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Coordinated Border Management through Digital Trade Infrastructures and Trans-national Government Cooperation: The FloraHolland case

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Abstract. Digital infrastructures (DI) that support information exchange related to international trade processes (here referred to as Digital Trade Infrastructures (DTI)) have been seen as an instrument to help address the trade facilitation and security challenges. Data pipelines can be seen as an example of a DTI. Data pipelines are IT innovations that enable the timely provision of data captured at the source from different information systems available in the supply chain. Using the pipeline companies can share information with authorities and enjoy trade facilitation in return. The benefits of such data pipelines have been showcased in demonstrator settings. However, outside the controlled environment of demonstrator installations, the adoption and growth of these DTIs has been limited. The benefits based on purely implementing the data pipeline are limited. Combining data pipeline capability with Coordinated Border Management (CBM) has potential to articulate more clear benefits for stakeholders and push further investments and wider adoption. In this paper based on the FloraHolland trade lane related to exporting flowers from Kenya to the Netherlands we discuss a data pipeline/ CBM innovation. Through the conceptual lens of DI (examining architectural, process and governance dimensions) we demonstrate the potential benefits of data pipeline/ CBM innovation and the complex alignment processes between business and government actors needed for the further adoption. From a theoretical point of view we enhance the understanding regarding the governance dimension of such data pipeline/ CBM innovations by identifying four type of alignments processes involving businesses and government actors nationally and internationally. As such the paper contributes to the body of research on DI and more specifically DTI. Form a point of view of practice, the insights from our analysis can be used to better understand other data pipeline/ CBM innovation alignment processes in other domains as well.

Keywords: Digital Trade Infrastructures, Data pipelines, Coordinated Border Management, Cost-benefit, International Government Collaboration, Governance

1 Introduction

In the international trade domain digital infrastructures, here referred to as Digital Trade Infrastructures (DTI), have been seen as an instrument to help address the trade

facilitation and security challenges. It has been argued that DTI can transcends the current information silos and can enable more efficient risk assessment, supply chain optimization and cost savings [1,14, 20]. Data pipelines can be seen as an example of DTI, where a data pipeline can be defined as "an IT innovation to enable capturing data at the source" [11, p.14]. A data pipeline can enable the timely provision of data captured at the source from different information systems available in the supply chain [8,11]. Solutions like the data pipeline rely on re-use of business data by multiple government authorities involved in cross-border inspections of goods for government control purposes. The benefits of DTI such as the data pipeline have been showcased in demonstrator settings in various EU projects including ITAIDE, CASSANDRA and now in CORE. However, beyond the pilots in these projects, the adoption and growth of these DTIs have been limited. One factor that makes DTI initiatives come to a halt relates to lack of financing and fair cost-benefit distribution among the DTI partners [12]. Significant investments need to be made for scaling up from a demonstrator to a real-life setting and that requires much sharper articulation of the benefits and the value propositions. In order to secure commitment from parties to invest and further adopt these DTI a better articulation of the value proposition for the parties involved in necessary.

As there are substantial risks involved in international trade activities, border management and safety inspections by the authorities have increased in complexity and can cause delays, extra cost, and negatively impact the competitiveness of supply chains [9]. An aggravating factor is the lack of coordination among the different inspection agencies at the border such as Customs, and National Plant Protection Organizations. Coordinated Border Management (CBM) aims to improve this inter-government agency collaboration and thus to achieve greater efficiency. According to the World Customs Organization, the term Coordinated Border Management (CBM) refers to a coordinated approach by border control agencies, both domestic and international, in the context of seeking greater efficiencies over managing trade and travel flows, while maintaining a balance with compliance requirements [21]. CBM according to the EU (Integrated Border Management) is referred to as national and international coordination and cooperation among all the relevant authorities and agencies involved in border security and trade facilitation to establish effective, efficient and integrated border management systems, in order to reach the objective of open, but well controlled and secure borders [5]. Both these definitions distinguish between national collaboration (collaboration among number of authorities in the same country) and international collaborations (i.e. collaborations between authorities of different countries) transcending national borders. Developing Coordinated Border Management solutions holds potential to reduce delays and reduce costs. Developing data pipeline innovation to achieve Coordinated Border Management solutions will potentially reduce inspection delays and costs at the border even further. This would it its turn enable a sharper articulation of the value of proposition for the data pipeline solutions.

In this paper, we conduct an in-depth interpretative case study of the trade lane for flower import from Kenya to Royal FloraHolland in the Netherlands. Building on the Digital Infrastructure literature we examine the FloraHolland innovation efforts related to data pipeline/ CBM innovation. By doing so, we demonstrate the potential gains, as well as the complex governance and alignment processes between business

and government actors (nationally and internationally) needed to develop such innovations. The remaining part of this paper is structured as follows: In Section Two we introduce the problem context and the theoretical background. In Section Three we discuss our interpretative case methodology. The case analysis of the FloraHolland case is presented in Section Four. We end the paper with conclusions and recommendations.

2 Theoretical framework: Digital Infrastructures and Digital Trade Infrastructures

In order to provide a better understanding of the context complexity, we start with a brief explanation of the import procedure of flowers From Kenya to the Netherlands (see Figure 1 below).

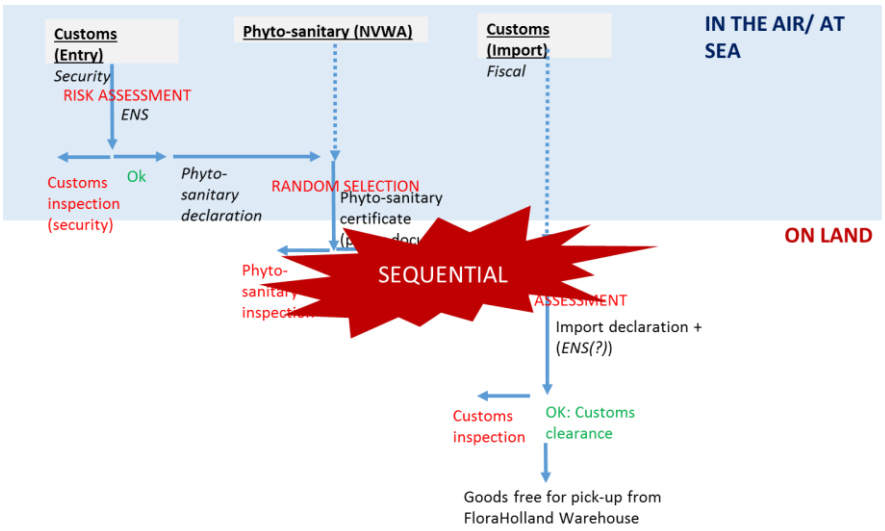

Fig. 1. Sequential procedure, most of the risk analysis done on land

The essential part of an inspection procedure is to conduct a risk assessment of goods to identify whether or not there is a potential risk. When flowers are imported from Kenya to the Netherlands there are three risk assessment processes (see Figure 1), namely: *(1) safety and security risk assessment by Customs at entry in the EU*, *(2) phytosanitary product safety risk assessment by the National Plant Protection Organization (NVWA),* and *(3) a Customs import risk analysis* related to the fiscal aspect and related import duties. While we will not go in detail in the documents exchanged, there are a number of issues with the current procedure. First, this is a sequential process, where one assessment cannot start before the other is finished. This sequential dependency of various border inspections is a typical example of lack of CBM. Second, most of the procedures take place once the goods are on the ground.

Authorities can also ask for additional information to perform their risk analysis which adds extra delays and for businesses that translates in extra costs. In the FloraHolland pilot as part of the CORE project, FloraHolland together with the Dutch authorities designed a new procedure called *Clearance in the Sky/ at Sea*. This new procedure shows how to develop a data pipeline that contributes to achieve CBM and is considered very beneficial for both the authorities and for the horticultural supply chain. For this procedure to be implemented however, complex alignment processes need to take place between business, the customs and phytosanitary authorities both nationally and internationally. While the further details of these alignment processes will be discussed in the Case analysis section, this brief example already gives an idea of the context and complexities involved.

Conceptually the data pipeline/CBM innovation can be seen in the context of Digital Infrastructures (DI) and more specifically Digital Trade Infrastructures (DTI). DI can be seen as a System-of-Systems [6, 7] that transcends organizational and systems domains, reducing information fragmentation. DI that support information exchange related to international trade processes are referred here as Digital Trade Infrastructures. The DI literature identifies a variety of challenges faced by the DI development. As digital infrastructures span among diverse set of stakeholders and develop over time, challenges include the inertia of the installed base [19], coordination challenges among the stakeholders [3], conflicts and struggles for influence and control [17]. DI literature also include critique of existing traditional systems development methods to deal with the complexity of digital infrastructures [4, 13, 18] and it has been suggested that different approaches are needed for DI development [6].

When thinking of development approaches there are two specific aspects that set DTI apart from other Dis such as e.g. infrastructures for the healthcare domain that are solely on a national level. The first aspect refers to the international dimension of international trade, where goods transcend national borders and regulatory regimes [20, 14]. The importance of the international dimension has been also highlighted in a stream of research focusing on Transnational Information Systems [2] and can be traced to other domains such as banking as well. The second aspect that is very specific for DTI is the high level of involvement of authorities both on the import and the export side in the business-to-business supply chain processes [8], which also leads to high influence on the system development efforts [15]. It is these two aspects in combination that distinguish DTI from other DI and that needs to be reflected in development approaches targeted at DTI. Identifying these specifics and based on the DI literature Rukanova et al. [16] propose a DTI framework to study DTI by looking at three dimensions, *(1) architecture*, *(2) process*, and *(3) governance*. For simplicity we will not discuss the full DTI framework but what is important to mention is that the concepts of *levels,* and *actor* as part of the architectural dimension of the DTI framework can be used to capture the distinguishing characteristics of DTI. More specifically the *levels* can be used to capture the increasing complexity related to legislation and alignment needed when dealing with trade relationships that transcend the national context towards the international and global level. The *actors* will capture the interrelationships between the business and government actors. To sum up, in this paper we will use the high-level dimensions of the DTI framework [16], namely *(1)*

architecture, *(2) process* and *(3) governance* to steer our analysis of the data pipeline/ CBM innovations of the FloraHolland pilot.

3 Method

In this study, we build on the interpretative and contextualist tradition that is well-established in Information Systems (IS) research [10]. The focus of this study is the trade lane for importing flowers from Kenya to FloraHolland in the Netherlands via Sea and Air by the support of data pipeline, which is part of the EU- funded research project CORE. FloraHolland, as a growers' cooperative, represents the growers and facilitates them in their trade. This trade lane further zooms in on how data pipeline can enable CBM. The data was collected as part of the FloraHolland pilot of the CORE project. The authors have been actively involved in the project in different roles. The data has been collected from the start of the project in May 2014 till January 2017. Data collection included participating in meetings, workshops including FloraHolland, Dutch Customs and the Dutch Plant Protection Organization, and document analysis. Two visits to Kenya took place, the second one in December 2016. In the second visit a delegation from the FloraHolland pilot including also the Dutch Customs and The Dutch Plant Protection Organization (NVWA) visited among others the Kenyan counterpart authorities to gain understanding about export procedures in Kenya. Next to that, via the participation in another pilot also including Kenyan authorities the authors were following closely the developments related to further alignment of the authorities on the Kenyan side driven by TRADEMARK, an international development organization that supports the development of the East Africa Customs Union. Regarding the data analysis, as discussed earlier we used the three high-level dimensions from the DTI framework [16], i.e. *(1) architectural* (including levels and actors), *(2) process*, and *(3) governance* as a conceptual lens. We further detailed and elaborate these dimensions based on the case findings to capture the specifics related to data pipeline/ CBM innovations.

4 Case analysis

4.1 Architecture

The first dimension of the DTI framework [16] is the *architectural dimension*, which includes analysis of *actors*, and *levels*. The FloraHolland initiative focusses on the import of Flowers from Kenya to The Netherlands. In terms of *actors* both business and government actors are involved on both sides.

Key business actors on the Kenyan side are the Growers, the Freight Forwarder responsible for arranging transport and necessary paper documents needed for export. On the Dutch side the key business actors are the Freight Forwarder, and FloraHolland. FloraHolland either prepares the flowers for auctioning or delivers them to the Importer. The (sea/ air) carrier is responsible for transporting the flowers between Kenya and The Netherlands and for preparing Entry Summary Declarations (ENS) required before entering the EU. The process steps are visualized below. The key government actors are as follows: Kenyan Customs Administration (KRA),

Kenyan Plant Protection Organization (KEPHIS), Dutch Customs Administration (DCA) and the Dutch Plant Protection Organization (NVWA). In the development of the DTI for the FloraHolland pilot, two intermediary actors are of key importance. The first one is the data pipeline provider (DESCARTES) for sharing supply chain information such as invoices and packing lists between the business parties. The second one is the IT provider Intrasoft which develops a customs dashboard, which is an interface linked to the business data pipelines that can be used by the Dutch Authorities. Through this interface Dutch Customs can access additional business information (such as pro-forma invoice) and reuse it for risk assessment purposes such as cross-validation of information that appears in customs declarations.

The *levels* (national, international, and global) are used to define the scope of the initiative, as well as to trace legal and regularly developments (see Figure 2).

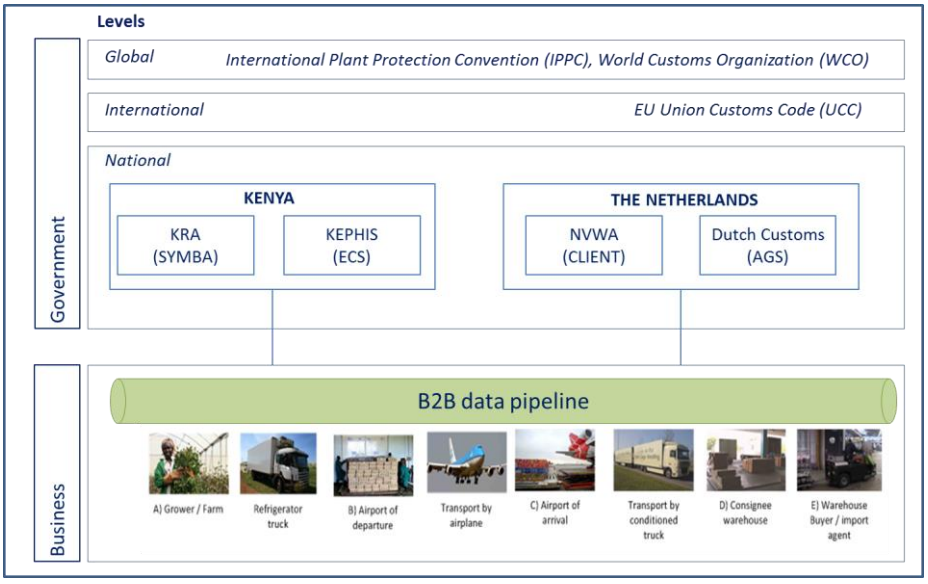

Fig. 2. FloraHolland data pipeline/ CBM: Architectural dimension

The scope of the FloraHolland initiative is international, as it focusses on DTI in combination with CBM that can support trade processes between two countries, namely Kenya and the Netherlands. Due to the involvement of the Customs and The Plant Protection Organizations, there are two important legislative and regulatory developments which have an influence on the DTI development. The first one is the International Plant Protection Convention (IPPC), which sets the international rules for national Plant Protection authorities. One important development related to that is the legal requirement set for the EU for having a paper Phytosanitary certificate present during the physical inspection, which is a major barrier to achieving CBM solution that utilize the possibilities of digital documents to a full potential. The discussions around the possible use of electronic Phytosanitary certificates is very important for data pipeline/ CBM innovation to achieve further simplifications. On

the Customs side, the new Union Customs Code (UCC) that came in force in 2016 for the European Union is a very important legal framework, as it enables CBM solutions such as clearance at sky (see also the process section) to become possible.

4.2 Process

The second element of the DTI Framework [16] focusses on the process dimension. In Section 2 we discussed the inefficiency of the sequential AS-IS procedure. Below we present the new procedure *Clearance in the Sky* that was developed in the FloraHolland pilot (see Figure 3 below).

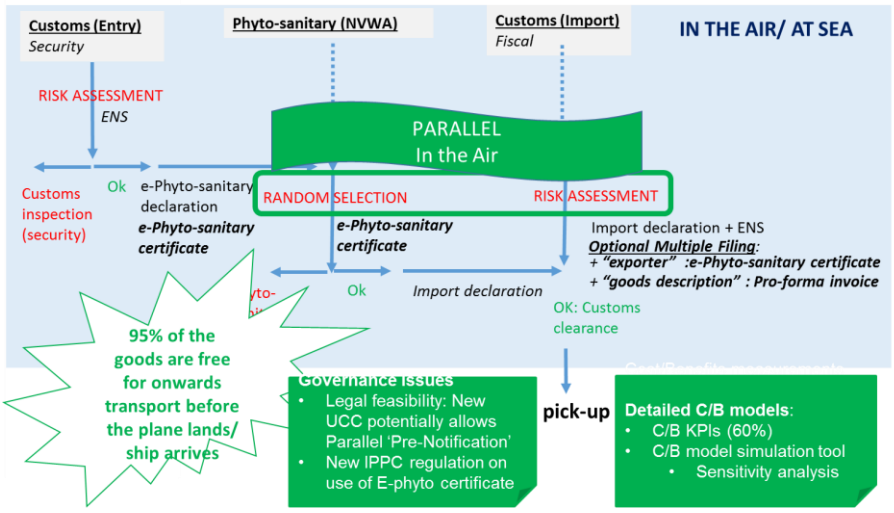

Fig.3. TO-BE Clearance in the Sky procedure based on data pipeline and CBM

This procedure builds on the data pipeline which enables sharing information in advance with the authorities (also known as Optional Multiple Filing). Importers are obliged to send two mandatory documents to Customs, namely Import Declaration, and Entry Summary Declaration (ENS). To cross-validate the data accuracy of these mandatory documents, Customs would like to collect two additional documents from other parties in the supply chain; namely the pro-forma invoice from the grower of the flowers, which contains the most accurate goods description and the Phytosanitary certificate from KEPHIS which contains information about the real exporter. In such a way, by getting these documents via the pipeline, Customs does not need to ask and wait for additional information but can have access to additional cross-validation information earlier through the data pipeline (in Figure 3 above the documents highlighted in bold/ italic are shared via the data pipeline). The import process could be also further optimized by moving from a sequential procedure, most of which takes place on land to a parallel procedure, where all the risk assessments related to the three procedures described above are done in parallel in the air/ at sea. This redesign also becomes possible due to the new EU Customs legislation set in the new Union

Customs Code[1]. This means that the importer can be notified in advance whether the goods will be selected for inspection for one of the three procedures ((1) Customs security, (2) Phytosanitary, or (3) Customs import) already before the plane lands. As in the current situation only about 5% of all the FloraHolland flowers undergo any kind of inspection but all the goods need to go through the current risk assessment process, the new procedure allows for 95% of the flowers to proceed further immediately after the plain arrives. For the other 5 % the new procedure allows for better planning of inspections and related efficiency gains and cost savings.

4.3 Governance

Implementing the new procedure requires complex alignment processes, which are examined through the Governance dimension [16]. Figure 4 outlines four types of key allignment processes needed for the data pipeline/ CBM innovation.that we identify and describe based on the case.

Alignment type 1. Business-to-Business (B2B) alignment of data sharing between all parties in the supply chain to enable the data pipeline (arrow 1).

Alignment type 2: Government-to-Government (G2G) alignment between different authorities on a national level (at import (2A) and export (2B)).

Alignment type 3: Government-to-Governmant (G2G) alignment between the same type of authorities on international level (Customs (3A) and Plant Protection (3B)).

Alignment type 4. Business-to-Government allignment (B2G) (Import side (4A) and export side(4B)).

Below we provide further details about how each of these alignment processes took place in the context of the FloraHolland pilot. The first alignment that was essential in the FloraHoland pilot was the B2B alignment (Alignment type 1, Arrow 1). In the FloraHoland sea trade lane, where FloraHolland is in control of large parts of the chain, aligning the parties was relatively easy. In the air trade lane it took more efforts to achieve such an alignment and commit parties to join. However, due to the long business relationship this alignment was successful. A data pipeline was built and piloted in both trade lanes.

Once the data pipeline was available, the key question was whether data from this pipeline could be reused for government control purposes. Therefore, the second key alignment process started, namely B2G alignment (Alignment type 4, Arrow 4A). As part of the pilot FloraHolland initiated a number of workshops to discuss with the Dutch Authorities (NVWA and Customs) which data they would need in advance. Two elements. i.e. information about the goods description and information about the real seller are crucial for risk assessment. Having that in mind during the FloraHolland pilot an inventory was made of what information do businesses have in the data pipeline and what information they need to provide to other agencies.

[1] While the full vision of Clearance in the Sky is to have full pre-clearance, for the full scenario legal changes are needed. However, the new UCC allows for prior declaration (i.e. import declaration to be submitted earlier), prior notification (in case of inspection decision), and prior verification (i.e. that the customs officer can ask for additional information (and this can be made available via the pipeline)). As such, the businesses can be notified about the outcome of the assessment (for logistics planning), while the administrative procedure would still need to be finalized independently from the logistics flows.

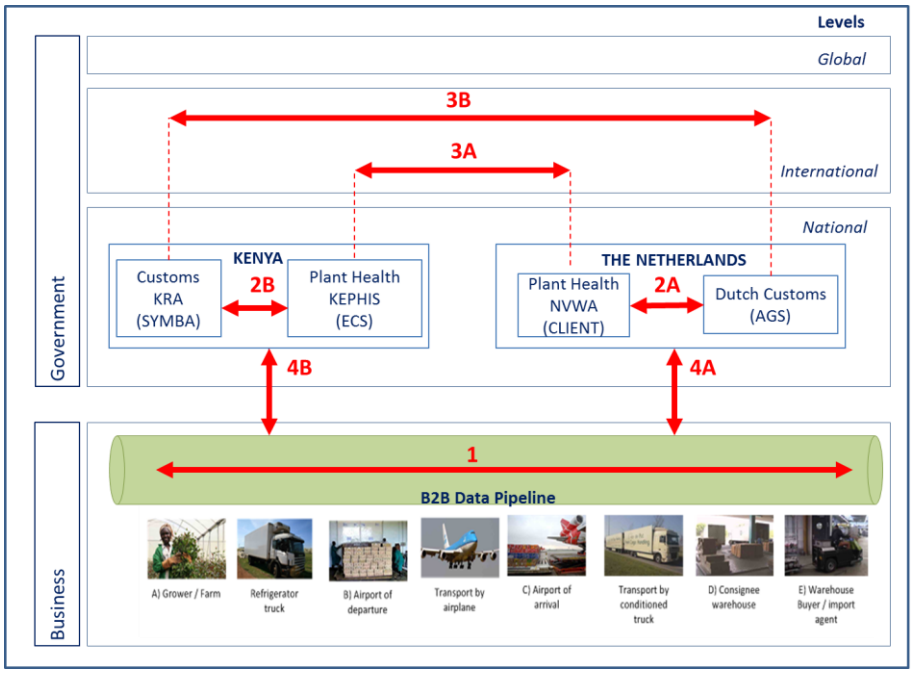

Fig. 4. Allignment processes related data pipeline and CBM

By following that process the pro-forma invoice (a business document containing detailed goods description of what was actually shipped that can be made available to Customs via the data pipeline) and the Phytosanitary certificate (a document that provides information about the real seller and the real buyer of the goods) were identified as two documents which could be reused for improving Customs risk assessment processes. There were benefits through this solution especially for speeding up the last step for the import process (i.e. the import clearance), because the more accurate the data about imported goods is, the more Customs at import could de-risk the goods and then they do not need to inspect the goods. Implementation of this concept was also legally possible under the new Union Customs Code (UCC) of the EU. The FloraHolland pilot participants however wanted to look further than that. In a series of workshop, the concept of Clearance in the Sky/ at Sea was developed. But the implementation of this concept required further alignment between the two Dutch authorities, namely Customs and NVWA (Alignment type 2, Arrow 2A). The participants of Dutch Customs and NVWA also collaborated in developing the Clearance in the Air scenario, which would allow for the two agencies to perform the risk analysis in parallel and in the air rather than after the goods have arrived at the airport. As part of the further alignment Dutch Customs and NVWA needed to check the legal feasibility and this seemed possible in the new UCC. Dutch Customs was very interested to pilot in the CORE project the new “pre-declaration, pre-notification, and pre-verification” clauses of the UCC; i.e. that the risk assessment can be done by Customs before goods arrive at the border, and businesses could also be notified of

the results of the risk analysis whether their goods are selected for physical inspection before their goods have arrived. While the goods still needed to go through administrative customs procedures, the simplification for the physical flow of the goods was significant. This efficiency gain implies lower operational costs for the logistics service provider (LSP), and hence lower costs for the seller and/or buyer that pays the LSP for its transport services. The realization of the full benefits of the clearance in the sky scenario also depended on further collaboration with the Kenyan side, as ideally Dutch Customs wants to reuse the electronic phytosanitary certificate issued by Kephis. As a result, alignment Type 3 started to take place between NVWA and KEPHIS (Arrow 3A) to discuss the possibility to exchanging ePhyto certificates.

Historically there has been collaborations between NVWA and KEPHIS when developing their electronic declaration systems. There were even pilot projects parallel to the FloraHolland pilot for exchanging ePhyto certificates between the systems of KEPHIS and NVWA. For the FloraHolland pilot it was very interesting to link the ePhyto certificate exchange to the data pipeline. The direct link between the systems of KEPHIS and NVWA would allow for the ePhyto certificate to be exchanged directly via the G2G channels, assuring even higher data quality, compared to the alternative version when a pdf document issued by KEPHIS is shared via the commercial parties in the data pipeline with Dutch authorities. In December 2016 a delegation of the FloraHolland pilot including representatives of FloraHolland, Dutch Customs, NVWA visited Kenyan Customs (KRA) and KEPHIS to discuss the clearance in the sky scenario and align further collaboration related to the data pipeline/ CBM innovation and more specifically the possibility for including ePhyto in the pilot. Next to that, in the context of the FloraHolland pilot discussions were started about further collaboration also between Dutch and Kenyan Customs (Alignment type 3, Arrow 3B). While historically there has been less collaborations between the two Customs administrations, there is an interest for closer collaboration between the two Customs administrations due to the data pipeline developments. By collaborating closely Dutch Customs can better understand how the Kenyan Customs is performing the controls during export of the flowers, and if the control measures are strict on the export side, Dutch customs may be able to rely on these controls and simplify the checks on the import side.

The alignments discuss above are essential for proceeding further with piloting with the Clearance in the Air scenario. This scenario concerns combining data pipeline capabilities with CBM to realize benefits on the Import side. Further potential for exploring the possibilities of additional procedure simplification lies on the Export side. This relies on further alignment between the Kenyan Customs and KEPHIS (Alignment type 2, arrow 2B), as well as B2G collaboration building on the data pipeline capabilities on the Kenyan side (Alignment type 4, Arrow 4B). These latter two alignments are the least developed in the FloraHolland pilot but there are intentions to develop these further. There is willingness for further collaboration between KRA and KEPHIS. In the context of the FloraHolland pilot, further contacts and alignments will be maintained and regular visits are envisaged to explore further possibilities for collaboration between the Kenyan and the Dutch authorities and possibilities offered by the data pipeline. In addition, the Kenyan authorities are also part of another alignment and mobilization effort driven by TRADEMARK. Also in these other mobilization efforts, the data pipeline in combination with CBM is the

focus but more from the point of view of the exporting country. This link (4B) will be developed in the future, these efforts are likely to elicit additional benefits form combining the data pipeline and CBM.

5 Discussion and Conclusions

How to ensure safety and security while at the same time reducing the administrative burden has been a challenge for businesses and government for almost two decades. By looking at the FloraHolland pilot and through the conceptual lens of DI (looking at (1) architectural, (2) process, and (3) governance dimensions) we examine the potential benefits of data pipeline/ CBM innovation. From a theoretical point of view we also enhance our understanding regarding the governance dimension of such data pipeline/ CBM innovations by identifying and illustrating four type of alignments processes needed for supporting data pipeline/ CBM innovation involving businesses and governments nationally and internationally. As such we contribute to the body of research on DI and more specifically DTI. This study is limited to a trade lane involving The Netherlands and Kenya representing EU and East Africa respectively. Further research can explore the applicability of our findings to trade lanes involving other countries or regions. Regarding the practical contribution: In many cases for various reasons such as supply chain efficiency, response to market demands for visibility regarding fair trade or environmental concerns businesses are investing heavily in IT systems to achieve end-to-end visibility. On the government side, different authorities have already been investing or are in the process of developing IT systems to control businesses. For realizing further value of these systems the art is to identify the important information exchanges and identify the alignment processes that need to be put in place to realize the potential gains. Due to the high level of complexity, identifying the links and the alignment processes needed may be a very lengthy process. The four alignment types that we identify allows us to understand that complexity. They can be used as an analytical lens to identify what parts of the data pipeline and government systems are already available, identify existing alignments and collaborative relationships among agencies on which the data pipeline/ CBM solution can rely on. This would allow to a more efficient process of identifying and realizing the benefits of data pipeline/ CBM solutions.

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