords: e-customs; value assessment; public value; private value; case study research; living lab research.
6.2.1. Introduction

European government aims to achieve safe trade enabling secure import and export: the European Union has promoted many initiatives that aim to provide a simplified trade within the community. One of those initiatives is the Multi-Annual Strategic Plan (MASP) that has as goal the implementation of a common standardized electronic customs system among all 27 member states (European Commission, 2007a). Several authors studied the e-customs case highlighting local solutions and new applications (Baida, Liu et al., 2007; Baida, Rukanova, Liu et al., 2007; Baida, Rukanova, Wigand et al., 2007; Bjørn-Andersen et al., 2007; Rukanova et al., 2007).

The MASP presents an e-government model that provides high-level technical and functional specifications. However, procurement of information technology and implementation of e-customs solutions are not specified leaving the adoption as a matter of the EU member states. For this reason, e-customs solutions and their adoption process are studied. The European funded project Information Technology for Adoption and Intelligent Design for e-Government (ITAIDE, IST-027829) aims to develop e-customs solutions that can enhance business-to-government collaboration and to analyze future adoption of these solutions. In order to understand how potential stakeholders can be interested in such innovations, it is necessary to identify how they can benefit from them. In other words, the value of e-customs solutions has to be assessed for private as well as public organizations.

Based on the ITAIDE case, this work aims to assess the value of e-customs system innovations for private and public sectors. The value assessment is conducted based on the value assessment framework suggested by Liu, Derzsi, Raus, & Kipp (2008). The framework gives guidelines on how to assess the value of IT innovations in the context of business-to-government systems.

The article is structured as follows. Section 6.2.2 provides an overview on the theoretical background. Then, Section 6.2.3 gives an overview on the research approach and presents the ITAIDE project. Next, Section 6.2.4 is dedicated to the application of the proposed value assessment framework on the ITAIDE case, i.e., on the implementation of e-customs IT solutions in a European country. The value assessment is conducted for two main stakeholders: a multinational business company representing the private domain and the tax and customs authority representing the public domain. The discussion and conclusion part, Section 6.2.5, resumes the results highlighting strengths and weaknesses of the application of the value assessment framework and gives an outline on future research.
6.2.2. Theoretical framework

Literature provides many overviews on value assessment related to both private and public sector organizations. Several frameworks were elaborated for the value assessment of IT innovations in the private (Aladwani, 2002; Murphy & Simon, 2002; Shang & Seddon, 2002) as well as in the public sector (Cole & Parston, 2006; Cresswell et al., 2006; Emerson et al., 2000; Foley, 2006; Mark H. Moore & Khagram, 2004). These frameworks are meant to be applied either in the private or in the public sector so that a transfer between both sectors can be difficult. This research gap was fulfilled by recent studies of Gouscos, Kalikakis, Legal, & Papadopoulou (2007) who presented a conceptual framework for modeling quality and performance in the e-government field combining private and public stakeholders’ requirements.

The common denominator of various approaches is the following set of value categories for value assessment: financial, social, operational, and strategic value. However, none of the mentioned frameworks consider all these categories. In contrast, more recent studies (Liu et al., 2008) presented a further value assessment framework that takes into considerations all the mentioned value categories: the authors defined the four value categories, introduced an analytical top-down approach, and developed a value matrix that combines private and public sector’s needs. This new value assessment framework integrates value understandings of both sectors and it is meant to be used by experts in assessing values of business-to-government IT innovations.

The value categories consider strategic, operational, social, and financial values. Strategic value implies impacts on personal or corporate influence on government actions, policy, and influence on political parties or prospects for current or future public offers, including impacts on political advantages or opportunities, goals and resources for innovation or planning. Operational value emphasizes improvements, realized operations and processes. Social value impacts on society as a whole or community relationships, social mobility, status, and identity. Social and psychological returns include increased social status, relationships, or opportunities, increased safety, trust in government, and economic well-being. It also includes typical issues from the private sector like, e.g., employee satisfaction. Financial value impacts on current or anticipated income, asset values, liabilities, entitlements, and other aspects of wealth or risks to any of the above.

The identification of values is done top-down by going through three levels of analysis, namely goal areas (GAs), key performance areas (KPAs), and key performance indicators (KPIs). According to the authors, goal areas are areas where
stakeholders’ key objectives are described. The scope of these goal areas is to provide a top level of analysis. For each goal area the four presented value categories are analyzed and a set of key performance areas and key performance indicators is provided. *Key performance areas* are areas for business success factors. A key performance area can be assessed by providing *key performance indicators* which are qualitative or quantitative measurements.

In order to combine the four value categories with the three levels of analysis, the authors introduced a *value matrix* (see Table 6.4) that is meant to be created for every stakeholder for whom it is requested to perform a value assessment. The matrix is structured as follows: in the columns the goal areas are put in relation to the value categories that represent the rows. The combination of the columns (goal areas) and rows (value categories) gives an overview on key performance areas which are defined by key performance indicators. The value matrix has to be developed for every stakeholder, in our case for the private and the public sector considering different stakeholders’ goals.

### 6.2.3. Research approach and case study background

Eisenhardt (1989) argues that building theory from a limited number of cases is effective. Dedrik & West (2003) confirm her theory stating that it is helpful to develop a framework through a qualitative study of a specific adoption case in order to understand adoption decisions. Considering these assumptions, this research is based on a case study approach in order to collect qualitative data.

The framework of this study resides in the European funded project ITAIDE. In this project stakeholders coming from academy, industry, and governmental institutions are involved. The main goal of ITAIDE is to provide a concept for a new e-customs system contributing to Single Window (SW) as well as Authorized Economic Operator (AEO). Single Window is a methodology for standardized business processes and business information exchange; in Recommendation no. 33, the United Nations Centre for Trade Facilitation and Electronic Business defines a single window as ‘a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once. This may also provide a platform for coordinating controls among the agencies involved and payment of relevant duties, taxes and fees’ (United Nations Economic Commission for Europe, 2005, p. 3). Authorized Economic Operator is a certification given by the customs office of a European country that
enables an industry to simplify trade. Legislation stipulates that customs authorities shall grant to reliable traders the status of ‘authorized economic operator’ (World Customs Organization, 2006). The idea is to grant the AEO status to reliable operators including those that are also compliant with respect to security and safety standards and can, therefore, be considered as ‘secure’ traders. Those traders should have a specific status, which would grant them the status of secure members of the supply chain and would identify them as most reliable trading partners. Both topics are addressed by the European Union which developed an electronic customs strategy (European Commission, 2007a). The European customs strategy aims to reduce administrative burden of trade transactions and increase security and control mechanisms enabling a paperless environment for customs and trade, i.e., to develop a common standardized e-customs system.

Basing its work on SW and AEO, ITAIDE is researching testing its findings on four living labs located in four European member states. In each living lab ITAIDE project members strongly collaborate with both governmental institutions and business partners. Government is represented by tax and customs offices of the four European countries while business partners are represented by four different industries. Living labs are considered as research and development context: they bring together multiple stakeholders from different domains with the purpose of aligning particular interests and perspectives (Kipp & Schellhammer, 2008).

In this article one of the four living labs serves as a case of research. The case study took place from June 2007 to October 2008. It tried to understand the value of new e-customs solutions, i.e., how the private and the public sector can benefit from them. In order to reach this goal, three day-long workshops and several semi-structured interviews were conducted. The workshops and the interviews were carried out with representatives of the private as well as the public sector. The private sector was represented by personnel of the export department of one Danish multinational company whose products are sold in more than 100 countries. The public sector, i.e., customs and tax authorities from the EU member state where the living lab took place (Denmark), was represented by departments’ heads and experts in functional areas, such as recipe control, VAT assessment, AEO analysis, border security and control, as well as in IT areas.

This study is based on the value assessment framework presented in Section 6.1.4 and 6.2.2. In order to apply the framework in an accurate and precise manner, first a value matrix for each of both stakeholders is developed and second the value is assessed.
The next section will show the application of the value assessment framework on the Danish ITAIDE living lab.

6.2.4. Case study results

In this section results of this research are presented. The value assessment framework proposed by Liu, Derzsi, Raus, & Kipp (2008) is applied on the ITAIDE case, i.e., on the envisioned implementation of a common web-based e-customs system. The research is based on the findings of a study conducted in one ITAIDE living lab where private and public sectors were involved. Two main stakeholders were the topic of research: a Danish multinational business company operating in the food sector and the Danish tax and customs office.

Since the implementation of a web-based common EU customs system has not taken place yet, the private and the public sector’s representatives could only guess about the future situation. It was not possible to measure the assessment using key performance indicators since concrete data and figures were not available. For this reason, key performance areas are analyzed based on interviewees’ guesses and ratings.

However, a first step towards the value analysis of such significant IT change in the customs field took place giving a categorization of potential benefits.

Interviews and workshops’ results led to the expectations onward presented.

Value assessment for the private sector

The value assessment started with the definition of goal areas and key performance areas. The Danish business company’s personnel representing the private sector identified four major goal areas: security, administrative burden, compliance, and communication.

After interviews and elaboration of collected data, a case-specific value matrix was created (see Table 6.8) enabling the categorization of value categories, goal areas, and key performance areas.

The interviewed Danish business company identified nine key performance areas: (1) fulfillment of safety regulations (thanks to the AEO status); (2) increased services’ quality; (3) harmonization of different systems; (4) harmonization of regulations and procedures; (5) improvement of data exchange; (6) less people involved for the same work; (7) faster process cycle time; (8) communication with EU customs offices; (9) information sharing with EU customs offices.

These areas are distributed in the value matrix according to each value category. In
the following each goal area is analyzed.

Table 6.8. Danish private sector value matrix

<table>
<thead>
<tr>
<th>Goal areas</th>
<th>Security</th>
<th>Administrative burden</th>
<th>Compliance</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value categories</td>
<td>Strategic</td>
<td></td>
<td>Harmonization of regulations and procedures (SW)</td>
<td>Communication between EU customs offices and business companies</td>
</tr>
<tr>
<td></td>
<td>Fulfillment of safety regulations (thanks to AEO status)</td>
<td>Increased services’ quality</td>
<td></td>
<td>Communication between EU customs offices and business companies</td>
</tr>
<tr>
<td></td>
<td>Fulfillment of safety regulations (thanks to AEO status)</td>
<td>Harmonization of different systems; Increased services’ quality; Improvement of data exchange; Faster process cycle time</td>
<td></td>
<td>Communication between EU customs offices and business companies; Information sharing between EU customs offices and business companies</td>
</tr>
<tr>
<td>Social</td>
<td>Fulfillment of safety regulations (thanks to AEO status)</td>
<td>Harmonization of different systems; Improvement of data exchange; Faster process cycle time; Less people involved</td>
<td>Harmonization of regulations and procedures (SW)</td>
<td></td>
</tr>
</tbody>
</table>

**Security** is a critical factor for trade and its improvement is one of the main goals of the EU. According to the interviewed business company, a common web-based European customs system improves security of international trade since the system facilitates safety regulations’ fulfillment helping business companies to obtain the AEO status. Indeed, the business company stated that a common e-customs system can influence the company from the strategic and the financial viewpoints contributing to the fulfillment of safety regulations enhancing the trade security and reducing monthly irregularities by approximately 50-75%. Consequently more orders can be executed faster with the contribution of fewer personnel reducing costs by 25-50%.

One of the main scopes of a new e-customs system is to reduce **administrative burden**. Interviewees stated that the elimination of paper-based customs documents and their electronic replacement constitute a significant improvement of trade procedures. According to interviewees’ argumentations, from the strategic point of view, the achievement of a paperless environment improves the services provided by
the private sector by 50-75%. Furthermore, considering operational goals, the business company identified four main areas of improvement. First, the harmonization of different systems may strongly improve the actual data sharing since the new system leads to a complete paperless environment. Second, the quality of services improves by reducing errors and irregularities during the export process. For example, the interviewed business company aims to reduce errors down to 1%, e.g., 10 errors every 1000 export declarations. Although it is difficult to give precise data of errors documentations and precise estimations for potential reduction, participants of the workshops estimated a possible reduction of 25-50%. Third, considering that nowadays data exchange between business companies and EU customs offices is done mainly manually (email, telephone, and fax), a standardized system improves information sharing quality. Finally, the export process cycle can be faster (interviewees estimated around 25-50%).

Also the social aspect is influenced by the reduction of administrative burden. Fewer people can do the same work, i.e., the finalization of customs clearance. The business company foresees a personnel reduction by 5%. This affects financials. For example, nowadays, the interviewed business company employs 30 people for customs clearance at a yearly cost of €70,000 per employee; a reduction of 5% means therefore a savings of around €100,000 per year. Additionally, the business company identified three further areas that may influence the financial aspect: faster process cycle time, harmonization of different systems, and improvement of data exchange. Although the interviewed business company sees some cost reduction related to these three areas, it was too difficult to make firms predictions at this stage since the implementation has not taken place yet. However, it is estimated that implementation costs are high but, on the contrary, running costs can be lower than the actual costs.

Together with security and reduction of administrative burden, compliance is the third goal area that was identified. The interviewed business company is already compliant to current regulations otherwise it could not export. However, harmonization of regulations and procedures through Single Window affects its compliance process. Nowadays, it may happen that a business company does not know every export regulation and procedure and therefore has to do many trials in order to have a compliant export declaration. An automated system can avoid this trial-and-error approach and a business company can be compliant in a more effective way. This affects business companies not only from the strategic but also from the financial point of view since time can be saved and export execution processes are faster.

Communication and improvement of information sharing between business
companies and EU customs offices are the last identified areas of improvement. According to business company’s assertions, communication and information sharing between companies and customs offices may differ. If a company has to communicate only to the local customs office, communication does not constitute an issue. However, if a company has to communicate to customs offices of other EU member states, communication might be difficult because of different languages as well as different customs procedures. A common European e-customs system can harmonize and standardize all export procedures enabling electronic communication and information sharing. New e-customs solutions can replace old systems improving the export execution process from the strategic and operational perspectives reducing the execution time and increasing the technology.

Value assessment for the public sector

As in the case of the private sector, the value assessment started with the definition of goal areas and key performance areas. Stakeholders representing the public sector identified four major goal areas: security, administrative burden, compliance, and communication/collaboration.

By elaborating collected data, key performance areas were identified and categorized along the value matrix. Danish tax and customs office’s personnel identified eleven key performance areas related to the four goal areas: (1) transparency of EU trade; (2) improvement of information quality; (3) single access point for VAT; (4) increased services’ quality; (5) harmonization of different systems; (6) improvement of data exchange; (7) faster process cycle time; (8) less people involved; (9) communication between EU customs offices; (10) collaboration between EU customs offices; (11) access to information of other EU customs offices.

The value matrix for the public sector (see Table 6.9) shows how key performance areas are distributed along goal areas as well as value categories. Each goal area is then analyzed.
Security is one crucial area of improvement. According to participants’ expectations, the strategic and social viewpoints are not affected. However, from the operational and financial viewpoint, a web-based common EU customs system can make European trade more transparent facilitating customs controls. Participants in the workshops stated that the risk analysis, which is usually done by the customs office for every export request, can be done in a more efficient way reducing its costs and accelerating the export execution process. Additionally, interviewees stated that quality of shared information between the customs office and business companies, i.e., between public and private sector, can improve so that less control is needed. This affects costs since the needed time for manual check decreases. This envisioned to-be situation can be reached in 2-3 years.

The last key performance area, which can improve security, is the introduction of a
single access point. Nowadays, exporters have to import the same data for three different scopes: export declaration, VAT declaration, and statistics report. Export declarations have to be fulfilled for every export. In contrast, in many European countries, VAT declaration and statistics reports are done quarterly. This multiple data entrance can lead to errors so that wrong VAT amounts are paid. A control is done by the tax office based on a risk analysis but it is not possible to check every company and therefore irregularities may occur. According to interviewees’ estimations, a single access point can avoid multiple data entrance decreasing irregularities by approximately 75%. This has financial implications since on the one hand correct VAT amounts are paid and on the other hand the tax and customs office can execute faster controls.

Reduction of administrative burden is one of the most important topics and affects all value categories. The first identified key performance area corresponds to the quality of services provided by the tax and customs office. The quality of services improves since an automated system can handle standardized messages and data exchange (strategic and operational viewpoints). Business companies enter data correctly increasing the efficiency of the tax and customs office by reducing the time invested in correcting wrong export declarations. Indeed, representatives of the tax and customs office stated that many export declarations are not fulfilled correctly because business companies do not always use standardized data. In contrast, an automated system avoids this uncertainty so that the tax and custom office can accelerate the export process time granting faster export permissions; therefore, business companies are more satisfied. This leads to an improvement of the public sector’s image (social viewpoint).

The second recognized key performance area is the harmonization of different systems. Nowadays, only a little data exchange between local tax and custom offices and business companies is automated. In addition, information sharing between EU customs offices is not automated at all. According to the envisioned future situation, different European-wide systems can be harmonized enabling a 100% automation of information sharing. This leads not only to an operational improvement but also to a financial relief. Indeed, the tax and customs office foresees that development and implementation costs can be very high but on the contrary running costs are low. Tax and customs offices make a big investment in the short term, but in the long term they save costs. Unfortunately, at this early stage it was not feasible to make cost calculations.
The third key performance area is process cycle time acceleration. This affects three aspects: operational, social, and financial. Because of the execution time acceleration, delays can be avoided increasing the satisfaction of the tax and customs office. Additionally, according to participants’ guesses, because of time saving, export process costs may go down by approximately 15%.

The fourth key performance area is the improvement of data exchange between tax and customs office and business companies as well as between tax and customs offices of different European countries. This affects the operational viewpoint since fewer steps are needed for data exchange, increasing the efficiency of information flows.

Last but not least, fewer people are employed (social aspect) and therefore personnel costs decrease (financial aspect). However, the tax and customs office’s personnel stated that they do not decide on employees’ reassignment since this is a decision taken by the Ministry of Finance. For this reason it is difficult to make an estimation of costs reduction.

Compliance does not seem to be a crucial aspect from public sector’s perspective. Indeed, only one key performance area was identified: harmonization of regulations and procedures thanks to Single Window (SW). It affects the public sector from the strategic, operational, and financial but not from the social point of view. The main scope of SW is to reduce the number of non-compliant regulations and procedures to zero. Irregularities decrease so that time is saved; this leads to costs reduction and improvement in efficiency.

The last goal area identified by the tax and customs office is the improvement of communication and collaboration between customs offices of different European countries. EU customs offices have interest in better communication and collaboration. Nowadays, EU customs offices communicate by telephone, emails, fax or having periodic meetings. An automated communication system can improve not only strategic and operational aspects but also financial. Since EU customs offices face the same issues and need meetings in order to understand the most efficient way to use new information and to discuss common topics related to the new system, the interviewed tax and customs office foresees a costs increase. Additionally, employees’ satisfaction increases because of better information sharing (social aspect).

The second key performance area is the improvement of access to the information of other EU customs offices. According to workshops’ participants, information which can be accessible after an implementation of a common EU customs system is
information about exporters and information about export flows. The interviewees stated that in their opinion exporters’ information does not increase, but that higher communication and collaboration can improve export information flows (operational aspect). Better information access influences costs since data collection costs decrease (financial aspect).

The last mentioned key performance area is the integration of new EU member states (social point of view). New EU member states can adopt a new common system that allows them to be immediately aligned with other European countries without major issues so that integration time decreases.

After the value analysis of the private as well as the public sector, first conclusions can be drawn. First, both sectors identified the same areas of improvement; the only exception is that the public sector recognized a potential improvement not only in the communication but also in the collaboration. Second, the key performance areas seem to be quite similar, like, e.g., transparency of European trade or harmonization of regulations and procedures thanks to a SW-based system. Finally, both sectors foresaw a considerable investment in such system but recognized that its benefits justify the expenditure.

6.2.5. Conclusions and future research

The studied case examines value assessment of a business-to-government IT innovation. After applying a value assessment framework, the value of e-customs solutions’ implementation was assessed for private as well as public sector. The case study showed interest in such solutions and benefits in different areas were recognized by the stakeholders. Four areas of improvement were recognized: increased security, reduction of administrative burden, facilitated compliance, and better communication. In these areas, strategic, operational, social, and financial aspects were analyzed showing potential benefits and changes that e-customs systems can deliver.

Although the application of the framework took place successfully, there exist some limitations. First, the value assessment is based on envisioned scenarios so that results could be biased. Second, although two different stakeholders were elaborately analyzed, there are many other players in business-to-government innovations, such as, e.g., other governmental institutions or IT providers, who were not considered because of time restrictions. Third, it was not possible to analyze key performance indicators because of lack of data and information so that precise figures were not presented.
Nevertheless, the conducted value assessment shows important results and gives a first analysis. This analysis can be extended by further research and be an example for similar value assessments in the context of business-to-government IT innovations.
7. Summary of Key Findings

This chapter summarizes the key findings of the conducted research linked to the research questions addressed in Section 1.2. In the following, Sections 7.1 and 7.2 illustrate the first and second research models that aim to build a framework in order to answer the first and second research questions, respectively.

7.1. Business-to-government IT innovations diffusion model

The first research question that has stimulated this research is: What are the innovation steps of e-customs and under which factors does e-customs diffusion take place?

In order to answer this question, a research model has been built, tested, and evaluated. It is composed of two main contributions: the innovation-development model presented in Section 5.1 and the framework for the adoption and diffusion of organizational innovation illustrated in Section 5.2. The first research model results in a six-step innovation-development model (Figure 7.1) based on Rogers’ model (2003):

1. identification of facilitators and barriers,
2. theoretical concept and business scenarios,
3. development of a demonstrator,
4. commercialization,
5. diffusion and adoption,
6. consequences.

This proposed research model represents an innovation-development model of B2G IT innovations in a cooperative context, such as a living lab, where potential adopters collaborate in order to develop a feasible IT solution.

Very often businesses and governments have to innovate their technologies in order to fulfill EU regulations’ requirements. For this reason, the demand of technological advances, imposed by the EU, replaces the recognition of problems and needs, as proposed by Rogers, by stimulating an innovation. Therefore, in the first step, the identification of facilitators and barriers is used to delineate in which environment the innovation takes place. In order to understand how facilitators, barriers, and research approaches can influence an innovation and moreover its diffusion, a categorization along technological, organizational, and environmental characteristics has been introduced integrating the adapted innovation-development model with the TOE model (DePietro et al., 1990). These factors build the characteristics for categorization of B2G IT innovations and are the results of the combination of innovation-specific characteristics defined by different researchers, as described in Section 5.1.2: relative advantage, compatibility, complexity, standards, technological edge, trialability, and observability.
Figure 7.1. B2G IT innovations diffusion model

The second and third steps of the model correspond to the development of theoretical concepts, business scenarios, and demonstrators. Both steps are executed by means of proof-of-concept that includes a continuous collaboration between the developers of IT demonstrators and potential adopters, i.e., the stakeholders, of the analyzed B2G IT innovation. In this way, the proposed IT solution shows the capabilities of the developed idea and allows the stakeholders to try out the demonstrator before commercializing a finished product. Stakeholders’ feedback gives the option to modify the IT solution until all adopters’ requirements are fulfilled.

The fourth, fifth, and sixth steps do not differ from the model proposed by Rogers. However, the proposed innovation-development model elaborates diffusion and adoption through five organizational adoption characteristics that derive from the combination of factors defined by Frambach (1993) and Woodside & Biemans (2005), as described in Section 5.2.2: environmental influences, innovation characteristics, adopter characteristics, information, and social network. Environmental influences are described by competitive environment and market situation; innovation characteristics are those introduced by Rogers (relative advantages, compatibility, complexity, trialability, observability, uncertainty); adopter characteristics are defined by its size, organizational innovativeness, and organization’s structure; the availability of information depends on the communication level of potential adopters, i.e., to which
parties they speak; social network of an organization corresponds to its interconnectedness and word-of-mouth exchange.

Thus, the first research model represents the innovation-development and delineates the environment of organizational adoption and diffusion of business-to-government IT innovations.

The application of the first research model on the case of e-customs by means of case study research, as described in Sections 5.1.4 and 5.2.4, has led to the following considerations.

Elaborating the first innovation-development step, the identified facilitators of e-customs adoption are: (1) benefits potential of the public sector, (2) procedural improvements and streamlined business process, (3) avoidance of misinterpretations of standardized regulations, and (4) standardization of process, messages, and data model. Next to the four facilitators, three barriers to adoption have been recognized: (1) slowdown in regulation execution due to missing procedural templates, (2) increased complexity in the standardization process itself, and (3) electronification of operations. The research approach that describes the innovation-development model is characterized by two aspects: (1) proof-of-concept and (2) collaboration between different stakeholders. The identified facilitators and barriers and the used research approach have been categorized along the business-to-government IT innovation characteristics as shown in Table 7.1.

The second and third steps, i.e., development of theoretical concepts, business scenarios, and e-customs demonstrators, have not been presented in this work. However, a detailed description of different business scenarios as well as the development of e-customs prototypes can be found in various ITAIDE deliverables, such as the Beer Living Lab final report (ITAIDE, 2008). Similarly, how e-customs systems can be commercialized (fourth step) and what the consequences of their diffusion and adoption are, (sixth step) have not been further analyzed because this research focuses on the model development and the identification of factors under which e-customs diffusion takes place, and so steps outside of this focus have been not tested.

According to the last argumentation, the fifth step, diffusion and adoption, has been a topic of research in the specific context of e-customs diffusion and adoption among stakeholders representing the private sector of a living lab. Five elements describe the diffusion and adoption in an organizational context such as a living lab, as illustrated
in Figure 7.1 (environmental influences, innovations characteristics, adopter characteristics, information, and social network).

<table>
<thead>
<tr>
<th>Characteristics of B2G IT innovation categorization</th>
<th>Relative advantage</th>
<th>Compatibility</th>
<th>Complexity</th>
<th>Standards</th>
<th>Technological edge</th>
<th>Trialability</th>
<th>Observability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit potential of the public sector</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedural improvements and streamlined business processes</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance of misinterpretations of standardized regulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Standardization of processes, messages, and data model</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowdown in regulations execution due to missing procedural templates</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased complexity in the standardization process itself</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronification of operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Proof-of-concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Collaboration between different stakeholders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

In the case of e-customs diffusion in the private sector, environmental influences correspond, first, to the competitive environment in which a business company is and, second, to its market situation. Information constitutes a crucial factor since without a high degree of information it is not possible to make potential stakeholders aware about new projects and IT solutions. Besides information, the social network plays, in the context of a living lab, a particular role since it is easier to involve people in a project if there is a certain degree of trust between the potential adopters and the project partners. Naturally, innovation itself and adopter characteristics are key elements for the final adoption decision. From the analysis of the private sector in regards to e-customs innovations (Section 5.2.4), two of the mentioned elements, i.e.,
environmental influences and social network, were found to negatively affect the adoption of e-customs systems while the remaining three have been confirmed to be positive factors, as already stated by Frambach (1993) and Woodside & Biemans (2005). Moreover, an analysis of the five elements on the public sector has not been conducted based on the following assumption: since e-customs innovation is an EU initiative that promotes e-government services, innovation diffusion among EU governments is facilitated by the willingness of the European Commission.

By developing the first research model and applying it to the case of e-customs, the first research question has been answered.

7.2. Business-to-government IT innovations value assessment model

The second research model aims to find an answer to the second research question: What is the value of e-customs for business companies and governments?

B2G IT innovations, such as e-customs, involve different actors like business companies and governmental institutions. For this reason, the notion of value of such innovations combines both private and public sector perspectives. One of the major challenges is to measure and assess the value of such innovations with the same method covering different stakeholders’ needs. The scope of the second research model is to build a B2G IT innovations’ value assessment framework that is applicable for both domains. The developed research model (Figure 7.2) consists of two main parts, as described in Section 6.1.4: a procedure model and a value matrix.

The first part of the second proposed research model, the procedure model, is a guideline on how to carry out the value assessment in five steps. The developed five-step model is the result of the combination between the methodologies proposed by Cresswell, Burke, & Pardo (2006) and Foley (2006) and is composed of five phases which build up a chronological and methodological approach: (1) definition of value assessment scope, (2) definition of value assessment criteria, (3) development of case-specific assessment frameworks, (4) assessment, and (5) conclusions and communication of results.
Figure 7.2. B2G IT innovations value assessment model

Phase 1 is dedicated to the definition of the value assessment scope and the goal areas, the set up of the project plan, and the project kick-off together with the stakeholders. In this phase it is defined for whom the value has to be assessed, i.e., who the stakeholders are and what the stakeholders’ goal areas are. Goal areas (GAs) are areas where key goals of the stakeholders are described.

In Phase 2, the value assessment criteria are the topic of research. First of all, value categories have to be determined. According to past studies, different perspectives on value categories of private and public sector can be found. Based on the literature research presented in Section 6.1.2, the following set of value categories results to be the common denominator: strategic, operational, social, and financial value. Thus, benefits of a business-to-government IT innovation are classified along these four value categories and defined by key performance areas (KPAs): they are areas for business success factors and improved performance of an organization. Key performance areas are assessed by key performance indicators (KPIs) that give the boundaries of each specific area and can be either quantitative or qualitative measurements.

In Phase 3, potential key performance areas and indicators, identified in Phase 2, are
tested together with the stakeholders by means of interviews and workshops. The outcome of the interviews and workshops is used in order to build a stakeholder-specific value matrix that combines value categories, key performance areas and indicators. Combining rows and columns of the value matrix, an overview of key performance areas of each stakeholder is given.

The developed value matrix is tested and evaluated in Phase 4 by assessing and measuring quantitative and qualitative key performance indicators.

In the last phase, the results, i.e., the benefits of a business-to-government IT innovation are presented and discussed with the stakeholders for whom the value has been assessed.

The case study research conducted in the ITAIDE Finnish Paper and Danish Food Living Lab, as outlined in Sections 6.1 and 6.2, respectively, followed these five steps. It tested and evaluated the proposed research model resulting in the value assessment of the potential implementation of a common standardized e-customs solution in the Finnish and Danish context. The case studies involved personnel of two different multinational business companies and the tax and customs authorities of both considered EU countries, representing the private and public sector, respectively.

Four areas of improvement, i.e., four goal areas, were identified: (1) increased security, (2) reduction of administrative burden, (3) facilitated compliance, and (4) better communication. The goal areas have been categorized along the four value categories for the sake of considering different aspects: strategic, operational, social, and financial. These four perspectives have been recognized by the representatives of the private and public sector to be the most appropriate in the case of business-to-government IT innovations. In order to analyze each goal area, key performance areas have been identified, such as, e.g., harmonization of different systems or faster process cycle time. Potential e-customs values are, e.g., improvement of EU trade’s transparency and communication between EU customs offices and business companies as well as customs execution time acceleration. Tables 7.2 and 7.3 outline the results of the case study research conducted in the living labs giving the value matrices of e-customs for the private and the public sector, respectively. Each combination of goal areas and value categories, which results in a set of key performance areas, has been analyzed in detail in Sections 6.1.5 and 6.2.4.

The comparison of the results of both case studies indicates that the implementation of a common e-customs system does not benefit every goal area from every perspective: the empty boxes in the value matrices show that some goal areas do not
improve along every value category. For example, from the private perspective as indicated in Table 7.2, the security improvement is not valuable from the strategic and social point of view; additionally, the facilitation of being compliant to EU regulations does not affect the operational and social perspective of a business company; next, a better communication between EU customs offices and business companies does not represent a social improvement and does not yield financial benefits. On the other side, the public sector seems to recognize e-customs benefits for the improved goal areas from almost every value category since only security and compliance improvements are not considered as beneficial from the social perspective (see Table 7.3).

By establishing the second research model, a value assessment framework for the benefits analysis of B2G IT innovations has been provided. The application of the proposed value assessment framework on the case of e-customs has allowed highlighting the value of e-customs for the private as well the public sector. In this way, the second research question has found an answer.
Table 7.2. E-customs evaluation: private sector value matrix

<table>
<thead>
<tr>
<th>Goal areas</th>
<th>Security</th>
<th>Administrative burden</th>
<th>Compliance</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic</strong></td>
<td>Increased services’ quality; Strategic position</td>
<td>Regulations and procedures harmonization (SW); Strategic position</td>
<td>Communication improvement between EU customs offices and business companies</td>
<td></td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Harmonization of different systems; Increased services’ quality; Data exchange improvement; Faster process cycle time; Improved infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Less people involved; Employee satisfaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Systems harmonization; Data exchange improvement; Faster process cycle time; Less people involved</td>
<td>Regulations and procedures harmonization (SW)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7.3. E-customs evaluation: public sector value matrix

<table>
<thead>
<tr>
<th>Goal areas</th>
<th>Security</th>
<th>Administrative burden</th>
<th>Compliance</th>
<th>Communication / Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic</strong></td>
<td>Fulfillment of organization’s mission</td>
<td>Increased services’ quality</td>
<td>Regulations and procedures harmonization (SW)</td>
<td>Communication and collaboration improvement between EU customs offices</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Transparency of EU trade; Information quality improvement; VAT single access point</td>
<td>Systems harmonization; Increased services’ quality; Data exchange improvement; Faster process cycle time</td>
<td>Regulations and procedures harmonization (SW)</td>
<td>Communication and collaboration improvement between EU customs offices; Information access to other customs offices</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Increased services’ quality; Faster process cycle time; Employee satisfaction; Less people involved</td>
<td></td>
<td></td>
<td>Communication improvement between EU customs offices; New EU member states</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Transparency of EU trade; Information quality improvement VAT single access point</td>
<td>Systems harmonization; Data exchange improvement; Faster process cycle time; Less people involved</td>
<td>Regulations and procedures harmonization (SW)</td>
<td>Communication and collaboration improvement between EU customs offices; Access to information of other customs offices</td>
</tr>
</tbody>
</table>
8. Conclusions and Outlook

This research aimed to investigate how B2G IT innovations get diffused and what kind of benefits they can bring to private and public organizations. In order to reach these goals, two research models have been developed and evaluated based on the specific case of e-customs. E-customs was chosen because it is a B2G IT innovation that has gained importance in the last few years and will engage business companies and governments with its diffusion and implementation in the next decade.

This work offers some theoretical contributions as well as practical implications. Although it is limited by a few restrictions, it nevertheless contributes to IT innovation and diffusion research and originates a starting point for future studies.

8.1. Theoretical contributions and practical implications

By addressing the overall research question - *How do e-customs innovation and diffusion take place and what are the benefits of this business-to-government IT innovation?* - this dissertation contributes to the theoretical understanding of IT innovations diffusion and value assessment. It shows conceptually and empirically how a B2G IT innovation such as e-customs can be developed and diffused. Further, it provides a set of potential values, i.e., benefits, that such innovation can bring to different stakeholders coming from the private and public sector. By this means, two research models have been presented and tested. Both models have been evaluated using the case of e-customs but they can be further applied on other business-to-government IT innovations.

Specifically, the first research model contributes to the analysis of the innovation-development process of IT solutions in the context of e-government by providing a staged approach focusing on the elements that can positively or negatively influence the diffusion. Next, the second research model combines different value understandings and gives a framework for value assessment of B2G IT innovations. The main contributions of this framework reside in the development of a guideline on how to conduct value assessment step-by-step and under which categories the identified benefits can be classified.

Therefore, by extending classic methods of IT diffusion and financial assessment, an innovation-development process and evaluation criteria are proposed as research models: both methods support the IT innovation-decision process under the business-to-government domain.
The study presented in this dissertation is meant to be employed for the prognostication of the diffusion of B2G IT innovations and specifically of e-customs innovations as well as their benefits. For this reason, business companies and governments can apply both research models to their specific cases in order to analyze the potential of e-customs implementation in their settings. Additionally, based on the findings of the case studies, e-customs adopters can have easy comparable results for the value assessment so that they can evaluate their redesign procedure. Moreover, the proposed models can be helpful in the analysis of further business-to-government IT innovations.

From both the theoretical and the practical perspective, the general pattern of both research models, presented and discussed in this work, provides a structure for application in other further contexts.

8.2. Limitations

The findings of this dissertation need to be considered in the light of some limitations, additional to the ones presented at the end of each section.

Both research models have been developed based on a deep literature review. The first research model is based mainly on Rogers’ model of diffusion of innovations (2003) although some studies, cited at the beginning of this thesis and in Section 5.1.2, demonstrated that this model is not the most appropriate to apply in the context of a complex technology that involves a broader social system. In order to overcome this issue, Rogers’ model has been integrated with the TOE model. The first research model has been successfully tested but only on the particular case of e-customs. Therefore, in the case of other B2G IT innovations, it may be not suitable and need some adaptations. Thus, the model could be criticized.

On the other hand, the second research model resumes different value assessment frameworks that have been used in order to identify and assess implementation’s benefits of various technologies in different organizations. The proposed model combines several frameworks and it is meant to be employed before the implementation of an IT solution has taken place in order to prognosticate potential values. The model assumes the identification and application of key performance indicators; although their identification does not face too many issues, their application can be complicated since precise estimations are difficult to conduct. For this reason, the model can be used in a limited way if used as ex ante assessment methodology. However, its application on already existing IT systems, i.e., as ex post methodology,
should not encounter difficulties and can, therefore, help an organization to understand whether a redesign is needed.

Although the application of both research models took place successfully, there exist some constraints. Both models have been developed within a limited time frame and a restricted context. Indeed, most of the case studies have been conducted within the particular case of living labs which substitute the real world in an efficient manner but at the same time limit the application of the new IT solutions in their context so that only specific stakeholders adopt the system. Living labs’ stakeholders take part in the innovation-development process so that usually they are prone to implement the new developed IT solution. Therefore, the results related to the perceived benefits could be biased.

Moreover, the application of the models and consequently the analysis of the diffusion and potential benefits of e-customs implementation have been conducted for two major stakeholders: business companies and tax and customs authorities. However, there are many other players in B2G IT innovations like technology providers or other governmental organizations. Those are represented in the living lab context but have not been taken into consideration for further analyses because of the limited frame of this doctoral thesis.

In regards to the value assessment, different key performance areas have been analyzed while key performance indicators have been difficult to identify since the case studies are based on an envisioned to-be situation, i.e., some data are missing so precise figures have not been found. This led to a difficult assessment of qualitative key performance areas while only few quantitative key performance areas have been assessed.

8.3. Future research

By discussing the limitations highlighted in the previous section, potential areas for future research are revealed.

First, the proposed diffusion model needs further investigations in order to prove if it is valid and applicable also on other B2G IT innovations. It has been evaluated on the basis of its applications on e-customs and it is assumable that it can be used in other contexts. However, this has to be tested. Additionally, a deeper analysis of the suggested steps 4 and 6 is needed since they have not been evaluated in this thesis. Moreover, future research can be conducted on further case studies in order to investigate how the five diffusion elements affect the diffusion (fifth step) of B2G IT
innovations. Indeed, in this work, it has been argued that two elements (social network and environmental influences) can have a negative impact on the innovation-decision process of an organization. This argumentation is based on the results of one case study and contradicts the assertions of Frambach (1993) and Woodside & Biemans (2005). Therefore, further investigations can clarify if this is true for other cases of B2G IT innovations or only in the specific studied case. The test of all five elements can specify whether only the two mentioned factors or also the remaining three can influence the decision process negatively.

Second, the value assessment framework can be extended by providing new value categories as well as new key performance areas and indicators. Its application on further B2G IT innovations can clarify how the model can be enhanced. This can lead on the one hand to an easier application of the model and on the other hand to an ex ante value assessment methodology that can be used without particular limitations. Specifically, new key performance indicators can better represent how organizations assess the performance of IT systems besides the classic financial measures.

Third, both models can be applied not only on other B2G IT innovations but also on the potential implementation of e-customs in other European countries, especially on new EU member states. Such studies can analyze whether e-customs is applicable not only in high-tech countries such as Denmark and Finland but also in less technological environments.

Finally, based on the investigations conducted on e-customs policies, deeper studies can clarify how e-customs legislations in particular and governmental directives in general can influence private and public organizations and international trade.

Being aware that this dissertation is only a first contribution to the investigated topics, more quantitative and qualitative research on different aspects of business-to-government IT innovations diffusion and value assessment in different empirical settings is needed to deepen the understanding of this phenomenon and its process.
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Appendices

I. Additional Publications

I.1. Cross-border supply chain: operational benefits of e-customs and e-taxation

Yvan Nieto, Gerald Reiner, Marta Raus

2008

Reprinted from Cross Border Supply Chain: Operational Benefits of e-Customs and e-Taxation, Yvan Nieto, Gerald Reiner, Marta Raus, Copyright (2008), with permission of the EUROMA Conference that took place in Groeningen, Netherlands on June 15-18, 2008.

Abstract

Recently, numerous initiatives were considered by governments to facilitate international trade without jeopardizing security. However, adoption of new solutions has to be motivated by potential benefits. This study discusses the impact of e-customs and e-taxations on operational supply chain performance. We point out that administrative workload reduction is only one of many possible benefits and potential improvement at the operational supply chain processes level has also to be evaluated. To support this evaluation, we propose a framework that considers the potential improvement of customs as well as the supply chain specificities to define the relevant performance indicators. In addition, we illustrate our position with an example based on a real supply chain. We use simulation to estimate benefits of e-customs and e-taxation on the operational supply chain performance. The paper concludes that operational benefits might be relevant and have therefore to be included in the assessment of new solutions.

Keywords: Cross border supply chain; e-customs improvements; simulation.
1. Introduction

In the last 50 years international trade has increased in a considerable manner, multiplying simultaneously volumes of imported/exported merchandise worldwide (World Trade Organization, 2007). This tendency raises the challenge for governments to keep trade competitive as well as secure, a task that recently became more difficult as national security intensified. Terrorist attacks such 9/11 in the US, Madrid 3/11 in 2004 or London 7/7 in 2005 induced more scrutiny in every kind of transaction and new legal responsibilities on businesses have emerged. Nowadays, companies that want to trade internationally have to consider numerous aspects of the international business rules and adhere strictly to changing regulations. It results in an extensive administrative workload, but also increased uncertainty in border processes as complex regulations induce errors and complications. Therefore, governments are under political pressure to simplify trade procedures and decrease the administrative overheads put on companies, while at the same time increasing control mechanisms within international trade. Achieving these two objectives of trade facilitation and security is crucial and numerous initiatives go in that direction. All over the world governments are modernizing their system and expect business to communicate electronically. An excellent example is Denmark, where at present customs and tax administration IT portfolios include more than 100 systems which support the execution of all tax and customs administrative tasks (Bjørn-Andersen, Razmerita, & Henriksen, 2007). In the European Union an e-customs initiative has as main vision the implementation of a paperless environment for customs. This initiative started in 2004 and has a 7-year time span. So far, the New Computerized Transit System (NCTS), and the Automated Export System (AES), were introduced respectively in 2004 and 2006. In 2008, the Automated Import System (AIS) is going to be introduced, and finally by 2010 the EU aims to have a common electronic customs system for all EU member states.

Besides the above mentioned e-customs initiative, there are two others strictly related to e-customs: the Single Window (SW) and the Authorized Economic Operator (AEO). Both topics are addressed by the EU for the purpose of reducing the administrative burden of trade transactions and increasing security and control mechanism. According to the UN/CEFACT (United Nations Centre for Trade Facilitation and Electronic Business), a single window is ‘a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point, to fulfill all import, export, and transit-related regulatory
requirements. If information is electronic, then individual data elements should only be submitted once’. The second main topic proposed by the EU is the AEO: a certification given by the customs offices of a European country that enables an industry to simplify trade. Legislation stipulates that customs authorities shall grant to reliable traders, which are established in the European Community, the status of ‘authorized economic operator’ (Dedrick & West, 2003; European Commission, 2006). The idea is to grant the AEO status to reliable operators including those that are also compliant with regards to respect of security and safety standards and can, therefore, be considered as ‘secure’ traders. Those traders should have a specific status, which would accredit them the status of secure members of the supply chain and would identify them as most reliable trading partners.

Along with these forthcoming e-customs solutions is the question of the related potential improvements they would provide. Adopting new technologies comes at a cost for companies (e.g., formation, IT-solutions, IT-implementation, etc.) and therefore, to facilitate the diffusion of the solutions, estimates of potential benefits for companies are required. In this context, a classical argument in the field of e-solutions is the reduction and facilitation of administrative tasks. The elimination of double entries and assisted entries are often valuable improvements. However, in the case of customs process improvement, relevant benefits could also come from an increased performance of operational supply chain processes. For example, errors in documents, extensive control processes or simply overloaded border posts could lead to unreliability in the processes and harm supply chain performance. Therefore, we point out that, in order to provide a complete assessment of new e-customs solutions, operational benefits have to be included.

Therefore, our main research question in the present study is how operational benefits have to be included in order to provide a complete assessment of new e-customs solutions.

Here, we propose a framework to perform an evaluation of potential improvement on supply chain performance. This evaluation framework shall take into account the relevant performance indicators. First, we emphasize that an analysis of a supply chain must be product- and company-specific and that the performance indicators have to be defined according to these specificities. Then, we illustrate our position with an example based on a real supply chain in the food industry. We use empirical quantitative modeling (Bertrand & Fransoo, 2002) based on a discrete event simulation model to illustrate the expected operational benefits of e-customs solutions.
2. Improvement Evaluation

To evaluate benefits induced by e-customs solutions at the operational supply chain process level, two key steps are required. First, the potential improvements have to be identified. New solutions might lead to numerous changes and only a few of them may be of interest in terms of operational performance. Therefore, it is necessary to list changes and to select the relevant improvements with potential effect on operational processes. Second, an analysis of the supply chain has to be performed to assess how selected improvements will influence supply chain performance.

Potential improvements

In the context of e-customs and e-taxation solutions, several improvements might be induced. For example, the introduction of SW is assumed to reduce cross-border time uncertainty as fewer complications (e.g., lost documents) are expected. However, waiting time related to manual inspections would not be reduced. On the other hand, an AEO certified company would be able to cross the border without direct customs control, avoiding at the same time waiting time and uncertainty. A potential improvement of an e-customs solution could be a reduced delivery time mean as well as variance. Others improvements could be considered such as security, e.g., theft while products are waiting to enter the country may lead to disturbance in the supply process. However, this aspect and some others (e.g., employee satisfaction, service quality, etc.) are not taken into account in this study; in particular we will focus on the delivery time.

The question arises whether delivery time reduction is of interest in terms of operational supply chain processes. We feel that it most certainly is. It is commonly known that risks in processes affect negatively process performance (Hopp & Spearman, 1996). Recognizing that risk, companies may over-react and assume unnecessary inventory costs or, conversely, neglect that risk and suffer stock out difficulties (Lee & Wolfe, 2003). Delivery time characteristics are directly related to inventory management as explicitly shown by classical safety stock calculation (Nahmias, 2005):

\[ I_s = z \sqrt{\mu_i v^2 + \lambda^2 \sigma_i^2} \]  

(1)

In this expression for a classical re-order-point replenishment policy, it can be shown that both delivery time mean ($\mu_i$) and variance ($\sigma_i^2$) influence safety stock ($I_s$).
Further, parameters $\lambda$ and $\nu$ are respectively demand mean and variance, and $z$ is the normal distribution parameter related to the desired service level. The last parameter, $z$, is relevant for the trade-off between service level and costs of inventory. Commonly, supply chains seek, on the one hand, to satisfy customers by providing reliable delivery, i.e., avoiding stock outs; but, on the other hand, constant efforts should be made to reduce inventory and related cost (e.g., inventory holding or obsolescence). According to that, delivery time is of high interest for operational supply chain process, as a reduction of its variance or of its mean can help to reduce safety stocks without hurting customers’ service level. Therefore, potential improvements in delivery time have to be included in the supply chain evaluation. A last comment concerning delivery time is that it is usually considered as normally distributed, although this is often not true, especially in the case of unilateral disturbance. Thus, probabilities of having extreme values are often underestimated. Nevertheless, delivery time potential improvement is with no doubt relevant for operational supply chain processes and therefore the effect that it could have on supply chain performance has to be evaluated.

**Impact on supply chain**

The next step is to evaluate the potential impact of improvements on operational supply chain processes. Evaluation of performance in supply chain is always challenging due to the complex dynamic structure of the system. The relationships existing between processes induce multiple modifications of the system whenever any parameter is changed. Delivery time reduction is known to reduce work in process, as stated by Little’s Law (Hopp & Spearman, 1996), but might also impact, e.g., quality (freshness) of products or service level. In addition to this complex behavior, the supply partners may use different replenishment policies and forecasting methods for the estimation of the stochastic consumer demand. Therefore, valid estimates for a ‘real’ supply chain cannot be obtained through analytical methods alone.

A second relevant issue in supply chain evaluation is that valid estimates for a specific supply chain process can only be obtained through a detailed process analysis. Benefits earned by one supply chain are not always 100% transferable to another supply chain process. Nevertheless, improvements achieved by one company can provide some information for other companies with similar supply chain processes. The iniquity of each supply chain is well known as each supply chain of companies significantly differ from each other, even in the same industry (Reiner & Trcka, 2004). The markets are product-specific and determined by customers’ requirement, which
are in turn closely related to the characteristics (e.g., functional or innovative) of the finished product (Fisher, 1997). Also, both customers’ requirements and product characteristics should root the entire supply chain strategy (agile, lean or, a combination of both). A starting point for performance evaluation is to identify the ‘markets qualifiers’ and ‘markets winners’ defined by Christopher & Towill (2000). These concepts are supply chain oriented and refer to the characteristics a supply chain should have to get markets. As mentioned by the authors, this points out that to be truly competitive requires not just the appropriate manufacturing strategy, but rather an appropriate supply chain strategy. ‘Markets qualifiers’ and ‘markets winners’ are of main interest as they allow defining the target system of the supply chain (lean, agile, ‘leagile’) and then to select which dimensions are critical for supply chain performance and therefore what the levers of relevant improvements are. Appropriate performance measures should therefore be selected as related to the target system in order to capture relevant improvements for the supply chain under study.

Once performance measures are identified, the relevant processes of the supply chain to model can be defined based on a process flow analysis. The model of the supply chain has to capture all necessary relationships between processes to provide valid estimates of performance measures. An important aspect is uncertainty, which has also to be characterized whenever it may influence relevant processes.

3. Illustration

The example presented in this paper refers to the current situation of a three-stage cross-border supply chain involved in the food industry (cheese). The products are manufactured in Denmark and exported by land to the Russian market. The Russian imported cheese market is in an expanding stage and is characterized by a very competitive environment since big European multinationals are present. However, even so, demand suffers little variability and the market is suitable to a lean supply. The market winner is cost and market qualifiers are quality, lead time, and service level, which is in accordance with Christopher & Towill (2000). If quality is not an issue in this situation (manufacturer strategy supports a constant high quality level), short lead time and high service level are more difficult to provide due to high uncertainty in the customs process. To reach Russia from Denmark, the products have to cross three borders, i.e., Swedish, Finnish, and Russian, and if no relevant issues exist concerning the intra-EU customs process in terms of lead time, the same is not true concerning the Russian border. If trucks may generally enter Russia within a day, they may be waiting for up to 3 days. In that case supply time will be extremely
increased. In particular, if transport from Denmark to Russia should take 4 days, it takes up to 8 days due to complications at the Russian border (mostly due to capacity problems and variability caused by manual inspection).

**Process description**

The three stages of the supply chain include a Danish manufacturer, a warehouse (storage) in Russia and around 50 retailers also in Russia. Figure 1 presents the general structure of this supply chain. In this setting, a highly relevant process is the Russian border process. As mentioned previously, the throughput time for this process is very variable and induces high uncertainty in delivery time. As a consequence, the inventory level at the Russian storage has to be high to ensure the requested service level to the retail outlets. This high safety stock is obviously not in line with the lean supply strategy, and reduction in delivery time uncertainty at the Russian border process constitutes an opportunity to reduce inventory at the storage without affecting the service level.

The performance indicators of interest are therefore the work in process and the service level, due to their close relation to the market winners and qualifiers of this supply chain. The process will be considered improved if the work in process can be reduced without jeopardizing service level.

![Figure 1. Three stage cross-border supply chain](image)
Simulation study

Using ARENA, we develop a simulation model of the supply chain under study. The objective of this model is to evaluate the performance of the supply chain under distinct customs process time. The model provides the performance indicators identified earlier as relevant for this supply chain, i.e., work in process, and service level.

For this illustration, we modeled the manufacturer as a perfect supplier. Each time the manufacturer receives an order from the Russian storage, it ships it within the same day. Under a normal situation, this occurs in average twice per week. An important point is that, due to the perfect supply assumption, manufacturer stock is not considered by the model and then not included in the work in process. Therefore, in this setting, we call work in process the number of products present in the system from the departure from the manufacturer to the sale to end customers. The storage receives orders from the retailers and ships the products immediately in the case that it is able to fill the order. The products are delivered to the retailers within a fixed delivery time of 2 days. In the case that the distribution centre runs out of stock, it ships the products as soon as possible. The storage follows a continuous replenishment policy with reorder point \( s_{wo} \) and order quantity \( Q_{do} \). These parameters were set to guarantee an average service level of 98% (Table 1). Finally, 50 independent retailers sell products to customers. Their replenishment policy is a \((t, S)\) policy, where \( t \) is 1 week (6 working days) and the quantity to order \( S_r \) is variable. In the case of stock out, arriving customers are reported as lost sales and sales are assumed lost forever. In order to minimize lost sales, retailers’ target inventory is set up to provide an average service level of 98% (Table 1). The weekly demand is based on a normal distribution, which is distributed daily and to each of the retailers according to the method used by Reiner & Trcka (2004). In this method the authors distribute demand using sets of random numbers uniformly distributed between 0 and 1. In this study, shipping time and cross-border time are of main interest. As mentioned previously, the intra-EU borders are known to be irrelevant and they were therefore not included in this model. By opposition, the Finnish-Russian border constitutes a main issue as its high uncertainty impacts strongly on manufacturer delivery time. This cross-border process was modeled with an asymmetric triangular distribution. Triangular distributions are suitable in cases where little information is available on the process behavior, and the asymmetrical shape is then obvious regarding the available information (see above). In the base case we use a triangular distribution mode of 24 hours and of respectively 12
and 84 hours of extreme values. Transport time was modeled using normal distribution
with mean of 96 hours and standard deviation of 4.66 hours.

Validation of the model was performed comparing output of the model with
available information from the supply chain.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>SL</td>
</tr>
<tr>
<td></td>
<td>$s_d$ [products]</td>
</tr>
<tr>
<td></td>
<td>$Q_d$ [products]</td>
</tr>
<tr>
<td>Storage</td>
<td>SL</td>
</tr>
<tr>
<td>Retailer</td>
<td>Sr [products]</td>
</tr>
<tr>
<td></td>
<td>SL</td>
</tr>
<tr>
<td>Demand</td>
<td>Mean [products]</td>
</tr>
<tr>
<td></td>
<td>$s_d$ [products]</td>
</tr>
</tbody>
</table>

**E-customs alternatives**

The assessment of benefits for supply chains requires estimates of the potential
improvements that could be achieved. With a focus on the Danish customs system, it
can be assumed that a full e-customs solution, including a complete commitment of the
countries, will eliminate any uncertainty in the cross-border process. Therefore, as a
first alternative, we will consider the case where Russian border process becomes
irrelevant in terms of delivery time. This optimal solution is, however, very
hypothetical, and in the case of the Russian border, e-customs solutions would
probably not lead to this perfect scenario, but rather to a reduction of waiting time
or/and a reduction of the uncertainty. It is believed that these initiatives will contribute
to closer relationships between countries and then increase commitment. Therefore, as
no precise estimation of improvement can be done, we propose to analyze reduction of
the work in process regarding distinct values of coefficient of variation. Due to the
asymmetric distribution of the Russian border throughput time (i.e., asymmetric
triangular distribution), the mean and the variance are related and effects of either
mean reduction or variance reduction cannot be performed separately. Therefore, we
use the reduction of the coefficient of variation as parameter for the sensitivity
analysis. We studied the improvement in the work in process, considering a gradual
reduction of the coefficient of variation for the Russian border process. The details of
the triangular distributions used in the analysis are presented in Table 2. In most case,
we kept the minimum and the mode parameters constant; however, in the scenario with
a coefficient of variation reduced to 25% of the original, we were forced to increase the minimum parameter in order to reduce variability to the right extend. It is important to underline that even with a fix mode, the mean fluctuates.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Parameters [h]</th>
<th>Characteristics [h]</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>min</td>
<td>mode</td>
<td>max</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>24</td>
<td>84</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>24</td>
<td>54</td>
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<tr>
<td>3</td>
<td>12</td>
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</tr>
<tr>
<td>4</td>
<td>16</td>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

4. Results

First we parameterized the model in order to have situations where service levels of both storage and retailers averaged to 98%. For the base case, this implied a reorder point $S_d$ of 10200 and for retailers a target inventory $S_r$ of 430. In the second scenario, where Russian border process is irrelevant, we found $S_d$ of 7900 and $S_r$ kept 430. The results of both scenarios are presented in Table 3.

Based on the model, we analyzed the improvement of the performance measure. Table 4 presents a summary of these results and it can be seen that improvement of the custom process leads to a reduction of the work in process.

This 8% reduction of the work in process is relevant, but it corresponds to a specific case that is very hypothetical. As mentioned previously, complete reduction of cross-border time mean and variance is not realistic in an early future at the Russian border and this probably even with the introduction of e-customs and e-taxations solutions. Therefore, intermediate scenarios have to be assessed. In the case manual inspection is maintained at the Russian border, we assumed that the mode of the triangular distribution will be maintained too. However, e-customs solutions might increase reliability in documents and therefore influence the extreme values. Then, we consider scenarios with constant mode, but where the variance is gradually reduced. This leads to 3 additional scenarios, with a coefficient of variation of respectively 75%, 50% and 25% of the original one, i.e., the one of the base case (Table 2). For each scenario, the model has been calibrated in order to provide an average service level of 0.98 for both storage and retailers. A summary of the results is proposed in Table 5. We can see that the reduction of the coefficient of variation leads to a reduction of work in process as it
does in the case of the second scenario. However, these reductions are weaker, especially in between scenarios 4 and 5. This is explained by the range of the differences between the means and variance consecutive scenarios: this difference is smaller at each step of reduction. Thus, smaller reductions imply also smaller improvements.

Table 3. Empirical model parameters

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Demand [products]</th>
<th>Delivery time [h]</th>
<th>Service level</th>
<th>Storage inventory reorder point [product]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>sd</td>
<td>mean</td>
<td>sd</td>
</tr>
<tr>
<td>1</td>
<td>10043</td>
<td>2553</td>
<td>4.0</td>
<td>0.19</td>
</tr>
<tr>
<td>2</td>
<td>10043</td>
<td>2553</td>
<td>5.65</td>
<td>0.63</td>
</tr>
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</table>

Table 4. Summary of scenarios 1 and 2

<table>
<thead>
<tr>
<th>Scenario</th>
<th>WIP [products]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
</tr>
<tr>
<td>1</td>
<td>30390</td>
</tr>
<tr>
<td>2</td>
<td>27988</td>
</tr>
</tbody>
</table>

Table 5. Summary of scenarios 1 and 3 to 5

<table>
<thead>
<tr>
<th>Scenario</th>
<th>CV ratio</th>
<th>Delivery time [h]</th>
<th>WIP [products]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ratio</td>
<td>mean</td>
<td>sd</td>
</tr>
<tr>
<td>1</td>
<td>1.00</td>
<td>135.6</td>
<td>15.19</td>
</tr>
<tr>
<td>3</td>
<td>0.75</td>
<td>125.9</td>
<td>9.27</td>
</tr>
<tr>
<td>4</td>
<td>0.50</td>
<td>120.0</td>
<td>6.27</td>
</tr>
<tr>
<td>5</td>
<td>0.25</td>
<td>118.0</td>
<td>4.82</td>
</tr>
</tbody>
</table>

Therefore, it should be mentioned that even e-customs and e-taxations impact the operational supply chain performance, i.e., by reducing WIP, this improvement might not be so dramatic. Nevertheless, an important point is that full benefits for the operational supply chain process might only be achieved through supply chain reconfiguration. Reduction in delivery time mean and variance may enable different strategies for supply chain management (Van der Vorst, Van Dijk, & Beulens, 2001). For example, the supply can be shortened by cross docking at the distribution center (previous storage). Not going that far in the reconfiguration, replenishment policies could also be rethought to enable lower shipment frequency or lower inventory level.
All these solutions may be highly relevant in combination with e-customs and e-taxation. Therefore, further research has to provide deeper analysis to provide an estimate of potential benefits at the supply chain process level, under consideration of reorganization.

5. Conclusions
We discussed, in this paper, the potential improvement of e-customs and e-taxation solutions and the benefits for operational supply chain processes performance. We pointed out that these solutions lead to a decrease of delivery time (mean and variance) which results in a reduction of the work in process. This constitutes operational benefits for supply chain. Nevertheless, this reduction is small in the case of low improvement in delivery time characteristics and the benefit for supply chain processes is limited. However, we pointed out that full benefits might be obtained through reorganization of the supply chain and therefore improvement in the illustration was as administrative workload is, and that further research is necessary in order to provide an estimate of benefits taking into account reorganization.

In any case, it is worth mentioning that regardless of the potential benefits for the operational supply chain, assessment of the e-customs and e-taxation solution has to take into consideration both the supply chain and the administrative benefits.

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I.2. Innovation steps in the diffusion of e-customs solutions

Marta Raus, Barbara Flügge, Roman Boutellier

2008


Abstract

This article examines the diffusion of an e-government innovation, a common e-customs standardized solution, which is currently subject of research in the European Union. The main goal of this study is to identify facilitators and barriers that can influence the adoption of standardized e-customs solutions. The research is based on Rogers’ theory of innovation considering the technological environment. Within the framework of a European funded project, we conduct our study collecting data from interviews and workshops involving an inhomogeneous group of participants, i.e., stakeholders coming from academy, industry, and governmental institutions. By demonstrating the existence of four generic facilitators and three barriers, the article contributes towards the research in the diffusion and adoption of e-government standards and in particular of standardized e-customs solutions.

Keywords: Diffusion of innovations; e-government; standards.
1. Introduction

One of the challenges of the European Government is to achieve trade facilitation as well as secure import and export. Customs, VAT, and duty are currently all processed by separate information systems, even though data are virtually identical. Electronic customs management is rarely considered as innovative as product design or manufacturing automation. It is mostly associated with administrative processes, filing documents, multiple data entry in paper, and electronically processed forms. Organizations are also expected to keep up-to-date with regulations and trade agreements. Governmental initiatives support organizations in form of export development programs, facilitating trade procedures, easing electronic process, and information exchange. One of these initiatives is, e.g., the Canadian Export Development Program of the Newfoundland Environmental Industry Association, established in 1998 (Peter F. Drucker Canadian Foundation, 1998). It has the objective of assisting local companies to take their products and services to international markets. The mission of the Newfoundland Environmental Industry Association is to promote the growth and the development of the environmental industry of Newfoundland and Labrador, primarily by providing a single window for communication between the environmental industry, the public, government, other countries, and industry groups.

Another similar initiative is the Multi-Annual Strategic Plan (MASP) of the European Commission (2006). One of the results of the European Community Treaty is the e-government model. The main goal of MASP is to pass on vision, objectives, strategic framework, and milestones to implement the electronic customs initiative involving all member states (European Commission, 2007a). As in the Canadian case, the European customs initiative has as its main goal the implementation of a single window based system.

However, while the e-government model regulates the boundaries of the e-government elements and provides high level functional and technical specifications, the adoption part is in the hands of the individual EU member states: procurement of information technology and implementation of the e-customs solutions are not specified. For this reason, the EU funded project ITAIDE (Information Technology for Adoption and Intelligent Design for E-government) is currently researching on e-customs solutions that can enhance business-to-government (B2G) collaboration. ITAIDE is a research project for e-innovation among universities, governments, and business partners. This project considers the customs situation in four different
European countries, namely Finland, the Netherlands, Denmark, and Ireland, analyzing it from governmental and business viewpoints. Considering the Danish experience, in this paper we empirically test the first step of the innovation development process. However, we do not focus on the problems and needs that stimulate the innovation since the electronization of the customs procedures belongs to an EU initiative and is therefore part of legislation. For this reason, we consider more relevant the identification of the facilitators and barriers that can influence the adoption of e-customs standards. In particular, we consider identification and further classification of facilitators and barriers as the first step of the diffusion of e-customs standards.

Therefore, the paper has two main objectives: (1) to review the conditions under which the innovation of customs procedures takes place, i.e., to identify facilitators and barriers of such innovation; (2) to test the innovation-development process as introduced by Rogers (2003) and further enhanced by Mustonen-Ollila & Lyytinen (2003) that provided many innovation characteristics in the field of Information Systems. In order to collect information for our analysis, we used first the Team Syntegration Theory developed by Beer (1994) and second several semi-structured interviews and informal discussions.

In the rest of this paper, we introduce the diffusion model of Rogers and related work on methods for the adoption and implementation of e-government solutions. This section also includes a set of characteristics that will be applied on the case study findings. In Section 3, we illustrate our research approach used in the background given by the case studies provided by ITAIDE. In Section 4, we show the main results of our study, introducing facilitators and barriers of the adoption of e-customs. In Section 5, the discussion, the key findings of the case study will be set into context to the innovation characteristics introduced in Section 2. The conclusions follow in Section 6.

2. Theoretical background and related work

Literature provides many overviews on diffusion of innovation both in past (Brown & Cox, 1971; Cooper & Zmud, 1990; Gold, 1981; Soete & Turner, 1984; Utterback, 1971, 1974) and in more recent (Baskerville & Pries-Heje, 2001; Keller, 2004; Mustonen-Ollila & Lyytinen, 2003; Swanson, 1994) studies. Various ways of how a technology can be diffused are analyzed. Several authors have applied the diffusion models on IT innovation in the field of e-government such as (Burn & Robins, 2003; Lee, Tan, & Trimi, 2005; Sagheb-Therani, 2007; Wonglimpiyarat & Yuberk, 2005). In
particular, the specific case of e-government and e-commerce diffusion in the Danish environment has been studied by some authors (Bjørn-Andersen & Andersen, 2003; Helle Zinner Henriksen, 2004; H.Z. Henriksen & Damsgaard, 2006) showing that Denmark is a country where electronic transactions are used both by the business and by the government.

According to Rogers (2003, p. 5), diffusion is a process by which ‘an innovation is communicated through certain channels over time among the members of a social system’. We can, therefore, identify four main elements, namely innovation, communication channels, time, and social system. The first element of the diffusion process is the innovation. ‘The innovation-development process consists of all of the decisions, activities, and their impacts that occur from recognition of a need or problem, through research, development, and commercialization of an innovation, through diffusion and adoption of the innovation by users, to its consequence’ (Rogers, 2003, p. 135). As stated by this definition given by Rogers, we can recognize six main steps that build up the innovation-development process: (1) recognizing a problem or need, (2) basic and applied research, (3) development, (4) commercialization, (5) diffusion and adoption, (6) consequences. The innovation-development process is illustrated in Figure 1.

![Figure 1: Innovation-development process](image-url)

As discussed at the beginning of this section, many authors have studied diffusion of innovation theory from different perspectives. For example, Katz & C. Shapiro...
(1986) and Fichman & Kemerer (1993) studied the economic value of the diffusion of innovations, i.e., the economic value for the adopters. There are also authors who considered game theory to interpret the adoption and diffusion of IT-standards (Belleflemme, 1999; Xia, Zhao, & Shaw, 2003). Fichman & Kemerer (1993) argue that a single theory of innovation adoption and diffusion is difficult to build due to the high variety among potential scenarios.

However, in order to give a more specific framework for the diffusion of innovations, DePietro, Wiarda, & Fleischer (1990) [cited in (Dedrick & West, 2003; Thomas, Probets, Dawson, & King, 2008)] introduced a model (TOE) that considers three elements for understanding technology adoption in an organizational context. The three elements are technology, organization, and environment:

**Technology.** The model subsumes the five innovation attributes that Rogers argues influence the likelihood of adoption.

**Organization.** Adoption propensity is influenced by formal and informal intraorganizational mechanism for communication and control.

**Environment.** Organizational adoption of new technologies depends on having the prerequisite skills for effective deployment.

They argue that, considering all these factors, it is possible to define a ‘context of change’ that describes the contiguity related to the diffusion of a specific innovation. Rogers classified innovation using five main characteristics that explain the different rate of innovation. These characteristics, also called attributes, are (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. In order to classify innovation in Information Systems (IS), Mustonen-Ollila & Lyytinen (2003) added four slightly different characteristics, i.e., price, problem solver, standards, and technological edge.

In this article, we refer to the model of DePietro, Wiarda, & Fleischer (1990) but only considering the technological aspect. We choose this aspect since at this early stage of our research it was not feasible to consider the others (organizational and environmental aspects). Consequently, because of the topic of our research, we decided to consider not only the five attributes introduced by Rogers (2003) and used by many authors but also to expand them with two characteristics proposed by Mustonen-Ollila & Lyytinen, (2003) (Table 1). These two characteristics are the standard and the technological edge. The other two, price and problem solver, are not considered in our research since the initiation of innovative customs management is a demand of the EU and therefore the cost of the innovation and the desirability to adopt it are not of top relevance. We used the seven attributes in order to categorize the
findings of this study.

Table 1: Innovation specific characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Source</th>
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<tbody>
<tr>
<td>Relative advantage</td>
<td>The degree to which an innovation is perceived as better than the idea it supersedes</td>
<td>Rogers (2003)</td>
</tr>
<tr>
<td>Compatibility</td>
<td>The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters</td>
<td>Egyedi &amp; Loeffen (2002)</td>
</tr>
<tr>
<td>Complexity</td>
<td>The degree to which an innovation is perceived as difficult to understand and use</td>
<td>Mustonen-Ollila &amp; Lyytinen, (2003) and Goossenaerts, Dreverman, Smits, &amp; Exel, (2006)</td>
</tr>
<tr>
<td>Standards</td>
<td>Manufactures and clients begin to use a standard forcing the user to follow</td>
<td>Byrne &amp; Golder (2002)</td>
</tr>
<tr>
<td>Technological edge</td>
<td>Superiority to other innovations</td>
<td>Mustonen-Ollila &amp; Lyytinen, (2003)</td>
</tr>
<tr>
<td>Trialability</td>
<td>The degree to which an innovation may be experimented on a limited basis</td>
<td>Byrne &amp; Golder (2002)</td>
</tr>
<tr>
<td>Observability</td>
<td>The degree to which the results of an innovation are visible to others</td>
<td>Nilakanta &amp; Scamell (1990)</td>
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3. **Research Approach**

In their work Dedrick & West (2003) state that in order to understand adoption decisions it is helpful to develop a framework through a qualitative study of a specific standards adoption case. In addition, while many believe that building theory from a limited number of cases is susceptible to researchers' preconceptions, Eisenhardt (1989) argues persuasively that the opposite is true.

Considering the above mentioned assumptions, we used a case study approach in order to collect qualitative data. We collected the data using informal discussions, semi-structured interviews, and one workshop. Primary sources of data were collected through discussions and interviews with individual experts from governmental institutions, representatives of the private sector and IT sector. In addition to the primary sources, secondary sources of data were used in the form of meetings and interview transcripts we archived, as well as specification and documentation material concerning the e-governmental model publicly made available on the websites. Data collected was categorized and clustered accordingly to the characteristics of innovation (see Table 1).
The day-long workshop was conducted based on the Team Syntegration Process introduced by Beer (1994) and further extended by Truss, Cullen, & Leonard (2000). The interviews and the workshop were carried out with non-homogenous stakeholder groups, i.e., representatives of the public and private sector, IT sector, and academy. (1) The public sector, i.e., customs and tax authorities, was involved from three EU member states (Finland, Denmark, and The Netherlands), represented by department heads and experts in functional and IT areas; functional areas included customs offices, tax administrations, border security and control personnel. (2) The private sector was represented by personnel from one multi-national dairy company whose products are sold in more than 100 countries. (3) The IT sector was represented by two software and technology providers who work on the development of standards for e-government, business-to-business (B2B), and business-to-government (B2G) solutions. (4) Participants from four universities have also taken part to the workshop. The universities are situated in the Netherlands, Germany, Denmark, and Ireland.

The case study was carried out from June to November 2007. We focused our research on the following research question: what are facilitators and barriers of the adoption of innovation in the context of business-to-government operations related to the introduction of e-customs solutions?

3.1 Case background

The framework of this study resides in the European funded project Information Technology for Adoption and Intelligent Design for e-Government (ITAIDE). In this project many stakeholders coming from academic, industrial, and governmental institutions are involved. The main goal of ITAIDE is to provide a concept for a new e-customs system contributing first to the Single Window (SW) and second to the Authorized Economic Operator (AEO). Both topics are addressed by the EU initiative, which aims to reduce the administrative burden of trade transactions and increase security and control mechanisms. ITAIDE is applying the UN/CEFACT methodology for standardized business process and business information exchange. According to the UN/CEFACT, a single window is ‘a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once’. The second main topic proposed by the EU and considered by ITAIDE is the AEO: it is a certification given by the customs office of a European country that enables an industry to simplify trade. Legislation stipulates that customs authorities
shall grant to reliable traders, which are established in the European Community, the status of ‘authorized economic operator’ (World Customs Organization, 2006). The idea is to grant the AEO status to reliable operators including those that are also compliant in respect of security and safety standards and can, therefore, be considered as ‘secure’ traders. Those traders should have a specific status, which would accord them the status of secure members of the supply chain and would identify them as most reliable trading partners.

Basing its work on SW and AEO, ITAIDE is researching utilizing four different countries as a test bed: the Netherlands, Denmark, Finland, and Ireland. In each of those countries the ITAIDE project members strongly collaborate with both the business partners and governmental institutions, i.e., the customs and tax offices. The research skeleton of ITAIDE is presented in Figure 2; the elements outlined in the figure are meant to interact consecutively following a cyclical process. For each of the above mentioned countries this approach is applied.

<table>
<thead>
<tr>
<th>Theoretical concept</th>
<th>UN/CEFACT methodology</th>
<th>Content from the living labs</th>
<th>IT architecture concept</th>
<th>Proof of concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value framework and evaluation</td>
<td></td>
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</table>

Figure 2: Research skeleton at ITAIDE

4. Results

In our research, we collected over the past months a series of characteristics that we categorized along with key facilitators of adoption and barriers to adoption.

4.1. Facilitators of adoption

The facilitators described below have been realized in the implementation test cycle during the research project. Four topics were revealed as facilitators:

1. Benefit potential of the Public Sector. Benefit potential was identified in multiple areas. ITAIDE rationalizes upfront efforts in harmonizing and simplifying daily operations. Areas to benefit from the e-customs solution were seen in the area of time and financial savings as well as higher accuracy in data processing. Time savings have been realized due to executing procedures faster and diminishing multiple as well as manual data entries. Financial savings were the result of streamlined operations and electronized processes of repetitive tasks. Rather than spending hours in aligning
paper-based documents with procedural information linked to IS transactions, electronically processed export declarations were processed faster and with higher accuracy among the participating organizations. The reduction of error-sensitive data entry is already realized in the first stage of the MASP execution in the majority of the participating countries. Improved technical connectivity between the European customs offices reduces costs of data exchange regarding export, transit or import activities.

(2) Procedural improvements and streamlined business processes. Simplifying administrative procedures, like in certificate handling, and applying the same rules for export regulations of different countries were stated as significant by governmental and business representatives. Procedural improvements included the elimination of irrelevant process steps and redesign of processes. Traditionally, due to sequentially conducted tasks and non-transparent data, process steps need to be carried out one after the other. In addition, customs officers need to wait for products and the accompanying export documentation before executing the audit of the exporting organization. The manufacturer also needs to transfer the products to the customs location for checking. However, by implementing pre-certification of organizations and accessing data prior to the arrival of the shipment, tasks could be carried out in parallel. The proof being regulation compliant, like in the Danish case (Bjørn-Andersen & Andersen, 2003), allows manufacturers to eliminate the process of delivering products to the customs locations for getting export-ready. Compliance requirements, however, ask to consider the 4-eye-principle by requesting visible control check points across organizations; paper-based and stamped document checks may be replaced by digital signatures as, e.g., demonstrated in the case of Swedish customs procedures (Tullverket, 2006).

(3) Avoidance of misinterpretations of standardized regulations. Formulating new laws or changing the current ones was seen by the participants as a key requirement to stimulating the environment for the development of IS economies in the countries. However, regulations have been interpreted differently since the change of regulations led to varying implementations. The SW initiative may avoid these misinterpretations since it is the part of the e-government model in MASP where a one-stop registration and acceptance of enterprises in one EU member state is regulated for the other EU member states. The access of registration related information will also benefit other customs activities world wide. Therefore, the implementation of SW allows an enterprise to give to the authorities the same information only once, regardless of the number of countries or political entities involved in the supply chain. An example of
how a single window access can be successfully implemented in an EU country is given by the Danish eExport customs system (Bjørn-Andersen, Razmerita, & Henriksen, 2007). It serves the Danish government and enterprises to check the data only once and to direct access to IS solution. It also indicates procedural updates automatically in the system.

Besides the SW part, the electronic exchange of data, the common risk procedures, and the audit mechanisms across countries are also subject to the regulation framework of MASP. Indeed, the interviewees of the governmental group noted that tighter cooperation between governmental authorities on a national level and among EU member states is required in order to specify in greater detail the execution of regulations. In addition, the business representatives also asked for procedural templates that accompany regulations, regulation changes or updates to achieve a higher adoption rate of regulations.

(4) Standardization of processes, messages, and data models ease the development of e-customs solutions. The interviewees’ findings showed the need of standardization by defining common process patterns. Key participants such as customs offices, freight forwarders, manufacturers, and export control bodies were involved in the analysis. One characteristic of appropriately standardized elements is that they are applicable and accessible by distinct stakeholders. Therefore, any stakeholder along the global supply chain would execute export or import related activities in the same way. Considering the variety of stakeholders involved in the export process (see, e.g., the Danish case represented in Figure 3), the standardization of the process steps, such as ordering, export declaration, and delivery, would ease the supply chain flow.

The exchange of data and messages is another field of standardization. For example, an exporting organization, which applies an ERP system on a worldwide basis, still exchanges data with the suppliers on the basis of proprietary interfaces. By defining data structures on the basis of common semantics, additional information that have to be exchanged, like risk related data, should not lead to extra effort in the interface settings. Project participants from governmental site and software solution providers research on standardizing data models including the data model of the World Customs Organization and the one as defined by UN/CEFACT.
4.2. Barriers to adoption

Three main barriers have been identified in our case studies:

1. **Slowdown in regulation execution due to missing procedural templates.** The e-customs solution roadmap of MASP gives greater detail to the e-government model mentioned in Section 1. Innovation development and execution are regulated by the EU. However, the details related to adoption, i.e., how to implement and by what means, are to be managed and conceptualized individually by each of the member states. This missing link from innovation development to innovation adoption is one of the most critical points stated by the involved participants. One interviewee from a business site asked governmental representatives how governmental bodies and subsequently regulations ease businesses. In particular, the criticism was referred to the details of process descriptions after regulations get changed.

In the case of the AEO concept, customs authorities, as well as businesses, struggle with missing procedural details referring to the decision making process and voting structures for European customs authorities. The following questions have not been answered yet: do customs authorities have the right to accept or deny an application for the AEO certificate if the applying organization is not based in their countries? How is the transfer of data and the accessibility for non-EU customs authorities managed? Will customs authorities have access to data of AEO certified partners?
During the interviews and discussions, participants started to argue about the means that should be used to visualize procedures and process flows. The discussion was more tool-based rather than about the impact and execution of the regulative change in the organization. While organizations are kept responsible in interpreting and visualizing procedural flows, the expected execution of regulations may need to be blocked out.

(2) Increased complexity in the standardization process itself confuses organizations. Not all regulative changes can be expressed electronically in the same manner. Nevertheless, a common denominator is required for a smooth transition from traditional to electronic customs management. The demand for standards directives was also stated by those participants who contribute to the standardization organization for trade facilitation and e-commerce (UN/CEFACT).

The research on technical readiness of a number of standardization organizations using a top-down approach for standardizing regulations overlaps with the standardization efforts in cross-industry groups such as UN/CEFACT. Which one should be followed? Interviewees asserted that the diffusion of regulations and the implementations of e-customs solutions will be limited if standards are not applicable to different industries. In addition, small and medium-sized enterprises (SMEs) seek guidance for standardization and access to standards. In particular, successful business collaboration for a SME is dependent on the reliability that the other business partner(s) can be connected easily. A participant stated that SMEs cannot afford to implement and maintain different standards or systems. For this reason, concepts such as the AEO require a common agreement across all participating parties.

One concern that has been pointed out by the interviewees was that the implementations, such as the AEO, might lead in Europe to 27 different versions. However, the EU has already started the implementation of standardized systems for the facilitation of the European trade. To become familiar with this project, we will highlight the key project stages of the European e-government model as described in (European Commission, 2007a).

The first stage builds on existing work, notably the New Computerized Transit System (NCTS) and the work in the field of risk management. It creates the foundation for an electronic customs declaration environment by adding systems for Import (ICS), Export (ECS), applying the International Road Transport Convention for Transit (NCTS-TIR), and including the Economic Operators’ Registration and Identification System. The second stage is seen as providing aspects of the electronic customs vision which primarily addresses trader concerns: the Economic Operators' Registration and
Identification System and AEO, together with the Common Customs Information Portal and the Single Electronic Access Point. Some work has begun in all these areas but the planning should ensure that it builds on stage one, with full implementation being in 2010. The third stage is based on the Modernized Customs Code concept (European Commission, 2007b) and it is focused on the more ambitious aspects of the electronic environment. These projects will lead to the completion of a fully automated export and import system (AES and AIS), as well as completion of the Integrated Tariff Environment (the latter being built on continuing work). The fourth stage is related to the Single Window project as described in the Council’s proposal for a paperless environment for customs and trade (European Commission, 2006). This would put in place the final elements foreseen in the electronic customs initiative for a paperless environment for customs and trade. The outlined implementation plan from stages one to four is also connected in one way or the other to the country specific deployed IS systems (European Commission, 2007a; Kuiper, 2007).

Therefore, the EU e-government model will lead to common standardized systems. However, the e-government model does not provide an answer to the following questions: (1) How would standardization efforts accommodate companies and customs authorities? (2) Would the effect of deploying the ICS system, e.g., in two governmental institutions (such as two customs offices in Denmark and the Netherlands) lead to the same effect in both customs offices? (3) Will the deployment of the ICS system be rooted in one standardized data model? For this reason, the e-government model cannot choreograph the deployment among all EU member states nor does it inform about the implementation deployment. Although the time plan of the e-customs project contains deadlines for the deployment, an overall cross-country implementation plan for the e-customs adoption phase does not exist. In addition, as data concepts are not shared, the tendency to first invest in proprietary solutions exists. Thus, some countries might not deploy the outlined roadmap to its full extent. According to a customs and tax representative, the tighter alignment among member states might lead to a discussion on the sharing of proprietary standards; those, however, will not always be applicable to every organization. Recognizing the need of going beyond individual concepts and data models will then be too late. That led to another question in the discussion: Would the effect of deploying a standard in two companies, e.g., one located in Denmark and the other one located in the Netherlands, be the same?

For all the above mentioned reasons, organizations do not have a clear understanding of what they have to do. The standardization process seems to be
effective but also very complex. Organizations feel therefore confused.

(3) Electronifying operations will affect the role of individuals as well as organizations. Successfully deployed e-customs solutions have the potential to increase dramatically the governmental offering to organizations. Electronified service offerings change the current paper-driven or counter-based activities; while citizens and businesses benefit from more convenient and accessible services (Burn & Robins, 2003), governmental activities might change or become obsolete.

However, it is necessary to conduct this change carefully. Indeed, some participants explained that the fear of loosing jobs or not having the right skills-set to cope with the new technical environment constitutes a crucial issue.

The affect was also seen on the organizational level that needs to change (Teofilovic, 2002). As one participant stated, the traditional role of customs officers and customs as such shifted to technology enabled activities concerning control and border security. Additional training, job rotation, and a future plan that considers both organizations and individuals are crucial. Being aware of change, the need of clear and ongoing communication should be addressed as soon as possible. The implementation of a thought-through technical solution is dependent on the involved parties. The risk of causing resistance in the involved organizations will be amplified due to the cultural diversity across the European member states. The aspect of conducting activities differently in different countries due to cultural habits was part of the discussion. Due to cultural habits, regulations are executed more or less strictly and control related tasks are executed more or less often and thoroughly.

5. Discussion

After having identified facilitators and barriers that form the conditions for innovative e-customs solutions, we test the innovation development process in our research setting (see Figure 6). According to Rogers, the innovation-developement process of a product is composed by three steps before commercialization, diffusion and adoption, and consequences. In our case we do not aim to develop a final product but a software prototype, a demonstrator, which can be tested by the stakeholders. We started our innovation-development process with the identification of facilitators and barriers that may inhibit the adoption of the software. Next we will provide a theoretical concept that will be tested in different business scenarios and develop an e-customs demonstrator.

In order to better understand how facilitators, barriers, and research environment can inhibit the innovation, we test them. The test criteria are based on the technology
related characteristics of Rogers’ (2003) and Mustonen-Ollila & Lyytinen’s (2003) attributes. In the following we group facilitators, barriers, and research environment along with the technology-related characteristics: relative advantage, compatibility, complexity, standards, technological edge, trialability, and observability. The relative advantage is given by the e-government model of the EU: it is the only possibility considered instead of developing local national IS solutions. This advantage can be perceived as demonstrated by the first facilitator, benefit potential of the public sector. Due to the long-term characteristic of the solution, individual elements, such as the NCTS implementation, are completed for the current EU member states. However, future member states might sense a complexity overload as they do not necessarily have to migrate from already existing export or transit management solutions. The review results presented by Jeyaraj, Rottman, & Lacity (2004) support our findings, affirming that the relative advantage will be perceived if the innovation can be adapted to the individual situation of the adopters. In addition, the author explained that the behavior of individual adopters in accepting an adoption or not is very much linked to the social network the adopter is embedded in.

Figure 4: Rogers’ innovation-development process mapped to the Research approach
In our research, social networks are characterized on the one hand by the types of organizations, such as authorities and enterprises, and on the other hand by individual groups based on the functions they perform along the global supply chain (e.g., customs officers, export controllers or audit personnel cooperating across countries and organizations). Considering the concept of relativity according to Jeyaraj, the third dimension of social networks that we consider is based on similarities, such as industry species. Take the example of dairy products manufacturers who are competing in global trade. They are demanding comparable and similar benefits from IS innovation development as other organizations. Thus, initiated by a superior political unit such as the European Commission, when does the innovation pay off for competing organizations? An answer to this might be given based on the entry point when adopters start to get involved in a certain stage of innovation development; being involved early in innovation development like in a research environment at ITAIDE, a Danish or Finnish dairy company benefits earlier from innovation adoption than competitors entering later. Barriers of the innovation concept can be addressed and resolved earlier. Other types of adopters, such as recently joint member states might perceive advantage once the effort to participate is minimal and the innovation is ready to implement.

Compatibility, understood as being consistent with needs of potential adopters, is given in our case (fourth facilitator, standardization of processes, messages, and data models ease the development of e-customs solutions). Depending on certain conditions, such as the duration of membership, new EU member states might perceive compatibility with the e-customs solution differently than EU member states that already had an operating customs solution. Concerning efficacy of change as another condition, previous efforts in the Dutch case to direct change in procedural handling serve as a role model for present change due to the e-government framework. The same applies to governmental institutions and the private sector and how they sensed consensus development in the past. Finding common ground in former innovation diffusion projects will steer the acceptance of newly introduced innovations, regardless of the origin of consensus and cooperation being mandatory, government imposed or voluntary (Farrell & Saloner, 1985). Thus, the need of managing change is one of the major outcomes of the analysis. Change in e-government initiatives was developed by Guha, Grover, Kettinger, & Teng (1997) and adapted by Burn & Robins (2003) based on the assertion of (Kalakota, Oliva, & Donath 1999) who stated that ‘any significant business process change requires a strategic initiative where top managers act as leaders in defining and communicating a vision of change.’ The participants in the
research are aware of the change: changes in job profiles and the shift to control and security specific tasks have been addressed as well as asking for more clarity on what is being expected from individuals and their organizations (third barrier, electronifying operations will affect the role of individuals as well as organizations).

*Complexity* in the innovation development is highly present as outlined (second barrier, increased complexity in the standardization process itself confuses organizations). The technological impact on performing operations and procedures on governmental, national, and company levels is high. Complexity results also from different habits in performing business operations and executing procedures. A major trigger to ease the impression of complexity can be derived from simplified procedures that are reduced to a minimum set of required manual steps: pre-defined workflows enable newly trained personnel to get used to the new e-customs solution. The underlying principle of resolving complexity is also highly linked to standardization efforts in IS development. In particular, managing increased complexity asks for standardization concepts to compensate for more complex supply chains. Another main focus on IS adoption is based on providing access to the e-government model for business partners or governmental institutions. To achieve this, organizations seek for simplified means to adopt IS solutions resulting from organizational or procedural changes. Interoperable solutions, as confirmed by Shapiro & Varian (1999), are a critical factor to ease adoption and reduce complexity in IS innovation. Workload caused by maintaining non-interoperable interfaces needs to be reduced. Organizations need to conduct trade in a cross-national scenario without worrying about additional data setup and data exchange with governmental institutions.

The notion of *standards* also evolves in IS diffusion based on its role as information carrier among trading partners (Lecraw, 1984). Standards may lead to several advantages like the procedural improvement (second facilitator), and also ease the development of e-customs solutions (fourth facilitator). However, if the standardization process does not consider every aspect, it is possible that the process itself will not work efficiently. One example is the first barrier: the regulation execution is slow since procedural standardized templates are missing.

Despite the research achievements in cost effects of standards, the role of standardization is going beyond potential cost reductions. A number of research studies focused on the effect of switching from one standard to another (Lecraw, 1984; Reimers & Li, 2005; Zhu, Kraemer, Gurbaxani, & Xu, 2006). In case of complex IS solutions and cross-organizational standardization organizations, especially UN/CEFACT, the committee on trade of the Economic Commission for Europe of the
United Nations (UNECE) envisions to develop recommendations, norms, standards, and other instruments for trade facilitation, electronic business, and regulatory cooperation (United Nations. Economic Commission for Europe (UNECE), 2006). Two concepts in standards development namely ‘universal’ and ‘good enough’ derive from that mission. Technological edge, according to Rogers (2003), is based on the motivation of organizations to switch from an inferior to a superior standard (second and third facilitator, procedural improvement of streamlined business process and avoidance of misinterpretations of standardized regulations).

What are the main attributes we collected based on our research? First, ‘universal’ as a characteristic in any means reflects a heavy-weight assumption of worldwide, globalized subjects. Comparing, for example, IT driven standards with products design, the measurements and weights of containers are standardized. Serving as product carriers they are designed to fit on any cargo ship type or cargo airplane; local and international cargo personnel worldwide is trained to use, maintain, and handle them regardless of the origin of the container. IT standards should be capable to be spread on a global basis, too. In order to reach a large community, the determination, definition, and specification of standard characteristics are key factors: the ability to get adapted without loosing the common semantics approach and to be implemented across industries and organizational sizes. Second, ‘good enough’ is meant to be efficient and effective in the way the standard is being used. Investments, such as human resources, a large number of cost-intense (dissemination) activities or additional co-financing activity are reduced to a minimum.

In the research environment, where the innovation-development process was being tested, trialability can be achieved based on the research approach as outlined in Figure 5. Trialability is given due to the fact that the development of e-customs demonstrators is supplied with real business scenarios and the input from the involved stakeholders. Indeed, the development phase will be conducted in the so called living laboratories. Those are characterized by pre-defined industry specific or cross-industrial trade scenarios with one exporting and one importing country. The development phase is subdivided into a development, testing and evaluation phase (Figure 7). A similar approach is described by Rogers, Takegami, & Yin (2001). The extended development phase supports also the characteristic concerning observability before deploying the innovation. Part of the deployment is currently ongoing in the EU due to the individual development plans of the involved member states.
6. Conclusions

The topic that has been analyzed in this paper concerns the diffusion of IT standards in the field of customs management. According to Rogers (2003) the first step of the innovation-development process is to identify the problems and the needs that stimulate the research. In order to recognize those problems and needs we analyzed the barriers and the facilitators of e-customs implementation. The need for innovation has been set by the governmental regulations as outlined in the MASP upfront.

We demonstrated that a complex IS initiative, such as the pan-European one, can be tested based on Rogers’ innovation development process. We also assessed main barriers that inhibit the innovation-development process and limit organizations from deploying commonly agreed IS solutions. The role of governments constitutes a key factor for the adoption of innovation. Major drawbacks can be expected if proprietary standards are defended and specifications in regulations are missing.

Therefore, this research paper constitutes the first step of a broad analysis that will consider the three first phases of the innovation-development process. Further research will consider the second step, research, and the third step, development. Taking into consideration the process of technical innovation proposed by Utterback (1971), we will analyze the problems and the needs and we will aim to find a feasible solution for an innovative e-solution for a common European e-customs.
The joint efforts of the UN/CEFACT working groups combined with our research objectives will allow us to further experiment on complex IS innovation and diffusion. Incorporating the concept of re-invention and the extension of Rogers’ innovation development process will be subject to further research in the area of cross-sectoral and cross-organizational standardization.

References


Appendices

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I.3. E-government project evaluation: an integrated framework

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Abstract

Recently, the EU government has put a lot of effort into modernizing its public sectors using advanced information and communication technology (ICT). Together with various universities and research institutes all over the EU, a number of e-government projects are now undertaken under the 6th/7th Research Framework Programme. One of the critical issues faced by both researchers and the EU government is how to evaluate and assess the successfulness of such projects. The traditional value assessment methods existing in the business field are not good enough to cope with the issue, as business and government hold different value perspectives and have different concerns. In this paper we present a comparative study of six value assessment frameworks and introduce an integrated value assessment framework that may better serve the purpose. A ‘value cube’ and a ‘step-by-step’ method design are generated for supporting the assessment and a real-life case (the Beer Living Lab) for applying the framework in practice is given.

Keywords: E-government; evaluation; assessment; framework; tool supporting.
1. Introduction

Information and communication technology (ICT) has become one of the core elements of managerial reform for creating the best efficiency and comparative advantages. ICT has opened up a new realm for business development in the last decades and now governments all over the world have also seen the opportunities and benefits that ICT may bring in. Many e-government projects are initiated and billions of Euros are going to be invested. The study of Moon (2002) shows that, although e-government has been adopted by many municipals, it is still at an early stage and has not obtained many of the expected outcomes (e.g., cost savings). This creates a growing need for understanding how the adopting public organizations should define the value of e-government, and how the underlying perceptions of e-government value affect e-government adoption decisions. One of the critical issues for both researchers and the EU government is how to evaluate and assess the value of such projects. However, currently, no integrative framework exists that can sufficiently serve such purpose.

In this paper, we address the aforementioned problem by analyzing existing theories and frameworks of IT investment in the public sector, and abstract the applicable propositions derived from past research to e-government settings (Section 2). We propose an integrated value assessment framework and its corresponding value cube, and we define a ‘step-by-step’ reasoning approach to evaluate e-government projects in Section 3. A real life case applying the integrated framework is presented in Section 4. We conclude the paper and indicate the future research efforts in Section 5.

2. Review of existing literature and value assessment frameworks

When assessing the value of e-government projects, most people’s first reaction is to relate it with commercial interests and evaluate it with monetary terms – how much money does a company make/lose? Indeed, money is the main equalizer of the private sector valuation. Most private sector valuation forms are inevitably related with the economic value and measured in monetary terms. Businesses use a sophisticated set of techniques to measure and manage value. Profit, revenue (turnover), cash flow, economic value added (EVA), net present value (NPV), and return on investment (ROI), e.g., (Brewer, Chandra, & Hock, 1999; McDonald & Siegel, 1986; Pindyck, 1988; Rogerson, 1997; Young, 1997), are all possible mechanisms for business valuation. However, when talking about value in the public sector, the assessment issue becomes much less straightforward, as private businesses and public sectors hold
different value perspectives and have different concerns (political, social etc.). Contemporarily, the concept of public sector value is developed by various researchers and organizations [e.g., (Moore, 1995); (Kelly & Muers, 2002); (Cole & Parston, 2006); (Cresswell, Burke, & Pardo, 2006); (U.S. Federal CIO Council, 2002)]. Some new insights of the public value, and more prominently, public value based government evaluation frameworks are presented in these studies. Here below, we give a short review of these frameworks.

**Mark Moore’s framework.** Mark Moore points out that ‘the goal of private managers is to create private (economic) value, while the goal of government agencies is to create public (social) value’ (Moore, 1995). He argues that the strategic problem for public managers is to ‘imagine and articulate a vision of public value that can command legitimacy and support, and is operationally doable in the domain for which you have responsibility’. In order to determine what constitutes public value and to act to produce it, a concept of ‘strategy in the public sector’ is developed. This idea is presented in the diagram ‘the strategic triangle’, which consists of the following three factors. (1) *Task environment* refers to the social conditions managers seek to change. The strategy must be substantively valuable in the sense that the organization produces things of value to overseers, clients, and beneficiaries at low cost in terms of money and authority. (2) *Authorizing environment* refers to the actors from whom the public manager needs authorization and the resources needed to survive and be effective. The public enterprise must be able to continually attract both authority and money from the political authorizing environment to which it is ultimately accountable. (3) *Operating environment* refers to the assets and capabilities entrusted to public manager plus those that the manager can influence, and are required to achieve the desired results. It must be operationally and administratively feasible in that the authorized, valuable activities can actually be accomplished by the existing organization with help from others who can be induced to contribute to the organization’s goal.

**REDF’s SROI framework.** In 1996 the Roberts Enterprise Development Fund (REDF) published a retrospective cost benefit analysis of the social purpose enterprises run by a non-profit agency in the San Francisco Bay Area. The study introduced the SROI framework, where the ‘S’ denotes some sort of social mission activity; the ‘ROI’ denotes the use of a business investment analysis. REDF’s SROI framework was specifically designed for social purpose enterprises run by non-profit organizations. According to Emerson et al. (2000) (REDF), the SROI framework looks at value creation from the investor’s perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely
economic, to socio-economic, and to social:

*Economic value* is created when there is a financial return on an investment. *Social value* is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individuals or society as a whole. However, it is very difficult to agree upon or to quantify the actual social value created. *Socio-economic value* measurement builds on the foundation of economic value measurement by quantifying and monetizing certain elements of social value, and incorporating those monetized values with the measures of economic value created. SROI framework incorporates measures of economic value with monetized measures of social value to calculate socio-economic value (Gair, 2002).

**U.S. Federal’s Value Measurement Methodology (VMM).** In 2001 the U.S. Social Security Administration (SSA) and the U.S. General Services Administration undertook the task of developing a methodology to assess the value of e-services. Their report (U.S. Federal CIO Council, 2002) built the foundation for the Value Measurement Methodology (VMM). VMM is based on public and private sector business and economic analysis theories and best practices, and provides ‘the structure, tools and techniques for comprehensive quantitative analysis and comparison of value (benefits) cost and risk at the appropriate level of detail’ (U.S. Federal CIO Council, 2002). Three elements – *value, cost* and *risk* – are analyzed from different perspectives in VMM. It provides a framework and information for making trade-offs among different alternatives, and for striving to *optimize value, minimize cost, and diminish risk*. Moreover, VMM identifies five essential value factors, which are direct customer value, social/public value, government financial value, government operational/foundational value, and strategic/political value (Foley, 2006).

**UK cabinet’s framework.** To assess the successfulness of the public service reform, the UK cabinet office developed an analytical framework. In their framework, Kelly & Muers (2002) define public value as ‘the value created by government through services, laws regulation and other actions’. They argued that in a democracy this value is ultimately defined by the public themselves. Value is determined by citizens’ preferences, expressed through a variety of means and refracted through the decisions of elected politicians. Three categories – *services, outcomes and trust* – are addressed as main components of the public value (Kelly & Muers, 2002).

**Accenture’s Public Service Value (PSV) model.** In 2003 a group of Accenture executives in cooperation with Harvard Kennedy School of Government developed the Public Service Value model (PSV model) from the global government practice. The Accenture’s PVS model provides ‘a baseline for comparing performance of a
particular government agency over time and/or compared to other agencies’ (Jupp & Younger, 2004). They consider public value in public service organizations as the public service value and suggest that ‘public service value is about more than simply attaining outcomes or just reducing cost; it is about doing both in a balanced fashion, and understanding the strategic trade-offs available along the way’ (Cole & Parston, 2006). They suggest that government managers should look at value from the perspective of the citizen – the primary stakeholder and most important beneficiary of government activities. According to them, the public value is created based on two criteria: the outcomes they deliver and the cost-effectiveness they achieve (Jupp & Younger, 2004). By focusing also on cost-effectiveness, high-performance government organizations strive not only to do the right things but to do them in the right way.

**SAP’s Public Return on Investment (PROI) framework.** Other than Accenture, another leading commercial organization, SAP, has been working intensively on the issue of evaluating public investment. Cresswell et al. (2006) (SAP) present a public value framework (also called the Public Return On Investment (PROI) framework) for evaluating IT investments of the government. Unlike other methods for assessing return on investment that focus on financial or economic metrics, the PROI framework includes a much broader view of how IT investments can produce results of value to citizens or to the society as a whole. In their framework, the government is an asset to the community or nation that delivers a wide range of values. Two sources of public returns are mentioned: (1) value to the public that results from improving the government itself from the perspective of the citizens, and (2) value that results from delivering specific benefits directly to persons, groups or the public at large. The framework thus presents a more comprehensive way of describing public value, compared to the previously analyzed frameworks. The public value proposition is composed of six parts based on different impacts that government IT can have on the interests of public stakeholders, including financial, political, social, strategic, ideological, and stewardship impacts.

A summary of the above six public value frameworks is presented in Table 1, listing the proposition and the main components of a specific value assessment framework. Three main points can be concluded:

Similar to the private sector, the public sector can also be seen as service provider to its customers: citizens. Its ultimate goal is to satisfy the needs and demands of citizens and to increase the total social welfare in general.

The existing evaluating methods for the private sector can also be applied to the
public sector. Economic (i.e., financial) value is an important aspect for public value assessment, however it is not the only concern: other values like social and strategic/political value need to be taken into account as well.

Not as direct as in the *input-output* analysis in the private sector, value assessment in the public sector focuses on *input-outcome* analysis. Outcome evaluating is abstract, and often difficult. ‘Cost-effectiveness’ is one of the most important criteria for such evaluation.
Table 1: Summary of public value frameworks

<table>
<thead>
<tr>
<th>Framework</th>
<th>Public value proposition</th>
<th>Public value composition</th>
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</thead>
<tbody>
<tr>
<td>‘Public Value’ for public strategic management (Moore, 1995)</td>
<td>The goal of private managers is to create private (economic) value, while the goal of government agencies is to create public (social) value</td>
<td>• Task environment: Public value, goals and mission</td>
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<td></td>
<td></td>
<td>• Authorizing environment: Sources of legitimacy and support</td>
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<tr>
<td></td>
<td></td>
<td>• Operating environment: Operational capabilities</td>
</tr>
<tr>
<td>Social return on investment framework (SROI) (REDF, 2000)</td>
<td>Value creation is from the investor’s perspective and assumes that value creation occurs simultaneously in three ways along a continuum, ranging from purely economic, to socio-economic, and to social</td>
<td>• Economic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Socio-Economic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Social</td>
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<tr>
<td>Value measuring methodology (VMM) (U.S. Federal CIO Council, 2002)</td>
<td>It provides the structure, tools and techniques for comprehensive quantitative analysis and comparison of value (benefits) cost and risk at the appropriate level of detail</td>
<td>• Direct Customer (User) Value</td>
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<td></td>
<td></td>
<td>• Social (Non-User/Public) Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Government Operational / Foundational Value</td>
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<td></td>
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<td>• Government Financial Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Strategic / Political Value</td>
</tr>
<tr>
<td>Analytical framework for public service reform (Kelly &amp; Muers, 2002)</td>
<td>The value created by government through services, laws regulation and other actions</td>
<td>• Services</td>
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<td></td>
<td></td>
<td>• Outcomes</td>
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<td></td>
<td></td>
<td>• Trust</td>
</tr>
<tr>
<td>Public service value model (PSV) (Jupp &amp; Younger, 2004)</td>
<td>• Public service value is about more than simply attaining outcomes or just reducing cost; it is about doing both in a balanced fashion, and understanding the strategic trade-offs available along the way;</td>
<td>• ‘Outcomes’ are a weighted basket of social achievements</td>
</tr>
<tr>
<td></td>
<td>• The public value is created based on two criteria: the outcomes they deliver and the cost-effectiveness they achieve</td>
<td>• ‘Cost-effectiveness’ is defined as annual expenditure minus capital expenditure, plus capital charge</td>
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<tr>
<td></td>
<td></td>
<td>• Nine capacities for creating public value:</td>
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<tr>
<td></td>
<td></td>
<td>• Strategy and Policy Making</td>
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<td>• Organization and Process Design</td>
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<td>• Performance Management</td>
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<td>• Human Capital Management</td>
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<td>• Information Management</td>
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<td>• Marketing and Client Relationship Management</td>
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<td></td>
<td></td>
<td>• Procurement and Logistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Operations</td>
</tr>
<tr>
<td>Public return on investment framework (PROI) (SAP, 2006)</td>
<td>Two sources of public returns: (1) value to the public that results from improving the government itself from the perspective of the citizens, and (2) value of delivering specific benefits directly to persons, groups or the public at large</td>
<td>• Financial</td>
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<td></td>
<td></td>
<td>• Political</td>
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<td></td>
<td></td>
<td>• Social</td>
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<td></td>
<td></td>
<td>• Strategic</td>
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<td></td>
<td></td>
<td>• Ideological</td>
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<td>• Stewardship</td>
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</table>
3. An integrated value assessment framework

3.1. Three-level analysis

Based on the literature study discussed in Section 2, in this session we present our integrated value assessment framework. The framework introduces a ‘top-down’ approach defining three different levels of analysis. First, as a result of the analysis of our literature review, we introduce a value typology, which divides the spectrum of values into four categories. Next, we define key performance areas (KPAs) per value category to refine the value assessment. Finally, every KPA can be measured or assessed by one or more concrete key performance indicators (KPIs).

3.1.1. Value categories

To proceed with our value assessment framework, we need to understand what the core value categories for public sector organizations are. The literature review in Section 2 provides us a rich resource defining generic value categories that we need. Although different frameworks propose different value compositions, Table 2 shows that there exists much overlapping between various frameworks and definitions of value propositions. The common denominator of the various approaches is the following set of value categories for value assessment: financial value, social value, operational (foundational) value and strategic (political) value. These four categories represent a shared understanding of various researchers and practitioners, and can be characterized as follows.

Financial value implies impact on current or anticipated income, asset values, liabilities, entitlements, and other aspects of wealth or risks to any of the above.

Social value implies impact on society as a whole or community relationships, social mobility, status, and identity. Social and psychological returns include increased social status, relationships, or opportunities; increased safety, trust in government, and economic well-being.

Operational (Foundational) value implies impact in realized operations and processes and in laying the groundwork for future initiatives.

Strategic (Political) value implies impact on personal or corporate influence on government actions or policy, on role in political affairs, or influence on political parties or prospects for current of future public office, including impacts on political advantage or opportunities, goals, resources for innovation or planning.

One of the important goals for an e-government project is to promote collaborations (between G2G, G2C and G2B) with IT enabled procedure redesign. We find that the
proposed value categories are rich enough to cover most concerns, including private and public financial interest (financial value), the social consideration of the public sector (social value), the operational benefit from the procedure/process redesign (operational value) and, last but not least the strategic planning for the business and political challenges for the EU government (strategic value).

3.1.2. Key performance areas

Key performance areas, referred to as KPAs, are areas for project success factors that embed an improved performance of an organization (e.g., cargo safety). They are initiated by specific goals or demands that an e-government initiative aims to satisfy. A KPA can be assessed via one or more concrete KPIs (see next paragraph), which are all related to this specific area. This hierarchy enables a transparent and aggregated view of a large number of KPIs, especially for big organizations with complex structures and heterogeneous business. For strategic organization’s planning, the first step is to define a set of goals and related success factors on KPA level. Goals and factors can be then further refined by using different KPIs.

3.1.3. Key performance indicators

Key performance indicators (KPIs) are quantitative or qualitative measurements, which reflect the project success factors and address the performance of an organization. While the concept of KPI stems from finance, where KPIs are quantitative and measurable, we studied 7 cases (available upon request) involving public sector organizations and found that KPIs can also be qualitative, which may not necessarily be measured with a quantitative measurement (e.g., acceptance of standards). Often more than one KPI is related to the same success factor. In that way different areas of interest can be evaluated to see whether a specific organizational goal has been achieved. Depending on the characteristics of an organization (e.g., public or private), KPIs differ. They are either long term considerations, or refer to a specific period, during which their values will be collected, measured or assessed. The definition of what they are and how they are measured or assessed, however, does not change often. It is important to stay with the same definition of the KPI from year to year, or during a particular time period. Each KPI must be correctly defined by a specific target e.g., gained profit (best as a fixed value), the period of validation (e.g., month or year), considerations (e.g., by units), the unit of measurement (e.g., EURO per months) and a description of how to assess/measure respectively how and where the data can be collected.
3.2. Value cube and a ‘step-by-step’ evaluation method approach

3.2.1. Value cube: stakeholder specific and network concerned assessment

The realization of any e-government project requires a cooperative effort from both public (e.g., government authorities) and private sectors (e.g., IT service providers). Stakeholders with different interests (e.g., commercial interest of service providers, legal interest of governments) perform different functionalities to provide benefits for the end customers. One of the challenges while reasoning over a potential success or failure of an initiated e-government project is, however, that stakeholder benefits have a broad interpretation due to the diverse interests of stakeholders. Thus, to find a way to assess the ‘real value’ of an e-government project is not straightforward, as it should be done from the multiple viewpoints of stakeholders. In the private sector, value is mostly measured in financial terms, i.e., a solution is proved to be beneficial if it results in financial advantages. Issues like security, trust or improvement in social efficiency, which are of great importance for public sectors, cannot be easily measured in terms of money, adding another complexity to our task. The challenge with these emerging conflicts is to find an acceptable networked value constellation, consisting of stakeholders from both the public and the private sector, which realizes the initiatives of an e-government project, and where each stakeholder can find her own benefit. To this end, we performed a study on the notion of stakeholder value, and we articulated a value cube that we further use to guide our evaluation process (see Figure 1).

The value cube is structured as follows. First, it shows the goals of the analyzed project (columns) and puts them in relation to the value categories (rows), giving an overview of the Key Performance Areas (per combination of row and column, see Figure 1). Once the matrix has been elicited, we define Key Performance Indicators for the KPAs that are initiated in the matrix. As the assessment of the full value matrix can be very time consuming, stakeholders can prioritize the KPAs and KPIs that they wish to assess. The value matrix is stakeholder-specific. As the KPAs and KPIs of various actors may be inter-related, to emphasize the network perspective on value assessment, vertical payers of the matrix are plugged in according to the number of stakeholders involved.
3.2.2. A ‘step-by-step’ evaluation method approach

Our ‘value cube’ is a light-weight approach to summarize the different concepts that are essential to exploring stakeholder value. However, it does not give any suggestions on how to assess the value impacts that are embedded in the execution of e-government projects. In addition, it does not assist in measuring different cross-cutting impacts on stakeholder value, caused by common interests among different stakeholders. To do so, we further detail our value assessment and introduce a step-by-step approach (Figure 2) that guides us to achieve this goal.

The method is described using UML class diagram (Fowler & Scott, 1997) in Figure 2. First, there are certain strategic initiatives of any e-government project, such as security, reduction of administrative burden and compliance that calls for an alternative, IT-intensive solution. In order to achieve these goals, stakeholders from both public and private sectors form a networked constellation executing different activities to fulfill various business/government functionalities. In other words: they operationalize the strategic goals by activating value creating functionalities. KPAs stand for key performance areas, which are originated from these business/government functionalities, and are the focal areas that we need to pay special attention to the value assessment. These KPAs are measured by selected indicators (KPIs). They can be either quantitative or qualitative measurements, which reflect the successfulness of the focal functionalities: the KPAs. Further, these business/government functionalities (presented as KPAs in the framework) and their measurements (KPIs) provide reliable assessment of the various value impacts perceived by different stakeholders. In the mean time, these value impacts also reflect to the strategic level, and assist in exploring which goals are fulfilled and to what extent. The task of measuring and/or assessing the particular KPI is still challenging. Whereas we assume, that there exist...
some methods of measuring (especially financial) KPIs in the companies, we also aim to provide support for developing methods of assessing the indicators of improvement in collaboration with the companies/administrations.

<table>
<thead>
<tr>
<th>Class diagram of value assessment framework components</th>
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<tr>
<td><strong>Strategic goal areas</strong></td>
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<tr>
<td>Goals</td>
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<tr>
<td><strong>KPAs</strong></td>
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<td><strong>KPIs</strong></td>
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<td><strong>Values</strong></td>
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</table>

Figure 2. Model based method for deploying the value assessment

4. **Application: assessing the Beer Living Lab**

4.1. **Background**

The EU is currently initiating several e-customs projects to reshape its customs legislation and practices with expectation to achieve seamless e-customs procedures over EU member states. The reasons for such initiatives are threefold. First, the threat of terrorism resulted in new control regulations to meet strict security and safety requirements. Second, the increasing excise and VAT fraud in the EU calls for the need of reshaping existing control mechanisms. Third, there is an articulated need by EU to reduce administrative burden, and so to keep the EU a competitive economic zone. Efficiency and reducing administrative burden however can easily contradict
with increased security, safety and control. To meet all aforementioned requirements, new customs procedures are required.

The Beer Living Lab is a pilot of the EU-funded ITAIDE project for redesigning these EU Customs procedures in the beer industry, focusing on shipments of excise goods. The redesign in Beer Living Lab uses innovative information technology (including GPS traceable e-seals, distributed database, and SOA supported information sharing scheme) to meet the above described EU e-customs initiatives. Five major stakeholders are involved in the Beer Living Lab pilot, which are Heineken; Dutch Tax and Customs; Safmarine (Ocean carrier); IBM (technology and service provider) and EPCGlobal (standard provider).

4.2. Value assessment

As elicited in Figure 2, first we identify the general goal areas of the living lab. *Goal areas* are areas where key goals of the Living Lab should be achieved. Based on interviews and workshops with stakeholders, we identified three generic goal areas that hold for Beer Living Lab, which are (1) security, (2) reduction of administrative burden; and (3) compliance (of trading businesses with trade-related regulations). Following, we develop the *value matrix* for each stakeholder (Figure 3). The idea of the value matrix is to provide a basic framework with generic goal areas and value categories. For each goal we provide a set of KPAs (Figure 3). As a next step, we define a set of specific KPIs for every KPA. In the Beer Living Lab a new trade procedure has been suggested that increases security and control in container-based international trade (and at the same time promotes other key customs visions). We can identify social value for the goal area ‘security’ when considering the Dutch Tax and Customs Administration as focal stakeholder. The KPA from where this kind of value emerges is ‘safety of international trade’. Safety is still very generic and therefore not measurable directly. The KPIs for this goal area could be defined as ‘controls per containers shipped’ or ‘number of detected smugglings’. While these KPIs would be valid for Dutch Tax and Customs (trading companies would use different KPIs for assessing their value of the Beer Living Lab, even if they want to measure their ‘safety’ outcome), the general goal area ‘safety of international trade’ may be valid for more stakeholders (from the private and public sectors).
Table 2. Value matrix for the Beer Living Lab

<table>
<thead>
<tr>
<th>Goal areas</th>
<th>Security</th>
<th>Reduction of administrative burden</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic</strong></td>
<td>Policy</td>
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<td>Governance</td>
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<td>Strategic position</td>
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<td>Fulfilling the organization</td>
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<td>Mission</td>
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<td></td>
<td>Public opinion</td>
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<tr>
<td><strong>Operational</strong></td>
<td>Productivity gains</td>
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<td>Service quality</td>
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<td></td>
<td>Improved infrastructure</td>
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<td>Convenient access</td>
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<td>Governance</td>
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<td>Compliance</td>
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<td><strong>Social</strong></td>
<td>Safety</td>
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<td>Health</td>
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<td></td>
<td>Environment</td>
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<td></td>
<td>Increased confidence in government</td>
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<td>Increased trust in government</td>
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<td></td>
<td>Employee satisfaction</td>
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<td><strong>Financial</strong></td>
<td>Cost savings</td>
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<td>Cost avoidance</td>
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<td>Budget increase</td>
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<td></td>
<td>Cost effectiveness</td>
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</table>

In reference to the value matrix, a set of questionnaires are developed for each stakeholder; the questionnaires include ranking of the KPAs and further detailed KPI calculations. To this end, we analyze and compare (AS-IS vs. TO-BE) the results and in the meantime communicate the results with stakeholders to reach a common understanding among all the parties. [Details are skipped in this paper].

5 Conclusion and future research

In this paper we propose an integrated value assessment framework for evaluating the e-government projects. The paper contributes to the academic literature of public sector IT investments by explaining the multidimensional nature of value for the e-government projects. More specifically, the proposed conceptual framework emphasizes the important concerns of multiple value dimensions (financial, social, political/strategic and operational) and multiple stakeholders for the e-government project valuation. Furthermore, we create a lightweight virtualization of the assessment
framework with ‘Value Cube’ and UML model based ‘step by step’ evaluation approach. The two artifacts are proven to be very effective and declarative during the interviews and workshops with stakeholders, which can create a vivid and communicative environment for the value assessment in practice.

There exist some limitations in the research: first, our framework is developed under the G2B context, though it manages to cover most of the aspects in this context, other concerns (e.g., G2G and G2C) may still be ignored; second, for the moment we do not have any specific guidelines for measuring KPIs, all of which currently depend on and are assessed by stakeholders themselves, which may create subjective evaluation bias. These limitations also indicate our future research directions. We will dig into these issues and wish to get solutions for them in the future.

**References**


II. Guidelines for Case Studies

Case studies have been developed using three main methods: semi-structured interviews, workshops, and one online survey. Besides these three methods, a syntegration process-based workshop has been used in order to collect data.

The table below categorizes the case studies presented in the publications along the used methods. The asterisk indicates the use of the syntegration process that includes semi-structured interviews as well as workshops.

In the following guidelines, all used methods are described along the three topics: introduction, diffusion, and value of e-customs system innovations.

<table>
<thead>
<tr>
<th>Table II.1. Topics related to used methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topics</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Introduction to e-customs</td>
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<tr>
<td></td>
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<tr>
<td>Diffusion of e-customs innovations</td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Value of e-customs</td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>
II.1. Semi-structured interviews and workshops

Semi-structured interviews and workshops have been used for the data collection in all three topics. The results are presented in the publications as outlined by Table II.1. In the following, what was asked and discussed with the stakeholders is shown.

General information
Scope: to acquire information about the participating organization.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Contact data</th>
<th>Role within the organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>Type of organization:</td>
<td>Business company</td>
</tr>
</tbody>
</table>

Introduction to e-customs
Scope: to understand how e-customs impact on the organization.

| Supply chain process in international trade | Stakeholders analysis | Supply chain process steps description |
| Description of customs and e-customs | Customs procedures description | Success factors for effective trade related to IT systems and e-customs systems |

Diffusion of e-customs innovations
Scope: to identify differences between old systems (paper-based or electronic) and a common e-customs solution.

| IT satisfaction | Comparison between old and new customs systems in regard to: | Interoperability | Security | Quality |
| Differences between a common standardized e-customs system and national e-customs solutions | Customs process execution (time, quality, and security) | Organization image | Organization employee satisfaction | Compliance to regulations |
Value of e-customs
Scope: to identify goal areas and key performance areas

| Analysis of potential benefits areas | • Strategic  
|                                      | • Operational  
|                                      | • Social  
|                                      | • Financial  
| Benefits of e-customs compared to old customs procedures | • Customs process execution (time, quality, and security)  
|                                                            | • Organization image  
|                                                            | • Organization employee satisfaction  
|                                                            | • Compliance to regulations |

For an accurate value analysis, after the identification of potential goal and key areas, workshops participants were interviewed in regards to more specific data. Categorization tables were developed for each organization in order to analyze each goal area along the value categories according to interviews results (see Tables II.2 and II.3). Private and public stakeholders were asked to give a rating and identify key performance indicators. The rating has been categorized as follows:

- very low = 0-25%;
- low = 25-50%;
- high = 50-75%;
- very high = 75-100%
<table>
<thead>
<tr>
<th>Value category</th>
<th>Key performance area</th>
<th>Question</th>
<th>Rating / KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational</strong></td>
<td>Fulfillment of safety regulations</td>
<td>How strong will the fulfillment of safety regulations be influenced by the introduction of a common e-customs system?</td>
<td></td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td></td>
<td>How much will the fulfillment of safety regulations reduce costs?</td>
<td></td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>Services quality</td>
<td>How much will quality of services improve?</td>
<td></td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Harmonization of different systems</td>
<td>How strong will data sharing be improved?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Services quality</td>
<td>How much will quality of services improve?</td>
<td></td>
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<tr>
<td></td>
<td>Improvement of data exchange</td>
<td>How much will data exchange improve?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Faster process cycle time</td>
<td>How much will process cycle time improve?</td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Less people involved for same work</td>
<td>How much will the number of people involved for the same work decrease?</td>
<td></td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Faster process cycle time</td>
<td>How much will process cycle cost decrease?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harmonization of different systems</td>
<td>How much will be development / maintenance costs reduced or increased?</td>
<td></td>
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<tr>
<td></td>
<td>Less people involved for same work</td>
<td>How much can costs be influenced by employees reduction?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improvement of data exchange</td>
<td>How much can costs be influenced by data exchange improvement?</td>
<td></td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>Harmonization of regulations and procedures (SW)</td>
<td>How strong will the harmonization be supported by SW?</td>
<td></td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td></td>
<td>How strong will costs be reduced?</td>
<td></td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>Communication between EU customs offices and business companies</td>
<td>How strong will communication between EU customs offices and business company improve their relationship?</td>
<td></td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Access to the information of EU customs offices</td>
<td>How strong will communication between EU customs offices and business companies improve?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information sharing between customs office and business company</td>
<td>How strong will the information sharing between customs office and business company improve?</td>
<td></td>
</tr>
</tbody>
</table>
Table II.3. Workshops guidelines – public sector

<table>
<thead>
<tr>
<th>Value category</th>
<th>Key performance areas</th>
<th>Question</th>
<th>Rating / KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>Transparency of EU</td>
<td>How much will gained transparency of EU trade make risk analysis be better?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>trade</td>
<td></td>
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<tr>
<td>Financial</td>
<td>Improvement of</td>
<td>How much will information quality improve?</td>
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<td></td>
<td>information quality</td>
<td></td>
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<tr>
<td></td>
<td>Single access point for</td>
<td>How much will single access point decrease VAT (no fraud) fraud?</td>
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<tr>
<td>Strategic</td>
<td>Services quality</td>
<td>How much will quality of services improve?</td>
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<tr>
<td></td>
<td>Harmonization of</td>
<td>How much will data sharing be improved?</td>
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<td></td>
<td>different systems</td>
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<td></td>
<td>Services quality</td>
<td>How much will quality of services improve?</td>
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<td></td>
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<tr>
<td></td>
<td>Improvement of data</td>
<td>How much will data exchange improve?</td>
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<td></td>
<td>exchange</td>
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<tr>
<td></td>
<td>Faster process cycle</td>
<td>How much will process cycle time improve?</td>
<td></td>
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<tr>
<td></td>
<td>time</td>
<td></td>
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<tr>
<td>Social</td>
<td>Less people involved</td>
<td>How much will the number of people for same work decrease?</td>
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<tr>
<td></td>
<td>for same work</td>
<td></td>
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<tr>
<td></td>
<td>Faster process cycle</td>
<td>How much will employees’ satisfaction time improve?</td>
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<tr>
<td></td>
<td>time</td>
<td></td>
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<tr>
<td></td>
<td>Services quality</td>
<td>How strong will your image improve?</td>
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<tr>
<td></td>
<td>Faster process cycle</td>
<td>How much will process cycle time improve?</td>
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<td>time</td>
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<td></td>
<td>Less people involved</td>
<td>How much are costs influenced by for same work reduction?</td>
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<td>for same work</td>
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<td>Improvement of data</td>
<td>How much are costs influenced by data exchange improvement?</td>
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<td></td>
<td>Strategic</td>
<td>How strong will the harmonization be supported by SW?</td>
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<td>Harmonization</td>
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<td>of regulations and</td>
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<td>procedures (SW)</td>
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<td></td>
<td>Operational</td>
<td>How much can irregularities decrease?</td>
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<td></td>
<td>Communication between</td>
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<td></td>
<td>EU customs offices</td>
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<tr>
<td></td>
<td>Collaboration between</td>
<td>How much will collaboration between EU customs offices improve their relationship?</td>
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<td></td>
<td>EU customs offices</td>
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<td></td>
<td>Information access to</td>
<td>How much will the access to information of other customs offices improve?</td>
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<td></td>
<td>other customs offices</td>
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<td></td>
<td>Communication and</td>
<td>How much will communication and collaboration between EU customs offices improve your belonging feeling as one customs office?</td>
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<tr>
<td></td>
<td>collaboration between</td>
<td></td>
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<td></td>
<td>EU customs offices</td>
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<td></td>
<td>New EU members states</td>
<td>How much will integration of new EU member states improve?</td>
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<tr>
<td></td>
<td>Social</td>
<td>Communication between EU customs offices how much will communication between EU customs offices reduce costs?</td>
<td></td>
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<tr>
<td></td>
<td>Information access to</td>
<td>How much will improved access of other customs offices information influence costs?</td>
<td></td>
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<td>other customs offices</td>
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</table>
II.2. Syntegration process

The syntegration process is a methodology introduced by Stafford Beer in 1994 (Beyond Dispute: The Invention of Team Syntegrity. Chichester, UK: John Wiley and Sons Ltd). The purpose of a syntegration is to enable the effective contribution of a wide variety of stakeholders to the discussion of an issue of major concern. This purpose has been kept as syntegration process has been used to exchange knowledge on barriers and facilitators in e-customs systems.

This particular workshop was conducted in June 2007 in the context of the ITAIDE project. It was carried out with non-homogenous stakeholder groups, i.e., representatives of the public and private sector, IT sector, and academy. (1) The public sector, i.e., customs and tax authorities, was involved from three EU member states (Finland, Denmark, and the Netherlands), represented by department heads and experts in functional and IT areas; functional areas included customs offices, tax administrations, and border security and control personnel. (2) The private sector was represented by personnel from one multinational dairy company whose products are sold in more than 100 countries. (3) The IT sector was represented by two software and technology providers who work on the development of standards for e-government, B2B, and B2G solutions. (4) Participants from four universities also took part to the workshop. The universities are situated in the Netherlands, Germany, Denmark, and Ireland.

The structure of the method is based on the structured methodology proposed by Phrontis Limited (www.phrontis.com): (1) number of participants, (2) time-scale, (3) process. In the following the methodology is described.

The ideal number of participants is 30. In the workshop the number of participants on the barriers’ part of the process and on the facilitators’ part was 16.

Usually the participants meet from three to five days. In this case the time-scale was three hours for each part with a short introduction of 15 minutes.

The process is divided in six sub-steps.

*Trigger Question.* A trigger question was used to stimulate thinking around the key issue question. The trigger question was: ‘What are barriers and facilitators for adoption of e-customs systems?’

*Statements of Importance.* Participants were invited to contribute individually giving opinions or ideas that they felt were relevant to the trigger question. Each
participant was asked to write a maximum of three concepts or keywords on two post-it stickers. Out of this were produced 62 and 64 ‘statements of importance’ on barriers and facilitators, respectively.

**Aggregated Statements of Importance.** Based on the statements of importance, the participants had to cluster and refine the wording of the statements in free forming groups. The identified statements were grouped in 12 themes for both barriers and facilitators.

**Workshop Agenda Formation and Topic Allocation.** The consolidated statements of importance became the conference agenda topics. Participants were allocated as proponents and critics before the syntegration started: each member was a proponent in one theme and critic in another. The rest were either reporters or observers. For each session two reporters were also appointed.

**Outcome Resolve Meetings.** Each participant was a member of two teams and a critic of two other teams. Each team addressed one of the 12 topics. The teams discussed their topics over three iterative team meetings. The discussions were moderated by facilitators, whose role was to guide and safeguard the process, help participants maintain their roles, and document the flow of ideas on flip chart sheets that were then posted around the walls of the room in which the team met.

**Workshop Output.** The final summarizing statements became an integrated set of policy recommendations which addressed the question. The minutes from the meetings were digitalized thanks to the work done by the reporters.
II.3. Online survey

An online survey was used in order to explore how the Swiss electronic customs system, e-dec Export, is perceived by small and medium-sized Swiss business companies. The online survey was conducted in October 2008. The results of the survey are presented in Publication 4.2.

*n.s. = not specified

General questions

| To which sector does your organization belong? | • Industry  
| • Logistics  
| • Government  
| • n.s. |
| How many employees does your organization have? | • 0-50  
| • 50-250  
| • >250 |

Export related questions

| Do you export from Switzerland? | • Yes  
| • No |
| Where do you export? | • EU  
| • Asia  
| • Africa  
| • USA  
| • Australia |
| How many export declarations do you do daily? | • <100  
| • 100-500  
| • 500-1000  
| • >1000 |

E-dec Export general questions

| Did you already implement e-dec Export? | • Yes  
| • No |
| If ‘no’, will you implement e-dec Export in 2009? | • Yes  
| • No |
| If ‘no’, why? | Open question |
| Will you delegate a logistics provider for the customs process? | • Yes  
| • No  
| • n.s. |
## E-dec Export specific questions

How will following factors change after e-dec Export implementation?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Will increase</th>
<th>Will decrease</th>
<th>Will not change</th>
<th>n.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time needed to complete export declarations</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Number of daily export declarations</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Price of an export declaration</td>
<td></td>
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<td></td>
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<tr>
<td>Waiting time at the borders</td>
<td></td>
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<tr>
<td>Control of the customs office</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Number of entry errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Transparency between SMEs and customs office</td>
<td></td>
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<tr>
<td>Control of the goods along the supply chain</td>
<td></td>
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</tbody>
</table>

According to the Swiss customs office, e-dec Export will bring several advantages. What do you think?

<table>
<thead>
<tr>
<th>Factor</th>
<th>It is an advantage</th>
<th>It has no influence</th>
<th>n.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic notice of VAT assessment</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No media breaks</td>
<td></td>
<td></td>
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<tr>
<td>Data and communication standardization</td>
<td></td>
<td></td>
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<tr>
<td>Declaration possible 24 hours a day</td>
<td></td>
<td></td>
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<tr>
<td>Unique data collection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export certificate also used for internal controls</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>More transparent export process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination of the monthly export list</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## III. Contact Data of the Publications’ Co-Authors

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Address</th>
<th>Telephone</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roman Boutellier</td>
<td>ETH Zurich, Chair of Technology and Innovation Management</td>
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