

Master Thesis

The Trade and Compliance Costs Model in the International Supply Chain



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The Trade and Compliance Costs Model in the International Supply Chain

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Cover photo: Workers load a container on a truck at a port,
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Delft, August 2017
Tuty Arsyida

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Management Summary

Research Background

Trade costs for the international supply chain are enormous, even in the absence of formal border barriers. In fact, the costs involved in moving a container physically are less than half the costs of managing the information about the transport activity. Thus, the physical infrastructure in international trade is fairly efficient, but that is not the case for the information infrastructure.

In addressing the complexity of the border activities, both public and private organizations are interested in making the compliance process more manageable and less costly, while still achieving the same level of security and safety. For the government, a well-managed border activity not only improves the revenue but also promotes the ports and increases their competitiveness. Based on the empirical finding, a 1% reduction in the transactional cost in relation to the border compliance process is worth \$43 billion. Therefore, it is necessary for all stakeholders, both private and public organizations, to support an effective and efficient border-related compliance process, which can be done through the IT innovation of the compliance process.

In this thesis, we use one example of such an IT innovation, namely the *data pipeline*, which is a kind of worldwide internet for logistics that can be used to exchange data across the international supply chain. For this purpose, we use the example of the Global Trade Digitalization (GTD) blockchain solution. GTD is a cloud platform that is focused on exchanging the event information and the (URL) links to documents securely across the multiple stakeholders in the supply chain, rather than the physical documents themselves. Hence, it can replace the current complex one-to-one messaging.

However, the implementation of any IT innovations in the trade facilitation, like the GTD, to facilitate the trade might be hampered if we cannot measure its benefit in reducing the costs and inefficiencies. A costs model that explains the actual trade and compliance costs involved in the international trade is required. Once the costs are made explicit, they can be used as a starting point to evaluate what costs can potentially be reduced by the proposed IT solution, and this can serve as a basis to reason about the proposed solutions and articulate more clearly the potential benefits it can bring.

Articulating trade costs has already been a focus of earlier research. More than 3 million studies have discussed 'trade costs', indicating how important this research is in general. Unfortunately, most of these studies examined the trade costs only as the domain research, like the study of how to improve productivity in international trade, or competition in international trade, etc., and did not discuss the trade cost composition as a conceptual study.

One of the most cited literature that argued the general idea in classifying the trade costs component is the trade costs study by Anderson and van Wincoop (2004). Their study offers a general idea on how to divide the trade costs based on the primary activity involved in international trade. They argued that the trade costs are comprised of three components; the transportation costs, border-related compliance costs, and the profit margin taken by retailer/wholesaler. However, their study viewed the costs at a macro-economic level; hence, they were not broken down into the constituent components that become crucial when individual companies want to assess a particular business process. They also did not explain in detail the cost structure in the border-related barrier that partly involves the formal policy barrier. Considering how huge the compliance costs are as the formal policy barrier, a detailed explanation of the customs compliance costs is needed to counter the limitation of the study by Anderson and van Wincoop.

Regarding this need, unfortunately, only a few trade cost model studies have been conducted at the level of an individual company. Such studies are necessary to assess a company's specific costs of compliance in their international supply chains, and how the company could benefit from an IT-enabled trade facilitation to reduce these costs. As a result, Grainger's articles on compliance cost models at the company level that can be decomposed to a business process level are cited (e.g. Grainger, 2011, 2013,

2014a/b/c). Grainger classified the compliance costs as the total of initial set-up costs, transactional costs, inspection costs, and post border costs. He then decomposed them into more detailed cost components. However, his studies are not sufficient as customs-related compliance costs are only one of the many aspects in existing trade cost models, such as the well-known trade costs model of Anderson and van Wincoop. Moreover, the Grainger's studies only focus on the compliance costs based on empirical findings for a specific commodity (meat imports) in a particular country (the UK).

To sum up, the Anderson and van Wincoop study does not go into the details of the compliance costs; the Grainger studies do, but do not cover the other expenses mentioned by Anderson and van Wincoop, as well as other studies that give only a fragmented view of trade and compliance costs. With such a gap in the literature, we argue that it is essential to actively conduct further research into what company-level trade and compliance costs are.

The Research Objective and Question

The objective of this study was to address the knowledge gap of the existing studies in the area of trade and compliance costs at an individual company level. By formulating this objective, it was expected that this research would lead to a viable artefact that could be applied as a framework to evaluate the trade and compliance costs explicitly and to measure the potential benefits and value proposition of IT-enabled trade facilitation solutions for particular actors in the chain. Hence, the research would support the further adoption and upscaling of IT-enabled trade facilitation innovations, not limited to the GTD as the future global data pipeline.

Based on research background and objective, the main research question was formulated as follows:

“What are the costs involved in the trade and compliance procedure of an international supply chain, taking into account the trade costs study by Anderson and van Wincoop, and the compliance costs study by Grainger? And to demonstrate how can these costs be applied as a practical tool/model to measure the trade and compliance costs at the company level, and make them explicit?”

Research Methodology and Deliverables

In order to answer the research question, a Design Science Research approach was adopted. The approach suggested a three-cycle process before introducing a viable artefact: a rigor cycle, a relevance cycle, and a design cycle. First, the rigor cycle relates the IS design to the knowledge base. Second, the relevance cycle describes the IS design's application to the environment in which it will be applied and evaluated. Third, the design cycle as the main activities in the IS research that consists of building and evaluating the artefact until a satisfactory design is achieved based on the rigor and relevance cycles.

In the design cycle, we developed an initial Company-Level Compliance Cost (CLCC) model as the artefact by consolidating insights from the models of Anderson and van Wincoop (2004), the Grainger studies, and other studies on trade and compliance costs. The CLCC model was evaluated in the case study that combined several data collection methods, like the archival analysis as the first stage evaluation, then an observation and semi-structured interviews as the second stage evaluation. Specifically, the archival analysis method was applied to the CORE research project in analyzing the cost data that were collected in relation to three perishable shipments from Kenya to the Netherlands. Later, semi-structured interviews with the practitioners were carried out to gather the costs information and analyze their past case incidents. Based on the finding of these two stages, we demonstrated how the CLCC model could be applied, and we further revised and extended the initial CLCC model to a revised CLCC model based on the analysis findings.

The findings show that the costs involved in international trade are very extensive, but can be divided into three general categories based on the activity area:

1. **Transportation costs.** These cover the logistic moves from the manufacturer in the origin country to the point of consumption in the destination country. They are divided into direct and indirect transportation costs. These costs cover inland domestic transport and the international sea freight.

2. **Border-related barrier costs.** These consist of customs compliance costs for export and import, language barrier, currency barrier, information barrier, and security barrier. The customs compliance costs or the policy barriers for export and import are divided into: direct and indirect initial set-up and approval (authorization) costs, direct and indirect transactional costs, direct and indirect inspection costs, and post clearance costs.
3. **Retail and wholesale margin.** This cost was not examined in detail in this research.

Each cost component above was cascaded into more detail cost compositions and mapped in an explicit model. At the end of the study, an artefact of *a final CLCC model was introduced and presented visually* as a tool for organizations to make the trade and compliance costs explicit. It is useful for interested stakeholders to measure their costs because the CLCC model can show what and where the costs are to get a better picture of the cost line. This is a critical step in the further articulation of potential benefits and value propositions of IT-enabled trade facilitation solutions for particular actors in the supply chain, which is crucial for the further adoption and upscaling of other IT-enabled trade facilitation innovations.

Contributions, Research Limitations, and Recommendations

The findings presented in this thesis have both academic and practical relevance.

Regarding the academic relevance:

- The research enriches the knowledge domain as it fills the knowledge gap of the limited trade costs studies at the level of an individual company.
- The study contributes to several bodies of knowledge. For example, the international supply chain and ICT innovation, specifically about trade facilitations.
- This research is a new foundation to support other research as part of the reverse loop of the rigor cycle in design science research.

Regarding their practical relevance:

- The model can be used by practitioners to measure the costs faced by their organization to do an international trade and make them explicit for their further internal need.
- The model can be used as a tool to make the benefit of IT-enabled trade facilitation explicit, which then supports such IT-enabled trade facilitation initiatives to foster the stakeholders' mobilization and engagement for the future adoption and financial support.

The present research also had several limitations. First, there were limited data available in the report of the CORE research project so that there were only three shipment cases that could be used for the evaluation process. Second, the discussion in the building and evaluation process used the point of view of the importers, hence, it is of vital importance for future studies to review the costs from different stakeholders' perspective. Third, the model only focused on the compliance costs related to import processes and did not address the compliance costs for export processes in detail. Fourth, the model was not ready to be applied by a company since the costs mapping process was still done manually due to the complex and massive coverage of the costs and the limited time available in this research.

Subsequently, there are some recommendations for the future research to tackle the limitations. First, further research could be done to explain the specific cost components in the export process, and to develop a generalized CLCC model that is based on discussions from other commodities, thus increasing the relevance of the research to a wider audience. Second, it would be advantageous to carry out a trade and compliance cost study that observes the expense structuring from the other stakeholders' points of view, and especially from the point of view of the government as the trade facility provider. Third, practical guidelines or other empirical applications to discuss the CLCC model to be linked as foundations to other related study domains are needed. For example, a study to explain the relationship between the CLCC model and the GTD's KPI measurement, or the detailed process of how the trade and compliance cost model supports the risk analysis of an international trade, etc. Fourth, a simpler interface or input method is needed in future studies. For example, a user-friendly interface can be developed to help identify the costs automatically and increase the practicality of the model.

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List of Abbreviations

3PL	Third Party Logistic
4PL	Fourth Party Logistic
ABC	Activity Based Costing
AEO	Authorized Economic Operator (Customs)
APHIS	Animal and Plant Health Inspection Service
ATA	Actual Time of Arrival
ATD	Actual Time of Departure
B2B	Business to Business
B2C	Business to Consumer
B2G	Business to Government
BAF	Bunker Adjustment Factor
BAS	Basic Sea freight / Basic Ocean Freight
BATF	Bureau of Alcohol, Tobacco and Firearms
BIP	Border Inspection Post
CBM	Coordinated Border Management
CIF	Cost Insurance and Freight
CLCC	Company-Level Compliance Costs
CVED	Common Veterinary Entry Document
DTI	Direct Trader Input
ENS	Entry Summary Declaration
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
F&W	Fish and Wildlife
FCL	Full Container Load
FDA	Food and Drug Administration
FOB	Free on Board
GTD	Global Trade Digitalization
ISPS	International Ship and Port Facility Security
LCL	Less Container Load
LOLO	Lift-on Lift-off
NCTS	New Computerized Transit System
NTM	Non-Tariff Measurements
OECD	Organization for Economic Co-operation and Development
PCS	Port Community System
PHA	Port Health Authority
PPGM	Public-Private Governance Model
STG	Single Transactional Guarantee
TFA	Trade Facilitation Agreement
TRQ	Tariff Rate Quota
VAS	Value Added Service
VBS	Vehicle Booking System
WCO	World Customs Organization

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1

INTRODUCTION

In this chapter, the motivation and general idea in executing the research are presented. Here, the discussion is started by a discussion of the research background, the identification of the research problems, the research objectives, the research question and its breakdown into sub-questions, the research scope, and the research methodology. Finally, the structure of this thesis is presented.

1.1 Research Background

1.1.1 The Importance of Information Infrastructure for International Trade

Globalization offers an opportunity to trade the goods across nations, but it also poses some challenges. An empirical study showed that a company could produce a product for \$1 and sell it overseas for \$10. This is because trade barriers can cost as much as 900% of the production cost, which is dominated by the border-related barrier costs (Anderson & van Wincoop, 2004). Such a high border-related barrier cost indicates inefficiency and ineffectiveness in the logistic pipeline as well as in establishing a safe and secure supply chain that concentrates on the layers of processes at the border.

Border compliance procedures involve many information and document transactions. An OECD study suggested that a 1% reduction in the transactional cost is worth \$43 billion (Grainger, 2014b), which is an awful lot of money. Thomas E. Jensen (2015), an IT infrastructure specialist at Maersk Line, stated that “The cost of physically moving a container is less than half the cost of handling the information related to its transport.” This statement reinforced his previous idea that whereas the physical infrastructure in international trade is pretty efficient, the information infrastructure is still in a mess (Jensen, 2015).

Poor supply chain information handling leads not only to inefficient border clearance processes but also a significant disruption and delays in the whole logistic system. In the macroeconomic estimation, for each additional day spent in the transportation from the origin point to final destination, there is a probability of consumption reduction from the US for goods exported from that country as much as 1–1.5%. Meantime, a day saving of the import shipping time is valued as 0.8% of ad-valorem in the high-income country and 1.5% in South Asia, while for the export it is worth 1% and 0.6% of the goods value for export shipment, respectively (Hummels, 2001).

1.1.2 Initiatives in Establishing an Effective and Efficient Supply Chain

In regards to the enormous complexity of the border activities, both public and private organizations are interested in making the compliance process cheaper and more manageable, while still achieving the same level of security and safety. Lee and Whang (2003) suggested that high supply chain security at a lower cost could be accomplished by implementing the right management approach, adopting new technology, and re-engineering operational processes to be more effective and efficient. Recent studies that discuss the adoption of new technology are getting more popular as one of the most promising solutions for the issues. In other words, there is a positive trend of the research that focuses on the IT innovation toward the compliance process, such as by developing a single window to achieve better communication, cooperation, and understanding between government agencies and the logistic partners (Dutch Institute for Advanced Logistic, 2012).

Conducting effective and efficient border compliance procedures by border inspection agencies is necessary for addressing safety and security concerns, and for promoting a country's competitiveness in international trade. While private organizations demand an efficient process to minimize logistic costs (since they perceive the border compliance process as a barrier to the efficient flow of their goods), government border agencies have the task of ensuring safety and security. This concern often requires lengthy procedures and leads to an increased administrative burden for companies. To overcome those barriers, governments develop various approaches to facilitate trade, for example, IT solutions that enable trade facilitation¹, which is often called "IT-enabled trade facilitation."

In this paper, we use an example of such IT innovation, namely the *data pipeline*, which is a kind of worldwide internet for logistics that can be used to exchange data across the international supply chain (van Stijn et al., 2012; Hesketh, 2009, 2010). For example, container tracking information captured via container tracking and monitoring technologies can be shared in real time with authorized parties along the supply chain via the data pipeline. The pipeline can also be used by trusted traders to provide an accurate and timely cargo import/export declaration data to customs administrations (van Stijn, Klievink, Janssen, & Tan, 2012). In addition to the data pipeline, other border management reforms can be considered to improve the coordination between the logistic stakeholders, like coordinated border management, one-stop border posts, or single windows.

In relation to the data pipeline, Maersk and IBM are developing a global pipeline called the global trade digitalization (GTD) blockchain solution. The GTD is expected to be the solution to reduce the information handling complexity to achieve their vision of facilitating the secure global trade by real-time access to a single verified portal. For it to become a global platform, the stakeholders should be explicitly and clearly informed about the projected potential costs saving to get them to support the development and adoption of the data pipeline (Klievink, et al., 2012). This is because the GTD is still at the initiation phase that needs stakeholders' involvement both to develop the GTD through the pilot project and to invite the stakeholders to invest in it. Therefore, it is necessary to understand the GTD's benefit before it can be communicated externally to encourage their participation.

1.1.3 The Need of the Trade and Compliance Cost Model

Identifying the GTD's benefit or any other IT-enabled trade facilitation is an important issue when an initiative to improve the international supply chain is planned. To do so, a costs model that explains the costs involved in the international trade is required to make the costs explicit. Once the costs are made explicit, they can be used as a starting point for an evaluation of what costs can potentially be reduced by the proposed IT solution. At the same time, they can also serve as a basis to reason about the proposed solutions and articulate more clearly the potential benefits it can bring. These reasons were the first research motivation based on the business need point of view.

In the other hand, articulating trade costs has been a focus of earlier research. There are more than 3 million studies discussing trade costs², indicating how important this matter is. Later in a more intensive literature study, we found around 11,900 articles that discuss trade and compliance costs³. They were then filtered in several stages until only eight studies remained. A careful reading of these eight studies revealed that only two studies clearly described the trade and compliance costs, namely the trade costs study by Anderson and van Wincoop (2004), and the customs compliance and trade facilitation study by Grainger (the detailed literature process is presented in Chapter 2).

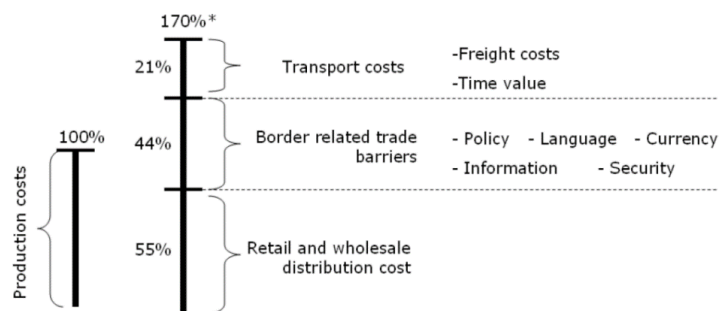
The study by Anderson and van Wincoop offers a general idea on how to divide the trade costs based on the primary activity involved in an instance of international trade. The authors argue that the trade costs are comprised of various components; such as transportation costs, border-related barrier costs, and the profit margin taken by the retailer/wholesaler (see Figure 1 for a detailed

¹ See for an overview of these IT innovations for trade facilitation <http://tfig.unece.org/>

² Based on Google Scholar searching result using keyword "trade costs"

³ Based on Google Scholar searching to the articles that contain all the word of *trade compliance costs international supply chain logistic customs border information management trade facilitation*

breakdown). Apart from the fact that their study is one of the most cited studies in the area of trade costs analysis, it does have its limitations. One fundamental limitation is that the study is typically based on macro-economic research at the aggregated level or the national/country level, and hence the costs were not broken down into their constituent components, which become crucial when individual companies want to assess a particular business process. Company-level and compliance-specific trade cost models are needed when individual companies want to know their own specific costs of compliance in their international supply chains, and how they could benefit from IT-enabled trade facilitation, such as the data pipeline, to reduce these costs. Their study is also limited to measuring the detailed cost structure in the border-related barrier that partly involves the formal policy barrier. Considering the substantial significance of the compliance costs as the formal policy barrier, therefore, a further study about the detailed explanation of the customs compliance costs for the individual company is needed to address this limitation of this trade costs study.



* The cost breakdown is expressed in ad-valorem equivalent terms as $1.7=(1.21*1.44*1.55)-1$
 Figure 1. The estimated trade cost in industrialized country adapted from Anderson & van Wincoop (2004) as cited in Portugal-Perez & Wilson (2008)

Both limitations of the current mainstream research on the trade cost models are partially addressed in the study by Grainger, who published various articles on import compliance cost models at the company level that can be decomposed to a business process level (e.g. Grainger, 2011, 2013, 2014a/b/c). He classified the compliance costs as the sum of initial set-up costs, transactional costs, inspection costs, and post border costs. He then decomposed each of these costs into more detailed cost components based on empirical findings related to the UK's meat import shipment. However, his studies are not sufficient as customs-related compliance costs are only one of the many aspects in existing trade cost models, such as the well-known trade costs model of Anderson and van Wincoop (2004). Moreover, they only focus to the compliance costs based on empirical finding for a specific commodity in a particular country.

All in all, both studies are helpful in eliciting some aspects of trade and compliance costs, but each study in isolation is limited as it captures some aspects but misses others. The Anderson and van Wincoop study does not go into the details of the compliance costs; the Grainger studies do, but they do not cover the other expenses mentioned by Anderson and van Wincoop, as well as in other studies on trade and compliance which give only a fragmented view of trade and compliance costs. With such limitations, we argue that it is essential to actively pursue further research related to trade and compliance costs at the company level, or so-called company-level compliance costs (CLCC), which is the next research motivation based on the applicable knowledge gap.

1.2 Problem Statements

The actual costs of international trade are unknown because of the complex compliance process and the inefficient information flow and document trails. It is even harder to cut costs to increase competitiveness when the costs are unknown, as well as to manage risks when the real picture is not clear (Hesketh, 2010).

Given the research gap that no holistic model allows moving from the high-level categories of trade and compliance costs to a detailed breakdown of these expenses, the main problem is then formulated. It is that very little trade and compliance cost model research has been done at the level of an individual company that can be used as a framework to evaluate the trade costs explicitly.

Similarly, there are limited studies that can be adopted as a tool to measure the potential benefits and value proposition of IT-enabled trade facilitation solutions for specific actors in the chain, which is crucial for the further adoption and upscaling of IT-enabled trade facilitation innovations. The implementation of any IT innovations in the trade facilitation might be hampered if we cannot measure their benefit offered in reducing the costs and inefficiencies. The stakeholders should be explicitly and clearly informed about the benefit or the projected cost savings to encourage them in supporting the development and adoption of the data pipeline (Klievink, et al., 2012).

1.3 Research Objectives

The objective of this research was to address the knowledge gap in studies in the area of trade and compliance costs at an individual company level. By formulating this objective, it was expected that this research would result in a viable artefact that can be applied as a framework to evaluate the trade and compliance costs explicitly and measure the potential benefits and value proposition of IT-enabled trade facilitation solutions for particular actors in the chain. Hence, the research would support further adoption and upscaling of IT-enabled trade facilitation innovations, not limited to the GTD as the future global data pipeline.

Consequently, introducing an artefact in the form of trade and compliance cost model through abstraction and representation was needed to fulfill this research objective to allow stakeholders to use it as a tool in measuring their costs explicitly.

1.4 Research Questions

In order to attend the research objective as above, the research question was formulated as follows:

“What are the costs involved in the trade and compliance procedure of an international supply chain, taking into account the trade costs study by Anderson and van Wincoop, and the compliance costs study by Grainger? And to demonstrate how can these costs be applied as a practical tool/model to measure the trade and compliance costs at the company level, and make them explicit?”

The research question addresses two gaps. First, there is a lack of a costs model that explains the expenses involved in international trade, which is required as a tool to measure the actual trade and compliance costs. Second, the lack of a study to support businesses in measuring the actual trade and compliance costs, as very little trade costs model research has been done at the level of the individual company. This main research question was answered by answering the following four sub-questions.

First, it was necessary to understand how previous studies explained the problem, as the present study did not depart totally from scratch but further developed the earlier studies. To achieve this aim, any information about the trade and compliance costs were synthesized through literature review. The output of this part suggested the direction of the research focus and provided an underlying cost structure from the main literature selected as the potential input for the next step. This first sub-question was then formulated as follows.

SQ1: What do the existing studies explain about the trade and compliance costs from the business environment application and other knowledge base?

Second, the output of the first sub-question was explored and expanded to address the first design cycle activity: the building of a trade and compliance cost model at the company level. Thus, wider information to explain the necessary costs that build the model were gathered and presented, especially from the literature in the research domain. This part was concluded once a trade and compliance costs model had been introduced, called the initial Company-Level Compliance Costs

(CLCC) model. It also became the model visualization along with the classification of which existing studies contribute to which part of the model. This second sub-question was formulated as follows.

SQ2: What do the current costs model studies contribute to construct a trade and compliance costs model, and how do they relate to each other to build the costs model?

Third, an evaluation process when building a model is crucial to ensure that what is produced represents the reality as closely as possible. The objective of this part was to capture the model's failure and revise it when needed before it could be confident and trustworthy applied for future practical purposes. At the same time, the evaluation process would demonstrate how this CLCC model is applied to the empirical cases. For this need, third sub-question was formulated as follows.

SQ3: How well can the built trade and compliance costs model represent the real costs of the empiric cases?

Fourth, the product of this research should also share the utility or the benefits both internally and externally. Hence, a discussion and a demonstration of how the research product is applied to the previously identified business need (e.g. the GTD) and if possible to the knowledge domain were required to conclude the analysis result. The objective of this part was to show in detail how the built model can contribute to the practical needs.

SQ4: What can we possibly know about the trade and compliance costs model in relation to the knowledge base/research domain, and to the relevance to the business need, in particular to the Global Trade Digitalization (GTD) as an example of IT-enabled trade facilitations?

Finally, by carrying out the research that answers these four sub-questions, it was expected that a viable artefact in the form of a trade and compliance costs model applicable at the company level could be produced and applied to relevant practices, which would answer main research question.

1.5 Research Scope

The scope of this thesis is limited to the following discussions.

- The research discussion is focused on the area of customs compliance and transportation costs, without a further discussion of the production costs or the retail/wholesale profit margin, as the third cost category, based on the trade cost study by Anderson and van Wincoop.
- The compliance costs discussion focuses on the import activities with limited exploration of the export side, considering that the export compliance costs are smaller than the import costs.
- The domestic transportation is represented by the use of trucks as the dominant transport mode instead of another form of modality.

1.6 Research Methodology

To answer the main research question, which highlights the need to build a trade and compliance costs model at the company level and make it applicable to the practice, a design science research approach was adopted. The design process is a sequence of expert activities that produces an innovative product/artefact by addressing the research through the artefact's building and evaluation to identify the business need (Hevner, et al., 2004).

This approach was selected for two reasons. First, the research domain revolves around the information system (IS) discipline, so that the design science is appropriate seeing that the design science is fundamentally a problem-solving paradigm (Hevner, et al., 2004, p.76). Second, the high level of applicability of the research result to the empirical practice showed that the evaluation and generalization of the result are required, and this can be achieved through design science.

Design science research suggests that three cycles are required to produce an artefact: the design cycle, the relevance cycle, and the rigor cycle (Hevner, 2007). In the design cycle, there are two processes involved – namely *building* and *evaluation* – and four kinds of possible design artefacts, that is, *constructs*, *models*, *methods*, and *instantiations* (March & Smith, 1995). In this research, “model” was chosen as the artefact as it can help the problem and solution understanding. It also often represents the connection between the problem and the solution to be used to change the real practice based on its abstraction and representation of the real world (Hevner, et al., 2004).

Other than the design cycle, the rigor and relevance cycles are also important in conducting design science research. Hevner, et al. (2004) described the *rigor* as the ability that the research departs from the knowledge bases, both the foundations and methodologies that are applied to the applicable knowledge to support the information systems (IS) research in building/developing and justifying/evaluating an artefact. In its reverse loops, the artefact should make additions/contributions to the knowledge base itself. Meanwhile, the *relevance* means that the environment of the related research domain (e.g. the people, organizations, technology) possesses the business needs to produce the artefact while at the same time the IS research product, namely the artefact, is applicable in the appropriate environment, the setting to which the design is applied.

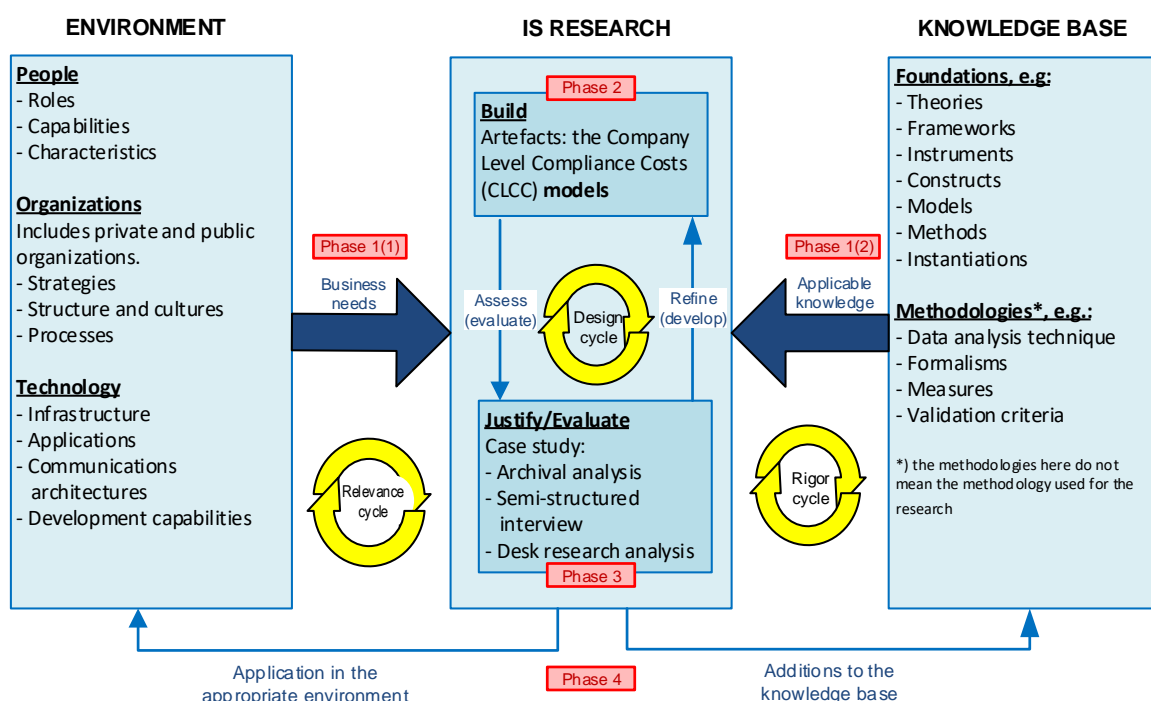


Figure 2. The research framework in relation to the building of information system according to Hevner, et al. (2004, p.80) which has been modified based on this research need

To satisfy the three cycles, this research was managed to follow this flow:

- First, we identified the *business needs* that had not been solved by the *applicable knowledge* base. At the same time, it was the first attempt to find a possible solution to the problem as we could see what other studies reported about the problem. It partially involved the relevance and rigor cycles.
- Next was the design cycle. This included the two key processes in design science research: the building and the evaluation. During the evaluation, a revision was expected to revise the initially built artefact.
- Last, a discussion that addressed the reverse loop of the rigor and relevance cycles, since the output of design science research is ideally returned to the application domain and the environment for the applicable study (Hevner, 2007).

Following the design science research framework presented in Figure 2, the study was divided into the following four phases.

Phase 1: Identify the Business Need and Applicable Knowledge

Based on the research background that motivated the study, a further action was conducted to understand the research domain so that we could narrow down the particular business need that had not been met by current applicable knowledge. In this step, a *desk research* by conducting *literature analysis* was conducted. At the end of this phase, we had a better understanding of the research domain and its problem and had identified what existing studies said about the trade and compliance costs, and this formed a stepping stone to the next phase of *building*. Indirectly, a rough idea of the trade and compliance cost framework had been identified. The detailed process of how the literature review was conducted is presented in Chapter 2, section 2.2.

At the end of this phase, we had a better understanding of the business need and the applicable knowledge domain, as well as a clearer idea of what current studies could offer about the trade and compliance cost structure. This phase answered the first sub-question

Phase 2: Build the Model

The “building” terminology is translated as the process of constructing an artefact for a specific purpose (March & Smith, 1995). The main task in this step was to design a model by combining a comprehensive review and literature integration through artefact synthesizing from existing knowledge, both formal/explicit knowledge (literature study) and tacit knowledge (from own knowledge, expert discussion, observation, input, etc.). This process involved a combination of observations from previous literature, and author’s common sense and experience (Eisenhardt, 1989). The detailed process of how this second literature review was conducted is presented in Chapter 3, with the literature review summary given in section 3.3.

This phase resulted in the first built viable artefact, namely the Company-Level Compliance Costs (CLCC) model. This model enabled a detailed breakdown of trade and compliance costs at the company level. This answered the second sub-question.

Phase 3: Apply and Evaluate the Model

This phase was prepared to follow up the first artefact from the second phase so that it could be readily used to address the design science research contribution in novelty, generality, and the artefact’s significance. For this need, a *case study* was adopted that was motivated by three main reasons according to context (Yin, 2009) why this strategy is appropriate.

- When it is for the exploratory phase of an investigation to find the answer of “how” questions, so that eliminates the experiments that are more suitable for exploratory of a causal inquiry
- When there is a little control over the events, which suits the situation of practical cases and incidents
- When the research focus on the contemporary phenomenon in the real-life context.

In the other hand, the case study also *allowed the combination of several data collection methods*, such as data archives, questionnaires, interviews, and observations in the form of either qualitative data (e.g. in words) or quantitative data (e.g. numbers), or both (Eisenhardt, 1989).

Knowing that case study can involve several data collection methods, this phase was divided into two activities: the *archival analysis* to the CORE research as the first stage evaluation, and the observation followed by semi-structured *interviews* with the experts as second stage evaluation.

1) First Stage Evaluation: Model Evaluation Through Archival Analysis at Shipment Level

According to (Yin, 2009), archival analysis is appropriate to use when:

- The “what” question is asked to answer the implicit query of “what are the costs incurred during the shipments”
- When the evaluation does not require control of behavioral events
- When it does not focus on an ongoing event.

Nevertheless, it also offers a stable process as the information can be reviewed repeatedly; it is unobtrusive (not creating a new result of the case study); broad coverage to a long time span and several events from several settings; and, of course, it is quantitatively precise, despite the limitation that the access to archival records is deliberately blocked (Yin, 2009).

In this step, the secondary log data/archival records of the pilot project shipment cases of perishable goods reported in the CORE research, which involves three independent shipment cases, were used. The main reason why it only used three shipment cases is due to the availability of archival record itself that *only* presents data on three shipments. Nonetheless, the limited cases might be advantageous because of the fewer the cases, the greater the opportunity to do an in-depth observation (Voss, Tsikriktsis, & Frohlich, 2002).

2) Second Stage Evaluation: Model Evaluation Through Observation and Interview at Non-Aggregate Level

An *observation* was conducted to gather information from scratch by participating in a half-day meeting at the management office of a Dutch company that imports perishable goods. This meeting involved not only the importer staff, but also the importer's customs brokerage staff and the researchers from the CORE project who were collecting the data to understand the costs and inefficiencies in the trade lanes. This observation's findings led to a further individual interview that was targeted to get further specific input for the cost model.

Next, a *semi-structured interview* was conducted. A semi-structured interview was adopted considers the broad scope of the topic and the problem. Hence, this interview model offers a live experience while also enabling one to address the theoretically driven variable of study interest and providing a repertoire of possibilities to address specific topic related to a particular phenomenon in the research, while leaving enough space for the interviewees to offer new meaning to the research focus, allowing enough space for such empirical and theoretical study (Galletta, 2013). The interview took place at the two different companies as follows for a total of three interviewees.

- A Dutch company that imports perishable goods where the previous meeting was held. This involved two interviewees using a direct (face-to-face) interview method.
- A freight forwarder company based in Indonesia that manages the perishable goods import. This involved only one interviewee. The interview was conducted over the phone.

Unlike the first stage evaluation, which reviewed the costs at the shipment level, the second evaluation focused on the costs at the non-aggregate level, which means collecting the data based on company experience that is not necessarily from one whole shipment flow.

By the end of this phase, the initial CLCC model was expected to be improved through revision based on this two stage evaluation result through the *desk research* analysis. Later, a revised CLCC model was introduced that could be confidently generalized and applied to the future needs. This answered the third sub-question.

Phase 4: Enrich the Model through the Reverse Loop Cycle

This phase addressed the design science utility, quality, and efficacy of the model as the design artefact so that the research could provide a clear and verifiable contribution to the research area (Hevner, et al., 2004). *Desk research* on the research domain and environment (e.g. the GTD project) was conducted during this phase.

By the end of this step, the reverse loop of the rigor and relevance cycles had been covered, so that the artefact could add to the knowledge domain and meet the business need as an application in the appropriate environment. This phase answered the fourth sub-question

A summary of the research strategies applied during this research is presented in Table 1 below.

Table 1. The research strategies for the research questions along with the deliverables

	Questions	Research strategy	Data collection method	Deliverables
RQ	“What are the costs involved in the trade and compliance procedure of an international supply chain, taking into account the trade costs study by Anderson and van Wincoop, and the compliance costs study by Grainger? And to demonstrate how can these costs be applied as a practical tool/model to measure the trade and compliance costs at the company level, and make them explicit?”	Design science research	All of the following methods	A viable artefact in the form of trade and compliance costs model at the company level that answers the objective of the research in addressing the knowledge gap and the demonstration of artefact’s application which can be used as a framework to evaluate the trade and compliance costs explicitly, and as the tool to measure the potential benefits and value proposition of IT-enabled trade facilitation solution, in particular the GTD.
SQ1	What do the existing studies explain about the trade and compliance costs from the business environment application and other knowledge base?	Desk research	1 st Literature review	<u>Phase 1:</u> A better understanding of the business need and the research domain (applicable knowledge), and most importantly an initial finding of the important model, framework, theory, discussion, or other studies from existing literature about the general idea of the trade and compliance cost structure to be cited for next phase.
SQ2	What do the current costs model studies contribute to construct a trade and compliance costs model, and how do they relate to each other to build the costs model?	Desk research	2 nd Literature review	<u>Phase 2:</u> The first viable artefact (the trade and compliance cost model at the company level).
SQ3	How well can the built trade and compliance costs model represent the real costs of the empiric cases?	Case study	<ul style="list-style-type: none"> • 1st stage: archival analysis • 2nd stage: observation and semi-structured interview • Desk research to analyze the findings 	<u>Phase 3:</u> A revised viable artefact (the trade and compliance cost model) that has passed the evaluation iteration so that it can be confidently generalized and transferred to the next phase in sharing its utility. Nonetheless, a demonstration of how to apply the artefact to measure and map the costs.
SQ4	What can we possibly know about the trade and compliance costs model in relation to the knowledge base/research domain, and to the relevance to the business need, in particular to the Global Trade Digitalization (GTD) as an example of IT-enabled trade facilitations?	Desk research	<ul style="list-style-type: none"> • Literature review • Desk research to analyze the collected information 	<u>Phase 4:</u> An elaborate discussion that discusses the reverse/return loop of rigor and relevance cycle so that the artefact can confidently share its additions to the knowledge domain and to solve the business need as an application in the appropriate environment.

1.7 Expected Contribution

The research was expected to make contributions to both the academic sphere and that of practice.

For the academic relevance, this study introduces the trade compliance costs model as a novel model that can answer the research gap in providing the cost–benefit evaluation framework to the trade cost in general with sufficiently detail explanation to the compliance cost at the company level discussion. The end product here is not only being presented in a qualitative description, but it is also visualized in an explicit model. At the end of the research, it enriches the body of knowledge of international supply chain management, in specific to the trade and compliance at the single company level study.

For the practical relevance, this research contributes to the empirical application by practitioners in measuring their trade and compliance costs, make the costs evaluation explicit in knowing *what* and *where* the costs are. It is advantageous for the company in improving their logistic to be more efficient. In broader contribution, the research supports the articulation of potential benefits and value proposition of IT-enabled trade facilitation solutions for particular actors in the chain. Such benefit articulation is potentially useful to engage the stakeholders, mainly the private stakeholders, to establish the GTD as the global data pipeline platform, both in the GTD infrastructure development stage and in the GTD financial support stage.

1.8 Organization of the Remaining Chapters

This thesis is divided into six chapters, as shown in Table 2 below.

Table 2. The overview of remaining chapters

Chapter	Research questions	Discussion	Process phase
1. Introduction	-	Formulated problems, research objective and questions, scope, research methodology, research contribution, and organization of the remaining chapters.	-
2. Basic concept in the research domain	SQ1	The discussion of the key information from the domain knowledge.	Phase 1
3. The conceptual model building	SQ2	Definition of the cost constructs, presenting the contribution of existing literature in building the model, first attempt of the artefact/ model	Phase 2
4. The conceptual model application and evaluation	SQ3	Demonstration of how to apply the model to empirical practice, model testing to evaluate if it sufficiently explains the reality through iteration of application to different cases.	Phase 3
5. The return cycle of the conceptual model to the knowledge base and environment	SQ4	Research contribution as additions to the knowledge base, and its relevance to the application in the appropriate environment	Phase 4
6. Concluding the research	RQ	The discussion of final findings, conclusion, research contribution, research limitation, future research recommendation, and critical reflection toward the research process.	-

2

BASIC CONCEPT IN THE RESEARCH DOMAIN

This chapter presents the overview of the key concepts that are relevant to the research domain. It relates to the first research phase in understanding the first loop of the rigor cycle and relevance cycle in emphasizing the applicable knowledge gap and the business/practical need. Indirectly, this chapter also provides the reader with a sufficient knowledge base so they can understand the basic concept, language, terminology, etc. to allow them following the rest of research discussion.

Going into the structure, this chapter is divided into four sections. First, it is started with the discussion about the conceptual knowledge in the trade and compliance of an international supply chain. Second, it then presents the summary of the literature review of existing trade compliance cost studies, which becomes the first input to build the costs model in the next chapter. Third, it is then followed by a brief introduction to the two most popular supply chain costing techniques: the traditional technique and the Activity Based Costing (ABC). Finally, this chapter is wrapped up by presenting the conclusion to reiterate the knowledge and practical gaps.

2.1 The International Supply Chain

This section provides an introduction to the essential concepts of the international supply chain. The discussion in this section is begun by explaining the trade compliance and facilitation. Then the explanation to several IT-enabled trade facilitations follows. Finally, it is closed with the discussion of the stakeholders who are involved in international trade.

2.1.1 The Trade Compliance and Trade Facilitation

An international trade includes the transaction of all aspects; goods, information, commercial/ financial, as well as the risks. There is a limiting liability involved in an international trade, such as in ensuring an accurate description of goods to be reflected in the shipping documents. Importers have no visibility for it since the only person who exactly knows what are being transported in the supply chain is the one who physically packed the box. This means that such international supply chain poses the safety, security, legal compliance, and the commercial risk (Hesketh, 2010).

The Network Trade Compliance (2014, p.6) defined the trade compliance as “the process by which companies transporting goods internationally, comply with all laws and regulations (including safety and security) of the countries where goods are shipped to. The focus of trade compliance is not only on complying with law and internal company policies & logistic procedures and documentation but also on reducing direct and indirect logistical cost”. Meanwhile, Dutch Institute for Advanced Logistic (2012) translated the trade compliance as “the process by which companies transporting goods internationally, comply with all laws and regulations (including safety and security) of the countries that goods are shipped to”.

In brief, the trade compliance is aimed to create a trusted supply chain both at the origin and at the destination countries, which is proportional to visibility, credibility, reliability, transparency, and inversely proportional to business self-orientation. However, some challenges do exist, such as the complexity of the trade/commercial transaction, or in the border compliance procedure.

Addressing the issue, the trade facilitation has been introduced and now is widely used by the government institutions to improve their regulatory interface between public and private organizations at the national border level. WTO translated the trade facilitation as “the simplification and harmonization of international trade procedures where trade procedures are the activities, practices, and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade” (Grainger, 2008). Besides offering the trade facilitation, trade experts concluded the four dominant factors that have significant impacts in the export and import of the particular country based on the data evaluation from 75 countries. These factors are (1) the port efficiency, (2) customs environment, (3) regulatory environment, and (4) the use of e-commerce platform by the enterprises (Bolhofer, 2008).

Another idea to achieve visibility, credibility, reliability, and transparency is by developing a novel IT-enabled trade facilitation to achieve those business self-orientation goals. This idea can be reflected in four innovation approaches as the following (van Stijn, et al., 2011).

1. Realization of sustainable, cost-efficient supply chains by establishing shared knowledge between seller and buyer to allow a better real-time data management and traceability.
2. Optimization of logistics and terminal operations through synchro-modality.
3. Acquiring an Authorized Economic Operator (AEO) or Trusted Trader status to demonstrate that a supply chain partner is trustworthy and complies with the regulations.
4. Improvement in coordinated border management, facilitation, and supervision, as well as further development of a public-private partnership with businesses involved in international supply chain operations.

One idea in improving the four areas mentioned is by proposing the *data pipeline* as the technology innovation application which enables a seamless integration of all data and information elements from different sources.

2.1.2 The IT-Enabled Trade Facilitation

In this section, several examples of the IT-enabled trade facilitation initiatives are presented. The discussion departs from the border management reform that covers the Coordinated Border Management, one-stop border posts, and the single window system. Later it is followed by Port Community System, then the data pipeline, and finally it is closed with a discussion of the Global Trade Digitalization (GTD) as one example of the IT-enabled trade facilitation initiatives.

1. Border Management Reform

The border management reform focuses to the simplification and harmonization of all crossing border procedures. The crossing border procedures may involve the incorporation of the modern techniques of extensive use of risk management and ICT for the information sharing, co-located agencies’ facilities, close inter-agency cooperation, a delegation of administrative authority, and cross-delegation of officials. McLinden, et.al (2011) in the World Bank report argued that many developing countries have a keen interest to develop a harmonized, streamlined, and simplified procedures in the border management system. And they try to attend it through several initiatives such as the Coordinated Border Management, one-stop border posts, and single window system.

a. Coordinated Border Management

One of the initiatives in reducing customs clearance delay has been started in the 1990s by introducing the Coordinated Border Management. Coordinated Border Management, or CBM⁴, significantly becomes the need for border agencies to coordinate their activity in the crossing border procedure to increase the efficiency and effectiveness (Polner, 2011). Aniszewski (2009) translated the CBM as "a coordinated approach by border control agencies, both domestic and international, in

⁴ Also widely known as *Integrated Border Management* in EU, or *Collaborative Border Management* in recent terminology choice by World Bank, or *Comprehensive Border Management* by the Organization of Security and Cooperation in Europe (OESC)

the context of seeking greater efficiencies over managing trade and travel flows, while maintaining a balance with compliance requirements".

The collaborative border management involves the collaboration of the policy, process, people, ICT, the infrastructures, and the facilities. A border management collaboration is mainly based on the need of the agencies and the international trade and logistic community to work together to achieve common goals (Doyle, 2010). For the private organizations as the customers, the CBM can reduce their administrative and compliance costs. It not only saves their time, but it also makes the services more predictable. In wider application, the CBM is implemented to reduce the processing delay in customs clearance and reduce inefficiency in the process.

As public organizations, government border agencies have a responsibility to provide confidence in supply chain security while maintaining a smooth flow of goods (Lee & Whang, 2003). These all agencies, including customs, work together to establish the regulatory in revenue collection, ensuring safety and security, environment and health control, consumer protection, and trade policy (Grainger, 2011). Therefore, such CBM is needed to minimize the inefficiency because the empirical data from several countries shows that the revenue losses due to inefficiency may contribute more than 5% of the national GDP (Moise & Bris, 2013).

b. One Stop Border Posts

One-Stop Border Post means the ability of the border authorities, both customs and non-customs agencies, from two respective countries in performing a joint control. This concept enables traders to eliminate the duplication of the regulatory formalities on both border sides because the neighboring countries do the coordination in the import, export, and the transit process. The cooperation is not only about sharing the location and facilities (such as by jointly using one scanner to examine cargo), but also sharing the intelligence like the idea, information, or experiences for a better resource utilization.

Some examples of principal features of one-stop border post presented by Kieck (2010) are:

- Relocate the both states' offices in proximity, highlighting the necessity of only 'one stop' for border crossing.
- Demarcate the control zone within which officers of both states who conduct the controls based on their respective laws
- The control zone for the offices, inspection areas, and other related facilities are usually located within one national territory of one state involves.
- Both states handle the immigration, import, and export formalities in a seamless transaction
- The inspection process and the cargo searches are conducted with the presence of both states' officers

The benefit of the one-stop border practice is mainly to reduce waiting time for the commercial vehicle so that it can shave down the costs. The secondary positive impact is to help to combat the fraud since the process only needs single customs declaration, prevent the document substitution one to another. In spite of the benefit, the one-stop border has a challenge in the establishment since it requires an active involvement from all key players (Kieck, 2010).

c. Single Window System

Van Stijn, et al. (2011) defined the single window as a concept that enhances the coordination and collaboration between the administration process and the private actors in facilitating business processes and data exchange nationally for the export and import activities, by analyzing the business processes and the information flows to be simplified and standardized. While the UN Center for Trade Facilitation and Electronic Business (UN-CEFACT) translated it as "a facility that allows parties involved in international trade and transport to lodge standardized information and

documents with a single point to fulfill all import, export, and transit-related regulatory requirements” (McMaster & Nowak, 2006).

Single window acts as a one-stop service portal of an integrated electronic gateway. It enables the actors in the international trade to submit the information and documentation related to export, import, and transit shipments that are needed by other parties (e.g. customs and non-customs agencies, licensing, port, even to the insurance companies and banks). However, the single window allows an *only at one-time* submission through a single electronic platform instead of submitting same information repeatedly to several different government entities. This promotes the shift from *data push* to be *data pull*. Not only transmitting the information or documents, but the single window can also cater the duties transaction, tax, and other commercial invoices and value-added services (e.g. electronic payments, Letter of Credit advice, e-logistic management, market research studies, e-training, security and message authentication, and many others). In brief, the single window emphasizes the concept of ‘only once’ submission at a single entry point (UNECE, 2005).

Single window in its establishment is divided into two stages: the single window that revolves around the B2G or the e-government development, and the single window that revolves in the B2B transaction (McMaster & Nowak, 2006). As a remark, single window does not necessarily require a high-tech ICT, though government can offer a substantially enhanced facilitation from identification and adoption of relevant ICT for it (UNECE, 2005).

In application, there are three basic models of the single window reported by Tsen (2011).

- A single authority which receives and disseminates the information to the relevant government’s authorities, as well as coordinate the controls in the logistic chain

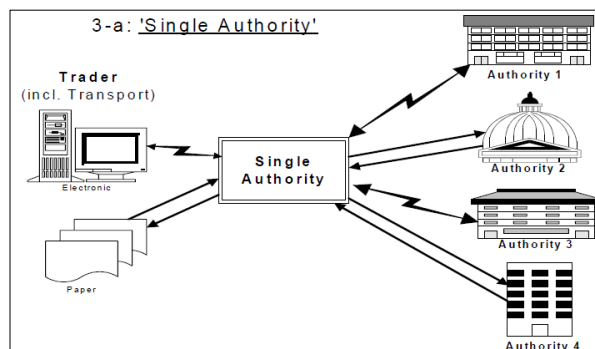


Figure 3. The single window scheme for the single authority model (UNECE, 2005)

- A single automated system that allows the collection, dissemination, and integration of information and data related to the trade. There are multiple possible forms: an integrated system where the data is processed through the system; interfaced system that uses decentralization approach by sending the data to the agency for the further process; and the combination of the previous two forms.

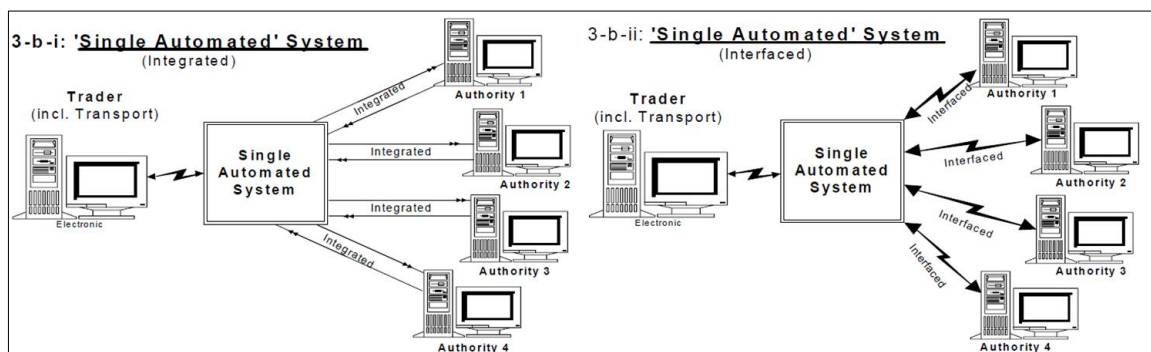


Figure 4. The single window scheme for single automated model, in the form of integrated system (left) and interfaced system/decentralized (right) (UNECE, 2005)

- An automated information transaction system that allows the traders to submit the electronic trade declarations to other government authorities for further process in obtaining electronic approval in a single application.

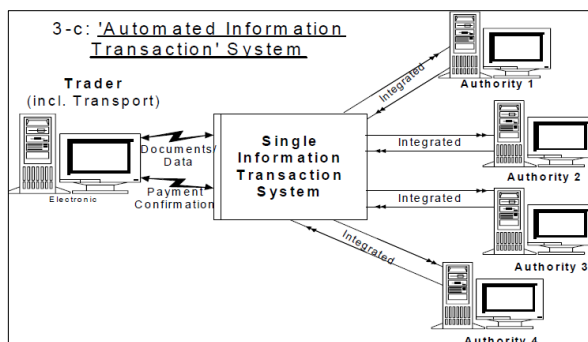


Figure 5. The single window scheme for the automated information transaction model (UNECE, 2005)

Single window supports CBM through streamlining and harmonizing procedures and information exchange between related parties, not limited to the relevant ministries and border agencies (Kieck, 2010). By implementing the single windows, there are at least three benefits to expect. First, it improves the implementation of the standardization, techniques, and tools. Second, it expedites the flow of information between private and public organizations. Third, it simplifies the process and data harmonization to improve the information transmission across government agencies. The short list of the benefits both for government and for private organizations in the trade can be seen in Table 3 below.

Table 3. The benefit of single window for government and the trade summarized from UNECE's recommendation no. 33 (UNECE, 2005)

Benefit for the government	Benefit for the trade
More effective and efficient resource deployment	Cost saving through delay reduction
Correct, or even increase the revenue yield	Faster clearance process
Improve traders' compliance	Predictable application and explanation of the rules
Leverage security	More effective and efficient resource deployment
Increase integrity and transparency	Increase transparency

To summarize, for the government, the single window shares benefit mainly to leverage security which at the long term improves the port's competencies and increases the revenue. While for the traders, the single window is more to cost efficiency and increase the transparency. At the long term, single window is aimed to improve the efficiency and effectiveness of the control function by reducing the resource use and allocation to achieve less cost (Tsen, 2011). All in all, single window is the practical application of the trade facilitation that can reduce the non-tariff barriers and is supposed to share immediate benefit to the actors in the trade community (UNECE, 2005).

2. Port Community System

To cut the transactional cost both direct and indirect cost, a Port Community System (PCS) is introduced. Rodon and Ramis-Pujol (2006) shared the PCS definition as "an electronic platform that connects the multiple systems operated by a variety of organizations that make up a seaport community". It enables a secure and intelligent information exchange between private and public institutions, with the primary goal of increasing the port's competitiveness (Bisogno, et.al., 2015). The design for PCS can be varied in technicality, functionality, operation, and its coverage to the users and locations. Even, the most effective PCS can provide service that most single windows cannot, especially for the B2B information exchange (Long, 2009). Therefore, PCS is a single platform but incorporate to multiple different functionalities at one particular port which can support the single window.

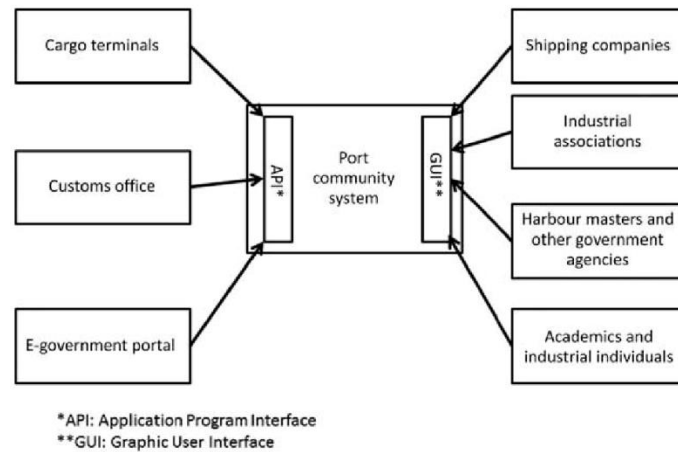


Figure 6. The Port Community System (Aydogdu & Aksoy, 2013, adapted from Keceli, 2011)

In one hand, the PCS concept allows the information to be passed accurately in a speedy manner and paperless between shippers, shipping lines and agents, forwarder and brokers, customs and other government agencies/authorities, transport operators, ports and the terminal operators. It indicates a potential efficiency improvement for the whole operation when the PCS can handle several documents electronically. Port operator that has a high declarable cargo prefers to put in an electronic PCS instead of using paper-based transaction. Then, the costs associated to develop, implement, and run the PCS are passed to their partners in the form of transactional user fee. For the users, they only need to pay when they use the service with demonstrable added value which is considerably low (even some are free) compared to the benefits in some services (Port of Rotterdam, 2016). In another hand, PCS maintains an efficient goods movement while still allows Customs and other government agencies to keep their effective control. In the long run, it allows the terminal throughput to rise through a faster goods movement as an attractive port's proposition to offer in the trade market.

3. Data Pipeline

In reality, the commercial transaction between counterparties, logistic activities, and the border procedures in the international trade are very complex. Hence, an innovative approach is required to enhance the effectiveness and efficiency of this big system. One of the key concepts to address this concern is *Data Pipeline*. It integrates the data from various parties within the supply chain that incorporates the data from new information tracking and monitoring technologies. The data pipeline enables a real-time data management for the business and increases the data pull and piggybacking⁵ principle (van Stijn, Klievink, Janssen, & Tan, 2012).

The data pipeline is a kind of worldwide internet for logistics that can be used to exchange data across the international supply chain (van Stijn, et.al. 2012; Hesketh, 2009, 2010). Examples are data from container tracking and monitoring technologies so that it enables a real-time data management for the business. The data pipeline works by integrating the available information system, not limited to the enterprise system such as the system used by sellers and buyers, Customs system, and inter-organizational information systems used by freight forwarders and the Port Community System. To ensure the data security, typically, the data access is controlled by a particular security technology. This control restricts any access except by the organizations that have been authorized by the data owner. The concept of the data pipeline can be seen in Figure 7.

⁵ Piggybacking means the data or information is re-used for different purposes other than its original purpose so that it will switch the practice from data push where businesses send the information or documents to multiple parties based on their need, to be data pull so that related parties can pull the data out from the system depends on their needs.

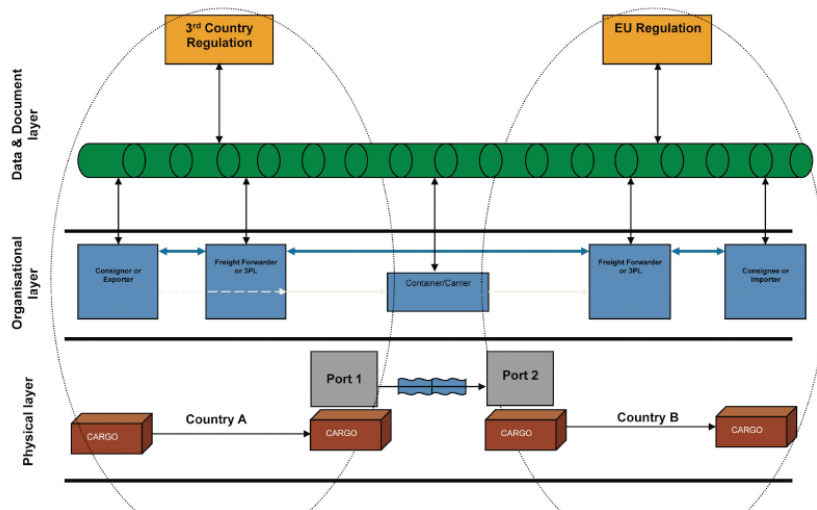


Figure 7. The conceptualization of the data pipeline (van Stijn, et al., 2012, adapted from Hesketh, 2010)

Two critical successes to achieve the data pipeline vision are the standardization and the interoperability. Standardization is aimed to enable organizations to connect to the built platform, composing the data pipeline. Standardization also allows the application development, such as to the smart devices so that it can interconnect any given platform. While interoperability means interconnecting the existing systems and solutions from multiple stakeholders to support the commercial as well as the community solution, as it is not expected that one global system to entirely implement and offer the data pipeline in actual practice (Hofman, 2015). Other border management reform can also follow to improve the process for a better coordination within the logistic stakeholders, such as through the CBM, one-stop border posts, or single window as what has previously discussed.

The data pipeline concept is meant to create benefits for several organizations within the supply chain, both for public and private organizations, by increasing the supply chain visibility and the data availability. Trusted traders often use the data pipeline to provide more accurate and timely cargo import/export declaration information to the customs administrations (van Stijn, Klievink, Janssen, & Tan, 2012). For governments, they use data pipeline mainly to improve the border coordination management and perform a better risk analysis to reduce the unnecessary administrative burden. Besides the benefit in commercial perspective, data pipeline allows better data transparency to optimize the supply chain, further shares the positive effect to foster the synchro-modality in building a sustainable supply chain (Klievink, et al., 2012). It also offers flexibility whether to be conceptualized as *Thick* and *Thin*⁶, depends on whether the actual documents are exchanged or limited only to the events that are exchanged (Janssen, et al., 2015 as cited in Rukanova, et.al., 2017).

Though data pipeline offers a promising solution, it has main challenge to obtain an active participation from the private organizations. It is motivated that the data pipeline is typically driven by the businesses, where the information source is primarily based on their data on a global scale for their commercial interest. This dependency to obtain information from the businesses (private actors) becomes a critical challenge when considering several factors. First, it is not clear for the private organizations to see the benefit of such data pipeline initiative. Second, if the benefit can be drawn clearly, the actors who are expected to enjoy the most benefit of data pipeline are the Government agencies as the public organization, not the private organization, though it still offers lower benefit for the shippers, consignees, and freight forwarders (Nijdam, Romochkina, & van Oosterhout, 2012). Third, there might be some actors who enjoy higher benefit compared to others. For example in the importer category, the importers who bring high-value goods, or make the trade in large volume (e.g. FMCG), or perishable goods will enjoy more benefit from the data pipeline compared to other importers like the importers of manufactured goods. Fourth, some organizations might see data visibility as a threat to

⁶ In thin data pipeline, the events and URL links to the documents are exchanged, but not the document, which involves the B2G or G2G interactions. In thick data pipeline, there are documents that are stored to be accessed by related parties that are mostly for B2B interactions. To get the access to the information available along the chain, both in thin data pipeline and thick data pipeline, the organizations need to do system subscription end-point, connecting to their own system center dashboard or the control tower.

their current business practice. For example, the risk in disclosing manufacturer information might turn the importers to source the goods from the manufacturer directly instead of via existing trader as the mediator. Shipping lines also concern that a higher visibility of information might increase the liability of cargo damage or loss (Klievink, et al., 2012). Therefore, communicating the cost-benefit and understanding the stakeholders position are necessary during the development of any initiative like data pipeline.

4. The Global Trade Digitalization (GTD)

Global Trade Digitalization (GTD) is a cloud platform that allows the exchange of event messages links of associated documents securely across the multiple stakeholders in the supply chain, rather than the documents themselves (Rukanova, Henriksen, Henningsson, & Tan, 2017). The GTD has a focus on developing a thin data pipeline for the international trade in a global ambition with the primary purpose to avoid the current’s complex one to one messaging. The GTD is introduced partly as one of the projects focuses on the scope of Public-Private Governance Model (PPGM) in the CORE project⁷. In principle, GTD works like a data pipeline to support a reliable, accurate, and complete information. And achieving this state is important to help detect the stakeholder's risk in safety, security, compliance, and commercial, and to make the international trade becomes more efficient (Rukanova, Henriksen, Henningsson, & Tan, 2017).

The GTD development was initiated by Maersk and together with IBM to develop it, which is prepared for the future integrated global shipping information data pipeline. The GTD allows the supply chain parties to publish the event (including the link to access the associated documents), subscribe to the shipment events’ update through tracking ID, query the shipment events, and receive the events subscribed. Therefore, besides providing the *data pull* that allows the related stakeholders to access their needed information or link to access the documents anytime, GTD also allows *data push* method thus stakeholders can receive the notification update of any event that they have subscribed to.

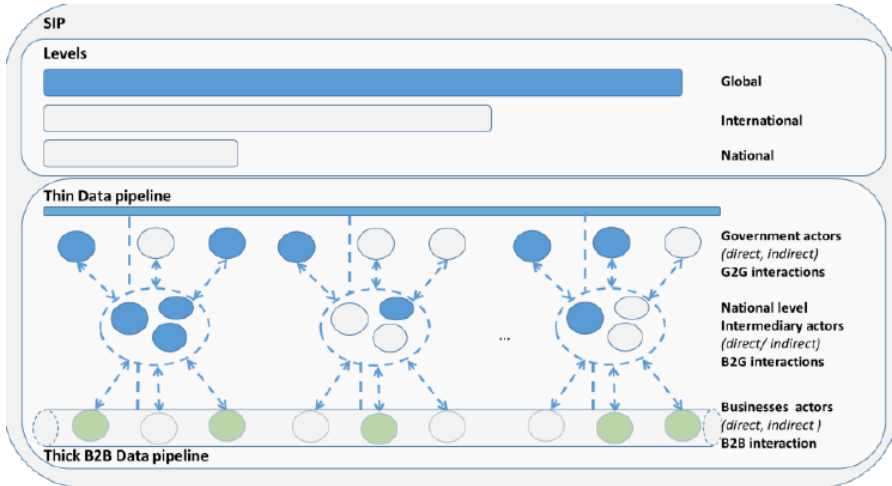


Figure 8. The visualization of DTI framework that describes the SIP or the GTD case (Rukanova, et al., 2017)

The GTD works by the initiation of the relevant parties to subscribe to the related events. Then, a particular event that occurs can be followed by uploading the document (storing) in a private document store which returns a link (URL) to re-access the file to be published by a related actor on the platform. Not only documents’ link that can be uploaded to the GTD, it also stores the events to then be broadcasted to the parties who have subscribed for that particular type of event. The messages then will be received by the subscribers’ internal system, as well as if they request for the detailed document after being authorized by the owner.

The GTD, in general, provides two solutions for the problems faced by the international trade and shipping partners. First, GTD provides a better end-to-end visibility of the shipment lifecycle, and

⁷ For more info see <http://www.coreproject.eu/>

increase efficiency through the sharing of common data or documents. Other than the two most important goals, GTD also provides other additional services such as its availability in mobile apps that allow the mobile people (such as truck drivers) for their need in picking up and delivering the containers, and the predictive and prescriptive analytic data of the events.



Figure 9. The GTD project phase (CORE, 2017)⁸

To date, the GTD is still at the initiation stage before getting further to the operation and maintenance stage, and finally to the new service stage (see Figure 9). During this phase, one of the most challenging tasks is to mobilize stakeholders for the joint infrastructure, both for the development purpose and financial purpose. Acknowledging this challenge, the trade and compliance costs model is needed to support this GTD project. It is potentially useful in mobilizing the stakeholders, mainly private stakeholders, to get their involvement in the pilot project as part of the development. In future, it might also be advantageous to support the financial objective through the system investment in establishing the GTD as the global data pipeline platform.

2.1.3 Supply Chain Stakeholders in an International Trade Environment

The primary concern in a global supply chain revolves around how to create a reliable and secure global supply chain network. The common suggestion for this concern is the investment initiative in establishing the cooperation between the government and the private business actors. Such relationships of Business to Business (B2B) and the Business to Government (B2G) are aimed to increase supply chain visibility and transparency to mitigate high-cost and high-risk issues.

There are two types of benefits in the effort of ICT innovation in the global supply chain: the B2B and B2G benefits. The B2B benefit focuses to the goods traceability and supply chain visibility to optimize the logistic distribution, such as through synchro-modality to support the cost-efficiency in the supply chain. Meantime, the B2G focuses on reducing the administrative and regulatory burdens for the business actors. This efficiency can be reflected by providing timely and accurate information to various government authorities caused by the introduction of government's strict laws and regulations. Collaboration between businesses and government in such public-private governance in capitalizing a modern IT is needed to take advantage of the innovation that at the end improves the data sharing and risk management (van Stijn, Klievink, Janssen, & Tan, 2012).

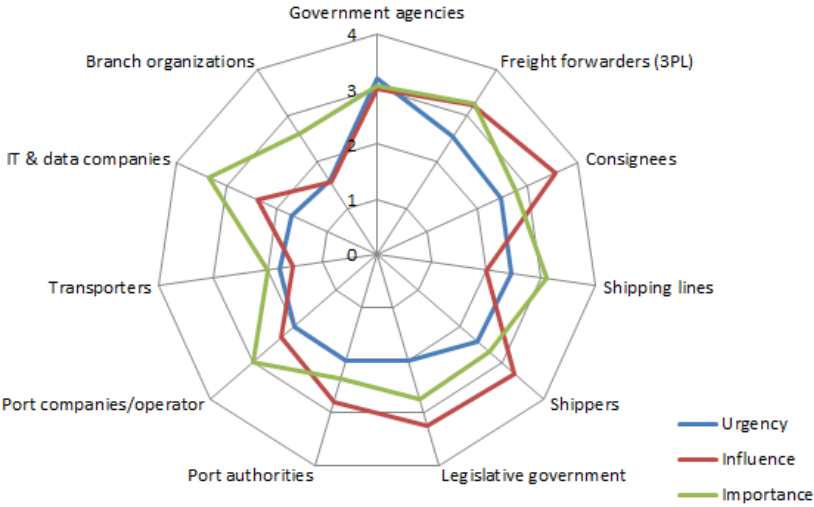
The B2B and B2G relationships traditionally involves many actors. It is interesting to understand their position, interest, power, influence, network, and other characteristics that would be beneficial when introducing an IT innovation initiative to the supply chain actors. Based on the activity, the actors are divided into five groups; commercial, organizing, physical, authorization, and financial (see Table 4).

Table 4. The actors involved in the global supply chain (Nijman, 2012 adapted from Wagenaar, 1992)

Group	Example of organization
Commercial group	Seller/supplier (shipper); Buyer/customer (consignee)
Organizing group	Forwarder; Shipping line; Logistics service provider (4PL)
Physical group	Sea terminal operator; Shipping line/sea carrier; Pre- or On carrier: carrier inland transport, i.e., barge operator, rail operator, road carrier; Inland terminal operator; Logistics service provider (3PL); Empty container depot operator
Authorizing group	Customs; Port authorities; Seaport police; River police; Inspection authorities
Financial group	Bank; Insurance company

⁸ Document is disclosed from public access, and is excluded from reference list

Regarding the data pipeline or other ICT innovation for compliance process, there are three stakeholders' categories identified: the organizations based on the *sense of urgency*, the *influence of the outcome*, and the *importance of the outcome* (Nijdam, Romochkina, & van Oosterhout, 2012). Each of them has different prioritization level, from low to high (see Figure 10).



Score Legend: scale 1 to 4 means from the lowest to the highest
 Figure 10. The radar chart of the stakeholders' position towards urgency, influence, and importance

In term of urgency, government agencies have high expectation of the idea of data pipeline to improve their risk-based approach in establishing their tasks. Other organization groups of shippers, consignees, shipping lines, and forwarders also see the urgency but in slightly lower level compared to government agencies, in particular to the data pipeline practicalities. They typically deal with the data related to the supply chain every day. Thus they are likely more aware of the potential benefits.

In term of influence, the organizations with the highest interest of the data pipeline influence are shippers and consignees since they frequently interact with customs inspections. Practically, the legislative government can directly influence the implementation by establishing laws and regulations.

In term of the importance of application, the IT and data companies have a high interest on it just because it is impossible to develop the data pipeline without them. Freight forwarder also has the strong position in the application because, in the end, the data pipeline application will change their way in providing the data and doing the business.

To summarize, considering the stakeholders' position, their power of influence, and others, there are several strategies approach that is prepared in relation to involving them in such data pipeline development project. The approach is summarized in Table 5 below.

Table 5. The generalized approach towards the stakeholders (Nijdam, Romochkina, & van Oosterhout, 2012)

Organizations	Actions/approach
Branch organizations	Involve in consensus building and influencing activities
Consignees	Involve in most (all) activities that deal with the practical implementation
Forwarders / 3PL's	Involve in most (all) activities that deal with the practical implementation
Government Agencies	Involve in most (all) activities that deal with the practical implementation
IT & data companies	Involve in the technical activities
Legislative Government	Inform about developments and involve in consensus building
Port Authorities	Inform about developments and involve in consensus building
Port Companies	Involve in practical activities, when their clients are involved.
Shippers	Involve in most activities that deal with the practical implementation
Shipping Line	Involve in practical activities, when their clients are involved.
Transporters	Inform, only limited involvement in final implementation phase

The United Nations International Symposium on Trade Efficiency recommended six areas focus which is believed to be able to generate the tangible improvement in an international trade environment. They are the customs, transport, banking and insurance, information in the scope of the trade, business practice, and telecommunication (Hesketh, 2010). In consideration of the need for information gathering and sharing, any IT innovation that would reduce administrative burdens and at the same time enhance safety and security in global supply chains should bring a concrete benefit to the primary stakeholders. It is necessary for those IT innovation to be further adopted because companies spend some costs to implement it, such as the cost to build the interfaces from their own information systems to a data pipeline. One way to articulate the benefits could be to develop a cost model for the trade and compliance to make costs in the current situation explicit. This would provide the basis to investigate further the trade facilitation offered by particular IT-innovations and the possible cost saving.

All in all, a study of the trade and compliance cost is essential to make the costs explicit, allowing the actors to articulate the potential benefits of IT innovations for trade facilitation. This concern is then followed up by discussing the current situation of the trade and compliance cost study in section 2.2.

2.2 Literature Review of the Trade and Compliance Costs

The management ignorance causes many operational level problems in the logistics management due to their particular decision, both the direct and indirect effects (Christopher, 2010). Unfortunately, they even face more problems to find out the indirect effects rather than direct ones. It means, the actual costs themselves have not been fully known. Therefore, identifying all cost components is critical as the first stepping point in this research which can be carried out by tracing the current literature study.

For this need, the literature like (but not limited to) published papers, books, journals, conference proceeding reports, organizations report, etc. were reviewed by searching them from Google Scholar searching engine. The initial finding suggested to focus the literature review from at least four sources: World Bank Publications, World Customs Journal, World Trade publications, and OECD library, as the most suggested and cited study sources. Though it did not limit the review to others, e.g. Journal of International Economics, The International Journal of Logistics Management, etc.

Based on the World Bank’s policy research working paper, the trade cost discussion should focus on the expenses spent in the area of border-related costs, transport costs, costs related to behind-the-border issues, and the costs of compliance with rules of origin (Portugal-Perez & Wilson, 2008). They simply translated the trade cost as all expenses incurred to get the final goods to the final users. The summary of how this first literature review was conducted is presented in Figure 11 below with the overview of selected eight kinds of literature that follows.

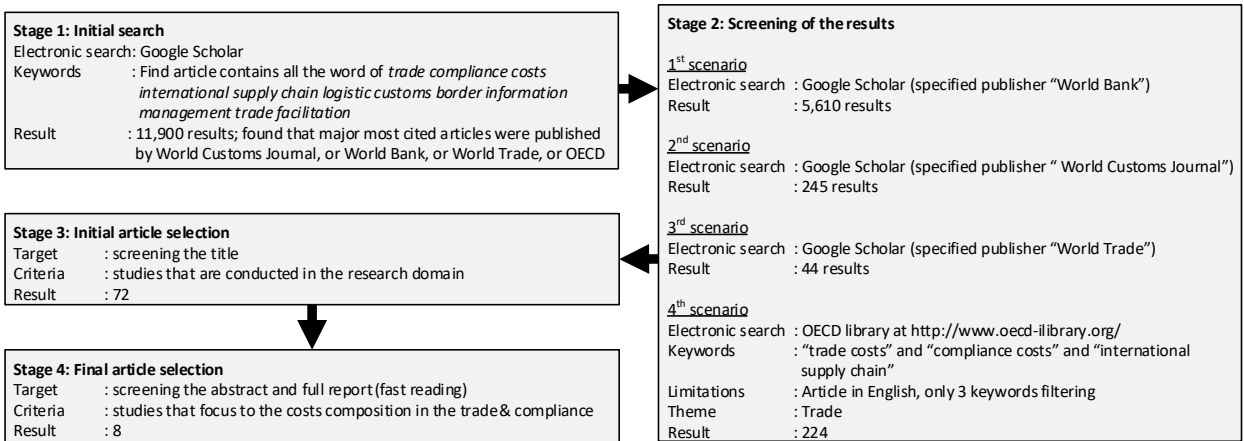


Figure 11. The summary of the first literature review process and result in the first phase

1. Portugal-Perez & Wilson (2008) in the World Bank report suggested the four areas that build the trade costs, based on their study towards Africa’s trade.

- The border-related costs, which highlight the trade policy and border barrier. The authors divided the traditional trade policy barrier as the tariff (both ad-valorem and specific), quota, and the combination of both (tariff-rate quota, and TRQ). While the other ‘less traditional’ trade policy instrument covers the expense in relation to the anti-dumping duties, countervailing duties, and safeguard measures.
- The transportation cost, which was not clearly classified in the literature discussion, is dominated by the international ocean freight moves. However, they shared the idea that the transportation costs rise linearly to the distance due to the fuel consumption increase, the manning/staffing, and the capital expense. But it might not be applicable to the case when the place is located in a landlocked area. They also presented the idea that the general freight cost is the combination of basic freight charge, inland haulage transport, and other extra costs.
- Behind the border issues and other sources of costs, which involve the loss due to corruption, governance, transparency, and the business environment; information and communication costs; and other cost sources.
- Costs related to preferential trade: rules of origin. These costs address the effort that the producers must comply with the origin’s rules. It means the product must undergo a process to obtain the originating status to prevent trade deflection.

Out of the four areas, the authors added the consideration toward the investment made, either for ‘hard’ infrastructures such as (highways, railroads, ports, etc.) and ‘soft’ infrastructures like transparency, institutional reforms, etc.

2. Anderson and van Wincoop (2004) study that focused to the trade costs at a macroeconomic level. In their research’s methodology, the authors collected the primary data by surveying the commodity flow in several countries in the US, Canada, and others. Meantime, the secondary data was adapted from the database of United Nations Conference on Trade and Developments Trade Analysis and Information System (TRAINS) and World Trade Organization’s trade barrier.

They suggested that the trade cost consists of transportation costs (includes the freight cost and the time cost), border-related barrier costs, and the retail /wholesale margin. Their study has limitation to discuss the border-related barrier in detail since this costs are believed dominate the whole trade costs. The border-related barrier costs’ scope is pretty broad, ranging from policy barrier (both tariff and non-tariff), language barrier, currency barrier, and information cost barrier, to the security barrier. These trade cost compositions can be visualized as follows.

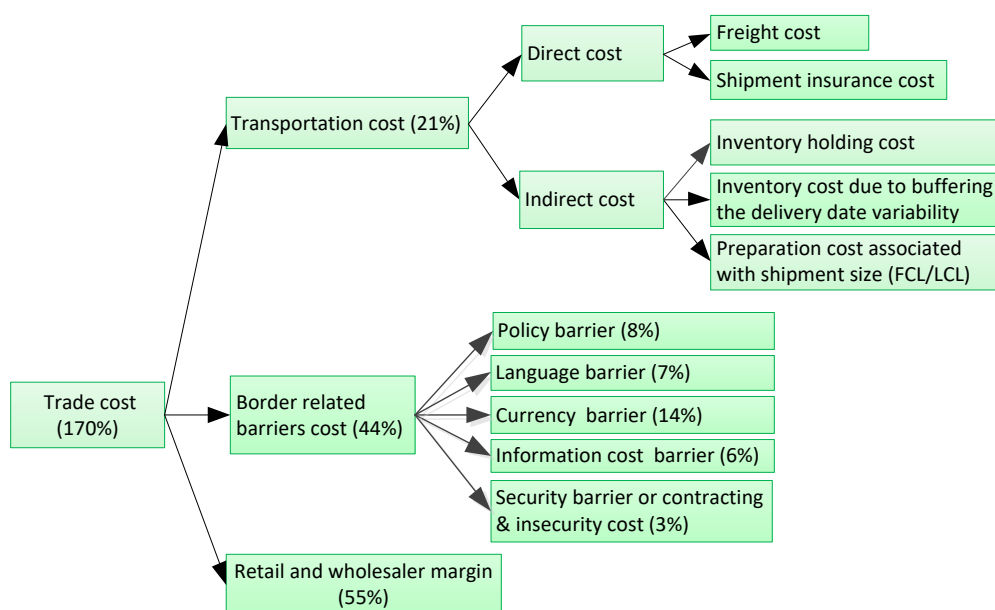


Figure 12. The visualization of the trade cost model based on Anderson & van Wincoop (2004) study

3. Moise and Bris (2013) in their OECD report explicitly presented the trade cost components into three areas: getting to the border, at the border, and behind the border.
- Getting to the border activities, which consist of trade finance, hard infrastructure, logistic service
 - At the border activities, which consist of direct costs, indirect costs, and hidden costs.
 - Behind the border activities, which consist of regulation, service trade, and institutional structure.

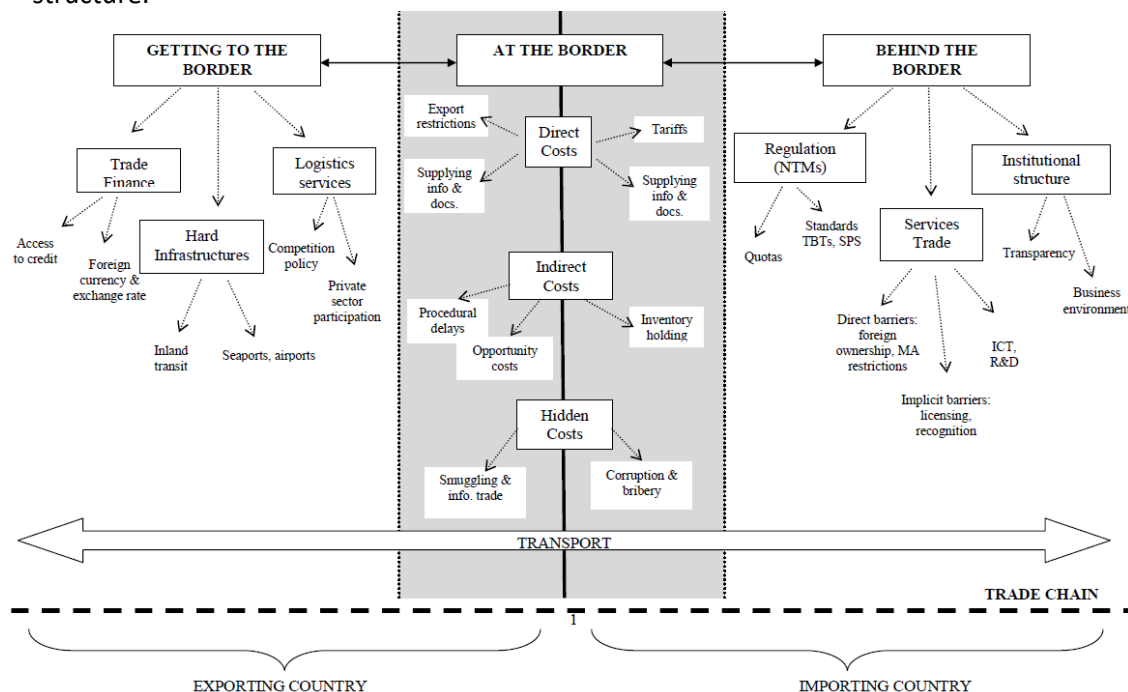


Figure 13. The trade cost components to diagnose the trade costs (Moise & Bris, 2013)

Out of the three categories, there are also other expenses to reach the final user or the ‘beyond-the-border’ costs. For this concern, they suggested Lean Retailing as one approach to minimize this cost, such as by implementing the ICT, enhancing the understanding of the customers’ taste and product variety, increasing logistic integration, marketing, etc.

Their study further also diagnosed the three major cost sources involved in a high-cost trade.

- Uncertainty and unpredictability, which involves the costs from area of:
 - Financial, includes the trade finance and exchange rate volatility
 - Customs, includes the documentation, trade delays, and other hidden costs
 - Regulation includes the standard process and market access
 - Infrastructure includes telecommunication and transportation
- Rent extraction and trade wage, which involves the costs from area of:
 - Macro risk includes corruption, bribery, and insecurity
 - Market failure includes externality effects, increasing return, monopolistic power, and information asymmetries
- Political economy, which involves the costs from area of:
 - Group of interest from supply side and demand side
 - Partisan preference
 - Distortive contribution

Their study offered more specific discussion of the border-related costs covering the transportation/logistic service costs and the border-related barrier costs which are spread to all areas. Their idea is slightly similar to the cost classification by Portugal-Perez & Wilson (2008). However, their model does not explain the costs regarding the inspection activities at the border into specific. There is also a limited discussion to the expenses addressed to the government agencies and port operator who act as the trade facilitation providers.

4. Andrew Grainger (2011, 2013, 2014a/b/c) in his several publications examined the compliance cost in relatively detail. He took the practical cases of the meat import to the UK from the importers perspective, though in some discussion he presented a brief analysis from the point of view of government authorities. In his literature, instead of explicitly show the cost classification, he presented his finding more in the empirical examples of the cost occurred in the three primary cost classification. His research came up with the conclusion that the customs compliance costs constructed by initial set-up and approval (authorization) costs, the transactional cost, and the inspection cost (Grainger, 2013). Also, a post-clearance cost was added besides the three cost groups mentioned (Grainger, 2014c). These expenses are divided into the direct and indirect costs. The sub-components of each category are as follows.

- The initial set-up and approval (authorization) costs
They are perceived as a one-time payment or the investment. For public organizations, it covers the expenses to build necessary facilities like the building, office, or other inspection facilities (Grainger, 2014b). While for private organizations, mostly it goes to the financial related things such as the annual Block Guarantee, or compliance related requirements such as system subscription (Grainger, 2013).
- The transactional costs
These costs are divided into direct and indirect costs. Direct costs are quite easy to track, such as the payments made to the shipping lines, agents, port health, or port operator (Grainger, 2014c). However, it is not the case for indirect costs which are much more challenging to be measured. Indirect costs cover the secondary impacts when the process does not work as the regular business practice.
- The inspection costs
These costs are only applied for selected cargo and are also divided to direct costs which are the money charged by the inspection agents (Grainger, 2013), and the indirect cost that covers quite extent impacts like storage cost, demurrage cost, business opportunity loss, or competitiveness loss (Grainger, 2014b).

Subsequently, Figure 11 is presented to show Grainger’s costs classification visually.

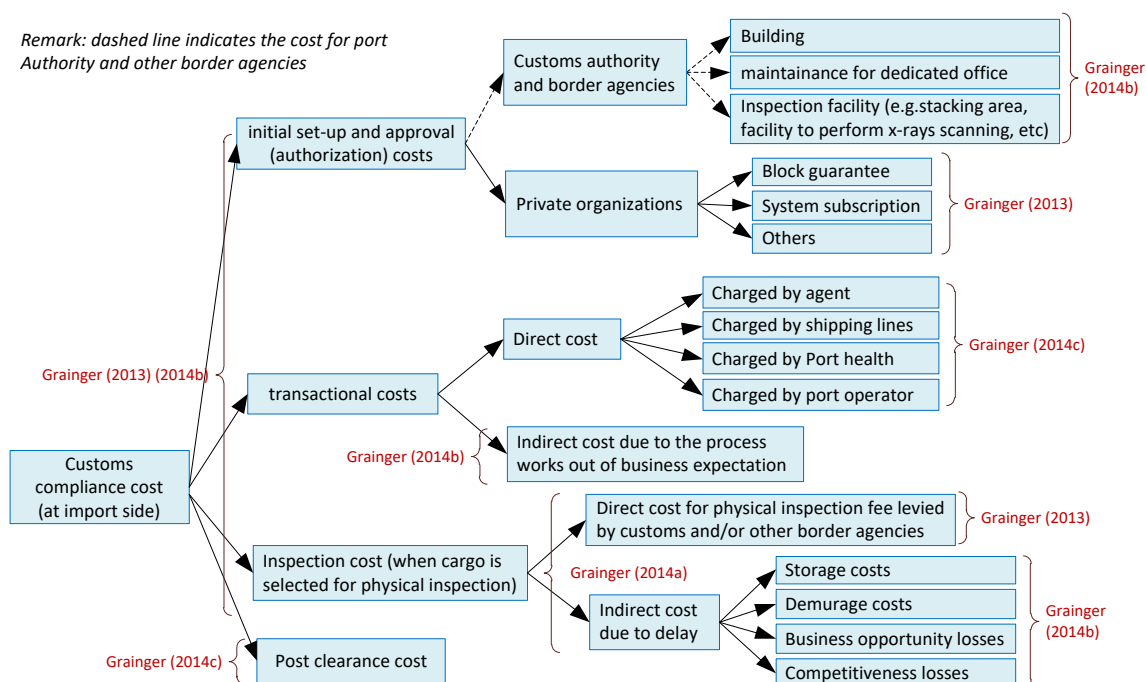


Figure 14. The visualization of the (import) compliance cost based on UK meat import case study by Grainger

5. The Network Trade Compliance (2014) proposed the mathematical model to measure trust worthiness in the global supply chain which is equal to the aggregate of credibility, reliability, and transparency, then is divided by self-orientation. There is no detail classification of the costs in the empirical perspective mentioned in this study.
6. Arvis, Raballand, & Marteau (2010) characterized the total trade cost as the sum up of the transportation cost, another logistic cost, and delay hedging cost.
 - Transportation cost covers the fee to be paid to the actual transit transportation service, such as trucker, rail operator, etc.
 - Another logistic cost is the aggregate of the transit overhead cost (such as the transit fee, cost for procedural, and facilitation payment) and the fixed cost of shipment.
 - Delay hedging cost is the total of the cost occurred due to in transit moving inventory, induced cost to hedge the unreliability inventory, warehousing cost, mode transportation shifting for the faster one which is often more expensive. This delay hedging cost is assumed as the indirect cost if referred to the Grainger's study.

Compare to other study, their research focused to the transportation costs only, less attention to other cost area like border-related costs highlighted by the first four studies discussed.

7. Ferrantino (2012) described the traded-goods prices along the whole supply chain as the aggregate of the associated costs from the trade actors and/or activities. These includes the factory price as the base price, then Free on Broad (FOB) price when goods are exported, Cost Insurance and Freight (CIF) price when they are imported, landed duty-paid price, wholesale profit, and retail profit. Similar to the fifth cited study, there is no detail classification of the trade and compliance costs in the empirical perspective mentioned in this study.
8. Renda, et.al. (2013) classified three cost areas within the six areas of legislation related to regulatory which is presented below. They argued that the total cost regulation is the aggregate of the first three cost area; the direct cost, enforcement cost, and indirect cost.
 - Area 1 covers the direct costs of regulation, which consists of:
 - Direct compliance cost, which includes the regulatory changes (fee, levies, taxes), substantive compliance cost, administrative burdens
 - Hassle cost which includes the cost associated with delay and waiting time, redundant legal provision, corruption, etc.
 - Area 2 refers to the enforcement cost in ex-ante impact analysis, which is the phase for monitoring, enforcement, and adjudication. This cost might vary significantly depends on the scope, enforcers, level of effectiveness, timelines, etc.
 - Area 3 is for the indirect regulatory costs. These costs are related to the stakeholder's obligation to comply with legislation, the cost of substitution, transaction cost, and market functioning negative impact (such as competition decrease, less market access, reduced investment, and innovation).
 - Area 4 includes the regulatory benefit in individual well-being improvement in health, environment, and safety, and efficiency improvement.
 - Area 5 includes the indirect regulatory benefits such as the spillover effect, wider macroeconomic benefit, and another non-monetizable benefit.
 - Area 6 covers the list of ultimate impacts of the regulation.

Their study is quite similar to Grainger's report that went more detail to the compliance costs and divided the costs based on direct and indirect costs. However, in this study, the idea is quite abstract and less detail, compared to Grainger's.

After all, based on these eight literatures, only two studies from Anderson and van Wincoop, and also from Grainger that would be adopted as the main literatures further on the design process. Meanwhile, the various trade and compliance cost studies that are presented above initiates a further discussion of the costing method in the supply chain, which is given in section 2.3 as follows.

2.3 The Supply Chain Costing Methods

In this part, a discussion about the supply chain costing is presented with a brief introduction to the traditional costing technique and a further discussion about the Activity Based Costing (ABC). Both of them are perceived as the most common costing methods used by practitioners to measure their supply chain costs, excluding the compliance costs.

One of the key factors to ensure an organization financial efficiency is the cost control which can be achieved through the collection of accurate and adequate information of the cost elements, both within the separate company and in inter-organizational management (Surowiec, 2013). The supply chain costing measures the costs of the activities spanning in the entire logistic channels by evaluating their performances to gain opportunity in improving customer service level and eliminating the unnecessary costs (LaLonde & Pohlen, 1996). It provides a mechanism to develop a measurement of cost-based performance to the key activities that comprise the supply chain. More importantly, it does not necessarily replace the traditional cost accounting method.

The concept of supply chain costing has characteristic of explaining the three cost levels: direct cost, activity-based cost, and transactional cost. Several costing techniques can be used: the direct product profitability, the activity-based costing, the total cost ownership, and the efficient consumer response (LaLonde & Pohlen, 1996). Surowiec (2013) added other techniques like target costing, open book accounting, kaizen costing, the theory of constraint, and the value chain analysis (or the balanced scorecard). However, in this particular section, the discussion is limited to the ABC technique.

The ABC was dominantly used as the means to more accurately assign cost within the organization in the 1980's. It offers the ability to assign the costs to the activities rather than to the product or service. Recently, the ABC is more widely used by organizations as they can obtain better information about how specific supply chains, or products, or customers in affecting their costs and profitability through evaluating the other supply chain members performance in driving the logistic costs. Below are some argumentations about the ABC superiority compared to other techniques like traditional technique.

- First, ABC is perceived to offer a solution that the traditional costing system was proven to be not sufficient in producing an appropriate cost allocation in a complex business environment (Tse & Gong, 2009 as cited in Tandoyo, 2016). The traditional costing technique typically allocates the costs as direct and indirect costs. The direct cost moves proportionally to the allocation basis, e.g. the direct labor cost. However, the indirect costs often do not vary in direct proportion to the working hours, machine time, or material quantity consumption, etc. Therefore, the traditional costing method might not be able to allocate the growth of indirect costs appropriately to the specific activities or the products/services, signaling an incorrect calculation towards the costs and profitability.
- Second, the use of ABC becomes a common practice that even replaces the traditional method since ABC is perceived to be able to calculate the cost more accurately. ABC is believed to be able improving the overhead cost allocation to the activities, processes, products, customers, and services. Thus, it allows the organization to observe the causal relationship the supply chain cost structure (Surowiec, 2013).
- Third, the organizations often suffer due to lack visibility of the expenses incurred through their logistic pipeline. One of the ideal idea to solve this problem is through radically change the basis of cost accounting. This change can be done by allocating all expenditures in a single unit (as a product) becoming the separate expenses by matching them to the activities that consume the resource, which can be obtained through Activity Based Costing approach (Christopher, 2010). Then, here the ABC provides the measure to the direct and indirect costs spent by organization to the activities that consume organization's resource, which can subsequently trace the costs in performing the activities such as to the products, distribution channels, or to the customers

Again, the ABC takes into account different relationship and considers multiple drivers to trade the indirect resource consumption. Compared to traditional costing techniques, ABC takes into accounts

multi drivers to assign cost, and assign the direct and indirect costs which are not covered by other techniques, like the Direct Product Profitability technique. So, the ABC practice likely is helpful in determining the cost drivers throughout the logistic pipeline that leads to the costs due to resource consumption. The simple distinction between the traditional cost basis and the activity bases is shown in the following example.

Table 6. The Traditional based costing method vs. the ABC (Christopher, 2010 p.112)

<i>Traditional cost bases</i>	<i>£000s</i>	<i>Activity cost bases</i>	<i>£000s</i>	<i>Cost drivers</i>
Salaries	550	Sales order processing	300	Number of orders
Wages	580	Holding inventory	600	Value of shipment
Depreciation	250	Picking	300	Number of order lines
Rent/electricity/ telephone	700	Packing/assembly of orders	100	Number of order lines
Maintenance	100	Loading	200	Weight
Fuel	200	Transportation	500	Location of customer
		Delivery at customer	200	Number of drops
		Solving problems	380	Number of order lines
	£2,380		£2,580	

Despite the ABC’s popularity among firms, it does not guarantee all firms are applying it. Most of the firms even have not implemented the ABC and cannot provide their supply chain-related costs at the activity level. However, the ABC methodology does not provide information to determine how the individual firm’s behavior has affected the total supply chain cost and does not allow the supply chain stakeholders or partners to determine where the non-value added activities are.

By adopting the ABC technique, organizations are expected to be able to reduce the costs effectively. It answers the problem that in any cost reduction initiatives, sometimes the solution suggests to shift the function of ‘done’ by the actors in the supply chain system since one actor might be able to perform a certain function more efficiently than other actors (Tandoyo, 2016). This means the ABC can be the tool for the organization to evaluate their performance, especially to consider the outsourcing option to increase their performance efficiency as it can draw the indirect costs closer to the different activities that consume the resources.

2.4 Conclusion: The Gaps

From the previous discussion, conducting an efficient process in the international trade lane has become the primary interest of the private organizations as well as the border authorities or the public organizations. The idea of implementing IT-enabled trade facilitation (such as the data pipeline, single windows, port community system, and other initiatives) are interesting to achieve the goal of establishing a visible and reliable supply chain to cut the logistic costs. However, knowing the costs themselves is a challenge as the real costs in international trade are unknown due to the complexity of the compliance process, and the inefficient information flow and document trails. It is even harder to cut the cost and manage the risk to increase the competitiveness when the cost itself is unknown (2010). Therefore, a study of the trade and compliance costs that can explain the costs involved in the international trade is needed, especially due to the complex compliance procedures. Moreover, there is a lack of study that can tell the costs at the company level which can be easily applied to see the costs explicitly from several articles cited, including the main two articles with the limitations as follows.

- The Anderson and van Wincoop (2004) that only explained the trade cost from macro-economic point of view, so that it is inappropriate for the application at the company level. Also, there is limited discussion about the policy barrier in the border-related barrier costs, while it is assumed as one of cost area that contributes the biggest costs.
- The Grainger’s studies are not sufficient to explain the compliance costs in general, as those studies only focus on the compliance costs for specific commodity (the meat import) for particular country

(the UK). These studies ignored other costs that are highlighted by Anderson and van Wincoop such as the transportation costs which perceived as the other major cost in the supply chain activity.

To sum up, the Anderson and van Wincoop study does not go into the details of the compliance costs; the Grainger studies do, but do not cover the other expenses mentioned by Anderson and van Wincoop, as well as other studies that give only a fragmented view of trade and compliance costs. Hence, the main research gap can be formalized that there is no holistic model allows moving from the high-level categories of the trade and compliance costs to a detailed breakdown of these costs to allow the analysis and measurements at the single company level.

The gap then is divided into several practical gaps as follows which are addressed in the next chapters' discussion.

- There is a need to build viable artefact in the form of costs model that explains the trade and compliance cost in international trade at the company level as part of design cycle in the Design Science Research.
- The artefact needs to be verified/evaluated as part of design cycle in the Design Science Research
- A discussion to demonstrate how the viable artefact is applied to the empirical case(s)
- The utility of the viable artefact to identify the research contribution and to address the reverse loop of the rigor and relevance cycle in the Design Science Research
- A critical analysis of the research compared to others related research domain, for example, the costing method of the built model to other supply chain costing method, e.g. the traditional costing method and ABC technique.

3

THE CONCEPTUAL MODEL BUILDING

Different from the literature review in Chapter 2, the Chapter 3 focuses to exploit the main studies that had been selected from the previous phase. In this chapter, the selected studies were explored through *backward* and *forward snowballing*⁹ methods, then immediately filtered the findings based on the correlation of the title to this research objective. If the result were not satisfying, the literature review would be continued by searching the articles, journal, or reports through Google searching engine using the specific terms or keywords needed. Finally, the first model was introduced, namely the initial Company-Level Compliance Cost (CLCC) model, which allows for a detailed break-down of trade and compliance cost at the company level. The deliverable in this chapter answers the second sub-question.

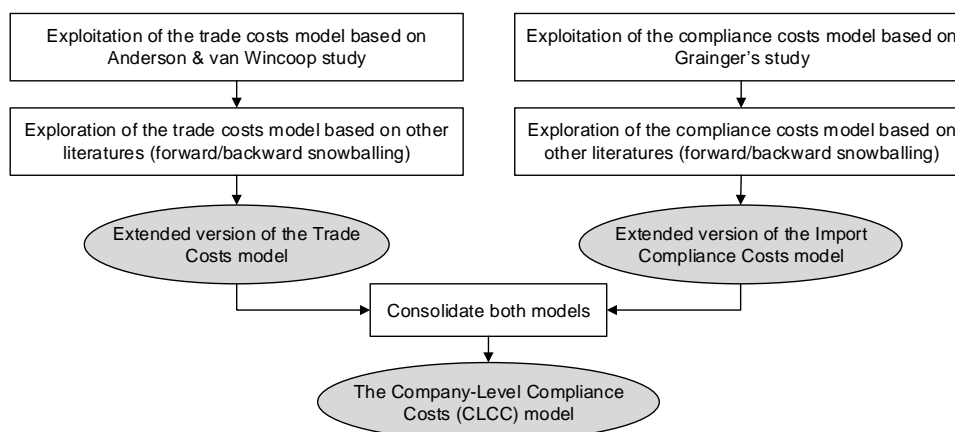


Figure 15. The work flow of Chapter 3

3.1 The Trade Costs Model

The trade costs study from Anderson and Wincoop (2004) was cited as the first reference for this research considering three main reasons. First, simply it is one of the most cited literatures in the field of trade cost analysis¹⁰. Second, their discussion scope has covered the entire activities in general of a supply chain; from the preparation of the trade, transporting goods from the point of manufacture, compliance process at the border, to the delivery to end consumer. Third, the cost approach used are perceived simple but clear enough in classifying the costs based on the related activity area.

In this sub-chapter, the discussion is divided into three parts: the trade costs model building, the extended version of the trade costs model, and the evaluation of the extended version of the model.

3.1.1 The Trade Costs Model Building

Trade costs are large, even with the absence of formal barriers. Anderson & van Wincoop (2004) defined the trade costs as “all costs incurred in getting a good to a final user other than the production cost of the good itself”. It covers the expenses at all stages of the export and import process, starting

⁹ Backward snowballing means tracing back the cited papers in such articles, while forward snowballing means tracing forward towards papers that cite the journal papers

¹⁰ At least it has been cited by 3,570 studies per 28 July 2017

from the information gathering about the market condition of foreign market to the final payment receive (Portugal-Perez & Wilson, 2008). Trade costs in average equal to 170% of the production costs and consist of three cost components: transportation costs (21%), border-related barrier costs (44%), and the retails/wholesales profit (55%) (Anderson & van Wincoop, 2004).

1. Transportation Cost

Transportation cost has three different perspectives in how to place this cost in the economic importance: the transportation costs relative to the goods’ value, the transportation costs relative to other trade barriers (such as the tariff cost), and the extent to which it alters the relative price (Hummels, 2007). Data from the US trade mentioned that in industrial countries, transportation cost contributes at around 21% compared to the production cost. This transportation cost covers the *direct costs* and *indirect costs*. Based on the real network, transportation cost measures several characteristics of the infrastructure, vehicles and energy used, the cost of labor used, insurance, and the charges borne by transport providers/carriers (Combes & Lafourcade, 2005). In practice, the transport provider companies often have included all of these factors in one bundled charge/invoice.

a. Direct Transportation Costs

The direct transportation cost consists of *freight cost* and the shipment insurance (which sometimes has been included in the freight charge cost). The freight costs address the expenses for the international movement, domestic movement, and the mode interchanges (Ministry of Transport, 2010). The international and domestic movement in this discussion does not purely represent the movement based on the country’s border boundary. The international movement refers to the vast ocean transportation (often across continents). While the domestic movement is translated as the transportation outside that vast ocean moves, both at the origin (before the international move) and at destination (after the international move), though in practice it is possible to arrange domestic moves across countries.

Shipping lines’ freight cost is the total price for bringing the shipment that consists of the BAS¹¹, BAF¹², THC¹³, other mandatory surcharges, and VAS¹⁴ (Maersk Line, 2017). The freight cost typically charged per tonnage and may include the loading and/or unloading expenses (Hummels, 1999). Out of the all-in freight cost, a detention and/or demurrage charges may occur which vary per shipping line, per country, and even per port. The detention charge is applied when the exporters/importers hold the shipping line’s container longer than the agreed free time outside the port/terminal. While, the demurrage cost is applied when the exporters/importers hold the container longer than the agreed free time inside the port/terminal. By applying the demurrage and detention penalties, there would be a high impact on the container users’ behavior. This is because they are indirectly forced to deliver the container before the additional costs occur, both for a full container until it is loaded to the vessel and for empty container back to the empty depot, (Fransoo & Lee, 2012).

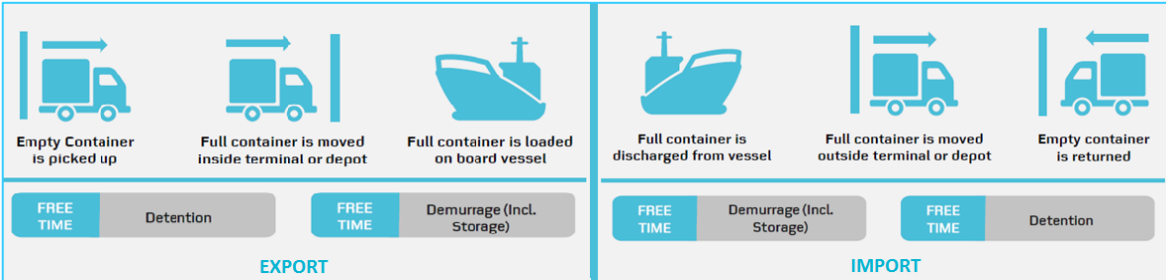


Figure 16. The illustration to detention and demurrage costs (adapted from Maersk, 2017)

¹¹ BAS is the basic ocean freight, or the transportation rate for moving your cargo which is determined by several factors such as combination of origin-destination, cargo type, etc.

¹² Bunker Adjustment Factor, is the cost in relation to the fluctuation of bunker cost (oil used by the vessel), normally per quarterly basis

¹³ THC is an additional cost on top of the sea freight that is charged by shipping company for the handling of container before being loaded onboard to the vessel and after unloaded from the vessel upon arrival.

¹⁴ VAS or Value Added Service is the charge for the extra services to accommodate customers’ additional requirement, for example container cleaning, Garment of Hanging (GOH), Out of Gauge, temperature control, etc.

The domestic transportation cost involves different modes of transport such as by truck (or other road modes), by rail, or by river/barge. A multiple mode combination is possible, but the mode interchange charge might apply. Other than the formal and non-formal charges, in most cases of FCL¹⁵ container, the trucking company would only allow the truck driver to wait for the loading and unloading process for limited hours (typically 2 hours). Otherwise, the overtime charge would be applied to compensate the waiting time beyond the standard free time (Sefco, 2011).

For certain occasions, the transport company providers can apply the booking fee, especially during the peak season. Securing the trucking slot might cost between £0-£15 with penalties of no-show cargo between £27.17 - £30.00 and vary per port (Grainger, 2013). For the shipping liner, the booking cancellation cost sometimes is applied either during the high demand period, or for a customized booking arrangement (such as for the GOH¹⁶ booking, or for certain container size which is not always available at every port like the 45 feet or 53 feet container).

When the shipment is subject to physical inspection, naturally there will be an additional transportation cost to be borne by the importers due to extra movement inside the terminal. This intra-terminal movement cost covers the container's transportation from import container stack yard to the customs inspection area or to the other agencies' inspection area (or even both) and the return trip, to accommodate the picking and delivering the container to and from the customs inspection facility (Grainger, 2014c).

b. Indirect Transportation Costs

The indirect costs refer to the costs of holding goods in transit (or the time value of goods), inventory cost due to buffering the delivery date variability, and preparation cost associated with the shipment size. The preparation cost implies the cost due to sacrificing the time when shippers postpone the shipment to wait until they can ship them in FCL. This assumption is based on the consideration that FCL offers more economical cost per cubic delivery than the LCL¹⁷ shipment, as well as other factors such as risk in safety and security in the consolidation process.

Indirect time value of goods is also translated as the willingness to pay for the saved time. A lengthy transportation time imposes both the inventory-holding and depreciation cost to the shippers. Hummels (2001) translated the inventory holding cost as the capital cost of goods in transit (e.g. the expense to provide dry packs to avoid moisture damage for shipment that takes 30 days in transit is bigger than if it takes 20 days) and the cost of holding for larger inventory at the final destination. The idea of the depreciation cost is incurred due to the mismatch between what the manufacturer produces and what the consumer desires to purchase weeks or months later. His study suggested that a one-day faster shipping time is worth for 0.8% of the ad-valorem for the manufactured goods.

2. The Border-Related Barrier Costs

The border-related barriers tend to be higher in developing countries than in the industrialized countries, which are partly contributed by the weak institutions and poor infrastructure. This cost is responsible for around 44% of the production cost (with a more meaningful range of 25% to 50%). The transport costs and the retail/wholesale margin can be directly measured, but not for the border-related barrier costs. Border-related barrier cost breakdown is presented as the expenses spent due to the policy barrier, language barrier, currency barrier, information cost, and security barrier. These costs are explained in detail in the following.

a. Policy Barrier

¹⁵ Full Container Load, means the goods inside the container belongs to one shipper who is responsible for the loading and the unloading, as well as the risk. It mostly offers a more attractive rate compare to an equivalent weight of loose

¹⁶ Garment on Hanger container, a standard container that is converted to be able to safely and conveniently carry the garments in hangers by installing the rope or bar inside the container

¹⁷ Less Container Load, means the goods inside the container belongs to multiple shippers. Typically, the loading process is done by the consolidator or freight forwarder.

The policy barrier contributes at around 8% from the production cost based on evidence from tariff and non-tariff barriers (Anderson & van Wincoop, 2004). This policy barrier refers to the regulatory (or regulatory policy). The valuation of 8% comes from the Anderson and van Wincoop's survey done in several countries, including US, Canada, and some European countries. The policy barrier is categorized into five areas: revenue collection, safety and security, environment and health, consumer protection, and trade policy based on Grainger's study to the UK import cases. All of these five areas represent the tariff and non-tariff measurement costs.

The trade policy cost in natural is much better documented though there might be some that are not complete or inaccurate due to scandals and a 'puzzle' since the political economy does not offer a convincing explanation for the data scarcity. One of the most cited data for the trade policy cost can be found at United Nations Conference on Trade and Development's Trade Analysis & Information System (UNCTAD's TRAINS) database, and other statistical source of Market Access Map (MAcMap) by CEPPII, a French research center in international economics (Moise & Bris, 2013).

The 'policy' terminology is also frequently named as 'regulatory', or 'regulatory policy'. OECD (2016) defined it as "achieving government's objectives through the use of regulations, laws, and other instruments to deliver better economic and social outcomes and thus enhance the lives of citizens and business". Grainger (2011) categorized the regulatory into five areas: revenue collection, safety and security, environment and health, consumer protection, and trade policy.

Table 7. The regulatory categories and examples (Grainger, 2011)

Regulatory category	Examples of related activities
Revenue collection	Collection of customs duties, excise duties, and other indirect taxes; payment of duties and fees; management of bonds and other financial securities
Safety and security	Security and anti-smuggling controls; dangerous goods; vehicle checks; immigration and visa formalities; export licenses
Environment and health	Phytosanitary, veterinary and hygiene controls; health and safety measures; Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) controls; ships' waste
Consumer protection	Product testing; labeling conformity checks with marketing standards (e.g. fruit and vegetables)
Trade policy	Administration of quota restriction; agriculture refunds

Other literature suggested that the policy barrier is divided into two: tariff (ad-valorem and specific) and Non-Tariff Measures or NTMs (De & Rout, 2008) (Hoekman & Nicita, 2011).

1) *Tariff cost, as a direct policy instrument*

Customs tariff, or simply stated as "tariff" is the import duties levied by Customs administrations according to the official trade tariff publication in the specific country (Grainger, 2014b). Tariff is often in the form of specific taxes on quantity which must be converted to ad-valorem equivalents. The tariff cost percentage is low in many developed countries (under 5%) but higher at developing country (10% to 20%). The average tariff rate or duty rate for manufactured goods is estimated at around 3.6% and vary per sector. For example, import tariff levy for pharmaceutical in most major markets is almost zero, a contrast to the European duty import for textile products which can hit 12% (Grainger, 2014a).

Tariff is classified based on the goods classification as per Harmonized Commodity Description and Coding System (tariff book). It contains the regular customs duties, excise duties, ad valorem duties, anti-dumping duties, and countervailing duties (SARS, 2017). By this definition, the tariff barrier is then included in the revenue collection based on Grainger's regulatory policy category.

Tariff barrier becomes a less significant barrier, proofed by a steady reduction in the tariff rate world widely (Moise & Bris, 2013). In the period 1960 to 1995, the average import tariff falls from

8.6% to 3.2% (Hummels, 2007). Other study mentioned that it fell from 15.5% in 1990 to be 7.9% in 2003. Therefore, though tariff still becomes the most widely used policy instrument to restrict the trade by Customs agency, there has been a declining trend to their relative importance (Hoekman & Nicita, 2011).

2) Non-Tariff Measurement

Non-Tariff Measurement (NTM) cost category is much more problematic than the tariff regarding the necessary information and the conceptual issues. The NTM is not merely only a number; it more represents all barriers or obstacles to the international trade other than the import and export tariff/levy duty. The NTM's impacts are often subtle, indirect, and very sensitive to the international trade (UNCTAD, 2013). This NTM cost is significantly different across the goods sector. Some are close to zero but other can be very high depends on the commodity sector. Unlike the tariff barrier, the non-tariff barrier is high and increasing due to the effect of antidumping policy and the effects.

Linkins & Arce (1994) divided the NTM barrier into five categories: quantitative restriction, non-tariff charges, government participation in trade and similar restrictive policies, customs procedures and administrative policies, and technical barriers to trade. Meanwhile, Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), and Southern African Development Community (SADC) added the previous five non-tariff barrier categories with three more measures. They are Sanitary and Phytosanitary (SPS) measures; other procedural problems; and transport, clearing and forwarding (see Appendix A for the full category list and examples).

Table 8. The NTM classification according to COMESA, EAC, and SADC, and Linkins and Arce

Non-tariff category according to COMESA, EAC, and SADC		Non-tariff category according to Linkins and Arce
Category 1	Government participation in trade & restrictive practices tolerated by governments	Government participation in trade and similar restrictive policies
Category 2	Customs and administrative entry procedures	Customs procedures and administrative policies
Category 3	Technical barriers to trade (TBT)	Technical barriers to trade
Category 4	Sanitary & Phytosanitary (SPS) measures	-
Category 5	Specific limitations	Quantitative restriction
Category 6	Charges on Imports	Non-tariff charges
Category 7	Other procedural problems	
Category 8	Transport, Clearing, and Forwarding	-

Since the NTM costs address the cost other than import/export duty which is incurred due to quota restriction, customs compliance procedure, embargo, import licensing, export subsidy, sanction, levies, currency devaluation, foreign exchange control, etc. (COMESA-EAC-SADC, 2017). It means the NTMs represent the regulatory policy classification from Grainger other than the revenue collection. Therefore, the NTM barriers in practice cover the regulatory of safety and security, environment and health, consumer protection, and the trade policy.

b. Language Barrier

International trade often involves additional task related to the language barrier, such as the foreign market research, communication to the foreign counterparties (including the documents translation), and some other challenges in marketing the product to the foreign consumers (Molnar, 2013). Melitz (2008) argued that different languages can be the impediments to communication and the trade. Indirectly, the language barrier requires the organization to pay the labor higher to acquire the language skills.

The cost incurred due to the trade with another party that speaks a different language is about 7% of the production cost. However, the language barrier can be assumed weak or non-existent if a foreign language can be understood and well received in one's home tongue freely without a need of a translator. There are two common reasons why the absence of common language/linguistic between organizations can be a problem leading to the cost of translation. First, it is quite clear to see the social overhead costs in preparing the 'ground' for the translation distribution widely to a broad audience and the cost due to dealing out those services to the people individually. Second, the organization perceives the need of resort to translation when Direct Communication¹⁸ is important (Melitz, 2008).

A phenomenon that indirectly increases a country's capability to hold direct communication with new countries comes from the immigrants move. Their ability to speak in their native language then translate into the primary language used in the host country can reduce the language barrier cost of the trade between their origin countries to the host country, as well as to promote the trade between those two nations.

c. Currency Barrier

The currency cost covers the expenses involved in exchanging currencies and hedging the currency risks. Anderson and van Wincoop (2004) studied the data from 143 countries and found that the barriers due to different currency shares around 14% over the production cost.

Typically, a buyer that uses foreign currency will absorb the exchange cost from each transaction made. There is less exchange rate volatility in a stable economic condition, reducing the risk for the actors in holding the bilateral trade. Therefore, a fixed exchange rate can promote the trade by itself. However, a total elimination of the exchange rate volatility from the mean only suggests 1% to 2% reduction in the international trade cost, which does not significantly change the entire variable (Klein & Shambaugh, 2006).

d. Information Barrier

Petropoulou (2005) classified the information cost as the expense that covers the search and communication activities between international trade partners, and it can affect the way in which the trade is organized. The information barrier cost might relate to the expense spent in the searching effort to find the international suppliers or customers. This searching cost is low when the trading partners well know the business practices, competitiveness level, product/service quality and delivery reliability.

The trades mainly take place through intermediaries when the information cost is high between two bilateral countries. Meanwhile, when the information cost is low as the result of good ICT networks, the more direct trades between countries can take place. Though the modern ICT cannot fully prevent language barrier, at least it can enhance buyer's information and trust which often shares higher benefit to the Small Medium Enterprises/SMEs if they can integrate the ICT application to their online commercial platform. Therefore, the application of e-commerce platform is required since an unreliable communication and technology infrastructure leads to higher uncertainty in the supply chain.

The information barrier also addresses the opportunity cost due to lack access to good transportation arrangement and poor telecommunication infrastructure and service (Nordas & Piermartini, 2004). Online platforms can provide ready-made marketing infrastructure that can significantly lower the trade costs due to the distance between sellers and buyers. This platform also can reduce the technical obstacles to establish an online presence when it is compared to the stand-alone websites. It also allows buyers and sellers to find an integrated fulfillment, market translation

¹⁸ Direct Communication (DC) measurement depends on the speaker's percentage of both countries that are able to communicate directly to make a statistical difference in explaining the trade between the two countries.

and data analytics, hosting, and customer services (WTO, 2016). For example, a shipper will have less reliability when they are using paper documents for communication to their counterparties instead of using electronic documents, either for tracking or customs processing. Recently, it is much cheaper and easier than before to obtain the information from the foreign market since the introduction of the internet of things. Therefore, the search process and communication activities between international trade partners, especially if it relates to the shipment, can be cut down by applying data pipeline.

e. Security Barriers or Contracting and Insecurity Cost

The contracting cost addresses the expenses due to writing contracts and enforcing them, or the self-insuring cost of unenforced contracts. It has an association with the contractual enforcement problem and corruption. Contracting and insecurity cost can be classified as the transactional cost for the trade, but often only occur once at the beginning of the contract.

The insecurity cost can also be translated as the effort established to reduce the uncertainty in the trade itself. In most cases, the uncertainty addresses the shipment's quality and quantity, which is often associated with the infrastructure quality. Poor infrastructure likely leads to higher risk of cargo damage, makes the importers/exporters spending a higher losses risk and insurance costs.

Nordas and Piermartini (2004) divided the trade's transactional cost into two dimensions: the direct monetary outlay, and time that represents the indirect monetary outlay.

1) The direct monetary outlay

This expenditure covers the cost of communication between traders, business travel expense, contract insurance (for example the use of "Letter of Credit" or LC that include third party involvement), and legal advice. Specific to the communication expense, it partly correlates to the information barrier that more or less depends on the technology infrastructure development of the countries involved. For example, the communication cost between two countries can be different even though they have the same distance. They are different because the country that has a poor telecommunication infrastructure will face higher communication cost with often lower quality. This cost will also be significantly higher when the bilateral trade involves more heterogeneous products compared to homogenous ones.

2) Time as indirect monetary outlays

Time is valuable, just like in proverb 'time is money'. However, it is portrayed in a slightly different way as it responses to the time in adopting the just-in-time process supported by a strong international supply network. In supporting the just-in-time concept, organizations are often faced to cumbersome and complex transactional processes to ensure they establish right contracting agreements to get a reliable process.

3. Retail and Wholesale Profit Margin

This cost has the association with goods movement over distance and across jurisdictional borders. The margin contributes at average 55% or higher over the production cost (close to the average industrial countries), with at least 40% irrespectively for the poor or rich country. In particular, the percentage goes at 68% for the US, 53% for Germany, and 50% for The Netherlands. This margin can be measured from data gathering or interviewing the related firms.

3.1.2 The Extended Version of the Trade Costs Model

Based on the discussion as above, the trade costs model then was constructed (see Figure 17). This model uses the primary trade costs classification by Anderson and van Wincoop (2004) that divided the trade costs as the transportation cost from a place of production to the place of delivery, the border-related barrier costs, and the retail/wholesale margin. The additional cost elements identified in the

section 3.1.1 of this paper were added to enrich each of the three main cost classifications based on other literature, author's own idea, and discussion with experts. The red color indicates this additional information.

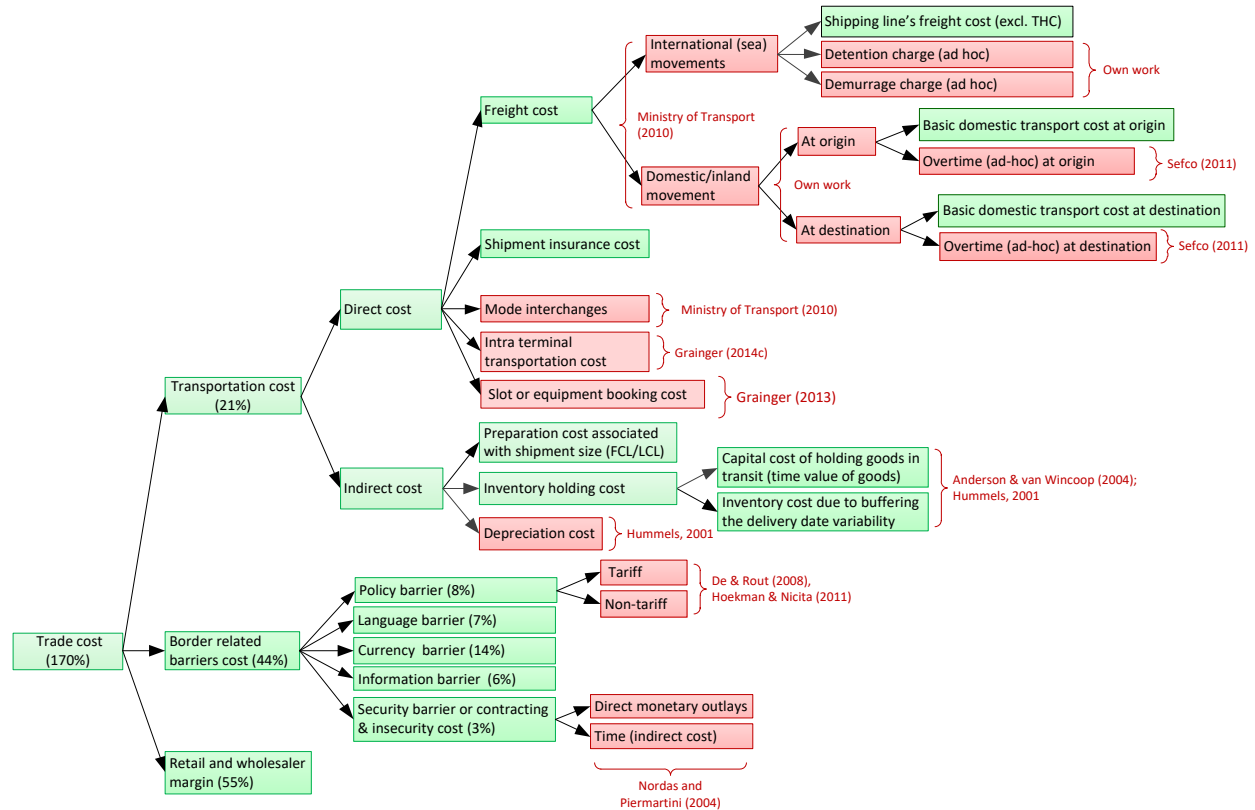


Figure 17. The extended version of the trade costs model of the Anderson and van Wincoop (2004), with author contribution in expanding the cost categorization from other literature as shown in red color

3.1.3 Evaluation of the Extended Version of the Trade Costs Model

This built trade cost model can explain the trade cost composition in general practice from the point of origin to the point of destination and provide the logic why the imported products have a higher price significantly compared to their production cost. In the previous discussion, the information about the percentage number for some cost areas are presented; however, these figures only indicate the average level based on an empirical study in several countries without information of the variance and the real value. Therefore, the number cannot be solely cited as a single data source to decide the cost magnitude for a particular country.

Positive side, this trade cost model is able to show the entire trade cost in a full cap. However, there is a weakness that the model only explains the cost component from the surface without a detailed breakdown, especially for the border-related barrier which contributes even at around 44% from the production cost. Also, this trade cost model application is limited to the study macroeconomic perspective and is hard to reflect this model to understand the dominant issue in the international trade in relation to the process of crossing the country border. Though the discussion to explore the cost breakdown is needed, not all of the cost components in this trade model are necessary to zoom in. Only the transportation cost and the border-related barrier cost that are necessary to be adapted to the further research considering their potential contribution to the trade and border compliance study. Meanwhile, the retailer/wholesale margin is left as it is without a further breakdown.

While the model presented in Figure 17 already provides rich insights from a macroeconomic perspective into the types of trade costs, it remains insufficient when it comes to capturing and making explicit compliance costs at a company level. To further zoom-in on the compliance costs, we built upon a series of studies of Grainger (see Section 3.2 below), as these studies provided further insights into cost categories related to compliance.

3.2 The Import Compliance Costs Model

The second step to enrich the initial trade cost model of Anderson and van Wincoop is to extend it with components of Grainger's import compliance cost model that is based on his empirical case study about meat import to the UK. He proposed that the import compliance costs consist of a) the initial set-up and approval (authorization) costs; b) the transactional costs, and (c) the inspection costs (Grainger, 2013). Additionally, (d) post clearance costs also exist after the goods have passed the border (Grainger, 2014c). We only take import compliance costs into account, because these costs are typically much higher than the export compliance costs (Walkenhorst & Yasui, 2003).

Grainger focused his research on the import compliance by conducting the case study to the UK's meat import from non-European countries. He took into a depth study of the trade and compliance costs that were experienced by three UK's meat importers, two freight forwarders (agents) specialized in the meat trade and the field visit to the Border Inspection Posts (BIP) at one of the port health inspection agency.

Similar to the previous trade cost model in section 3.1 above, this second costs discussion of the compliance costs study is divided into three parts: the model building, the presentation of the extended version of the customs compliance cost model, and the evaluation of the model's extended version.

3.2.1 The Customs Compliance Costs Model Building

Grainger (2013) suggested that the compliance cost is the aggregate of three cost components: the initial set-up and authorization cost, the transactional cost, and the inspection cost. Additionally, Grainger (2014c) later suggested that a post clearance cost also exists after the goods leaving the border. Each of these cost components is discussed in the following.

1. The Initial Set-Up and Approval (Authorization) Costs

For the importers and the agents as the trade facility users, *the initial set-up cost and approval (authorization) costs* refer to the necessary activities that need to be done (often require one-off payment) to make them eligible for the compliance procedures. Meanwhile, *for the public organization*, the initial set-up and approval costs are translated into the investment needed to provide suitable facilities so that the border agencies can perform the necessary activities of their duties (Grainger, 2014b). It includes the *building construction, maintenance for a dedicated office*, and providing *inspection facility* both for *physical inspection* and facility to conduct the *x-rays scanning*. The magnitude of the construction costs associated with this area depends on how tight the customs and non-customs control level, and the cargo throughput volume at the particular port.

For *private organizations*, the initial set-up and approval cost is divided into *direct* and *indirect* costs based on the general cost distinction. Citing the Grainger's case study, the UK meat importers should prepare the direct initial set-up cost ranges from £656.20 to £13,735.80 that is dominated by the Block Guarantee. A *block guarantee* is an example of customs guarantee¹⁹ that can be used for several numbers of transactions up to the guarantee's value, typically at £10,000 annually. The guarantor will reduce the guarantee balance when shipment enters into obligation and increase the balance back when the proof is received explaining that the particular shipment has met the obligations. The guarantee is not always in the form of block guarantee. It can be in Single Transaction Guarantee (STG), and other cash or security transfer (cash, check, bank draft, or bank transfer) but they are involved as the incidental/transactional cost paid case by case, not for securing a long term cases.

Other than for block guarantee, the remaining initial set-up costs are mostly spent for the *annual system subscription* to the main Port Community System providers. The subscription process is needed by agents for cargo clearance through port's customs. Later, agents will pass the cost to the importers as a 'customs entry fee' document costs £20-£40 per twenty-foot equivalent unit (TEU) declaration.

¹⁹ Customs guarantee is an agreement used to cover the customs debt that may arise from a certain procedure in relation to the import/export activity to guarantee that the importer comply with the import/export license terms (gov.uk, 2014).

Other one-off activities might also follow such as for the *registration to the customs, veterinary, and the shipping line system* which often requires additional training (ad-hoc) for the organization's staff. In overall, the set-up and authorization costs are perceived negligible if compared to the scale of whole business operation (Grainger, 2014c).

If the above discussion focuses on the direct costs, then the indirect costs address the secondary effects of the direct costs. The indirect costs involve but not limited to the expense to hold the *staff training* before they can use the system and other expenses needed to *set-up their facility* to be ready to adapt the IT system. This indirect costs also include the bank account setting up or another financial platform for the payment need, IT set up to synchronize software or system to comply and synchronize to the external system, or any other facility set-up to make them comply with the regulatory compliance. The set-up of facility, system, and financial are aimed to support the B2B and B2G control.

2. The Transactional Costs

Grainger (2014b, p.477) defined the transaction costs as "those costs incurred by the port (or its Port Community System provider) in collecting regulatory-relevant information that is not normally required for physical handling and commercial operations alone". More specific, it is transactional in nature to clear the cargo through the port and other government agencies (Grainger, 2014c). So, the transactional costs are applicable for all shipment without exception.

Directorate General of Foreign Trade (2011) translated the trade-related transaction costs as "a large number regulatory requirements, compliance measures, procedures, and infrastructure related costs, including communication costs with clients, domestic transport costs to bring goods from the production site to the border, time and money spent in ports on border procedures or to make products ready for shipment, international transport costs and inspection and certification costs". Therefore, the application of the transactional costs are revolving around the legislation and regulation enforcement, administration costs of the trade policies at the agencies such as customs, port authority, trade ministry, banks, etc., which are the focus of the trade facilitation.

The authors of OECD, Walkenhorst and Yasui (2003), described the Trade Transaction Costs (TTCs) as the costs related to the border procedure. They suggested that the transaction cost might contribute 1% to 15% of the goods' value. Also, the transactional cost varies and heavily depends on the efficiency and integrity of the business and administration interactions, goods' characteristics, and the business type and size. In particular to the business type and size, smaller traders will face disadvantages compared to bigger ones. This disadvantage refers to several issues like the following.

- The tendency that the small traders have fewer specialized employees so that they might need to devote more resource to acquire the knowledge in the field of trade and cross-border procedures
- Small traders face weaker capital reserves to see unforeseen delay cases
- Small traders have less or even un-sufficient shipment track records at the customs side which make them be classified to have higher risk category so that they are more frequently being addressed for physical inspection and leads to higher documentary cost

The transactional costs are also divided into two: *direct* and *indirect* transactional costs

a. Direct Transactional Costs

Directly incurred transactional costs are the expenses associated with supplying information and documents to the related parties/authorities. These expenses involve the costs in the context of collecting, processing, producing, and transmitting required information and documents. For the UK meat import, Grainger (2014c) divided the direct transactional costs into four cost components as the following as well as the explanation of the cost examples.

1) *Charged by agents*

Agents refer (but not limited) to the freight forwarder, customs broker, and other third parties assigned by importers to handle the process. This area includes the *initial document checking* by

the agents, *Direct Trader Input or the DTI charge*²⁰ (or often known as Electronic Data Interchange/EDI charge), agents' charges for preparing the *customs entry declaration* on behalf of importers such as the *Common Veterinary Entry Document*²¹ (CVED) production cost which includes the service to get it stamped, *dock/port levy charge* for customs inspection irrespective whether the container will be inspected or not, and other costs in relation to the flat rate inspection cost model.

2) *Charged by shipping lines to the agents*

This cost is charged by the shipping line that will pass on to the importers via agents at cost. For example, the *Terminal Handling Charge (THC)*, *Lift-on Lift-off (LOLO)* charges to load and unload the containers, *demurrage cost*, and *other port activities and equipment charges* such as the additional fee for temperature monitoring and equipment used for reefer cargoes when cargo is in transit. Since THC is assumed as cost paid to the shipping line to clear the goods from the port, therefore, the THC is then excluded from the freight cost of the international transportation cost. The demurrage cost is also mentioned in this case category other than what has been included in the transportation cost. The first demurrage cost in the transportation cost refers to the demurrage cost that is purely caused by transport related issue. Those transport issue might be due to importer's fault in arranging the truck to pick up the cargo from port, importer postponed the pick up since the warehouse was full and could not receive more goods, or other reasons. Meanwhile, the demurrage cost in this direct transactional cost addresses the additional cost occurred due to the customs compliance issue.

3) *Charged by port operators*

This cost area covers the *Border Inspection Post or BIP*²² fee per container inspection, the *International Ship and Port Facility Security (ISPS) security charges* per container, *infrastructure charge*, port's *Vehicle Booking System (VBS) charges*, and *port levy for the customs inspection*. VBS is a tool in relation to the terminal capacity management system by managing the containers and trucks movement through the port facility to drive efficiency, reduce congestion, and grow port's capacity. As the port operator provides it, thus it is charged by the port operator and then passed to the importer by an agent.

4) *Charged by port health*

A veterinary check is done by Animal and Plant Health Inspection Service (APHIS) who is responsible for the animal and plant product, but not limited to conduct the phytosanitary check. In the general trade compliance, it also refers to the cost charged by other government agencies, both by customs and non-customs agencies. Non-customs agencies may involve multiple agencies. For example the Bureau of Alcohol, Tobacco and Firearms (BATF), Fish and Wildlife Service (F&W), Food and Drug Administration (FDA), and others (Shapiro, 2017). So, this cost category is then labeled as "*Charged by border inspection agencies for cargo clearance*", covers a wider context than just the port health agency.

For the category of *charged by customs agency*, it covers the *tariff* charge that covers the revenue collection of customs duties and fees, other indirect taxes, management of bonds and other financial securities. The *Single Transactional Guarantee (STG) or cash/transfer* is also added since not all shipments are subject to the (block) guarantee payment²³. While for *the expenses charged by non-customs border agencies* include costs for the *veterinary check*, *phytosanitary check* which is done by APHIS, or *another check from other non-customs agencies* like BATF, F&W, etc. With this composition, it makes sense when the empirical evidence

²⁰ The fee that is charged by Port Community System (PCS) due to the manual data input from its users.

²¹ A formal document used by EU members as the pre-notification of shipment arrival of live animals (pets are not included), live animal products, animal products that are intended for import or as transit shipment at EU by third country.

²² A dedicated facility operated by the port/docking company at which port health official conduct their checks (Grainger, 2014c).

²³ Particular to the scope of agricultural product, if the license security payment is less than €100, there is no need to make deposit. If it is more than €100 but less than €500, importer has a choice whether to make deposit payment, or submit an undertaking that importer will pay any invoice from Rural Payment Agencies (RPA) if the license's condition is not met. If it is more than €500, deposit payment is mandatory and importers have the choice whether to prepare single transactional guarantee or block guarantee.

suggests that the agro-food products have higher TTCs compared to the manufactured goods because they require more special border procedures such as the phytosanitary controls.

b. Indirect Transactional Cost

If the total transactional cost depends on 1) the volatility of changes in official requirements, the amount of information, and procedures that need to be supported, 2) the use of open or propriety standards in electronic communications or paper docs, and 3) the ability to cross-reference trade documents, thus it indicates that the transactional cost might also lead to the indirect transactional cost (Grainger, 2011). This cost is associated with the issue of inadequate and/or discrepancy documentations, inspection facility congestion, insufficient staff especially outside office hour, unforeseen emergency measures, etc.

Walkenhorst and Yasui (2003) translated the indirectly incurred costs as the expenses due to procedural delay when the information exchange within the authorities works out of the business expectation. For example, the system breakdown that causes heavy process disruption. As the consequent, *the use of paper documents* is increasing to address the system breakdown. It can slow down port's ability to turn the shipments that impact to the *lower port's competitiveness*, and the long dwell time that further requires *more storage area* (Container Yard) at the port which is the costs for public organizations. For importers, such manual document transaction increases the *time and resource needed to prepare the paper documents*.

Grainger (2014b) suggested that the indirect costs are the result whenever the information exchange with government authorities falls out of business expectation. It is often associated with the *delay at the border* like the *environment uncertainty, additional handling costs, storage cost* (cost due to utilizing port, terminal/depot or inland container yard facilities), *demurrage cost, business opportunities and competitiveness losses* (Grainger, 2011, 2014b). Other than that, delay at the border can induce the *delivery delay to the end customers*, and leads to a *loss of domestic modality's booking fee* or the secured slot especially in the peak season (off course with the booking cost if any), and leads to *higher intermodality cost* due to failing to catch intended/cheapest modality as importer needs to re-arrange for it (Grainger, 2013).

3. The Inspection Costs

Inspection costs are the additional expenses incurred in the instance when the shipments are subjected to inspection or laboratory test (Grainger, 2014c). It means no such cost is applied if the container was not subject to the inspection. The inspection cost is also divided into *direct* and *indirect* costs based on the general cost distinction.

a. Direct Inspection Costs

Direct inspection cost is the expense incurred for the physical inspection and laboratory tests, and the labor and handling fee to conduct specific border control activities (Grainger, 2014c). The inspection activity can range from a cursory document check, visual inspection (such as cross-checking the container and seal number to match to what were declared in the documentations) to more rigorous physical inspection either using risk-based or quota-based approach. Customs mostly do the inspection according to a risk-based analysis, relying on the 100% documents screening electronically. This leads to a largely automatic process to decide the physical checks in mostly less than 3% with no longer than 24 hours delay. The process then is coupled with the x-ray scanning which is also conducted less than 3% from the total throughput volume.

There are three main cost categories for inspection in general; the customs *scanning* costs, the customs *physical inspection* costs, and the additional *transport related* costs. The additional transport related costs address the expenses to move the container to the Customs or other agencies inspection area and the return trip, namely the *intra-terminal transportation costs* (mostly it has included one-day chassis rent, but there will be *additional chassis rent* after one day rent).

Before conducting the inspection, authority typically checks the information electronically, but manual checking for related documents and information can follow. After performing the information scanning, some cases frequently need further physical inspection or another additional laboratory test that might take several days or even weeks to complete. Therefore, the demurrage cost occasionally occurs to finish this step as part of the indirect inspection cost.

Customs typically select the container for physical inspection or *fysieke control (Fyco)* in two ways; directly by customs pre-arrival team, and after the scan (or *Fyco* after scan). It may involve several parties such as Dutch customs, the inspectorate of the Ministry of Transport (*Inspectie Verkeer & Waterstaat* or IVW), a specialized inspection company, internal port transport company, the degasses company and even drugs-dog. The physical inspection related costs covers the *physical inspection fee* levied by customs and other government agencies, *laboratory test and examination, labor and handling costs for container devanning/revanning* (costs related to the process of unsealing the landed container since it needs the presence of customs officer, and the process of taking out/in its contents), and *other costs to execute the physical inspection procedure* (such as the reefer's temperature adjustment, gas measuring, etc.).

Customs typically use electronic document screening as the first screening process, then the port health agency or veterinary conducts 100% manual document checking by the inspectors, 100% identity check at BIP, and the 50% physical check for poultry (but less or around 20% for beef and lamb products). This veterinary inspection ideally can be finished within a half day, unless if it was executed after 15:00 as the daily UK Customs' National Clearance Hub cut-off, which will be proceeding on the following day, or early in the next week if it was Friday afternoon. The veterinary inspection also requires 1% to 10% sampling and may take up to 7 days delay for further laboratory tests. Specific to the UK's meat import cases, the physical inspection costs £52-£1,500 (depend on the inspection type, delay in the process, etc.). This cost mainly comes from the demurrage cost paid to the shipping line. Daily demurrage is up to £110 per day, and the incremental cost of £60-£110 as additional charge after 3-5 days (which is then considered as the indirect inspection cost).

Other than the physical inspection, there is the *container (x-ray) scanning fee* as one of direct cost related to the container inspection. It might cost €133,50 at the terminal, or €215 for the external scanning at Port of Rotterdam. ShipmentLink (2015) added a reference that the costs related to import customs scanning is around €170/container, with additional €25/container for the container scanning evidence request (scan attest), and another €85 for administrative cost if the scanning is done externally. The scanning cost depends on two factors: the container flow or the throughput volume, and the scanning machine productivity (CBO, 2016).

The inspection charge itself can be applied either in flat rate model (regardless the cargoes need inspection or not), or the other cost model which needs to be paid only by importer whose cargo is selected for physical inspection. If it is a flat rate model, then the cost is categorized as the transactional expenses as it is applicable for all shipments to comply with the shipment clearance procedure. All the charges to conduct the physical inspections (excluded the intra-terminal movement charge) are normally published openly as the port's tariff.

b. Indirect Inspection Cost

Inspection process often involves more than one border agencies, e.g. port operator for the x-ray scanning, customs for the physical inspection, and port health agency for the laboratory test. Because such compliance process involves many stakeholders, it is necessary to understand their dependencies, as in the large extent such dependency makes the supply chain vulnerable (Nijdam, Romochkina, & van Oosterhout, 2012). With such agencies dependency, if there was poor coordination between them, there would be a possibility that the process works out of the ideal expectation. Thus, a good coordination is needed to achieve an effective and efficient process.

Similar to the indirect transaction cost, it is likely to bear additional time and resource to complete the inspection. Not to prepare the paper-based documents, but more about *the time and resource to*

transport the paper documents and/or manual processing thereof or to transmit the electronic document from one agency to others as the impact of the dependencies. Often, it involves painful back-and-forth communication and coordination between the organizations and the importers/agents in relation to the inspection arrangement (Grainger, 2014b).

Indirect cost also occurs to address the shipment delivery delay from the lengthy waiting times to complete the inspection, which in another word; the inspection induces the border clearance delay that might jeopardize the delivery time. Similar to the indirect transactional cost, the result of the *(lengthy) inspection induced delay at the border* can be the storage costs, demurrage costs, business opportunities and competitiveness loss (Grainger, 2014b).

Specific to the end customers' delivery delay, it imposes inventory-holding and depreciation costs on traders. In the first trade cost model, the inventory holding cost refers to the capital cost of goods in transit and the need to keep larger buffer-stock inventories at the final destinations (Hummels, 2001) (Anderson & van Wincoop, 2004). Other than inventory holding cost, there is depreciation cost that holds the largest shares of the cost due to delay (Walkenhorst & Yasui, 2003). This cost refers to the loss related to spoilage of fresh product, items with immediate information content (such as newspapers), and goods for which demand cannot be forecasted well in advance (such as holiday toys or high-fashion apparel). With such definition of the depreciation cost, it can be concluded that depreciation refers to the business opportunity and competitiveness losses. This impact discussion of the delivery delay is also applied to the indirect transactional cost.

The delay indirectly affects the transportation cost as well. Similar to the delay due to transactional process, lengthy inspection induces customs clearance delay can impact to a higher transportation cost. This cost refers to additional expense ranging from demurrage cost, higher intermodality cost at destination since the delay makes importer fails to catch immediate or intended connection that has been planned to meet the desired delivery date at the best cost, truck overtime to wait for customs or other border agencies finish the inspection and others.

4. Post Clearance Cost

Other than the three top costs, post clearance cost might apply due to some additional activities such as document storage, use of duty suspending customs procedures, customs warehousing, and other special procedures. Post clearance costs refer to the compliance cost incurred as the subsequent when goods are leaving the ports (Grainger, 2014c). This cost deals with the expense of filing and storing documents for future audit needed by authorities, which might also apply to a private organization to store their document related to the customs clearance in the case of the annual audit by Customs office or other internal needs.

3.2.2 The Extended Version of the Compliance Cost Model

Based on the compliance cost discussion with the core framework of Grainger's study, it is necessary to visualize the cost structure (which has not been presented yet by Grainger) to understand such complex trade compliance cost compositions easily. Before introducing the model, some additional notes about the model modification are discussed as the following.

- **The demurrage cost**

There are three demurrage charges mentioned in the discussion. First is the demurrage charge in the direct transactional cost charged by the shipping line. Second is the demurrage charge in the indirect transactional cost due to shipment clearance delay. The third is the demurrage cost due to inspection induced delivery delay. Hence, a distinction is needed to address each of them.

Based on the occurrence, the demurrage cost is distinguished into two areas; the forecasted demurrage cost and additional demurrage cost out of the forecasted one.

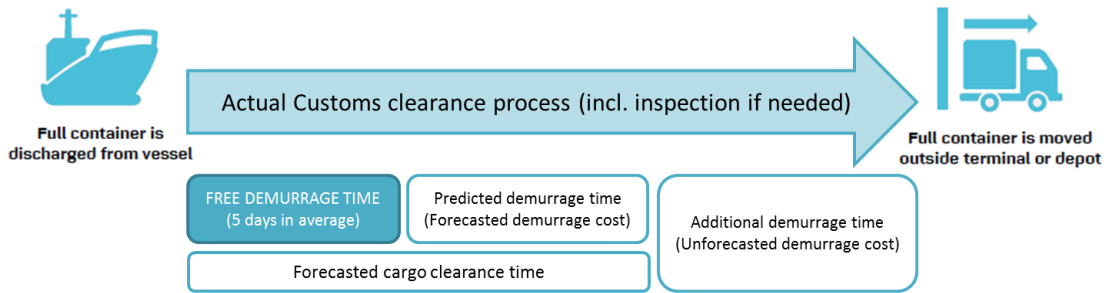


Figure 18. The demurrage cost distinction

The first demurrage cost addresses the direct transactional cost paid to the shipping line to cover the additional day needed to clear the cargo outside the agreed free time but has been predicted in advance based on historical practice. In average, import Demurrage free time is about five days (Catapult, 2016). In specific, the free demurrage time may vary on the shipping line, the country, the port, the commodity, and even specific to a certain contract. For example, Maersk Line Netherland applied three calendar days import Demurrage free time (dry and reefer shipments) for seaport discharge (Maersk Line, 2017). So, there would be two days of forecasted demurrage cost if an importer in normal condition needs five days to clear the cargo from the port. Such prediction is usually made in advance by freight forwarder when offering the cargo clearance service to the importer as their customer. The freight forwarder then by default will charge two days demurrage cost for all the shipments.

The second demurrage cost addresses the additional demurrage cost out of the expected clearance time. This un-forecasted demurrage cost mostly occurs due to an unintended situation which needs to be absorbed by the importer, such as due to the delay in customs clearance or the inspection process. Typically, the freight forwarder will charge this additional demurrage cost at a cost to the importer. Out of the demurrage cost in this compliance cost model, there is also the demurrage cost in the transportation cost of the first model, which is also categorized as the unforecast demurrage cost but specific due to purely transportation issue without any disturbance of the customs clearance process.

- **The hidden costs**

Other than the direct and indirect costs, there is the possibility of *hidden costs* involves. Moise and Bris (2013) presented the hidden cost as part of the cost classification other than direct and indirect costs in the trade transactional cost. Hidden cost addresses the costs and risks such as due to the smuggling of informal trade, corruption practice that involves public and private organization, and bribery. Such hidden costs will occur more often when the compliance procedure is too complicated, lack of efficient control, and involves more bureaucracies.

The OECD report by Hors (2001) who did the fact-finding studies of the customs experience in Bolivia, Pakistan, and Philippine concluded that the corruption in the scope of customs compliance is separated into three types. First, the routine corruption happens when the private organization pay bribes to obtain a regular or a faster customs procedure completion. Second, a fraudulent corruption that occurs when the traders or agents ask for a “blind eye” or an active collusion of the customs treatment so that there are reductions in the fiscal obligation like the tariff to enlarge involved parties’ earning. In the fraudulent corruption, private organizations try to pay less tax than it should, or even no tax at all by buying customs “blind eye” (Velkova & Georgievski, 2004). For the first and second case of routine and fraudulent corruption practices, they frequently involve a great number of actors. Third, the criminal corruption where the private organizations pay the bribes to permit the illegal and informal trade such as drug trafficking, an illegal weapon, etc. and seems to be not so systematic.

When such corruption case is held per incident (case by case), it can be included as a hidden cost in the transactional cost or the inspection cost if a private organization asks for normal or faster inspection process. However, for the corruption acts that involve several shipments, there is a

possibility that such hidden cost to occur as an initial set-up and authorization cost in establishing a commitment between the collusive parties in conducting such corruption acts. For example, in a fraudulent corruption, traders might try to pay an initial cost to get an agreement from border agencies of a certain tax classification for a certain commodity which is undervalued from the actual one. There are frequent cases of disagreement of the amount of the tariff due to misclassifying the goods, leading to misrepresent of import price. Such collusive corruptions mostly occur to set an agreement since shippers tend to under-report the value while bureaucratic tends to over-report the value. Such initial (set-up) hidden cost is aimed for the shipments that may last for months or even years.

The Import Compliance Cost Model is visualized in Figure 19 below (Figure 19 represents a simplified version, the full version is in Figure 37 of Appendix B). This model is an adaptation of basic compliance cost classification from several of the studies of Grainger and is enriched by other studies.

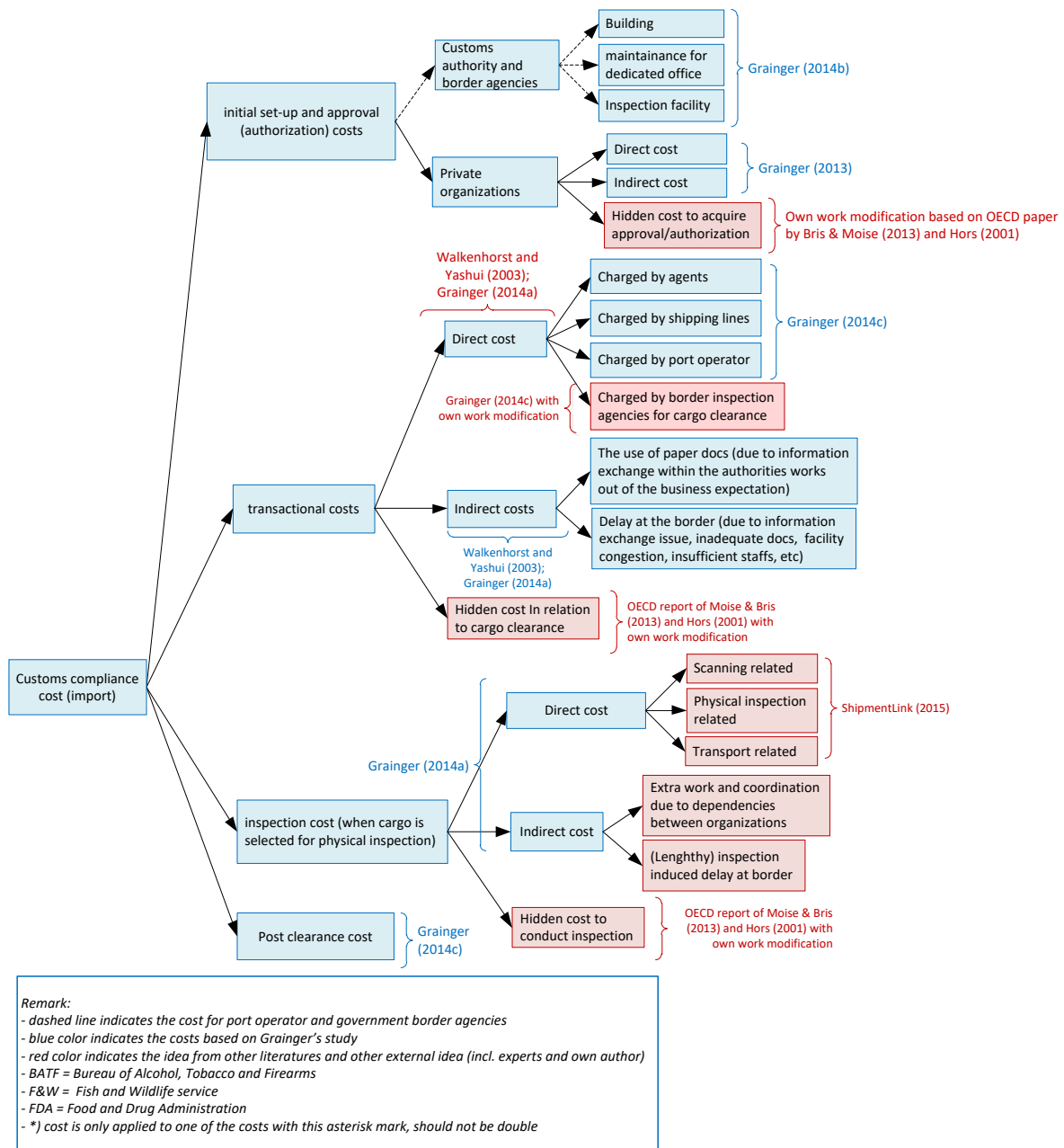


Figure 19. The extended model of import compliance cost based on Grainger (simplified version)

3.2.3 Evaluation of the Extended Version of the Customs Compliance Cost Model

Different with the trade cost model developed by Anderson and van Wincoop, this import compliance cost model discussed more detail to the import compliance cost components based on an empirical

study to the UK's meat imports. This built compliance cost model can provide a basic framework to explain the costs involved in (import) compliance procedure for an empirical study at the company level, completing the first trade cost model. In overall, this import compliance cost model represents the policy barrier in the border-related cost of the first trade cost model by Anderson and van Wincoop which is currently explained as the aggregate of tariff and non-tariff. Another limitation of this compliance cost model is that the transactional cost in this discussion is limited to the case of meat import to the UK, open up the possibility that the model can be developed more to accommodate other commodities that require different treatments and documentations.

In this import compliance cost model, the tariff cost can be seen clearly as a transactional cost charged by customs agencies. However, the non-tariff cost, in contrast, is difficult to be explicitly mentioned in this import compliance cost model. As the previous discussion, non-tariff represents all barriers or obstacles to the international trade other than the import and export tariff/levy duty (tariff). Therefore, such import compliance cost model in a whole represents the non-tariff but cannot be seen and measured directly.

The model presented in Figure 16 can explain the compliance costs on a company level. These compliance costs can be seen, regarding the terminology of Anderson & van Wincoop (2004), as policy barrier to trade. However, this model alone is not sufficient to address the total trade cost from the point of origin to the point of destination. Therefore, the import compliance cost model (Figure 16) was combined with the first trade cost model (Figure 14) to provide a more comprehensive view of the trade and compliance costs.

Though this compliance cost model answers the knowledge gap in addressing the compliance cost structures from company level discussion, unfortunately, it does not yet sufficiently cover the entire cap of trade and compliance costs that revolves from the point of origin to the point of destination. For example, no discussion of the transport costs covered in the first Anderson and van Wincoop model, and the absence of export compliance costs and the trade-related costs. Therefore, a Company-Level Compliance Cost (CLCC) model was needed to capture these all two cost models which are discussed in section 3.3 as follows.

3.3 Conclusion: The Initial CLCC Model

To solve the deficiencies of both models, the first trade cost model and the second model of the compliance cost model were combined. It was then also integrated along with the export compliance cost category so that the model can capture the cost from the point of origin to the point of destination, including addressing the cost at the origin port.

However, the export compliance cost discussion in this research is limited to the basic classification, which is not as comprehensive as the import case considering three reasons. First, the border activity at origin country is out of this research focus. Second, the export compliance procedure is not as crucial as the import one because export activity costs less as the result of fewer duties and taxes applied, means the export is subject to fewer controls and less attention. Third, the hidden export cost (such as bribes to be paid on the road) is less than 10% of the total hidden cost amount paid by the traders when importing the goods (Cochrane, 2010). Therefore, there are fewer customs interventions to the export activities which can speed up the clearance process and reduce the hidden cost. Similar to the idea from Walkenhorst and Yasui (2003) who argued that researchers prefer to focus on examining the import compliance process more than the export process considering that the export procedures cost lower and consume less time compared to import, except for special cases such as dual-use goods' export.

The trade cost model (Figure 12) is limited in explaining the border related barriers, in particular to the policy barriers. The compliance cost model (Figure 16) on the other hand provides specific compliance-related cost constructs as a form of regulatory policy. Such policy barrier can be seen as a linking concept which can allow inter-relating the two models. Moreover, the compliance model represents the border-related barriers, which is the synonym of the non-tariff costs (except the transactional cost

by customs which is part of tariff). If the policy barrier in the first trade cost model refers to the tariff and non-tariff measurement costs, thus it can be suggested that the concept of compliance cost (which can capture costs both at origin/export and at destination/import) is related to the idea of policy barrier in the trade cost model.

In the compliance cost model, the impacts of the delay at the border, either due to transactional activity such as inadequate docs, facility congestion, insufficient staffs, etc. or due to lengthy inspection procedures was merged to simplify the model and eliminate double calculation. So, a new cost item of 'shipment clearance delay' either due to issue in the transactional process or lengthy inspection was added in the model.

Besides merging two models and adding export compliance cost, several (red) lines were added to link the transport related cost that occurs due to the import compliance procedure, to the transportation cost in the trade costs model. By doing so, it is clear to conclude that any disturbance in the import compliance procedure might lead to additional transportation costs on top of the regular transportation cost. Asterisk signs were used to highlight the same costs to avoid double calculation, such as the Block guarantee and single transaction guarantee and payment which in actual is a choice for the importers.

So, in general, the trade and compliance costs are the aggregate of transportation cost (both domestic and international/ocean), the border related barrier that covers the compliance cost (export and import) and other barriers, and the profit margin. The merged model named the initial CLCC model was then constructed which is visualized in Figure 21 (see Figure 38 in Appendix C for the full version).

Now, the model has addressed the deficiencies both Anderson and van Wincoop study and the Grainger's study after expanding those two primary studies with other literature. This built model offers detail analysis for the import compliance cost as the primary focus in this research as well as sufficient explanation of main cost structure in international trade (macro-economic application). The summary of how this second literature review was conducted is presented in Figure 20 below.

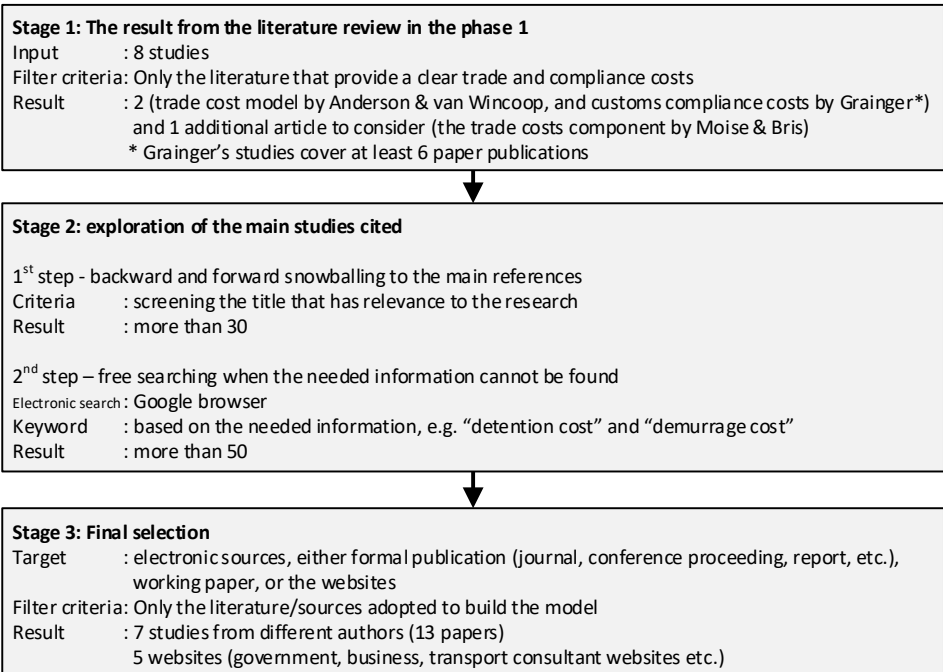


Figure 20. The overview of the first literature review process and result in the first phase

All in all, though the model construction has been finished, yet it has not shared its contribution if it has not been applied and evaluated empirically to discover the shortfall and failure of this initial CLCC model. Therefore, a further application and evaluation step are followed by the Chapter 4 discussion.

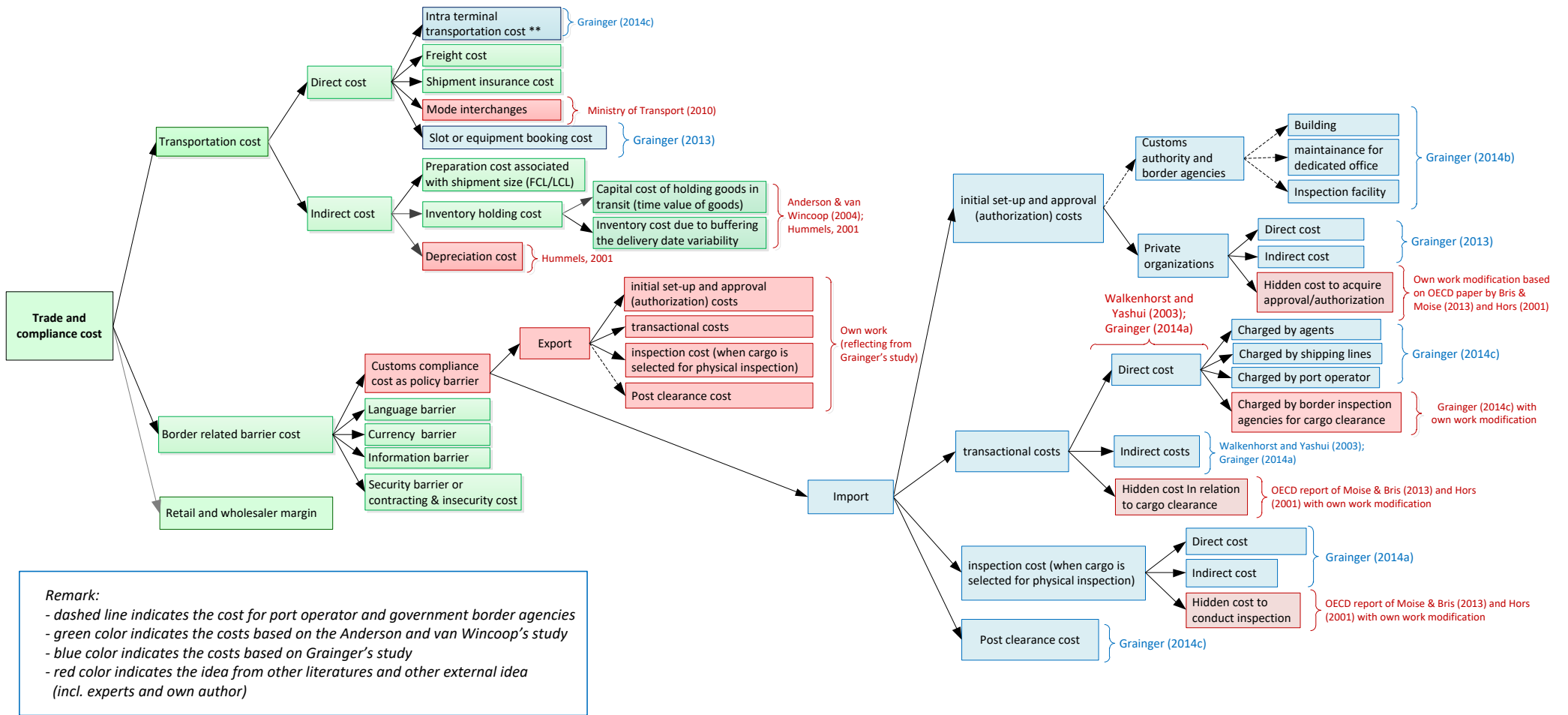


Figure 21. The initial Company-Level Compliance Cost (CLCC) model (simplified version)

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4

THE CONCEPTUAL MODEL APPLICATION AND EVALUATION

The conclusion of Chapter 3 highlighted that the CLCC model needs to be applied to empirical practices as a demonstration of how to map the costs and make them explicit. This process is required for an evaluation to know whether the CLCC model has covered the costs identified during the empirical application. Hence, this Chapter 4 is presented to address this purpose.

This chapter presents the evaluation/validation analysis as the second process in a design science (March & Smith, 1995). As mentioned in the methodology section, this evaluation was conducted by adopting the case study strategy that consists of two stages. First, an archival analysis in the context of the CORE project research of the perishable goods import from Kenya to the Netherlands (section 4.1). Second, the evaluation based on the semi-structured interview to the experts/practitioners (Section 4.2). Finally, a conclusion is presented that addresses the revised version of the conceptual model, namely the revised CLCC model.

4.1 Model Evaluation through the Application toward the Perishable Goods Import Shipments

In this first stage application and evaluation, shipments' case incidents from a Dutch importer of perishable goods that are reported in the CORE research were cited to evaluate the model accuracy. The previous CORE research unfortunately only provides three shipment cases, which becomes the limitation in this evaluation process. Nonetheless, the three cases have fairly represented the dominant issues faced by importers and freight forwarders in their daily practice.

This first stage evaluation is divided into three discussions: first, second, and third shipments. Each of the case analysis is structured into three parts. First, it is started with the case background as the general explanation of the case story. Second, the case analysis to the costs occurred followed by the cost mapping to the model. The third is the evaluation of the CLCC model. At the end of the three shipments analysis, the fourth discussion is added to conclude.

4.1.1 First Shipment: Vessel Delay and No Active Alert of the Change

This first case addresses the first pilot shipment of perishable goods for the destination of Antwerp, Belgium. The vessel departed from Mombasa on 16 December 2015. However, there was vessel arrival delay but no active alert about the new Estimated Time of Arrival (ETA) change. Such issue though not occurs often but becomes the top issue in the business.

1. Case Background

In this first case, the vessel was planned to arrive (ETA) on 10 January 2016 evening at Antwerp port. However, the Actual Time of Arrival (ATA) deviated from the initial planning to be on the next day of 11 January 2016 at 16.00 pm. Since the most updated ETA was only visible in the shipping line's customer portal, an information push was needed so that the related parties could be aware of such change. Unfortunately, this new ETA information was not proactively communicated, neither to the importer nor the freight forwarder. As a result, the truck that was arranged on January 11 early morning to pick up the container from Port of Antwerp for further domestic transportation to the Netherlands could not load anything. The truck even had to spend two hours waiting for nothing due to the absence of latest information of the vessel delay to the trucking company. No choice for the truck arrangement but to come back again on the next day of January 12 in the morning.

Irrespective to the shipment arrival delay, the particular container was selected for physical inspection. Therefore, after the container was unloaded from Antwerp port and complete the scanning process by Belgian Customs, it was then transported by truck under NCTS transit arrangement to the importer's warehouse in the Netherlands to complete the actual customs import administration and final customs clearance conducted by the Dutch Customs. In this particular case, luckily there was no queue in the container scanning process at Belgium so that there was no significant additional waiting time to be considered. The event flow of the case can be seen in Figure 22 below.

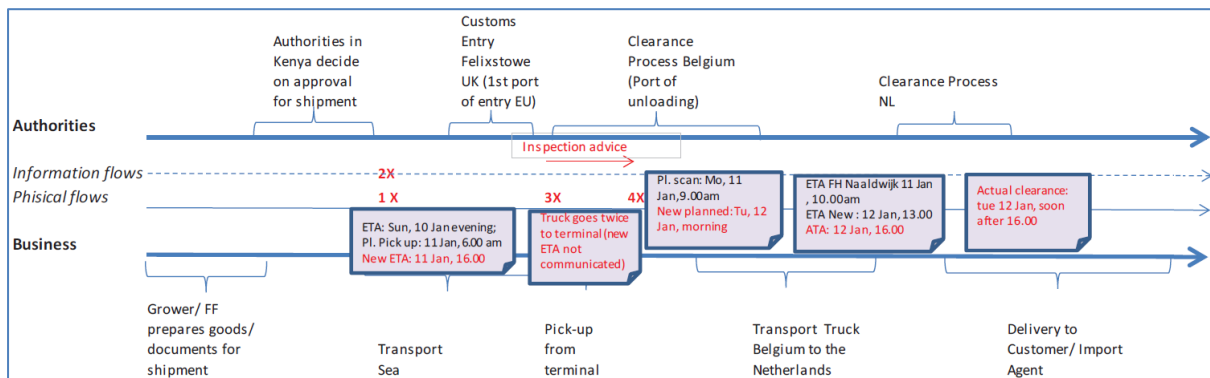


Figure 22. The events flow and the timeline of the first case (CORE, 2016)²⁴

2. Case Analysis and Costs Mapping to the CLCC Model

The impacts of this incident are explicitly mentioned in the CORE research as an additional charge of €600. This cost consists of 1) the €150 for the truck charge entering the port, 2) other €250 for the truck driver's waiting time, and 3) 30 emails and/or phone call that worth for €200 for the extra work and coordination due to very last minutes transport arrangement change. These costs are analyzed in the following.

- €150 for the cost of truck entering the port
Typically, the truck only goes for only one return trip. But due to the vessel arrival change without advance notice, the truck picked up nothing on the scheduled day so that it was re-assigned to come back to the Antwerp port on the next day. As a result, the importer was charged twice. Due to no detail information, it is assumed that this extra €150 represents the trucking freight of the inland transportation cost (fuel, labor cost, and other administration costs) and other additional cost needed to enter the port. This loss is categorized in the *Direct Transportation Cost* as the *freight* at the *domestic/inland movement* for the *basic domestic transport costs* at the *destination*²⁵. This cost confirms the applicability of the category Direct Transportation Cost in our Company-Level Compliance Cost (CLCC) model.

²⁴ Document is disclosed from public access, and is excluded from reference list.

²⁵ Italicized capitals are used to indicate cost types that come from the Company-Level Compliance Cost (CLCC) model

- €250 for the truck driver two hours waiting time
 These two hours waiting time is reported as an additional charge of €250 by the trucking company to wait the cargo coming on the initial arrival date before the trucking company known that he waited for nothing on that day due to vessel arrival delay. After spending two hours for nothing, the driver pulled back the truck and would come back to the port again on the next day (the new arrival date). The truck driver waiting time as part of transportation cost is a bit tricky due to the label of 'waiting time', which often is assumed as an indirect cost of transport time. But since it was the final monetary value charged by trucking provider company to the importer, this is included as a *direct transportation cost* excluded from the basic freight charge. Mapping to the model, this cost can be categorized in the *direct transportation cost* as the additional *freight cost* for the *domestic/inland movement* at the *destination*, specifically as the *overtime cost*. This cost confirms the applicability of the term *Direct Transportation Cost* in our CLCC model.
- 30 emails and/or phone calls for the extra work and coordination that worth for €200
 This €200 value comes from the monetization toward the extra effort and time needed for the last minute's transport arrangement change. It compensates the extra effort to handle at least 30 e-mail messages and/or phone calls in which each needs approximately 10 minutes using the assumption of €40/hour as the value of time. This communication cost occurred to arrange the transportation arrangement change but was not directly paid by the importer to the trucking provider. Thus there were extra costs by monetizing the extra work for *communication and coordination to arrange/re-arrange transportation* due to very last minute transport arrangement change. It is then classified as *indirect transportation cost*, and the initial CLCC model should be revised to cover this cost category as it has not been included in the model yet.

The Figure 23 below (or Figure 39 in Appendix D) shows how the CLCC model can be applied to capture the identified costs. In this case, there are three extra costs on top of the regular transport costs are reported. We used the CLCC model to capture these costs. The red boxes in Figure 23 show the routes that are followed to move from primary cost categories to subcategories in the CLCC model to more accurately classifying the costs encountered in the case, while the green and yellow balloons explain the actual cost measurements for this particular case.

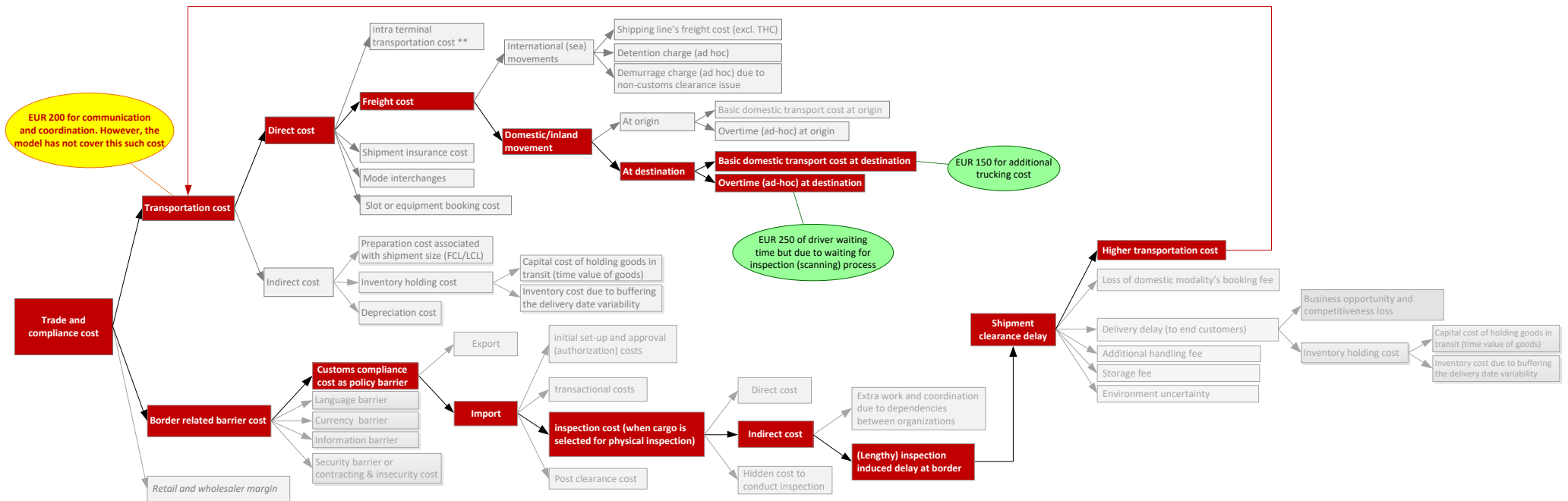


Figure 23. The cost mapping to the trade and compliance model for the first case before the revision

3. Evaluation of the Model

From the first case model validation, only the first impact of €150 for the cost of a truck entering the port and the second impact of €250 for the truck driver waiting time that could be mapped to the current model. Meanwhile, the third expense to address the 30 emails and/or phone calls, or equal to €200 to do extra work and coordination could not be explicitly mapped to the current model. Therefore, a revision was needed to the model.

As the third cost is categorized as indirect cost in the transportation, then a new cost construct was added and was labeled as 'communication and coordination to arrange transportation'. By adding this new cost construct, it is now clear that arranging transportation can lead to indirect cost not only to prepare the shipment to achieve full size (whether to ship as FCL or LCL) but also to prepare the arrangement with the truck company. This indirect cost can be minimized when both companies have known each other and are familiar with the business requirement.

The vessel arrival delay is an example of the unintended problem in the logistic chain. In most cases, the causes are unavoidable. For example the inclement weather, congestion from previous calling port, ship's engine trouble, etc. In simple, such incident adds one day longer transportation which shares some impact about the indirect transportation cost.

Though the vessel arrival delay occurrence might not be easily avoided, it does not mean there is no opportunity to change the business process better. The delay incident is bad, but it might be worsened by the ineffective communication when the shipping lines have to update the case to each customer due to the system limitation that only allows information owner to push information to involved parties. One solution that can be offered is to change the system that not only enables the information push system but also the pull approach that allows importers to call information whenever they need it. With this ICT improvement, there is potential cost saving for around €600 as the importer can avoid the truck's double trip, the overtime, and massive emails/phone calls communication. This saving comes when there is an immediate information update in the process, allowing the importers to know any supply chain information in real-time. However, the impact of one day delay still shares negative consequences to the customers, like the business opportunity and competitiveness loss, and also the inventory holding costs which have not been addressed in the CORE research but can be mapped to the CLCC model.

The final mapping to the CLCC model after revising it by adding the 'communication and coordination to arrange transportation' in the indirect transportation cost and addressing the potential delivery delay to end customer can be seen in Figure 24 (or in Appendix E).

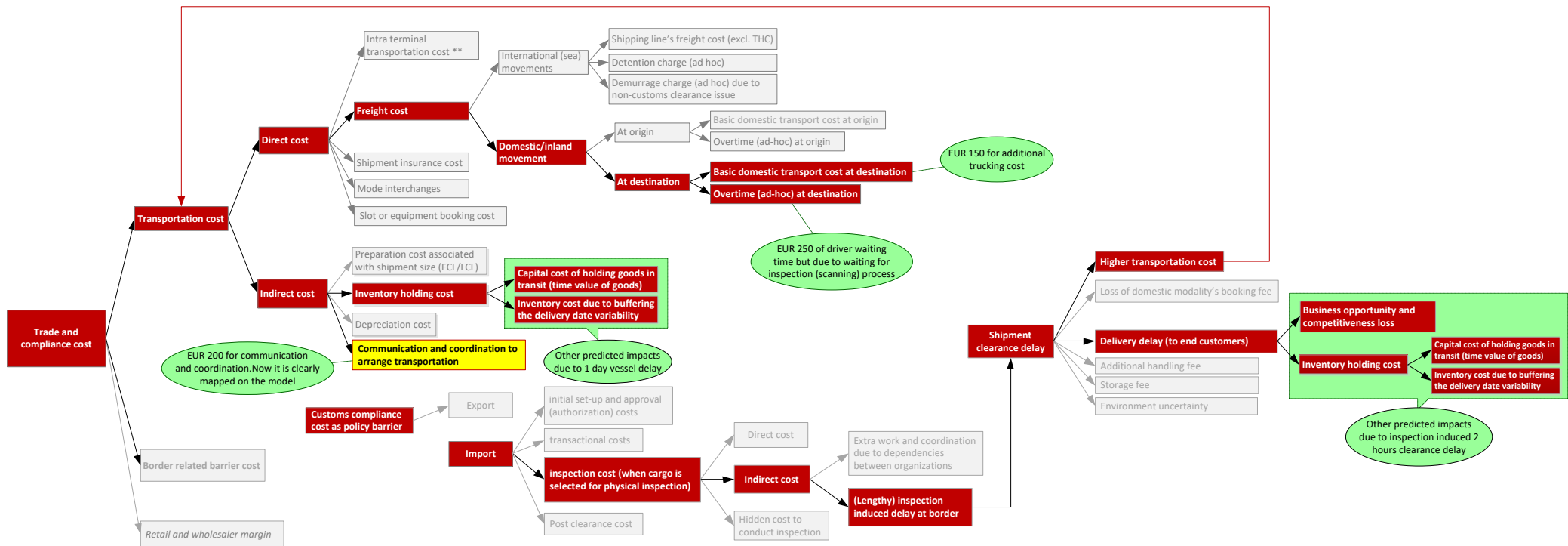


Figure 24. The cost mapping to the trade and compliance model for the first case after the revision

4.1.2 Second Shipment: Delayed Administrative Procedure

In the second shipment validation, a shipment departed from Mombasa on 13 January 2016 with one-day early arrival at Port of Antwerp is analyzed. Instead of early delivery to customers, this shipment faced a longer delivery from initial planning due to delayed administrative procedures.

1. Case Background

This shipment was initially scheduled to arrive on Sunday, 7 February 2016 and a truck had been arranged to pick up the container on Monday, February 8th early morning since the importer needed the cargo immediately to meet the peak season demand for a specific occasion day. The particular vessel arrived one day earlier to be on Saturday, February 6th.

On Monday morning, the shipment status indicated that the required arrangements (including needed documents) to transfer the phytosanitary inspections from Belgium to the Netherlands were not successfully met. No detail information of the root cause. But it might be due to the party who is responsible for the arrangement planned for the arrangement later of the day (Monday late in the morning or afternoon), following the initial vessel arrival on Sunday which should be fine for standard arrangement (without considering the pickup rush to meet the peak demand and without vessel early arrival case). As a result, the local plant health inspectorate of Belgium (FAVV²⁶) had to issue transfer document (the phytosanitary certificate²⁷) as a priority so that the container could be cleared from Antwerp port and transported by truck to the Netherlands immediately. In the meantime, the truck had been waited for around 6 hours to get the cargo ready to pick up after the FAVV issued the document and assigned the courier to collect it and deliver to the transporter in the port of Antwerp. This waiting time is much longer than the initial delay that was estimated for only 3 hours to prepare documents. Consequently, there was a rescheduling activity that involved at least 14 emails and/or phone calls, plus the 5-hour delivery delay to importer's warehouse, independent from the 6 hours truck waiting time. The event flow of the case can be seen in Figure 25 below.

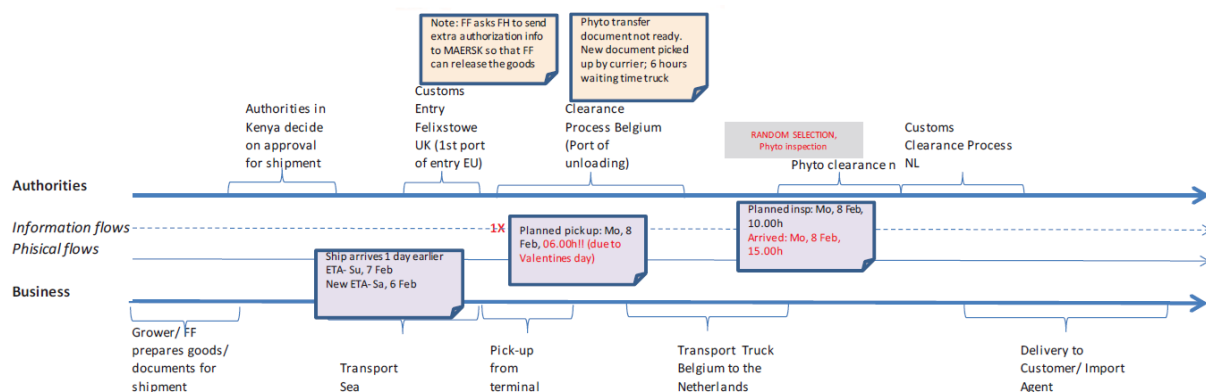


Figure 25. The events flow and the timeline of the second case (CORE, 2016)

2. Case Analysis and Costs Mapping to the CLCC Model

With such delay administrative process, there are three unintended impacts identified in the CORE research. They are the 6 hours truck waiting time worth of €500, 14 emails and phone calls that value of €93.33, and the 5 hours container arrival delay to the final destination. These costs then are analyzed as the following.

²⁶ *Federaal Agentschap voor de Veiligheid van de Voedselketen*, the Belgian Federal Food Safety Agency (Federal Agentschap voor de Veiligheid van de Voedselketen) which issues permits, approvals and registrations to establishments or plants engaged in certain activities related to the handling of animal by-products and food and feed production

²⁷ Phytosanitary certificate is the document issued to indicate that the shipment contains plants or plant products or other regulated articles meet the specific requirement of import country.

- 6 hours truck's waiting time
Different to the second cost analysis in the first case, the truck's waiting time, in this case, is not a pure transportation cost as it is assumed as an additional transportation cost due to clearance delay to complete the phytosanitary document transfer at Port of Antwerp. Further for the additional transportation cost, it lays as the overtime cost of the direct domestic transportation cost at the destination. Unfortunately, there is no explicit information on the actual charge. If the waiting time rate was assumed the same as the rate in the first case, it means there would be around €750 to be absorbed by the importer to compensate the 6 hours waiting time (assuming one hour overtime costs €125, same as the rate in the first case). This loss can be categorized in the *direct transportation cost* as the additional *freight cost* for the *domestic/inland movement* at the *destination*, specifically as the *overtime cost*. This cost confirms the applicability of the term *Direct Transportation Cost* in our CLCC model.
- 14 emails and/or phone call for the extra work and coordination between agencies
The additional cost of €93.33 was calculated from the additional activities done for at least 14 e-mail messages and/or phone calls for the agencies coordination to make the priority arrangements (assuming one e-mail needs approximately 10 minutes, and 1 hour of time is valued at €40). The back-and-forth communication was conducted to address the non-customs agency's delayed administrative so that the truck could pick up the container from Antwerp port after the presentation of the phytosanitary inspection result prepared by FAVV. This communication was necessary to arrange the paper-based phytosanitary certificate, and in addition, there was the cost to send the document per courier post. However, the initial model has not explicitly covered these expenses. Therefore, two new costs constructs of '*back and forth*) coordination in the document arrangement' and '*courier cost*' to transport documents were added to the *indirect transactional cost* in consequent of the use of paper documents as the initial practice.
- 5 hours container arrival delay at importer's final destination
The CORE research only mentioned the delayed delivery in 'hour' dimension and had not been transferred into monetary value. It indicates that such cost is assumed as an indirect cost which should be absorbed by the importer (not as an explicit charge by another party) due to the delay in the border's customs clearance. This shipment delivery delay to customers is mapped as the *shipment clearance delay* induced *delivery delay to end customer*. Even though there were no further impacts mentioned in the CORE research, the CLCC model can predict several impacts due to the delivery delay such as the *depreciation cost (business opportunity and competitiveness losses)*, and the *Inventory holding cost*.

The Figure 26 below (or in Appendix F) illustrates how the costs can be captured by using the CLCC model.

3. Evaluation of the Model

From the costs mapping to the second shipment, only the impact of six hours truck's waiting time (overtime) and the five hours container arrival delay that could be explicitly mapped to the current CLCC model. Meantime, the 14 emails and/or phone calls that worth for €93.33 as the additional work and coordination in the indirect transactional cost was not yet captured in the model. Similar issue to the possibility of courier costs and the reasoning that there were still some processes using paper document were not addressed yet in the current CLCC model.

The cause of delayed administration is not explicitly mentioned in the CORE research. But similar to the first case, the customs clearance process was conducted in such push system approach manually using paper document, so that the Belgium local plant health inspectorate had to deliver the document inspection result manually to the necessary party. If a data pipeline was implemented, allowing the sharing of document like piggybacking, the truck over time and the impacts of delay in clearance process induced delivery delay could be reduced, as well as the (back and forth) coordination in the document arrangement and courier cost that could also be eliminated.

The Figure 27 below (or in Appendix G) illustrates how all of the reported costs could be captured in the CLCC model after refining the model. The yellow boxes indicate the additional categories added to the model based on the insights from the case of the second shipment.

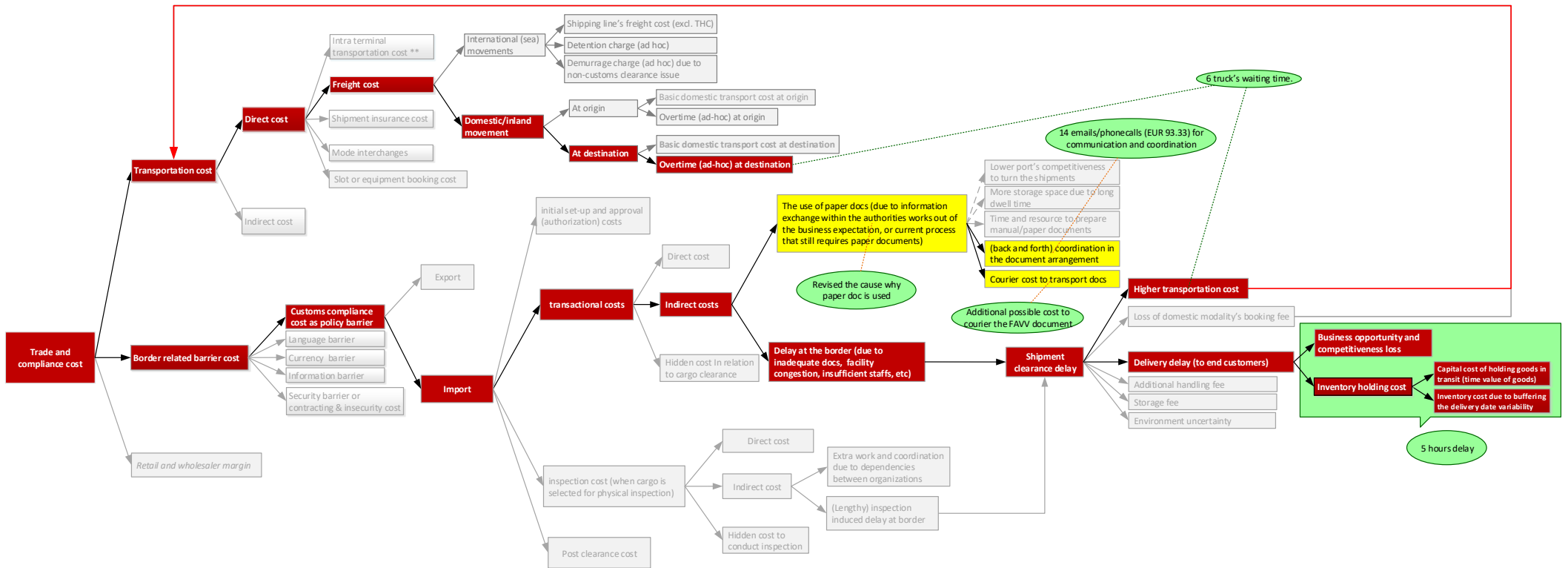


Figure 27. The cost mapping to the trade and compliance model for the second case after the revision

4.1.3 Third Shipment: Vessel Delay and Delivery Delay

In the third case, a shipment of perishable goods with Actual Time of Departure (ATD) from Mombasa on 17 March 2016 was examined. This shipment faced an arrival delay and was worsened by a further delivery delay due to customs' physical inspection arrangement at the Netherlands.

1. Case Background

The shipment was initially planned for arrival (ETA) at Antwerp on Sunday, April 10 at 14.00 pm. What the container picks up at Antwerp port was scheduled on Monday morning of April 11th at 06.00 am. Unfortunately, there was a vessel delay that arrived on Monday, April 11th at 06.00 am. Therefore, the container pick up was rescheduled on the next day, Tuesday, April 12nd at 06.00 am with new estimated arrival at the importer's warehouse of perishable goods on the same day (Tuesday) at 11.00 am.

During the clearance process at Antwerp port, Belgian customs authority did not receive the inspection request from the UK customs (as the first EU port visited for that particular container), means the specific cargo has had the 'green light' on the ENS²⁸ risk analysis. Therefore, the container clearance at Antwerp port went smoothly after the importer re-arranged the truck to the new date arrangement.

With such new arrangement, the truck successfully delivered the container with actual arrival at the importer warehouse at 10:00 am, one hour earlier than estimation. However, there was sudden information that the container was selected for the physical inspection by Dutch Customs. Based on the inspection protocol, the Dutch Customs has to stand by at the inspection location within 120 minutes from the notification. It means the inspection in estimation would be started at 12.00 pm and finished at 14.00 pm, following the standard inspection that takes around 2 hours. Therefore, the importer had expected that the cargo could only be picked up by the customers and be arranged for further transportation to end customers at 14.30 pm, adding additional 30 minutes from inspection process finalization. However, close to 12.00 pm, the freight forwarder received a signal from Authority that they would not be able to perform the inspection in time. In the end, there was no choice but to let importer (or the agent) opening the container under Dutch Customs' permission without phytosanitary physical inspection. Not only the delivery delay due to canceled physical inspection, but importer also wasted their employer time since for such phytosanitary inspection, but the importer also has to provide one employee to stand by at the inspection location. In this case, the importer's employee waited at least 4.5 hours (from 10.00 am since cargo arrival until 14.30 pm when the cargo was ready to be picked up for further distribution). The event flow of the case can be seen in Figure 28 below.

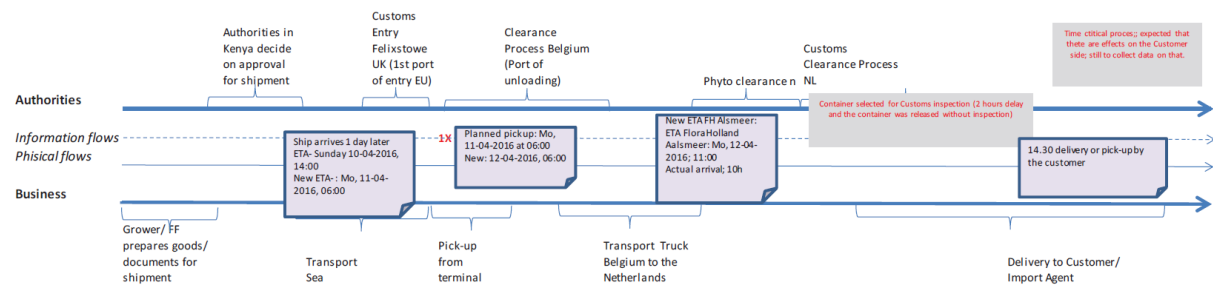


Figure 28. The events flow and the timeline of the third case (CORE, 2016)

²⁸ Entry Summary Declaration, a document that is submitted to EU customs and is needed for goods that enter the first seaport or airport of the EU customs territory

2. Case Analysis and Costs Mapping to the CLCC Model

With such delay both in vessel arrival and the delivery to end customer due to the requirement to conduct the physical inspection (but then cancelled), there are at least three unintended impacts mentioned in the CORE research. The impacts are: a lot of communication either by e-mail or phone call, a 4.5 hours staff waiting time that values around €180, and delivery delay to the end customers. These costs then are analyzed as the following.

- A lot of e-mail messages and phone calls
In the CORE demo's report, there is no explicit information about how many e-mail messages sent and the phone calls made. However, the vessel arrival delay and the sudden inspection arrangement and the cancellation must have caused a lot of effort to the importer to communicate all update to all counterparties. Different to the first and second cases, this communication activity is classified as two separate costs based on the activity area. For the container pick up date change, the *communication and coordination to arrange transportation* are classified as the *indirect transportation cost*. Meanwhile, the *back-and-forth communication and coordination to arrange inspection* fell under the *indirect inspection cost* as it is meant to conduct the inspection and applied for selected cargo only.
- €180 of company staff waiting time
The €180 comes from the monetization of 4.5 hours waiting time with the assumption of €40 per hour as the value of time. Such additional cost might not only applicable to assign staff to wait or assist the inspection, but it can be broader. For example, extra charge to rent the inspection area if the company does not have the facility or other internal administration for the company to record the inspection activity, etc. Assigning individual staff to assist and stand by at the inspection process is categorized as an *indirect cost* for the perishable importer due to the inspection activity. Unfortunately, this extra expense of *additional organization internal cost* (e.g. *assign staff, rent inspection area, etc.*) could not be mapped in the initial model. Therefore, a revision was needed to the CLCC model.
- Delivery delay to end customers
Typically, a physical inspection by phytosanitary agency takes around 2 hours to complete, exclusive from the 120 minutes time to wait for the government agencies arrive at the inspection location. So, there was roughly 4 hours delay before the cargo could be unloaded from the container and distributed to the customers. Other than at least 4 hours delay due to the inspection arrangement which is part of the indirect cost in inspection, there was also 1-day vessel arrival delay from the initial schedule which addressed the issue in the process. It shares the indirect cost to the transaction. This delivery delay to the end customers was mapped as *indirect inspection cost*, on top of the other 1-day vessel arrival delay from the initial schedule. To address these two types of delay, the CLCC model offered one cost category of *shipment clearance delay*, either due to issue in the *transactional process* or *inspection planning*. The impact is focused to the *delivery delay to end customers* which can be the *business opportunity and competitiveness losses* (depreciation cost), or the *inventory holding cost*.

Figure 29 below (or in Appendix H) demonstrates how the costs can be captured in the CLCC model. The green balloons highlight the identified costs, while the yellow box indicates the keynote revision as the particular cost has not well mapped to the model.

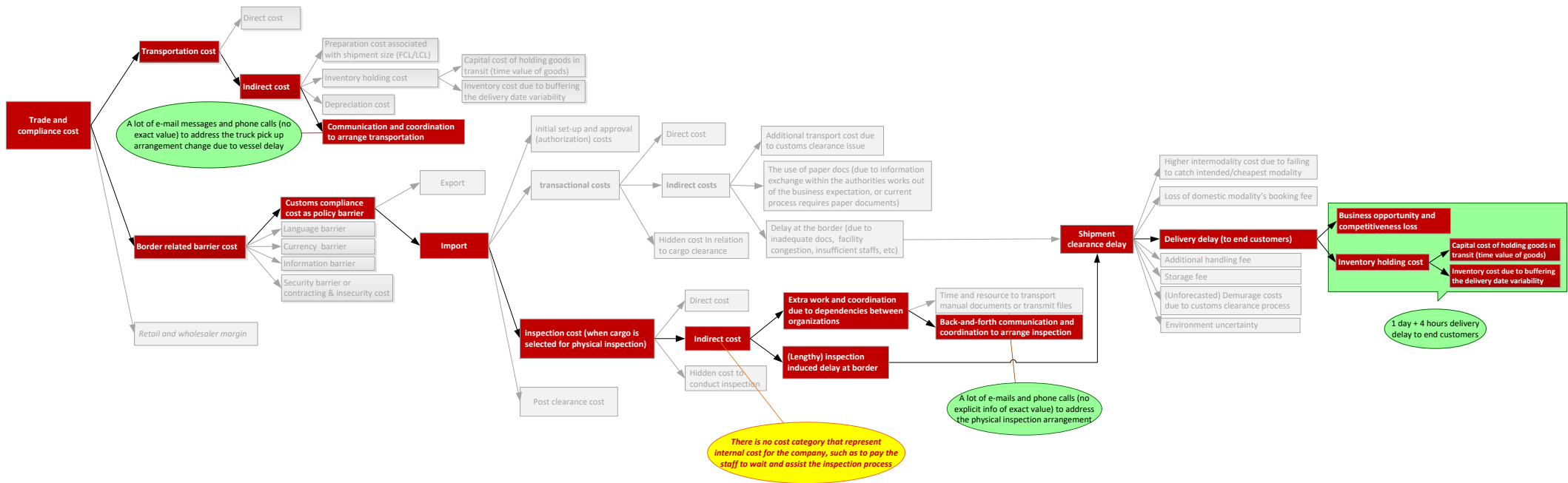


Figure 29. The cost mapping to the trade and compliance model for the third case before the model revision

3. Evaluation of the Model

From this third case model validation, there is one keynote suggesting to revise the current model. An additional cost category was required to address the €180 internal cost for the 4.5 hours waiting time. Therefore, the cost of '*additional organization's internal cost*' was added to cover this lack. This cost might include many aspects, such as to assign additional staff to stand by at location (as on this case) or to rent a special area for conducting the physical inspection, and others.

The revised model is shown in Figure 30 (or in Appendix I) after revising it based on the evaluation to the third shipment. The CLCC model is now able to satisfy the external validity analysis for the three impacts listed in the CORE research and for the predictive validity by explaining the possible impact options due to delivery delay in the inspection.

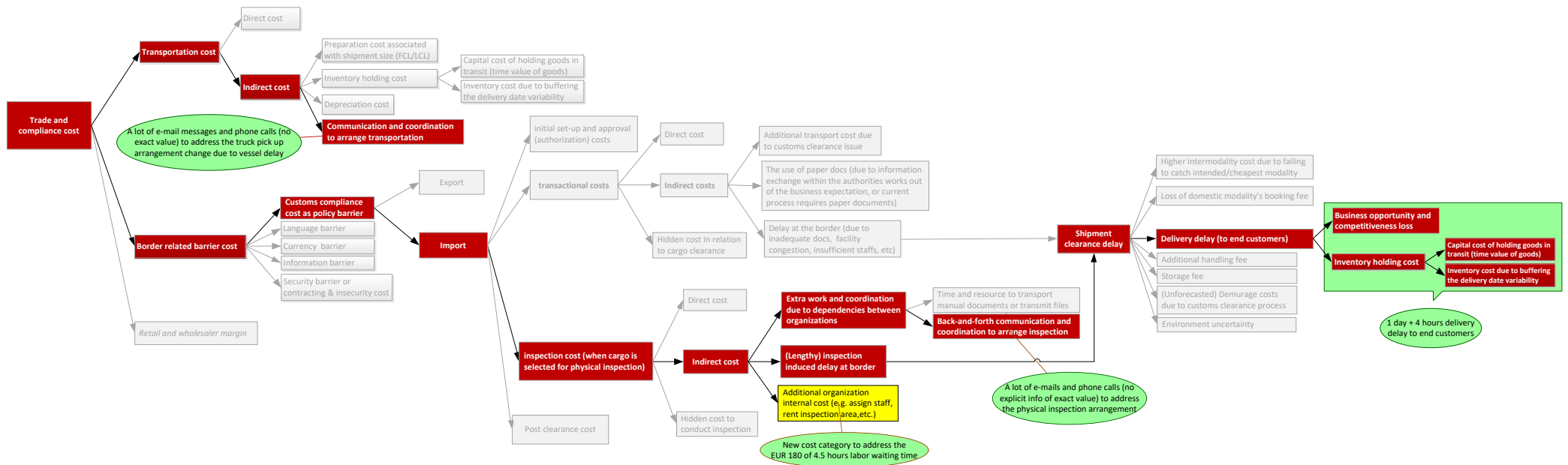


Figure 30. The cost mapping to the revised model for the third case

4.1.4 Evaluation of the CLCC Model Based on the Three Shipments Case Findings

After completing the evaluation to the three shipments, there are five major revisions highlighted to the model that are noticed as the following.

- 1) Adding a new cost construct of “Communication and coordination to arrange transportation” in the indirect transportation cost, which is an essential factor to consider either to arrange the transport or to change of arrangement.
- 2) Expanding the explanation of the cause when the transaction uses the paper-based document, to cover the case of a phytosanitary document that currently is still managed in physic. So, the cost construct was revised to be “The use of paper docs (due to information exchange within the authority’s works out of the business expectation, or current process that still requires paper documents)”.
- 3) Adding a new construct of “(back and forth) coordination in the document arrangement” in the indirect transactional cost when the paper documents are used.
- 4) Adding a new construct of “Courier cost to transport docs”, addressing the possibility of physical document handling in the indirect transactional cost.
- 5) Adding a new cost category of ‘additional organization’s internal cost’ in the indirect inspection cost to address another cost like to assign employee/labor to wait for the inspection, or to rent a facility that supports the inspection process.

To reflect the evaluation as on above, the CLCC model was then revised which can be seen in Figure 31 as follows (or see Appendix J).

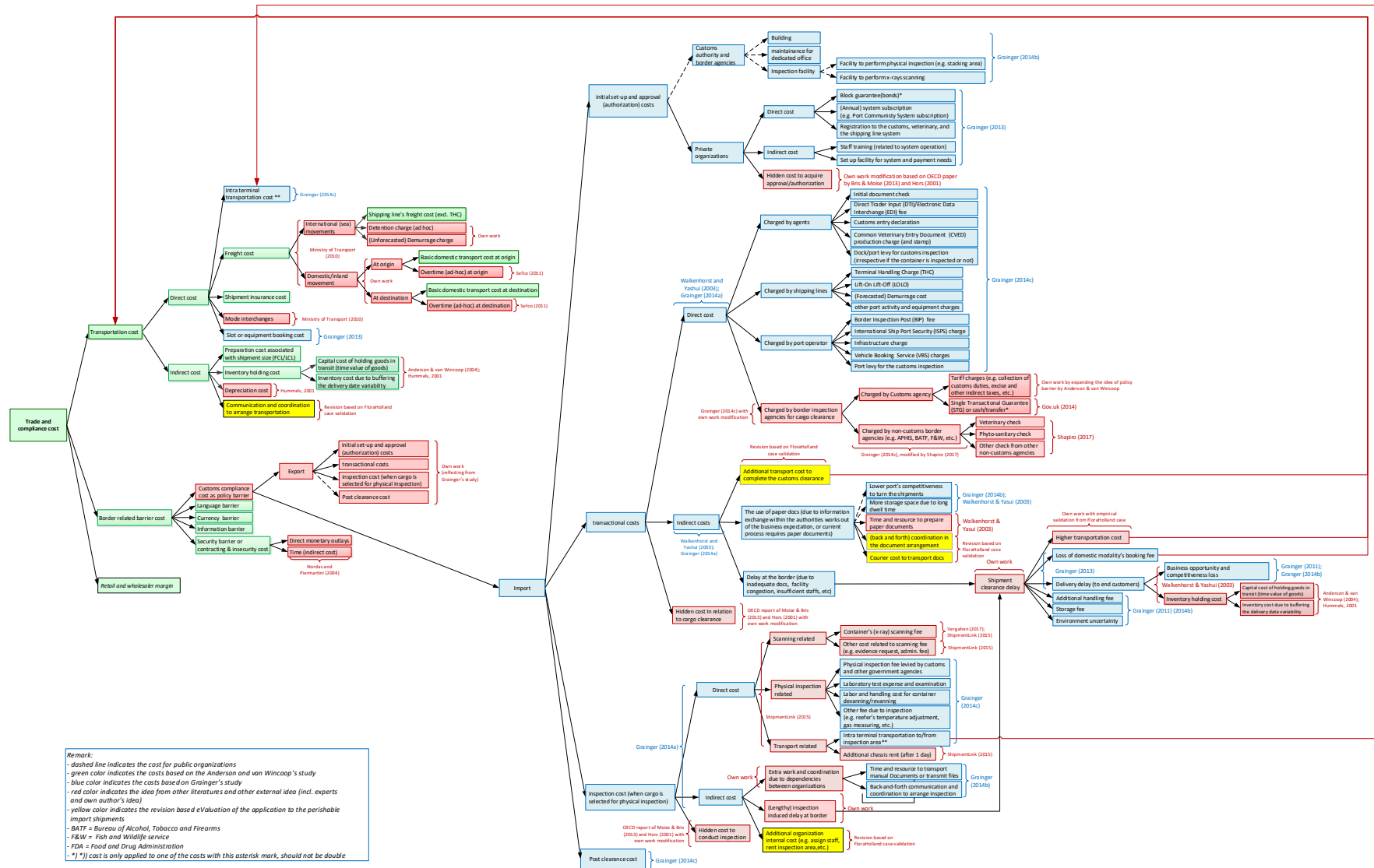


Figure 31. The CLCC model after the first stage evaluation to the perishable import shipments

4.2 Model Evaluation through the Application toward Empirical Case Based on Interview to Practitioners

Considering the limitation of the first stage application and evaluation toward the shipment cases in the CORE research (e.g. the limited number of the cases that could be adopted), another evaluation was conducted to improve the CLCC model quality further. An *observation* was then carried out to gather information from scratch by participating in a half-day meeting at the management office of a Dutch company that imports perishable goods to the Netherlands. This meeting did involve not only the importer staffs, but also the importer's customs brokerage staff and the researchers from the CORE project who were collecting the data to understand the costs and inefficiencies in the trade lanes. This observation's findings led to a further individual interview that was targeted to get further particular input for the cost model. Hence, a further semi-structured interview was conducted; not only to the Dutch company who imports perishable goods (the findings are presented in section 4.2.1) but also to a freight forwarder company based in Indonesia who also imports perishable goods (the results are presented in section 4.2.2). In the end, an evaluation was drawn based on the interview result (section 4.2.3).

4.2.1 The Findings based on the Interview to the Perishable Goods' Importer

This second stage of the evaluation was firstly conducted by interviewing a company who runs the business in importing and selling perishable goods to the Netherlands. This company imports the fresh fruits, like avocado, mainly from Kenya. Therefore, several insights were captured from the discussion with the importer (see Appendix K for the interview protocol and Appendix L for the Minutes of Meeting).

1. The guarantee payment about EUR1 inspection

For the import to the Europe, there is a trade facilitation named EUR1 (or movement certificate) that enables the importers to import goods with reduced (or even free) import duty based on the trade agreement between the EU and the beneficiary countries. Particular to the Netherlands, there is a new regulation that for the selected container for the EUR1 document inspection, the importer is required to pay the guarantee of around 1,500-1,600 euros per container. Though in actual, the charge is calculated not exactly per container but per tonnage of goods loaded inside the inspected container (assuming that one container loads around 23-25 tons cargo). This guaranteed money would be only transferred back to the importer after Customs established confirmation that the EUR1 document was not fake.

This payment is categorized as *EUR1 document inspection guarantee* as an additional cost in the *direct inspection cost*, which has not been mentioned in the current model. It might not be a big deal for importer if such payment is only needed to be paid once. Unfortunately, this cost is applicable for selected shipment (therefore can be multiple cases per importer). Moreover, historical experience showed that this process could take up to 6 months before the money could be freed up, leads to a quite significant disruption to the business in the long run especially if importers have multiple shipments in each week.

2. Preparation and documents courier in relation the EUR1 checking

When the container is subject to the EUR1 inspection, the importer is required to prepare the needed document for the verification, as well as to transport it to the related authority. Such process requires a resource, not only the time but also money such as to courier the documents, or to produce the copy of documents, etc. This cost, unfortunately, has not been well mapped to the model. Hence, the current cost of additional organization internal cost was revised to be *additional cost to support the inspection process* in the *indirect inspection costs*,

which covers the expense more in broader scope including adding the example of the cost of this fee to *prepare and courier the documents*.

3. The impacts of customs clearance delay

There were some cases of customs declaration system down during the working day (from 9.00 am morning to 15.00 – 16.00 pm). With such process that worked out of business expectation, the importer needed to manage the order delivery to the customers.

- a. In the optimistic scenario, the cargo clearance delay means an additional cost of trucking waiting time (overtime). This cost was mapped as a *higher transportation cost*, an example of the impact due to the shipment clearance delay due to delay at the border in the indirect transactional cost. Later, this *higher transportation cost* was drawn to be mapped as the *overtime* cost for the domestic transportation at the destination in the direct transportation costs.
- b. In the pessimistic scenario, there is a possibility that the cargo clearance delays impacts importer's buyers to cancel the order and purchase from another importer. Such booking cancellation is possible since the fruit business is in such closed community, therefore people mostly only rely the trust based on verbal agreement and relationship. Besides losing the business opportunity, importer surely needs to find a new buyer(s), pushing back to establish new commercial sale that often leads to additional commercial-related cost such as to call/e-mail new buyers. Finding new buyers often involves the trade cost related to trade barrier such as information barrier, security barrier/insecurity cost in establishing new contract, etc. So, there should be a link of such delay delivery impact to the Anderson and van Wincoop's trade cost model. In another hand, this order cancellation can be worse if there is a particular agreement between the importer and the buyer about the price deal so that importer might need to compensate the price difference. For example, buyer A (a supermarket let say) agree to buy the avocado at price of €10. However, due to the cargo clearance delay, buyer A has no choice but to buy from another importer (importer's competitor) at a higher price, let say €12. As a consequence, the initial importer has to pay the €2 price difference to Buyer A.

The risks were then mapped as the business opportunity loss which is the impact of the delivery delay to end customers due to shipment clearance delay in the indirect transactional cost. However, the CLCC model offered the cost classification as the competitiveness and business opportunity losses that needed to be revised. The first revision was made to split this cost as two different cost components:

- 1) The *competitiveness loss* as the impact of delivery delay to end customers in the indirect transactional costs. As the importer could not satisfy the contract in delivering the goods at the right time, which in the long term could affect the competitiveness of the importer in the market.
- 2) The *business opportunity loss* as the impact of delivery delay to end customers in the indirect transactional costs when customers cancel the order. In specific to this cost, the model was revised by adding two other secondary impacts of order cancellation.
 - i. The risk that the importer needs to absorb the loss of the customers due to failing to deliver the order. Therefore, a new cost component was added as the *penalty due to breaking trade agreement*.
 - ii. When the order is canceled, the importer needs to find the new buyer for their goods which will lead to the commercial cost such as to call the potential buyers

who assume time, money and effort, and cost too to create the new contract with the new buyer(s). So, the model was modified by adding the cost component of the *additional commercial-related cost to find a new buyer*, which was then linked to the border related barrier costs. As finding new buyer(s) means the importer needs to collect the information. It involves some challenges such as the language or the currency barriers (though in this case it might be very small since the potential buyers mostly are the Dutch customers who speak the same language and use same currency), or the information barrier, and most importantly the security barrier to establish the new contract.

4. The indirect impacts of inspection

Besides the current listed indirect costs of inspection induced delivery delay, importer also faces other indirect inspection costs about the risk to the quality and quantity of the goods.

Avocado as a perishable good needs a special handling starting from the harvesting to the placement at the buyer's shelf display. A right combination of temperature and gas composition (oxygen, etc.) has to be maintained during the transport. The temperature is monitored by the reefer's temperature setting during the transport. While for keeping the gas environment, importer places a special plastic curtain right inside the container, close to the container's door. The gas environment is aimed to make the avocado 'sleep' to stop its maturing process so that the fruit quality can be controlled. Therefore, there will be a serious risk that the gas composition deviates from initial setting, which later negatively impacts the avocado's quality if there is a physical inspection that requires the agencies to open the container.

The physical inspection might affect the goods quality, and sometimes the quantity as well (e.g. the meat laboratory test that take a portion of meat sample). Therefore, the new cost of *goods' quality and quantity change* is added to the indirect inspection cost.

The application of the CLCC model to map the cost findings that have been mentioned above can be seen in Figure 32 (or Figure 48 in Appendix M). The mapped costs are highlighted with red colors.

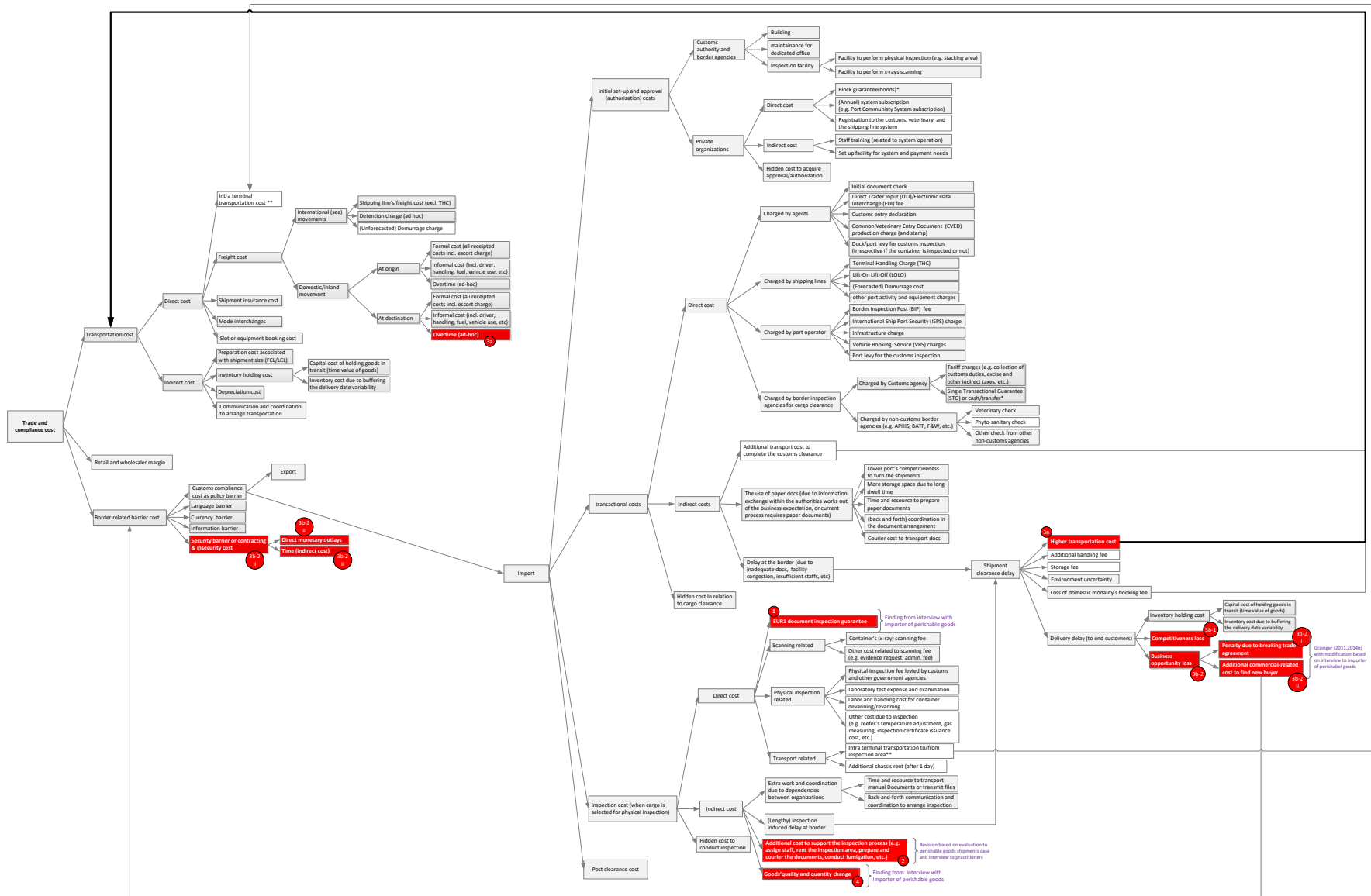


Figure 32. The CLCC model application to map the first interview result to another perishable goods importer

In the next step, to see the costs from other incidents from different regulation (due to a different country) and different commodity to see the generalization of the model, the CLCC then was evaluated to the second interview to Indonesian freight forwarder as discussed in Section 4.2.2 below.

4.2.2 The Findings based on the Interview to the Freight Forwarder

This second stage of the evaluation was conducted by interviewing an Indonesian freight forwarder company who manage the local transportation (trucking) from the port of destination to final importer site. There are several commodities to handle, but the focus of this interview goes to explore the import of perishable goods, in particular to the animal, animal product, plant, and plant products like the animal feed. The findings then are presented as the follows (see Appendix N for the interview protocol and Appendix O for the Minutes of Meeting notes)

1. Unforecast demurrage cost

To clear the perishable goods that need a phytosanitary or veterinary check, importers normally need one week to get the cargo from shipment arrival and full pouch documents submission. The average clearance time (lead time) can be predicted. Therefore in particular to the transportation cost, forecast demurrage cost should be minimized such as by negotiating the free time to shipping line that can cover this forecasted dwelling time. If the dwelling time takes longer time than normal process, there will be additional demurrage cost which is mapped in the CLCC model as the *unforecast demurrage cost* in the domestic's freight cost of direct transportation cost at the destination. However, this cost comes from the *higher transportation cost* as the impact of the shipment clearance delay at the border in the indirect transactional cost.

2. Indirect transactional cost of preparation, communication, and coordination for clearance

Before picking up the goods for the customs clearance, importer needs to complete several processes. For example preparing the pouch documents, sending the soft file to individual agencies, checking the accuracy or completeness of the documents to avoid the documents being rejected by Customs or other agencies, collecting vessel arrival date information, going to bank website to settle the payment, etc. However, these costs have not been covered in the model. Thus, the CLCC model was then added by the *preparation, communication, and coordination for clearance process* as a new indirect transactional cost in the customs compliance at import side.

3. Many costs due to incident of two months cargo holding by customs authority

There were three shipments for totally 16 containers that brought sorghum to Semarang, Indonesia. When the shipments were approaching discharge port, importer started to process the permit from the Agricultural Agency. However, the request was rejected since the country began to apply the import ban for sorghum considering there were more than sufficient supplies from domestic suppliers, that's why the sorghum import was restricted to protect the domestic market. As cargo was approaching, importer had no choice but tried to precede import the goods since delivering back to origin also costs a lot. In brief, importer continued to process the clearance that took around two months before finally got the containers to the final delivery site. The costs incurred due to handling these containers were enormous. In monetary, it was about one billion rupiahs²⁹ for the direct expenses as follows (excluding the intangible costs) to obtain customs clearance permit.

- a. Two months demurrage costs. This cost was mapped as a *higher transportation cost* of shipment clearance delay in the indirect transactional cost, which then linked to the *unforecast demurrage cost* in the domestic's freight cost of direct transportation cost at the destination.

²⁹ Equivalent to around €63,775 at the currency of €1=Rp 15,680

- b. Two months storage cost to pay the space/area used by the containers both at Container Yard (CY) and in other areas. In this case, the storage costs were divided into two: one-month storage cost at CY inside the port, and one-month storage at Customs auction area³⁰. This cost was sufficient mapped as *storage fee* as the impact of shipment clearance delay in the indirect transactional cost.
- c. There was a cost to transport the 16 containers from CY to the auction area. There is no detail information of the cost, but the arrangement and the cost had been included in that total charge of the one billion rupiahs. If the cost could be broke down, it was then mapped as the additional handling fee in the shipment clearance delay in the indirect transactional costs. This processing cost addressed the moves of the 16 containers from CY to auction area as the containers sit at CY for more than 1 month³¹.
- d. A lot of communications were made between counterparties to follow up the clearance process. This cost was fairly mapped in the CLCC model, but it was then added to the *preparation costs for clearance process*. This cost was then re-named as *preparation, communication, and coordination for clearance process* that covers the costs to communicate and follow up.

Upon getting customs permit, as part of the process clearance of plant and/or plant product, the shipments still needs to pass the phytosanitary inspection at the Agricultural Quarantine Agency. Several costs occurred as follows to complete this requirement..

- e. Physical inspection for the phytosanitary check, which is applied for all plant or plant products shipment. This cost had been well mapped as the *phytosanitary check* charged by non-customs border agencies for cargo clearance in the direct transactional cost.
- f. Laboratory check, which was only charged to containers that were inspected. This cost was properly mapped in the CLCC model as the *laboratory test expense and examination* of the physical inspection in the direct inspection cost.
- g. Inspection certificate issuance to state that the respective containers have passed the phytosanitary inspection. This cost had not yet covered in the current CLCC model. A revision was then added to update a new cost example due to inspection activity, in particular for the cost to issue a certificate as in this case. So, the fourth cost in the physical inspection related cost in the direct inspection cost was modified to be *other costs due to inspection (e.g. reefer's temperature adjustment, gas measuring, inspection certificate issuance cost, etc.)*
- h. Transportation cost to bring the inspected container from the auction area to the Agricultural Quarantine Agency. This cost was mapped as an *additional transport cost to complete the customs clearance* which was linked to the intra-terminal transportation cost in the direct transportation cost.

Unfortunately, when the containers were opened at the Agricultural Quarantine Agency's inspection area, so many sorghum lice were found as the sorghums had stayed too long inside the containers without a control to the container temperature, humidity, etc. The Agricultural Quarantine Agency would only do the physical inspection after the cargos were free from the lices. Hence, a fumigation process took place and caused other additional costs as follows.

- i. Fumigation process that costs at around Rp 1,350,000 per container. Fortunately, there was no extra transport cost as the fumigation company agreed to do the fumigation at the Agricultural Quarantine Agency site. This extra cost had not been covered in the current CLCC

³⁰ Based on country regulation that any cargoes not being cleared from the port after one month, they will be moved to auction area. If they are still not cleared within two months, the cargo's ownership right moves to the government side

³¹ As the regulation said that the full container can stay at CY for maximum period of 1 month, Afterward, it will be moved to the auction area that has higher storage cost compared to the storage cost at CY.

model. A cost revision was then made by updating the label name of *additional organization internal cost* (e.g. assign staff, rent inspection area, etc.) to be more general that could also cover this fumigation cost. So, this cost was then revised to be an *additional cost to support the inspection process* (e.g. assign staff, rent the inspection area, conduct fumigation, etc.).

- j. The possibility of truck overtime (or chassis rent cost) since to complete the fumigation process, the containers have to be wrapped with a gas-proof cover for at least 24 hours. This cost was mapped as *additional chassis rent (after one day)* in the direct transport related cost of inspection.

On top of above costs, importer lost a lot more due to the delivery delay to the customers for at least two months late. In the CLCC model, the impacts are mapped as follow, which are similar to the case of delay clearance in the first interview to the importer.

- k. The *competitiveness loss* as the impact of delivery delay to end customers in the indirect transactional costs. This shipment had absorbed a huge cost so that importer had less ability to offer a competitive price to negotiate the selling price.
- l. The *business opportunity loss* as the impact of delivery delay to end customers in the indirect transactional costs since importer could not fulfill the commitment to supply the sorghum to the buyers. Similar to the findings in the first interview, there was a possibility that the business loss if the customers cancelled the booking. No information whether there is penalty due to cancellation. However, such cancellation could lead to further commercial impact like to find the new customers who would like to buy the sorghum. Holding a new commercial activity to get a new contract with counterparty leads to the costs of security barrier or contracting costs in the border-related barrier.
- m. In general, the cargo spent two more months in the transportation. Therefore, there was *depreciation cost* in the *indirect transportation cost* since the quality of the sorghum had depreciated a lot.

4. Intra-terminal transportation to/from inspection area

When the container is subject to physical inspection, the importer should arrange the transportation to bring the container from Container Yard (CY) to the Customs inspection area. For this need, the importer needs to obtain a particular permit letter to bring the container outside the CY temporarily. Only after that, the intra-terminal moves can be executed with estimated costs of Rp 1,500,000 per container. This cost was mapped as an *intra-terminal transportation to/from inspection area* in the direct transportation cost for the transport related expenses.

5. Veterinary inspection and the other costs followed

When the shipment is subject to the veterinary check by Agricultural Quarantine Agency, there are at least four expenses incurred as follows.

- a. The veterinary check, which is applied per kilogram goods imported. The rate varies on the products. For example, meat and bone meal import is required to pay Rp 50/kg but applied only to specific containers that get physical (sample) inspection. In this sorghum import case, this cost was mapped as *phytosanitary check* cost charged by non-customs border agency for cargo clearance in the direct transactional cost.
- b. Laboratory test costs of Rp 1,000/container sample. Since the charge is only applied to the container that is selected for inspection, in this sorghum incident, this cost was mapped as the *laboratory test expense and examination* as the physical inspection related cost in the direct inspection cost.

- c. Inspection certificate issuance that costs Rp 5,000/certificate (per Bill of Lading). This document contains the test result that the particular shipment has passed the test which can be used by the importer to prove that their cargo is safe, healthy, etc. when there is an audit. Currently, no cost component perfectly represents this cost; therefore the current cost component of *other fee due to inspection (e.g. reefer's temperature adjustment, gas measuring, etc.)* is revised also to cover the example of *inspection certificate issuance cost*.
- d. Inspectorate operational cost for around Rp 150,000/person. Typically, an inspection case will involve two inspectorate staff. This cost has been covered in the cost component of the *additional cost to support the inspection process (e.g. assign staff, rent the inspection area, conduct fumigation, etc.)*.

6. Registration for inspection area

Importers who have high-risk cargo are required to carry out the veterinary check at their location. Before that, they have to first register their site area (or warehouse, or another form of the facility) to obtain the permit so-called 'location permit' in conducting the quarantine inspection. The permit is quota-based. For example, an importer is requested to issue the permit of veterinary check at the level of 100,000 tones. This means the importer needs to re-apply the license when the importer has exceeded this import quota volume. This regulation is also applicable for this sorghum import. So, this cost was mapped as an expense for the *registration to the customs, veterinary, and the shipping line system* in the direct initial set-up and approval (authorization) costs for private organizations.

The application of the CLCC model to map the costs that have been listed in this section 4.2.2 for the second interview discussion can be seen Figure 33 (or Figure 49 in Appendix P). The mapped costs are highlighted with red colors.

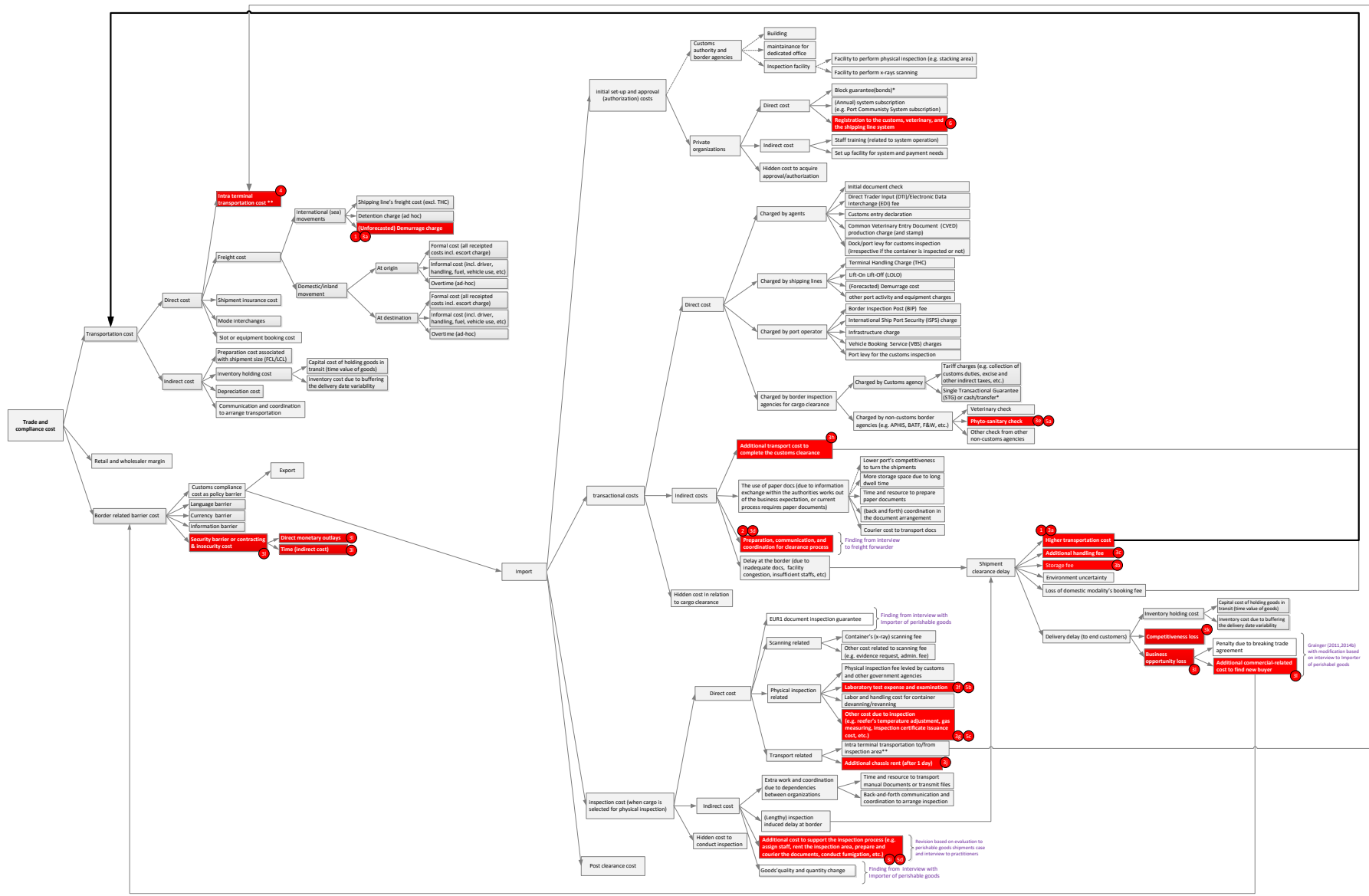


Figure 33. The CLCC model application to map the second interview result to freight forwarder

4.2.3 Evaluation of the CLCC Model Based on the Interview Findings

Based on the results listed in the section 4.2.1 and 4.2.2, some costs were able to be mapped to the model, but some others were not. Some highlights of the CLCC model revision are listed as follows.

- 1) Adding a new cost component of *EUR1 document inspection guarantee* as an additional cost in the *direct inspection cost* of the import compliance.
- 2) Adding a new cost of *preparation, communication, and coordination for clearance process* as a new cost component in the *indirect transactional costs* in the customs compliance at import side.
- 3) Dividing the cost of *Business opportunity and competitiveness loss* into separate two costs. These costs are listed as the impact of delivery delay to end customers, due to shipment clearance delay in the indirect transactional cost and indirect inspection cost.
- 4) Adding two new costs in the *business opportunity losses* (as the impact of delivery delay to end customers in the indirect transactional and inspection cost). They are the *penalty due to breaking trade agreement* and *additional commercial-related cost to find a new buyer* with the link to the border related barrier costs.
- 5) Adding a new cost of *goods' quality and quantity change* to the *indirect inspection cost*.
- 6) Revising the *additional organization internal cost* became an *additional cost to support the inspection process*. Also, adding the example also to mention a wider scope, e.g. the cost to *prepare and courier the documents* and to *conduct fumigation* to cover a broader range of secondary impacts due to the inspection process.
- 7) Adding a new example in the *other fee due to inspection*. Currently, the CLCC model mentioned the example of *reefer's temperature adjustment* and *gas measuring* only. But then it was added by the *inspection certificate issuance cost* in the direct inspection cost of the physical inspection-related cost category.

4.3 Conclusion: The Revised CLCC Model based on Two Stages Evaluation

To finalize the evaluation process, all of the findings from the first stage evaluation using archival analysis to the CORE research, and the interview both to importer and freight forwarder were all combined as the feedback to revise the CLCC model. Based on five revision points from first stage evaluation and seven correction points from the second stage evaluation, the CLCC model was then revised, which can be seen in Figure 34 below (or see Figure 50 in Appendix Q).

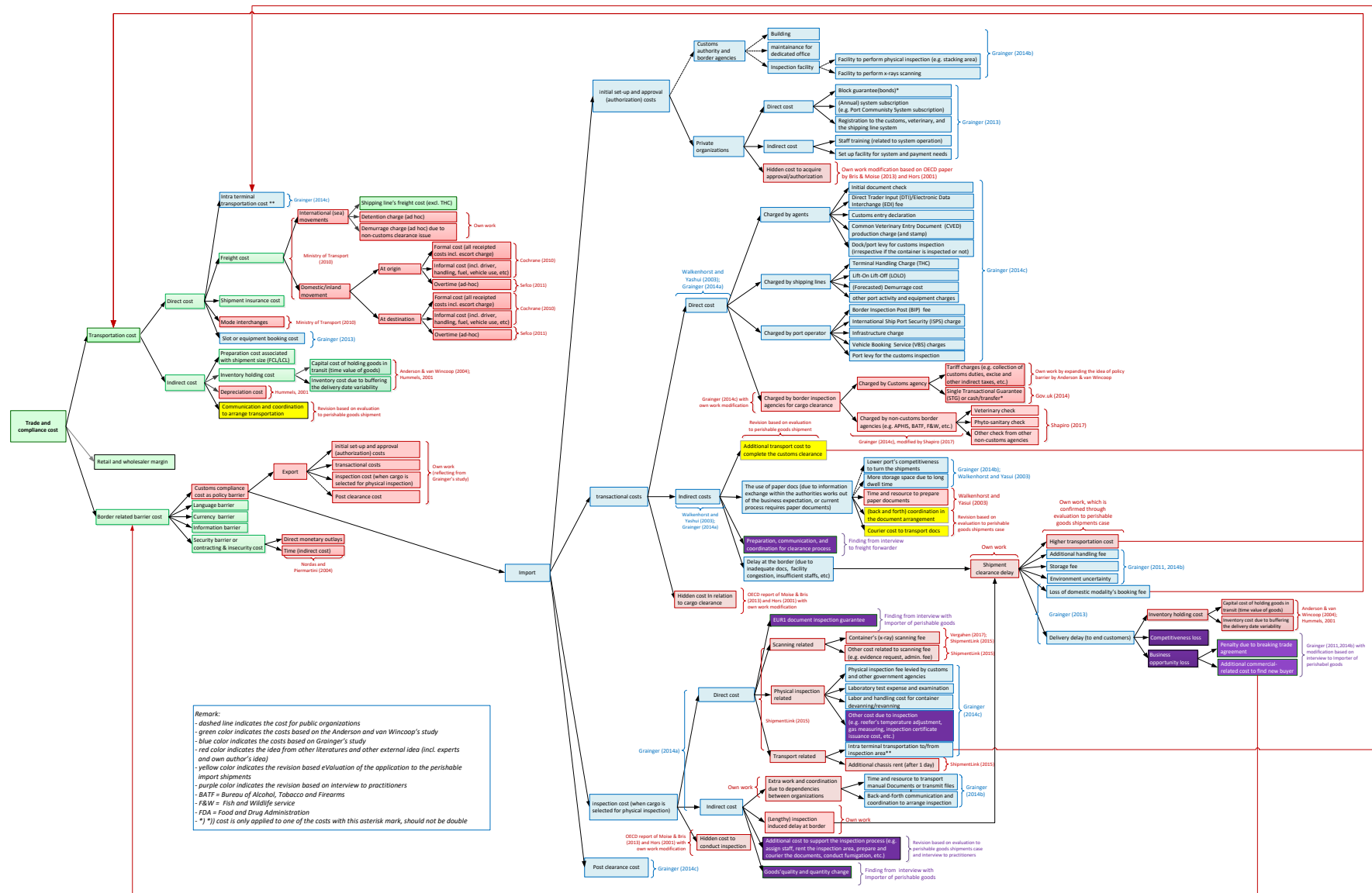


Figure 34. The revised CLCC model that has been modified based on the findings drawn from evaluation process through the application to empirical practice

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5

THE RETURN CYCLE OF THE CONCEPTUAL MODEL TO THE KNOWLEDGE BASE AND ENVIRONMENT

The output of design science research is ideally returned to the application domain and the environment for the applicable study (Hevner, 2007). Therefore, this chapter links back the CLCC model as the artefact to the application knowledge domain (the reverse loop of the rigor cycle) and the appropriate environment of related study (the reverse loops of the relevance cycle). By the end of this discussion, we can then predict that the CLCC model shares utility/benefit in two areas. First, it adds to the knowledge base as the foundations and methodology. Second, it creates a new value proposition as a tool to measure the trade costs in an international supply chain environment explicitly from the application at a single company to the application in a broader area, such as in supporting other research or the GTD development.

5.1 The CLCC Model as Addition to the Knowledge Base

Based on the initial reason the CLCC model was introduced, it is quite obvious where this research can contribute to the knowledge bases, namely in the domains of supply chain management, international trade, microeconomics, ICT and innovation, legal, and another related domain. Nonetheless, based on Hevner's design science research framework, the research product also adds to the knowledge base. The knowledge base itself is composed of foundation and methodologies. Hevner, et al. (2004) suggested that the foundations can be in the form of a theory, a framework, an instrument, a model, instantiation, etc. and that the methodologies might be data analysis, techniques, formalism, measures, or validation criteria.

The reasons the CLCC model can be seen as an addition to the knowledge foundations is explained as follows.

- The CLCC model as a new conceptual theory that is visualized in the form of a model to explain the costs and risks that are involved in international trade. This model at the end argues that the trade-related barrier costs described by Anderson and van Wincoop cover the compliance costs of Grainger's study, namely the policy barrier of tariff and non-tariff costs. The CLCC model can say that most of the policy barrier or the compliance costs are the non-tariff costs, as it represents the border barriers or obstacles to the international trade other than the import and export tariff/levy duty. The CLCC model might also provide concrete evidence that supports the theory that trade barriers are huge and might contribute as much as nine times the production cost to the total cost, which is dominated by the border-related barrier expenses (Anderson & van Wincoop, 2004).
- The CLCC model as an instrument for other research. For example, the risk analysis of international trade either to control the root causes or mitigate the impacts, financial analysis of the firms' performance in managing their trade competitiveness, supply chain improvement analysis through the approach of six-sigma that needs the cost quantification so that the improvement can be made right to the pain points, etc. Taking a specific example of the risk analysis, the CLCC model acts as an instrument to quantify and rank the risks. Such as the cost of container loss, which leads to a huge impact (though it very rarely happens), then compare it to the expenses of a customs system

being down, an incident that occurs more often but has less impact. Here, the CLCC model helps to analyze the possible incident risks for the company to decide the key priority action, by either preventing the root causes or mitigating the impacts³².

As well as being an addition to the foundations, the artefact adds to the methodologies. The methodologies provide the guidelines used in the evaluation or justification phase (Hevner, et.al. 2004, p.80). The methodologies include data analysis, formalism, measure, and validation criteria. For example, the CLCC model provides a clearer methodology to measure the supply chain performance: starting to see the general classification of the transportation costs, to the border-related barrier costs, and then to the retail/wholesale margin. By following the model flow, users can better measure their trade and compliance costs more accurately and in a more structured way. The CLCC model indirectly provides the validation criteria in the evaluation process. In general, the validation criteria can be the number/value, time, list, or something else that are calibrated against a known agreement. In this case, the validation criteria used for the justification are based on the cost lists/constructs presented in the CLCC model. In the validation process, the question is whether the identified costs can be mapped well in the model; if not, the model should be revised. The CLCC model provides the answer by validating that a certain cost is correctly identified as a transportation cost or should be classified as, for example, a compliance transactional cost.

5.2 The CLCC Model's Application to the Appropriate Environment

As well as being an addition to the knowledge base, the research results should also contribute to the application in the appropriate environment as part of the reverse loop of the relevance cycle. Based on Hevner's framework, the environment relates to the business needs, which can be the people, the organization, or the technology, though in reality, it is hard to separate the people, the organization, and the technology from one system in international trade.

1. Appropriate People and Organizations

As discussed in the problem statement section (Section 1.2), the actual costs of international trade are unknown because of the complex compliance process and the inefficient information flow and document trails. It is even harder to cut the costs to increase competitiveness when the costs are unknown and to manage risks when the real picture is not clear (Hesketh, 2010). Therefore, the CLCC model was developed to help importers to identify actual costs or to see how much cost reduction or how much the cost saving is as a result of any improvement initiatives.

In the application, by presenting the CLCC model to the businesses like importers, freight forwarders, or other private organizations, there are two main benefits captured:

- Businesses can quickly examine the events and conclude the possible costs that may occur when there is a disturbance in the logistic system, especially the indirect costs that majorly consists of intangible costs.
- Businesses can see more explicitly the possible cost saving from any supply chain improvement actions, like the application of the data pipeline that can reduce the complexity and cut the unnecessary costs.

In the next discussion, the CLCC model is then linked to show its application to the Global Trade Digitalization (GTD) as one empirical example of an appropriate environment in the area of technology application.

2. Appropriate Technology: The Case of Global Trade Digitalization

³² For the detail discussion of the adoption of risk based decision making model in asset management of energy infrastructures to international shipping domain, see the report of Anil Ravulakollu (2017)

The CLCC model is a tool to measure the efficiency and cost saving in international trade, not limited to the data pipeline or similar project initiatives like the GTD. It is argued that the CLCC model supports the global data pipeline like the GTD that is still at the initiation stage (the first stage of the three stages before GTD can be fully introduced publicly and commercially).

As mentioned, such a data pipeline is typically driven by businesses because the information source is primarily based on their data on a global scale. Therefore, the businesses need to be involved in the pilot project to develop the GTD to enable a seamless integration of all data and information elements from different sources. However, involving businesses or private organizations is not easy; they will only agree to participate in the project only if they are informed earlier about the direct benefit of the project to their organizations.

This is where the CLCC model has the contribution role. Organizations should fully understand that the GTD provides a clear measurement of the logistic events as it can capture the event that is recorded in the *event ledger* and is retrievable. In simple terms, in one hand, the GTD makes the logistic situation explicit, but not the costs. In another hand, the CLCC model can make the costs explicit. Therefore, linking the CLCC model to the GTD is advantageous, as the CLCC model can say what and where the cost saving is made so that the businesses can get a better picture of the cost–benefit line.

During the pilot project phase, the success of the GTD as a new global data pipeline platform is measured. There is a set of KPIs that adapt the SCORE model³³ to be introduced for five major actors: authorities, freight forwarders, terminals, shipping lines, and shippers. In this discussion, let’s take the example of the KPI assigned to the shippers only. Below are the five KPIs for shippers.

Table 9. The shippers’ KPI formulated in the CORE research project

Performance attribute	KPI Shippers	Targets	Description
Responsiveness	Replenishment time	20% reduction	Time between placing of order for goods and goods arriving at shelves or warehouse
Reliability	Supply chain reliability: deliveries on time	35% improvement	Ratio of the expected time to deliver to actual time to deliver
Cost	Safety stock	20% reduction	Amount of stock to be held in warehouse to accommodate for supply chain uncertainty
Reliability	Supply chain dwell time	30% reduction	Total time goods sits idle in a container in the supply chain
Responsiveness	Promotion planning lead time	30% reduction	Time required in advance of launch of a promotion

For the sake of research focus, only one attribute is discussed in this section, namely the attribute of reliability through on-time delivery. The delivery reliability is the ratio of expected time to deliver to the actual time of delivery. Shippers (or importers) can compare the initial planning of delivery time to the actual delivery time by retrieving the GTD’s event ledger record. However, the information is worthless if the costs are not known. For example, a shipment has a delivery deviation of two days on average (that means delivery two days later than the expected time of delivery). But after the GTD implementation, the deviation becomes only one day because the information becomes more visible and transparent to the stakeholders. So, there is around a 50% lead time reduction in the reliability attributes. The number of “50% lead time reductions” is only an abstract statement for the firm. Hence, a detailed measurement to see the explicit cost saving is needed through the application of the CLCC model to see the actual benefit of the GTD application.

Then how to measure the cost saving? Here we demonstrate how to measure the lead time reduction using the CLCC model. In the CLCC model, the lead time reduction can be mapped as the

³³ SCOR model is one of the most widely accepted frameworks in evaluating and comparing supply chain management in their activities and performance, established and maintained by Supply Chain Council (SCC). It allows the company to define the boundary as wide as possible, from the supplier of the supplier, to the end customer of the customer. The scope of analysis includes all activities in the supply chain, from the planning, sourcing goods, processing, delivering, and returning.

cost reduction due to less delivery delay to end customers, which is shown in the following CLCC model (see Figure 35)³⁴. The cost saving is the difference between the “before” and the “after” total cost of three components. First is the capital cost of holding goods in transit (time value of goods) and inventory cost due to buffering the delivery date variability. Second is the competitiveness loss. Third is the penalty due to breaking trade agreement and additional commercial-related cost to find a new buyer if there is a business opportunity loss. Without the CLCC model, shippers struggle to quantify these impacts.

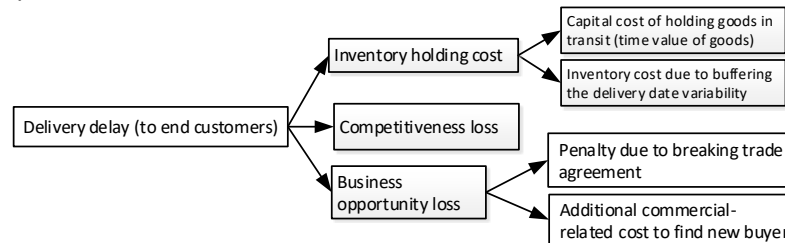


Figure 35. Mapping the cost of supply chain reliability through the delivery deviation using the CLCC model

It now becomes clearer how the CLCC can be used to measure the GTD benefit as well as quantify the KPI measurement. Nevertheless, this benefit or the projection of potential cost saving should be explicitly and clearly communicated to the stakeholders to support the development and adoption of the data pipeline (Klievink, et al., 2012).

In the long term, the CLCC model can also allow the private organization to see the broader costs that they might not see directly in the short term by using a traditional costing approach. For example, the delayed shipment delivery to the end customers due to unreliable information in the short term might not be seen as a serious problem. But if we look at the CLCC model, such a delay will impact to the business opportunity loss and competitiveness losses, or the inventory holding cost, which might be huge for the company, in relation not just to their operational issue but also to the commercial issue (company reputation, for example). Therefore, if private organizations are aware of possible huge impacts when the information is not reliable and is not visible to the logistic actors, they might be less reluctant to participate in such IT innovation initiative. Their involvement can be by investing their resources (money, time to train the staff, upgrade the system or facility, etc.) and getting involved in the infrastructure development and financial support of the GTD. Their participation then becomes a key step in the further articulation of the potential benefits and value proposition of IT-enabled trade facilitation solutions for particular actors in the chain, which is crucial for the further adoption and upscaling of IT-enabled trade facilitation innovations, not limited to the GTD.

As mentioned, the data pipeline is typically driven by businesses because the information source is primarily based on their data on a global scale. Building awareness among businesses of the benefit of any data pipeline initiatives through the evaluation in the trade and compliance cost model will be very advantageous, as the actors that are expected to enjoy the most benefit of a data pipeline are not the importers but the government agencies. However, it still offers shippers, consignees, and freight forwarders some advantages (Nijdam, Romochkina, & van Oosterhout, 2012). So, if the businesses are aware of the benefit from their point of view, such public-private governance projects can be fostered with less effort.

To summarize, the CLCC model supports the GTD development by comparing the costs incurred when there is such data pipeline applied so that private organizations will be more aware of the benefits of any IT-enabled trade facilitation regarding both the direct result and the long-term impacts. It is important for Maersk as the initiator and IBM as the developers of the GTD to mobilize the stakeholders (mainly private stakeholders) and get them involved in the pilot project. These are critical for the future developments to obtain the financial support from the stakeholders through investment in the system to establish the GTD as the global data pipeline platform.

³⁴ For the detail discussion of the KPI mapping using the CLCC model, see the report of Selma van Delft (2017)

6

CONCLUDING THE RESEARCH

This chapter summarizes the important parts of the research. The discussion is divided into four sections. First, the conclusion, which consists of revisiting the research questions, discussing the final finding of the importance of investing in the IT-enabled trade facilitation, and criticizing the CLCC model. Second, the iteration of the research contribution is presented to conclude the study's added value. Third, the research limitations and recommendations for future research are presented. Fourth, a reflection on the research execution, which might be advantageous as a learning point for future research based on the author's experience in completing this research.

6.1 Conclusion

6.1.1 Revisiting the Research Questions

This primary purpose of this research was to fill the gap in our knowledge of the trade and compliance costs at the individual company level by introducing a viable artefact that can be applied as a framework to evaluate the trade and compliance costs explicitly. Ideally, the artefact also can be used as a tool to measure the potential benefits and value proposition of IT-enabled trade facilitation solutions for particular actors in the chain. The research question was.

“What are the costs involved in the trade and compliance procedure of an international supply chain, taking into account the trade costs study by Anderson and van Wincoop, and the compliance costs study by Grainger? And to demonstrate how can these costs be applied as a practical tool/model to measure the trade and compliance costs at the company level, and make them explicit?”

To answer the research question, four sub-questions were first answered.

SQ1: What do the existing studies explain about the trade and compliance costs from the business environment application and other knowledge base?

The first step in this research was to identify existing studies in related research domains and about trade and compliance costs. It was found that most of other studies only explain the costs descriptively, and give an only fragmented view of trade and compliance costs: one literature study reveals the transportation costs, and another describes the compliance costs, or the information sharing costs, etc. Several kinds of literature on customs compliance costs were found relatively quickly. However, this was only one of many cost aspects in existing trade cost models and hence could not be broken down into the constituent components that become crucial when individual companies want to assess specific business processes. Company-level and compliance-specific trade cost models are needed when individual companies want to assess their specific costs of compliance in their international supply chains, and how they can benefit from IT-enabled trade facilitation such as the data pipeline to reduce these costs. Each of the studies has its own perspective in viewing the costs, but none of them offers a detailed costs explanation of the whole trade and compliance process at the level of the company.

The literature review showed that very little trade costs model research had been done at the level of the individual company. Thousands of articles were found, but when they were filtered in several stages, only eight were relevant. A careful reading of these eight articles revealed that only two made a significant contribution to answer the research question which was then cited to answer second sub-question, about Anderson and van Wincoop's study on trade costs and Grainger's study on import compliance costs.

SQ2: What do the current costs model studies contribute to construct a trade and compliance costs model, and how do they relate to each other to build the costs model?

The trade costs from Anderson and van Wincoop became the main framework, which was then expanded in more detail, especially in part of policy barrier as the compliance cost using the study by Grainger. In total, 13 studies and five websites were cited to build the costs model. For examples the hidden costs from OECD reports by Hors and by Moise & Bris, the indirect transportation costs from Hummels, direct transportation costs from New Zealand's Ministry of Transport's website, indirect transactional costs from Walkenhorst and Yasui in their OECD report, direct inspection costs classification from ShipmentLink, and others. Besides the mentioned sources, there were many other literature that were not directly mentioned or added to the model, but that helped to define and understand the costs at the early stage of the model construction. The product of this process is shown in Figure 21 (the simplified version, or in Figure 38 for full version) as the initial CLCC model, which has not been verified.

SQ3: How well can the built trade and compliance costs model represent the real costs of the empiric cases?

The initial CLCC model unfortunately could not accommodate perfectly the costs reported in the CORE research of the shipments cases in the first evaluation stage. On average, one-third of the identified costs could not be well mapped to the model. Similar to the first stage, the second evaluation stage of the CLCC model application to the experts' interview findings concluded that roughly one-third of the identified costs could not be perfectly mapped to the model. However, at the end of the research, the un-accommodated costs from both evaluation stages were added as the revision to make the artefact – namely the revised CLCC model – better at representing the reality.

The necessary changes to the CLCC model that were based on these two evaluations can be listed as follows (the revised CLCC model is shown in Figure 34 or Figure 50 in Appendix Q):

- 1) Adding a new cost component of *EUR1 document inspection guarantee* as an additional cost in the *direct inspection cost* of the import compliance.
- 2) Adding a new cost of *preparation, communication, and coordination for clearance process* as a new cost component in the *indirect transactional costs* in the import compliance.
- 3) Dividing the cost of *Business opportunity and competitiveness loss* into two separate costs.
- 4) Adding two new costs to the *business opportunity losses* (the impact of delivery delay to end customers in the indirect transactional and inspection cost). They are the *penalty due to breaking trade agreement* and *additional commercial-related cost to find a new buyer* with the link to the border related barrier costs.
- 5) Adding a new cost of *goods' quality and quantity change* to the *indirect inspection cost*.
- 6) Revising the *additional organization internal cost* to become an *additional cost to support the inspection process*. Also, add the examples also to mention a wider scope e.g. the cost to *prepare and courier the documents* and to *conduct fumigation*.
- 7) Adding a new example in the *other fee due to inspection of inspection certificate issuance cost*.

SQ4: What can we possibly know about the trade and compliance costs model in relation to the knowledge base/research domain, and to the relevance to the business need, in particular to the Global Trade Digitalization (GTD) as an example of IT-enabled trade facilitations?

The output of the design science research is ideally returned to the application domain and the environment for the applicable study (Hevner, 2007). Therefore, the CLCC model was then linked both as additions to the knowledge base as the reverse loop of the rigor cycle, and to share its application in the appropriate environment as the reverse loop of the relevance cycle. As an addition to the knowledge base, principally the CLCC model not only contributes to the body of knowledge of international supply chain management and international trade in macro- and microeconomic studies, but it can also be used as a reference for other further research, either as a foundation or a methodology. For example, the CLCC model can quantify explicitly the costs of logistic events, which can further be used as the input of a bow-tie analysis in an international supply chain risk analysis.

For the application to the appropriate environment, the CLCC model allows businesses to measure their trade compliance costs explicitly and send the signal where the costs are. In a wider scope, the CLCC model can increase the awareness of the GTD stakeholders of such data pipeline benefits. Therefore, it indirectly fosters the mobilization of the stakeholders in getting their involvement in the pilot project as part of the initial development stage and helps to engage the stakeholders' financial support through the system investment in establishing the GTD as the future global data platform.

Having answered all four sub-questions, the main research question could be answered.

“What are the costs involved in the trade and compliance procedure of an international supply chain, taking into account the trade costs study by Anderson and van Wincoop, and the compliance costs study by Grainger? And to demonstrate how can these costs be applied as a practical tool/model to measure the trade and compliance costs at the company level, and make them explicit?”

The costs involved in trade and compliance are extensive and can be divided into three main categories based on the activity area:

- 1) **The transportation costs.** These cover the logistic moves from the manufacturer in the country of origin to the point of consumption in the destination country. They cover inland domestic transport and international sea freight, and are classified into direct and indirect transportation costs.
- 2) **The border-related barrier costs.** These consist of customs compliance costs for export and import, language barrier, currency barrier, information barrier, and security barrier. The customs compliance costs or the policy barriers are divided into direct and indirect initial set-up and approval (authorization) costs, direct and indirect transactional costs, direct and indirect inspection costs, and post border costs.
- 3) **The retail and wholesale margin.** This cost was not examined in detail for this research.

Each cost component was cascaded into more detailed cost compositions and mapped in an explicit model, the Company-Level Compliance Cost (CLCC) model. The full range of costs covered in the CLCC model can help practitioners to review the possible costs. Indirectly, the model provides the insight that there are many indirect or intangible costs that might be overlooked by importers. Thus, the CLCC model not only shows the costs component in the trade and compliance process explicitly but also provides the ability to see how to apply the model as a tool to measure and map the costs through the model's visualization.

All in all, what distinguishes this research from previous research is that it offers a holistic analysis that combines several studies into one. It tackles the limitations of studies on trade and compliance costs and the absence of model visualization of the cost concept into a viable model. Specifically, it solves the

“too macroeconomic” criticism of Anderson and van Wincoop’s trade model, and expands the compliance cost study of Grainger that is “too narrow” to only the meat import case to the UK and even ignores other crucial cost aspects like transportation and other border-related barriers

6.1.2 The IT-Enabled Trade Facilitation as the Solution of the Trade Inefficiency

Based on the model evaluation presented in Chapter 4, there has been indirectly a demonstration on how to quantify the indirect costs incurred due to unintended incidents. It was found that the indirect costs in the transportation or the compliance process are not small. Such indirect costs are not efficient and need to be closely monitored, and if possible to be cut down or eliminated to keep the logistic costs low for the sake of trade competitiveness. The poorer the border facilities, the higher the overhead/indirect costs for the importers to comply with the regulation due to the high non-tariff costs to absorb.

One way to minimize the costs is to develop a better system and better management as one form of long-term cost planning. It is typically initiated by the public organization (government) with the support of other stakeholders, such as the shipping lines, who jump in as the ICT provider to build a global data pipeline by making the information more visible and more efficient through data/information sharing. This process can be the backbone for the establishment of a public–private governance model for a better supply chain in international trade.

An example of the positive impacts of such an investment is the reduction in the total transportation costs. For example, the domestic transportation cost at the destination. It can be pushed down through a good supply chain system and management when the IT-enabled trade facilitation allows the use of the data and information efficiently. The efficiency later contributes to a better decision making, and improves the communication and coordination within the counterparties that offer the greatest impact in reducing the demurrage/ detention cost due to free time violations (Catapult, 2016).

Relating this idea to the CLCC model, unfortunately, an explicit cost category of such a long-term effort to address the indirect transactional costs, inspection costs, and indirect transportation costs has not yet been covered in the revised CLCC model. So, an additional cost category of *investment in the system and management* was added in the initial set-up costs of compliance. It involves activities to organize the port community system to significantly increase the speed of information exchange between government authorities, port operator, and port users (Grainger, 2014b). The investment should also cover the harmonization, simplification, modernization, and integration of border procedures and related IT systems through the implementation of single windows, or new computerized transit systems (NCTSs) or trade facilitation agreements, etc. They all need a huge monetary investment for the first establishment and are thus categorized as the initial set-up costs for the customs authority and border agencies like the public organizations with the positive impacts shared with the stakeholders, especially the customers of the government service in border compliance like importers. Hence, the final finding of this discussion about the importance of any investment, mainly related to the IT-enabled trade facilitation, is added to a new cost construct to the very final CLCC model named the *final Company-Level Compliance Costs (CLCC) model*. These changes are shown in the Figure 36 below (the full version of the final CLCC model is presented in Figure 51 in Appendix R).

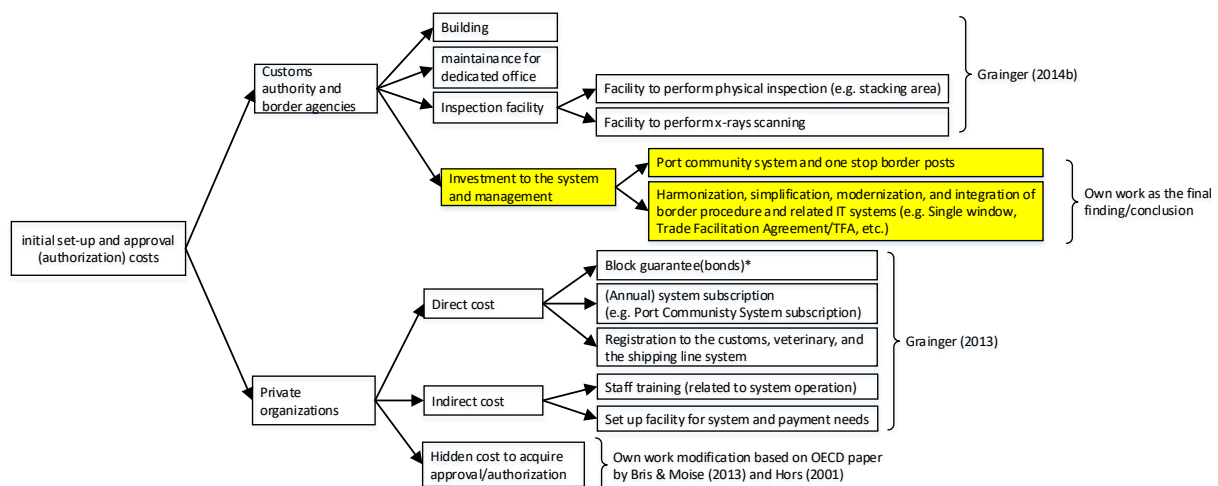


Figure 36. A new cost of investment is added as initial set-up costs for public organizations

Consequently, the answer to the main research question has been revised by introducing the final CLCC model. It is a viable and novel model that not only answers the research question but also provides an additional insight, namely that investments in the system and the organization managements are needed to cut the costs incurred in the international supply chain.

6.1.3 Pros and Cons of the CLCC Model Compared to Other Costing Methods

The CLCC model is neither entirely an example of the traditional costing method nor the activity-based costing (ABC) method. However, the CLCC model approach is slightly similar to the traditional costing method since it divides the cost mainly into direct and indirect costs. Nonetheless, it also has the characteristic of the ABC technique in defining the cost based on the activities involved.

Although there is no distinct technique used for the CLCC model approach, the cost classification in the CLCC model has several advantages as well as limitations compared to the other two costing methods mentioned. Below is a summary of the pros and cons of the main supply chain costing technique of the traditional technique and ABC, compared to the approach used in the CLCC model, to show their application to the trade and compliance costs.

The traditional costing method

Pros:

- In general application, it is inexpensive and relatively easy to implement.
- Suited for a labor-intensive, low-overhead-cost company.
- Focus on managing costs of the functional/responsible department.

Cons:

- Easy to trace all direct costs, but difficult to assign the overhead cost.
- Difficult to identify the costs of a complex system, such as compliance costs. It works best when the user already knows the cost structures at the beginning.
- Difficult to show exactly where the cost occurs in the process sequence.
- Less accurate than the ABC method; there is a risk of under- or over-costing.

The ABC method

Pros:

- Able to recognize the factual costs, especially when applied in a capital-intensive manufacturing industry.
- Provides a better understanding of where the overhead costs are so that the firm can eliminate the wasteful activity.
- Good to use when the overhead costs or indirect costs comprise the majority of the total costs.
- Focus is on managing the processes and activities.

- More accurate compared to the traditional technique as it provides a more precise breakdown of the overhead/indirect costs.
- Assigns more indirect costs than the traditional technique.

Cons:

- Implementation is time-consuming and expensive, as each process needs to be analyzed; not beneficial for a small firm.
- Difficult to identify the costs of a complex system, such as the compliance costs when there are a lot of activities that occur in parallel to other activities, or where the activities have no clear occurrence in the process but exist (e.g. hidden costs).
- The risk of double counting. The overhead costs are assigned to an activity, while in the trade and compliance case, the cost does not always have relation to only a specific activity, such as the case of the delayed delivery that has relation to the lengthy customs clearance process and/or the inspection process.
- The ABC technique is difficult to be generalized for a different application. For example, the ABC model of trade and compliance costs of company X might be not workable for company Y due to a different procedure, different commodity, different company regulation, different best practice rule, etc.

The costing method in the CLCC model

Pros:

- Offers satisfying feasibility, as the model was built by gathering cost constructs from a literature study to solve the issue that the actual costs of the trade and compliance themselves have not been fully known.
- Offers the mapping of the activity that occurs along the chain that might not have a clear activity sequence, or for activities that occur in parallel with others.
- Assigns more indirect costs compared to the traditional costing method and the ABC method, since the CLCC model is able to better address the intangible costs or to predict the possible costs that cannot be seen directly, especially for a long-term negative effect, for example the risk of business opportunity loss.
- If the ABC is better used when the overhead/indirect costs are huge, the CLCC model is more flexible either when the indirect costs are low or high (although the CLCC model in a high overhead cost situation can help the firm to mitigate the unnecessary costs).
- Focuses on managing both the cost and intended and unintended activities.
- Minimum risk of double counting as several same cost impacts have been merged, or by adding an asterisk to highlight that the cost is applied only once, e.g. block guarantee cost and the single transaction guarantee cost.
- Is able to show the correlation between one cost and other costs, such as in the CLCC model where the compliance cost can even impact the transportation costs, which might be assumed to be a very different and separate activity in the ABC or the traditional cost method.
- Whereas the ABC technique focuses on measuring the direct and indirect costs incurred by organizations to the activities that consume the organization's resources, the CLCC model tries to identify as many cost components as possible. Thus, the CLCC model often includes the costs that in practice might not be seen to consume resources but that have an impact on the company, especially in the long term.
- Offers a higher level of generalizability to other applications and different companies, compared to the traditional technique and ABC.

Cons:

- The model does not perfectly represent all possible costs due to a limitation in information collection (limited case study). The more iteration used through empirical evaluation, the more precise the CLCC model will be since the construction uses the inductive approach.
- The model is not practically ready to be applied to a company. A simpler interface or input method might help, such as developing an Excel interface or other software to help locate the costs automatically.

- As the model was built to be as generalizable as possible, it becomes too broad so that there are many cost constructs that in fact are not applicable to a specific case of a particular company.

6.2 Research Contributions

In this section, the research contributions are presented to show that the research has made the expected academic and practical contributions discussed in the previous chapter

6.2.1 Academic Contributions

1) Fill the knowledge gap

This study introduced the trade compliance costs model named the company-level compliance cost (CLCC) model as a novelty invention that can bridge the literature gap by providing the cost-benefit evaluation framework to the trade cost in general with a sufficiently detailed explanation of the compliance cost at the company level. The end product is not only presented as a qualitative description but is also visualized in an explicit model (Figure 51 in Appendix R).

2) Add to the body of knowledge of the research domain

The present research combined knowledge of state of the art in supply chain management, ICT, and international trade law (crossing border compliance procedures). Therefore, the CLCC model enriches the body of knowledge in the field of international supply chain management, specifically by offering a cost framework for trade and compliance at the single company level. It also contributes to the ICT field by highlighting the importance of any technology innovation or other IT-enabled trade facilitation in international trade in supporting the compliance process to create an effective and efficient logistic process.

3) As a new foundation for other research

As an independent research, the result of this research can support other research, even in different fields. It can be used as a theory, a framework, an instrument, a construct, a model, or an instantiation for other subsequent research. For example, the CLCC model can be used as an instrument to enable the researcher to measure the trade and compliance costs and make them explicit, and then share them as input for the risk analysis of international trade either to control the root causes or to mitigate the impacts

6.2.2 Practical Contributions

1) As a tool for practitioners to measure the costs of international trade and make them explicit

Such a viable artefact in a visible model enables practitioners to not only measure the real costs they face but to also predict the other expenses in the long term. The excessive costs mentioned in the model is a two-sided coin: it becomes the cons of the CLCC model, but at the same time beneficial for users to skim all possible costs component that they might not have predicted before, especially the long-term impacts and other intangible impacts.

2) Make explicit the benefit of an IT-enabled trade facilitation

Several forms of the IT-enabled trade facilitations were mentioned in Chapter 2. All of them are introduced to the public with the general aim of enabling real-time data management, and increasing the data sharing between private and public organizations through data pull and piggybacking principle to achieve a better coordination within the logistic stakeholders for better data transparency. All in all, they all are intended to optimize the supply chain by creating an effective, efficient, and sustainable supply chain. However, this statement might be perceived as too abstract. If the benefit itself can be measured, the public can decide how advantageous the solution is.

3) Support the GTD initiation stage by fostering the stakeholders' mobilization and engagement

The CLCC model supports the GTD development by comparing the costs occurred when there is such data pipeline applied and when not, which can be executed in separate research. Hence, the private organization will be more aware of the benefit of GTD as an example of IT-enabled trade facilitation both in the direct result and in long-term impacts. It is important for Maersk as the initiator and IBM as the developers of the GTD to mobilize the stakeholders (mainly private stakeholders) and get them involved in the pilot project. This is necessary as part of the development to get their financial support through the system investment in establishing the GTD as the global data pipeline platform in future.

All in all, as the last cycle of the design science research, the research contributes to the application domain and the environment for the applicable study as part of the rigor and relevance cycles

6.3 Research Limitations and Recommendations for Future Research

Reflections on the research's limitations and some possible recommendations are presented below.

6.3.1 Research Limitations

First, the case study done in this research concerned only three cases from the import shipment of perishable goods. The limitations are both in relation to the number of cases taken to observe due to the limitation of data available in the report of CORE research and the import shipment characteristic that represents the commodity of plant or plant product. Moreover, the model was developed based on case studies with specific plant products; hence the findings in these studies might not be generalizable to other commodities that have other inspection agencies at the border (e.g. electronics with dual-use inspections). In reality, the cases are wider and might be more complicated than what has been discussed here, and there are a lot more commodities involved in the international trade that require different treatment and might be significantly different compared to animals, plants, or plant products discussed here. Hence, it has the necessary limitations of case studies, namely that we do not have empirical evidence about the frequency of the delays that we observed. However, experts from the organizations that participated in the case studies confirmed that the delays we observed do occur quite frequently.

Second, the discussion used the point of view of the importers, from the costs model building (because the literature is dominated by the explanation of costs faced by businesses) to the cost validation process that also involves the importers and freight forwarder (on behalf of the importer).

Third, this model focuses on the compliance costs related to import only, and it does not address the compliance costs for export. In future research, we plan to conduct more case studies to overcome these limitations of the CLCC model.

Fourth, as part of the criticism of the CLCC model, this model is not practically ready to be applied to companies due to the complex and vast coverage of the costs while the mapping process of the costs is still done manually. This limitation is due to the constraint of the available thesis project time.

6.3.2 Future Research Recommendations

First, it is suggested that further research can explain the specific cost components in the export process, and further improve the CLCC model based on empirical study to other commodities point of view to increase the generalizability of the research to wider practice, not only to the perishable goods of plant and animal products.

Second, understanding the various stakeholders who take part in the international supply chain, it is known that there are at least three actors that should be involved in most activities dealing with the practical implementation of the GTD, namely the consignees or the importers, the freight forwarders, and the governments. Since this research focused only on the importer's point of view, in future research it will be advantageous if particular trade and compliance cost study is seeing the expense structuring from the other stakeholders' perspectives, especially from the government as the trade facility provider.

Third, empirical guidelines or other practical applications to discuss the specific model link to other related study domains are needed. For example, a study that explains the relationship between the CLCC model and the GTD's performance measurement in their internal KPI. Or other example of a study that describe the detailed process of how the trade and compliance cost model contributes to supporting the risk analysis, either to prevent the causal roots or to mitigate the impacts to minimize the cost occurs.

Finally, to address the fourth limitation, it is suggested that a simpler interface or input method is needed in future research. For example, develop an Excel interface or other software to help locate the costs automatically to increase the practicality use to interested stakeholders

6.4 Reflections towards the Research Execution

"The greatest part of a writer's time is spent in reading, in order to write: a man will turn over half a library to make one book."

- Samuel Johnson, *The Life of Samuel Johnson LL.D. Vol 2*

To successfully complete a project, one is expected to plan it well, even if it takes the most of the time to ensure that we know earlier what exactly to do to execute the project effectively and efficiently. In the summer of 2016, I found that my interest and knowledge background suited the research project of Prof. Yao-Hua Tan, who focuses on safe and secure trade lanes. Contacting him early to state my interest was a critical point that later brought me to know Dr. Borianana D. Rukanova, who then assisted me a lot to sharpen the direction of my research. Almost six months before my project officially started, my time was mostly spent reading a lot of articles and meeting Dr. Rukanova once a month to discuss my findings. I thus gained a better understanding of the research domain and finally found my research focus based on the literature gaps. The literature reading did not stop at that point, however, but continued throughout the writing process: a lot of reading was required to construct the majority of this thesis.

"Give me six hours to chop down a tree and I will spend the first four sharpening the axe."

- Abraham Lincoln

In February 2017, when my Master's thesis project officially started, I struggled to prepare the proposal for some weeks to make my planning clear, sharp, and viable to be completed within one semester. I found that drafting a proposal is not an easy task. To understand the research better, I started to write the primary research content, which is the cost model construction and to sketch the evaluation process. This process helped me to know what kind of research I would do finally.

Other than preparing the proposal content, I faced the challenge of composing a graduation committee that complies with the faculty's requirements. Initially, the committee members did not fulfill the rule that "at least one member is involved as course manager or instructor in the core modules". It took around a week to resolve when the graduation coordinator added to the committee one additional professor who is a course manager of MoT first-year core modules.

As a result, I had my kick-off meeting quite late compared to the ideal timeline. It was done on April 10, 2017, while others might have completed it in early March. In addition to the long planning process, the late kick-off meeting was also due to difficulty in finding a matching schedule for all committee members. However, with a better-structured proposal and more board members who sincerely gave the research direction inputs, the research later went more smoothly.

“Never stop writing because you have run out of ideas.”

- *Walter Benjamin*

There were often when I wanted to break away from the thesis routine, either because I'd run out of ideas or because I was bored with it. I understand that it is better to write something even though it might not be correct because later I can spot the mistake and make a revision. Sometimes, an incorrect sentence would lead to a good idea. Hence, I tried as much as possible never to take a break and to read or write at least one sentence every day (though frankly, it was tough), because I knew that once I broke my routine, it got harder to get back into the “thesis mood.” For example, after submitting a full draft a week before the green light meeting, I decided to take a short break. However, in fact, it took at least two weeks for me to get my pace back to finalize it.

“People may advise you, guide you and evaluate what you do, but bear in mind they can't think for you. You don't blame people for not thinking for you; blame yourself for depending on them to do what you must do.”

- *Israelmore Ayivor, Leaders' Watchwords*

In completing the Master's thesis, we should be aware and prepare the backup plan when we depend on others, including those who have the information that we need. In my case, I was strongly dependent on the practitioners to get their information and involvement during the evaluation process. Initially, I planned to complete this process at the latest by mid-May. However, due to the busy time they have, I had to reschedule my meeting with them, which delayed my evaluation process by almost one and a half months.

To avoid delaying the completion of my research, I decided to do what I could do even though the flow might deviate from my initial planning. I started to write my discussion and other concluding parts (the last two chapters) even though the core discussion was yet not completed. Therefore, once I had the time to gather the needed information and complete the empty part, the task left was to revise the last two chapters of discussion and conclusion, which saved a lot of time instead of writing from scratch.

“If you can't explain it simply, you don't understand it well enough.”

- *Albert Einstein, Physicist*

When I attended a lecture on writing a Master's thesis, the lecturer held up an example of quantitative research and qualitative research. We all saw that the qualitative research had a “thicker” result. It might be right, as when writing this thesis, I often felt that I had many more ideas to report. However, during almost all the committee's meetings, the input was always about the issue of verbose writing. It's true that in fact, people will understand better if the idea is communicated simply rather than offering them a complicated explanation, which might even make them fail to catch the core idea. Therefore, presenting a concise report will always be challenging for me.

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Appendices

Appendix A : The non-tariff measurement categories

Table 10. Non-tariff category according to COMESA, EAC, and SADC (2017)

Category 1: Government participation in trade & restrictive practices tolerated by governments
Export subsidies
Government monopoly in export/import
State subsidies, procurement, trading, state ownership
Preference is given to domestic bidders/suppliers
Requirement for counter trade
Domestic assistance programs for companies
Discriminatory or flawed government procurement policies
Import bans
Determination of eligibility of an exporting country by the importing country
Occupational safety and health regulation
Multiplicity and Controls of Foreign exchange market
"Buy national" policy
Lack of coordination between government institutions
Other
Category 2: Customs and administrative entry procedures
Government imposing antidumping duties
Arbitrary customs classification
Issues related to the rules of origin
Import licensing
Decreed customs surcharges
Additional taxes and other charges
International taxes and charges levied on imports and other tariff measures
Lengthy and costly customs clearance procedures
Issues related to transit fees
Inadequate or unreasonable customs procedures and charges
Lack of control in Customs infrastructure
Lack of capacity of Customs officers
Issues related to Pre-Shipment Inspections
Other
Category 3: Technical barriers to trade (TBT)
Category 4: Sanitary & Phytosanitary (SPS) measures
Category 5: Specific limitation
Quantitative restrictions
Exchange controls
Export taxes
Quotas
Import licensing requirements
Proportion restrictions of foreign to domestic goods (local content requirement)
Minimum import price limits
Embargoes
Non-automatic licensing
Prohibitions
Quantitative safeguard measures
Export restraint arrangements
Other quantity control measures
Restrictive licenses, and other

Table 10. Non-tariff category according to COMESA, EAC, and SADC (2017) (cont.)

Category 6: Charges on Imports
Prior import deposits and subsidies
Administrative fees
Special supplementary duties
Import credit discriminations
Variable Levies
Border taxes
Other
Category 7: Other procedural problems
Arbitrariness
Discrimination
Corruption
Costly procedures
Lengthy procedures
Lack of information on procedures (or changes thereof)
Complex variety of documentation required
Consular and Immigration Issues
Inadequate trade-related infrastructure
Other
Category 8: Transport, clearing, and forwarding
Government Policy and Regulations
Administrative (Border Operating Hours, delays at border posts, etc.)
Immigration requirements (Visa, travel permit)
Transport related corruption
Infrastructure (Air, Port, Rail, Road, Border Posts,)
Vehicle standards
Costly Road user charges /fees
Issues related to transit

Appendix B : The extended customs compliance cost model with basic cost study by Grainger

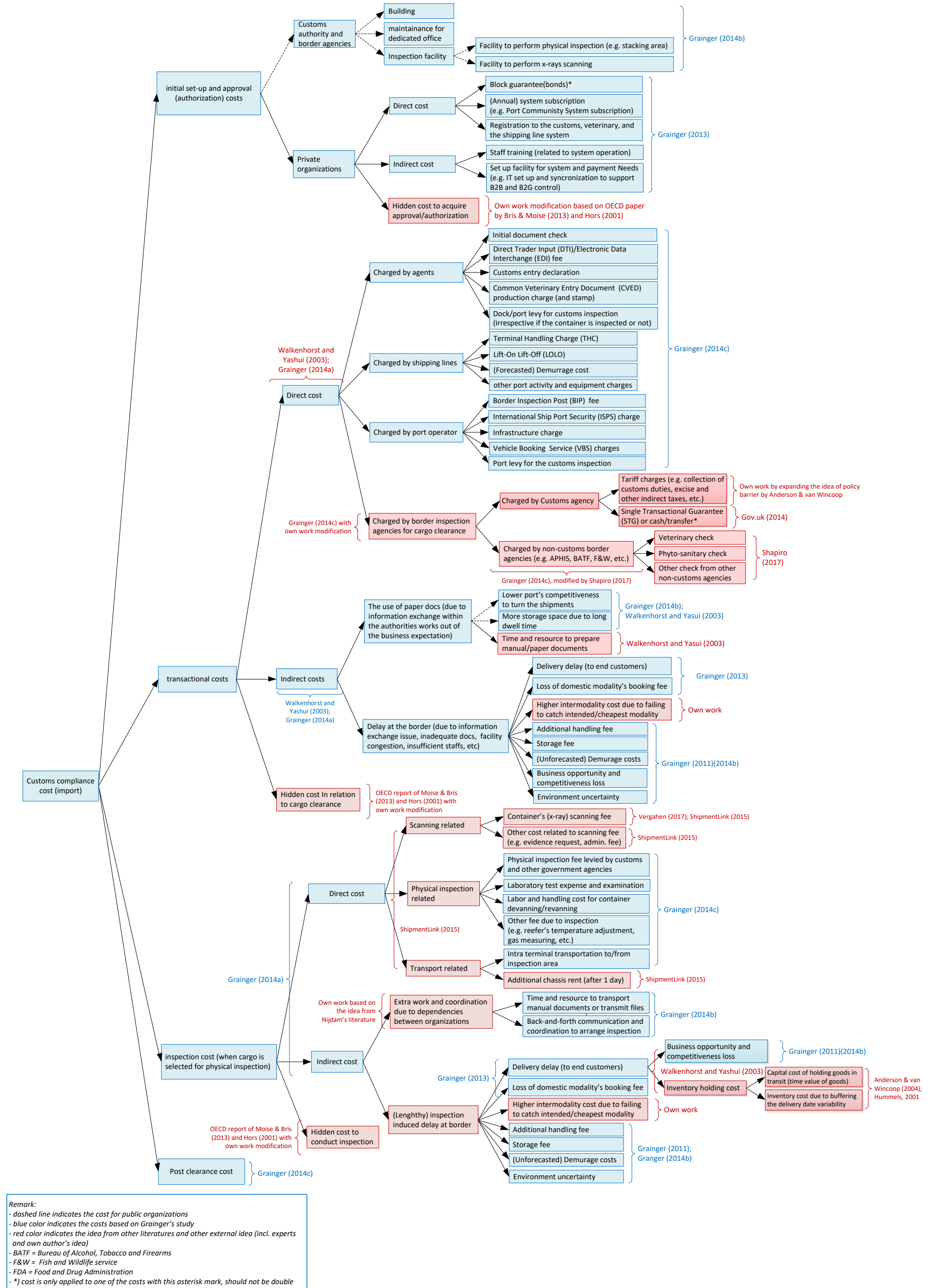


Figure 37. The import compliance cost model with the basic framework based on Grainger's study

Appendix C : The initial CLCC model (before being evaluated)

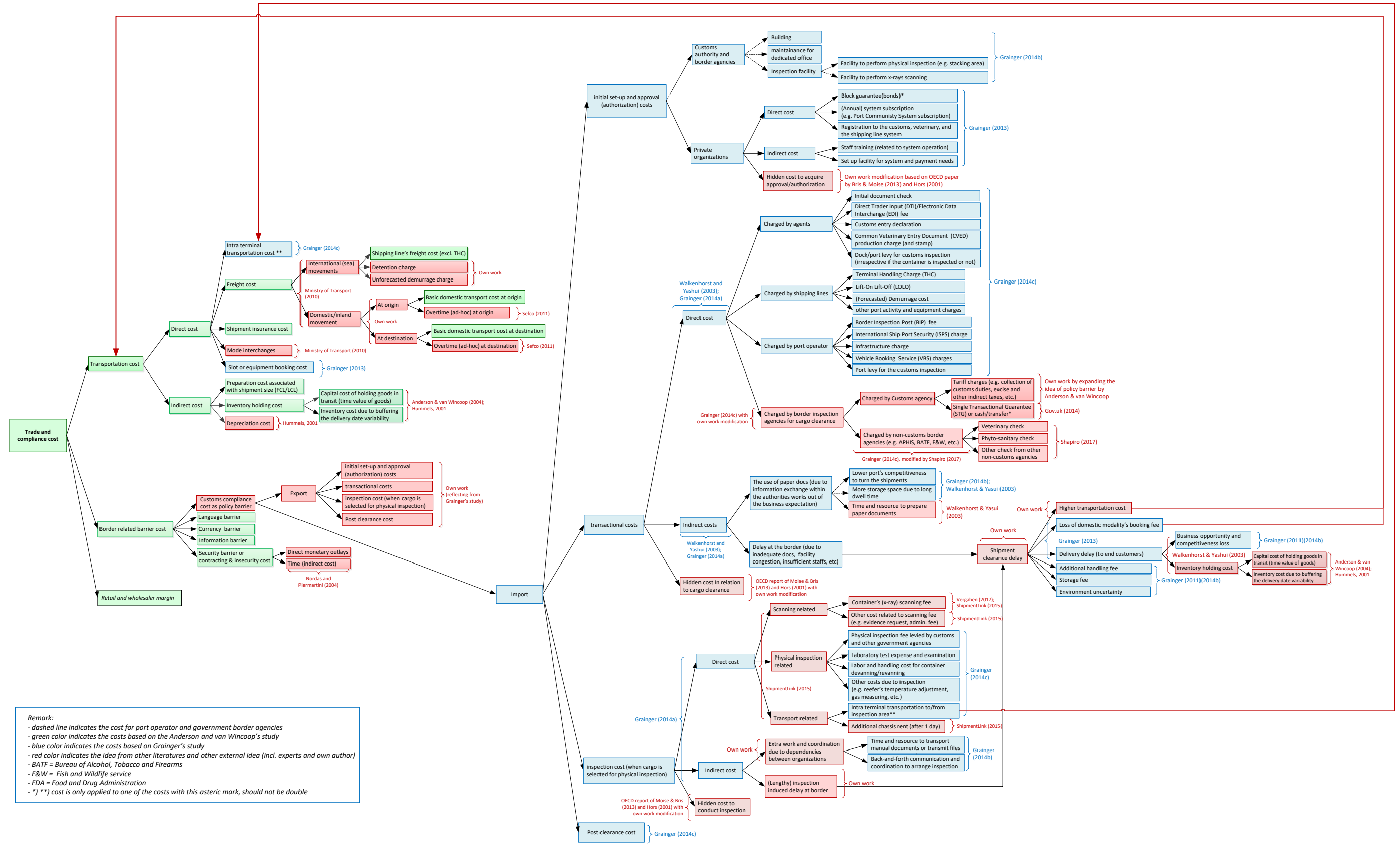


Figure 38. The initial CLCC model that merges the shipment clearance delay's impacts before being evaluated through the application in empirical practice

Appendix D : The first stage evaluation towards the first case (before revision)

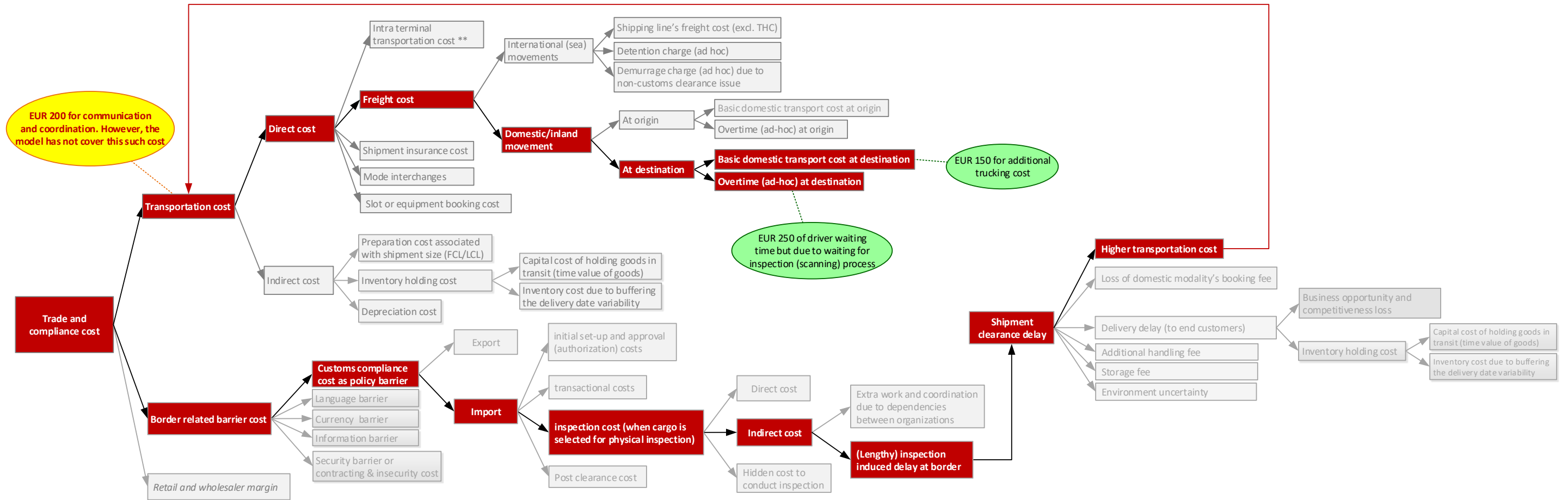


Figure 39. The cost mapping to the trade and compliance model for the first case before the revision (A3 page size)

Appendix E : The first stage evaluation towards the first case (after revision)

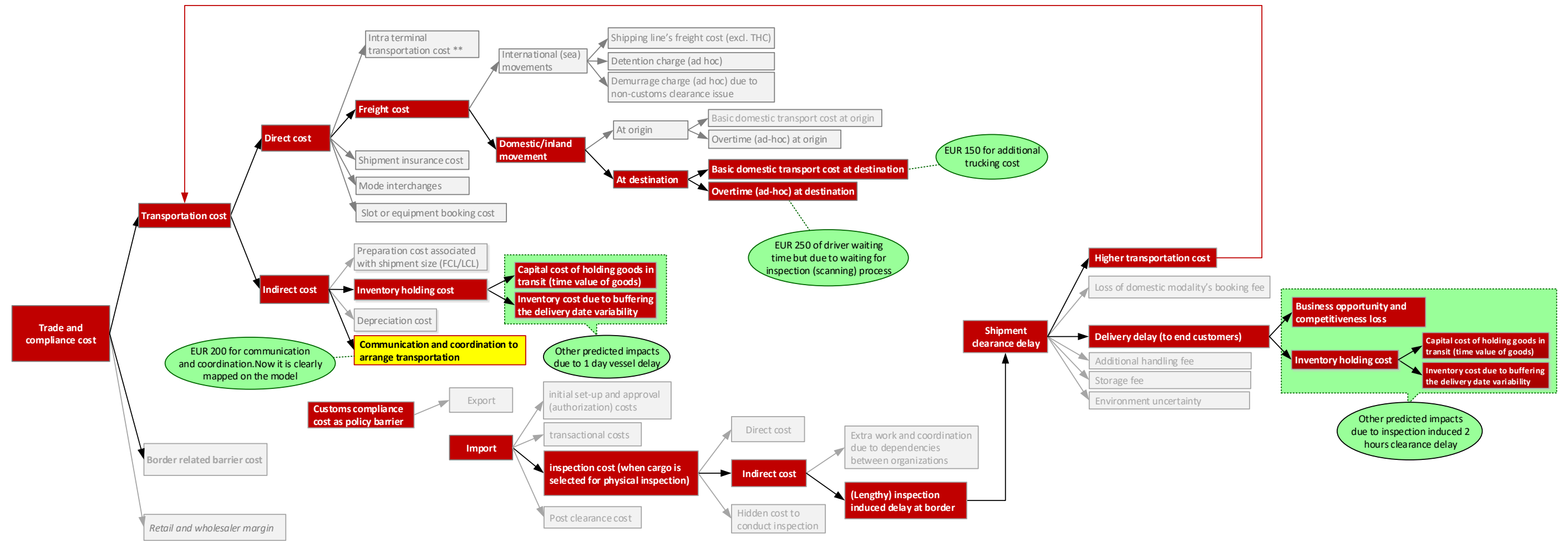


Figure 40. The cost mapping to the trade and compliance model for the first case after the revision (A3 page size)

Appendix F : The first stage evaluation towards the second case (before revision)

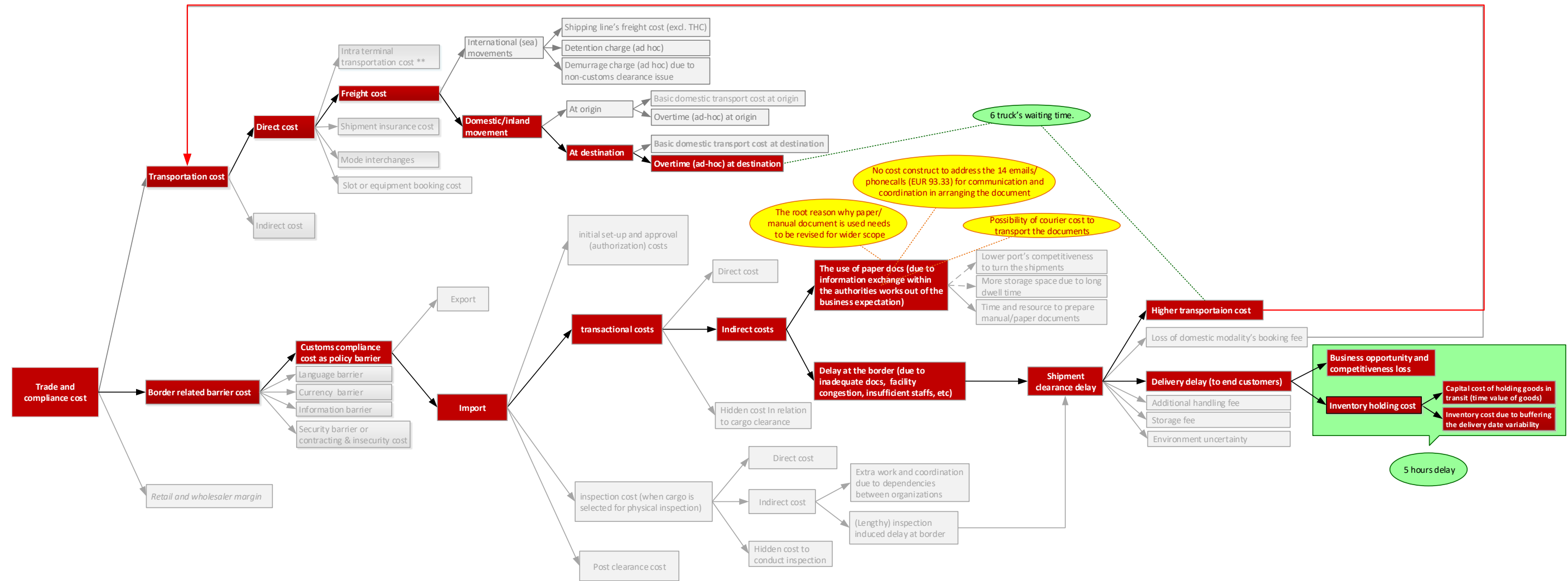


Figure 41. The cost mapping to the trade and compliance model for the second case before the revision (A3 page size)

Appendix G : The first stage evaluation towards the second case (after revision)

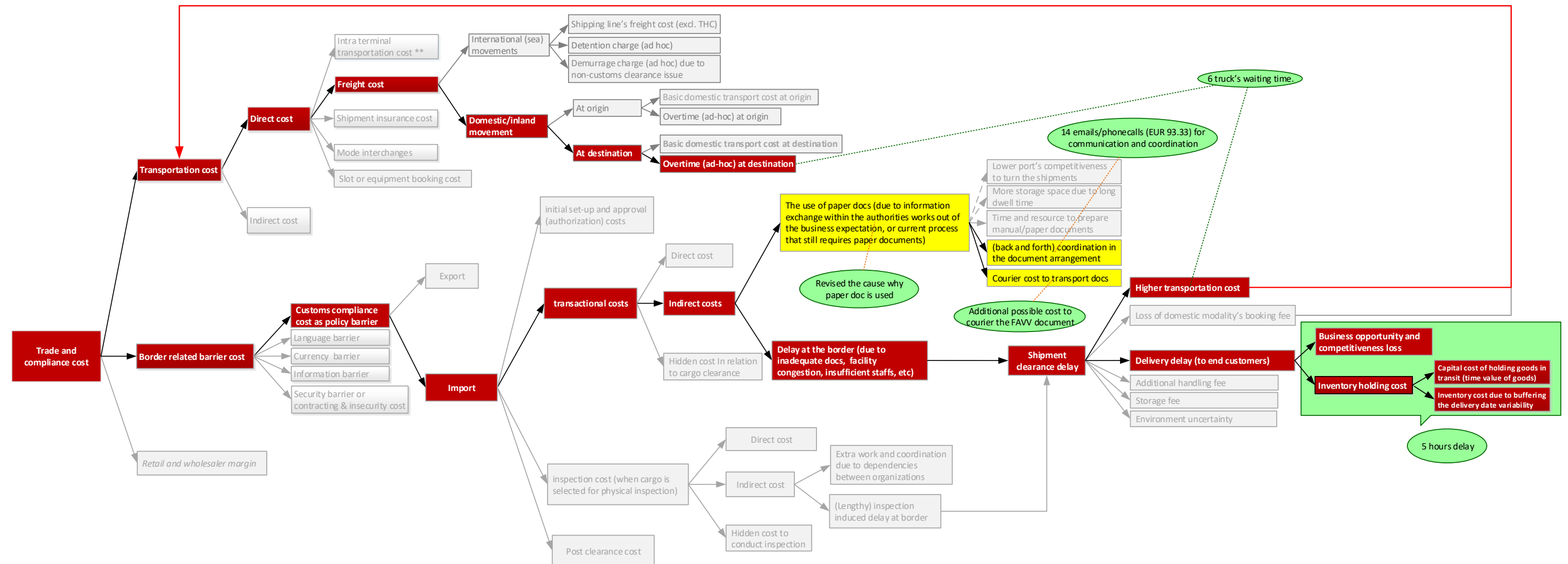


Figure 42. The cost mapping to the trade and compliance model for the second case after the revision (A3 page size)

Appendix H : The first stage evaluation towards the third case (before revision)

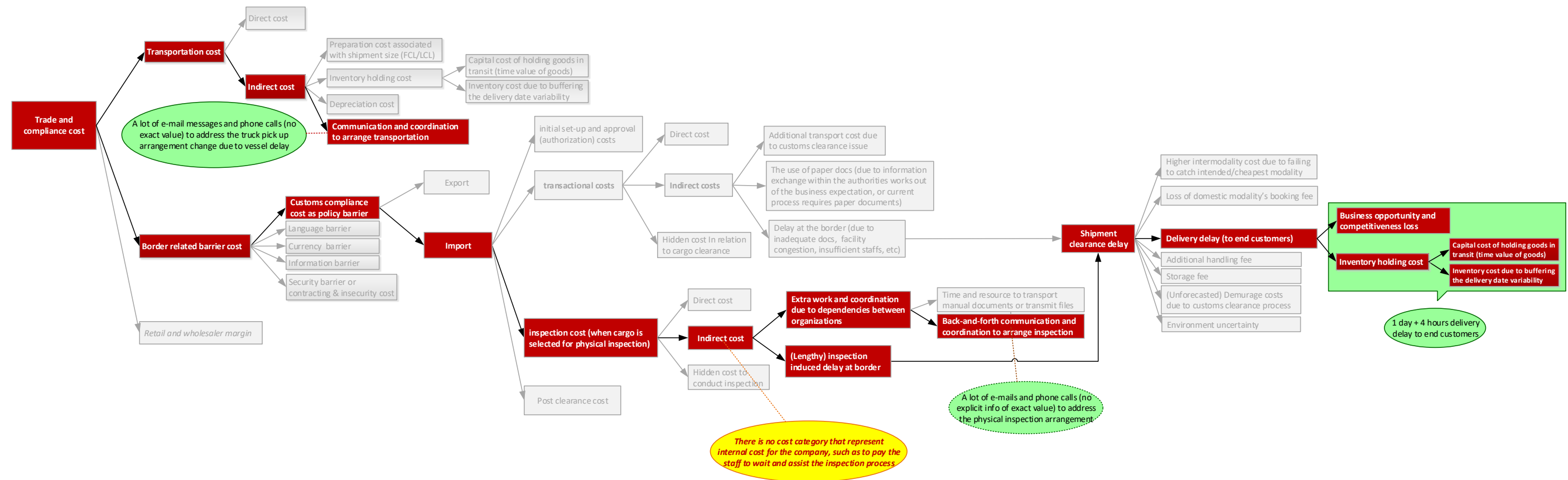


Figure 43. The cost mapping to the trade and compliance model for the third case before the revision (A3 page size)

Appendix I : The first stage evaluation towards the third case (after revision)

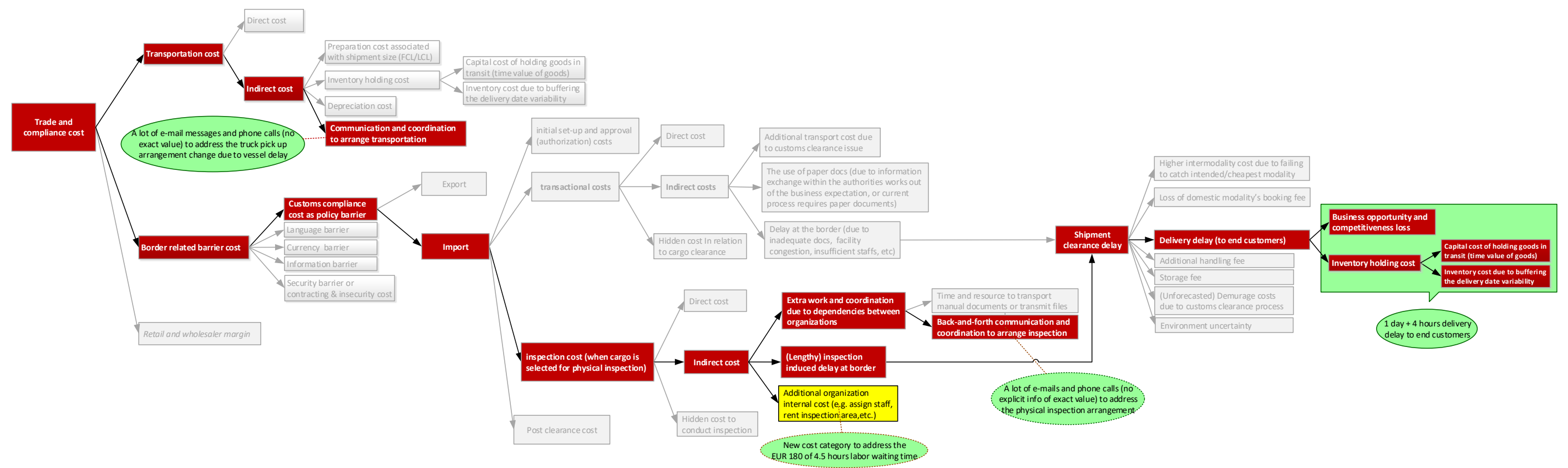


Figure 44. The cost mapping to the trade and compliance model for the third case after the revision (A3 page size)

Appendix J : The CLCC model after the first stage evaluation

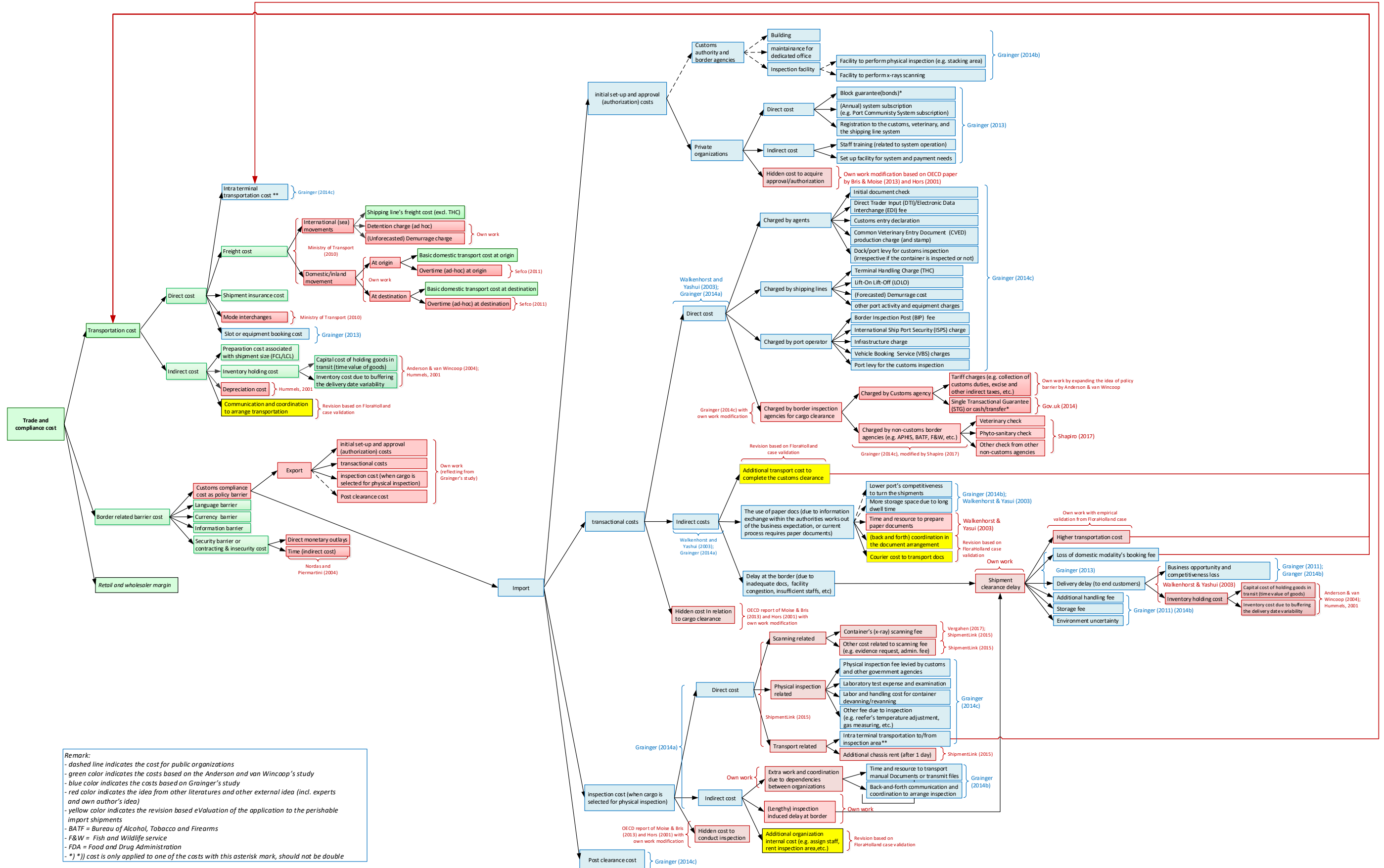


Figure 45. The CLCC model after the first stage evaluation to the perishable import shipments (A3 page size)

Appendix K : The interview protocol for the perishable goods importer

The following up meeting on 15 June 2017 is aimed to clarify the issues and risks listed from previous meeting (8 December 2016 and 7 April 2017). The risks list to be discussed:

Risks in relation to the trade's commercial activity

1. Growers selling Avocados to other company
When the avocados are harvested even if there have been prior agreements growers it may happen that the growers sell the avocados to the other company offering better prices. The bigger companies may also offer additional bonuses to growers at the end of the harvesting period to make it more attractive for growers to work with them. Particularly in situations with high demands, it may happen that the growers prefer to work with the bigger exporters who offer better prices.
2. Delayed delivery to the customers
The importer might face a situation when the containers were late to be cleared so that the goods were late delivered to the customers. There are several possible monetary impacts, such as customers ask for the overtime charge since their trucks were waiting longer than normal, or canceled an order which can lead either the importer loses the opportunity to sell the goods at a good price. Or the worse, the importer loses the order and needs to compensate the price difference if their customers shift the supply from other importer but in a higher price (when there is a special agreement).

Risks in relation to the transport's reliability and safety

1. Breakage of container door seal during the transport
Avocados are transported under very specific conditions. The right combination of temperature, as well as oxygen and other gas, needs to be maintained during the journey. There is a special plastic curtain that is placed inside the container to ensure the right conditions are kept. Any door opening can be damaging, as it will disturb the conditions and the avocado can wake up and start maturing.
2. Sometimes vessels arrive at ports other than Antwerp
The vessel typically arrives in Antwerp at the direct call, but sometimes they go via Felixstowe as the first call. When the ship arrives in the weekend some ports do not handle in the weekend, the port of Rotterdam does. So it can happen that the goods arrive at the port of Rotterdam as well.
3. Possibility of missing the vessel during trans-shipment
The big problem is when the goods are transferred from a smaller vessel to larger ship (there is transshipment). For products coming from Mombasa, there is always transshipment, as the big boats do not travel to Mombasa. The transshipment takes place in Salalah and big boats are coming from China. If you miss the boat, then it takes a week. So at times, it takes 21 days to receive the container but sometimes more than 30 days. The problem with missing the boat is not so much in the Kenyan port but on the transshipment port
4. Missing Container
In practice, it has happened that a container is lost. From earlier experiences, they know of two cases when a container is lost and reappears 7-8 months later. So the container is at the end there, but the cargo is entirely damaged. The value was in the range of 80 000 Euros

5. Damage due to temperature changes in the container

They requested the carrier earlier to provide this information but still have a little view on that aspect. Temperature readings can be very sensitive information, as in the case of damage claims can be placed. At the moment if damage occurs due to temperature deviations it is difficult to find out who is responsible. The importer has very little visibility on that. In some ports, the carrier is responsible for ensuring the agreed temperature requirements are met. In other ports that are outsourced to another company or handlers, so the carrier needs to rely on that they follow the agreements and procedures correctly. And sometimes if the damage occurs it can also occur before the goods reach a port. It could be that the truck driver did not follow the procedures for keeping the container cool. Next to that in the contract, there is an agreed temperature, but if the container is not pre-cooled, it takes time when the goods are already in the container to reach the agreed temperature

Risks in relation to the transactional/administration (documents and information handling)

1. Improper - phytosanitary documentation

It happened once that they had to get three times the phytosanitary certificate and to pay for couriers. It was an administrative thing, the goods were not delayed but it accumulated extra costs. The first time the phytosanitary was there but was not signed, so they had to ask for a renewed phytosanitary. This was reissued and was sent by courier, but when filling it in, they forgot to put the date, so the authorities did not accept it. So it had to be sent a third time

2. Issue with Document Proof for road transport (“bewijs van wegvervoer”) at Belgium customs

The goods frequently arrive in Antwerp, as it is faster than if it is discharged at Rotterdam port. Belgian customs issues a document “*bewijs van wegvervoer*”. There are often problems with that document.

3. Long waiting times at the customs

There were some cases of customs declaration system down during the working day (from 9.00 am morning to 15.00 – 16.00 pm). With such process that works out of business expectation, the importer needs to manage the order delivery to the customers.

Risks in relation to the inspection activity

1. Payment of guarantees at import side

For the import to the Europe, there is a trade facilitation named EUR1 (or movement certificate) that enables the importers to import goods with reduced (or even free) import duty based on the trade agreement between the EU and the beneficiary countries. Particular to the Netherlands, there is a new regulation that for the selected container for the EUR1 document inspection, the importer is required to pay the guarantee of around 1,500-1,600 euros per case (or per container?). This guaranteed money will be released back to the importer only after Customs establish that the EUR1 document is not fake.

2. Scanning takes very long at import side

If goods arrive via Rotterdam container scanning is a big issue. It can take up to one week before the container is scanned. For sensitive goods that can affect the quality. For some fruits coming from Columbia the damage of the delay can be so big that the whole cargo is lost. The importer had a period that 75% of the shipment was selected for a scan – where?. They were shocked by this high rate. In other periods they have much fewer scans, but in this given period, the scanning rate was very high.

Appendix L : The interview result to the importer (minutes of meeting)

First meeting

Date : 7 April 2017

Location : At the importer of perishable goods' office

- Reefer shipment is needed for the import from Kenya. Therefore, there is a process of pre-cooling before the harvested avocados are loaded to the container to keep the quality of the goods.
- There is a new regulation that required the importer to pay guarantee for the shipment that is selected for EUR1 (so importer sends all needed document to be verified, in relation to check the accuracy and others for import duty). So far, this perishable goods importer only face this issue once for their shipment departed early 2017 that consists of two containers. The guarantee amount is around EUR 1,500-1,600 for each container.
- Though guarantee payment will be transfer back to importer when the EUR1 docs are proofed not fake, depositing such big of money is not preferable for them as it impacts their cash flow, especially this company is included as small to the medium importer, not a big company. Moreover, there is no clear regulation when the process finishes, only it states that it takes around 6 months or one year. Other than commercial impact, the importer needs to pouch and transport the document for this EUR1 document verification.
- The critical issues in the fresh fruit import are about cargo temperature and the gasses composition inside the container.
- To maintain the gasses composition, a plastic seal like the curtain is placed inside the container (near the door) to avoid gasses leakage and keep the composition of CO₂, O₂, and other gas composition as required to maintain the avocado quality and prevent to ripe fast.
- Scanning process might take one week if there are too many queues. Some possible impacts:
 - Risk to the goods quality
 - If the goods quality that is delivered does not meet requirement/agreement, importer face risk to lose the market (as they have deal with the customers for goods delivery) due to quality depreciation
 - Lower bargaining power in selling the avocados as they might have completely or even overripe so that the avocados have to be sold fast as importer cannot hold the cargo any longer.
 - The commercial risk when importer breaks the agreement, there was a case that importer have to pay the loss of its customers. For example, there is a deal that importer supply the avocado to customer A but due to delay in delivery, customer A has to buy the avocado from another importer with a higher price and this importer is responsible for the different price loss if any.
 - If no update about the scanning process or any info about the clearance delay, possibility for the truck (including customer truck) to wait for the goods. Very few case the importer got the financial claim, but such incidents disrupted the logistic flow with the impact to the commercial
 - Cancelled order, means importer has also to find a new buyer for their goods.
- Customs system is sometimes down, even from 9 am to 3 pm or 4 pm (almost a full day working hour) and there is no early notification of such system issue. There are so many negative impacts. If the system issue is known in advance, the importer will prefer to do the clearance early to avoid delay clearance.
- There was a case that importer container was opened at Port Salalah. The major impact is that the gasses composition inside the container changed due to contamination from the open air

(as ideally the level of O₂ should be managed at around 5%). The impact as stated, the avocado start to 'wake up' and ripe soon.

- Most of the containers are discharged at Antwerp port ($\pm 95\%$)
- When there is a delay, there are two possible scenarios.
 - Low-risk scenario (optimist) means the delay impacts to the long waiting time for customers, complaint, etc.
 - High-risk scenario (pessimist) means the risk that customers cancel the order, and importer needs to create a new contract to new consumers.

Second meeting

Date : 15 June 2017

Location : At the importer of perishable goods' office

- The EUR1 guarantee payment is EUR 1,500-1,600 /container. The calculation is actually made per tonnage of the goods contained. So, if the container each has in average 23-25 tones, means the charge equal to around EUR 65/ton.
- If container missed the connecting vessel at transshipment port, there are extra works to coordinate with counterparties, and the risk of uncertainty such as the new schedule of the cargo arrival, uncertainty whether the containers are loaded onto the vessel successfully, etc.
- Information of the temperature is critical for the importer. Currently, it is very difficult to obtain the information during the transportation. Therefore, if any disturbance in the system and leads to temperature change that can risk the goods quality, the importer is hard to locate precisely when the incidents occur and who will absorb the loss.
- The shipments mostly planned for arrival at Antwerp port (95%) instead of other (including Rotterdam) considering the faster transit time (since the deployed vessel will discharge at Antwerp port first then just go to the Rotterdam port), since the trucking time and cost either from Antwerp or from Rotterdam is not too significantly different.
- The scanning process at Port of Antwerp takes longer due to less capacity. The normal scanning time takes around 1 to 3 days, but if the physical inspection is needed, it can take up to one week to complete.
- Such delay at the port leads to the demurrage cost. In the past, the delay could cost at around EUR 300/day (demurrage, storage, etc.). But the most important impact is to the commercial risks.
- There has been no specific insurance paid for the goods since the insurance company prefers to offer it to the big company.
- In the shipment, importer uses the original Bill of Lading, means importer needs to show the document physically in original, while the shipping line releases this document at the country of origin. Therefore, the exporter in Kenya needs to send it by courier. There is a risk of missing document during the transport, but fortunately, there has never been such case. However, there is sometimes the issue of the late document since the sender (exporter in Kenya) uses an unreliable courier (may be to cut the courier cost) to send such important documents to the importer in Netherland, including the phytosanitary documents.
- The pre-cooling process is important to maintain the quality of goods. Therefore, this process should be monitored to make sure the reefer container had enough pre-cooling so that the temperature can be maintained stably.
- Some issue in maintaining the temperature during the local transport (inland) from point of origin/stuffing location to the port of origin is that the plugin system is not well monitored, moreover, the truck driver perceives that the reefer system (the cooling process from plug-in) spend the fuel a lot, so if they are able to plug out for sometimes, it will save the transport cost.

- There is no information or indication of the hidden cost (e.g. corruption, smuggling, etc.) at the destination. However, it might occur at the origin such as paying extra money to get special treatment to fasten the process, but no explicit information about such case.
- Risks in relation to the trade's commercial activity: growers selling Avocados to other company, not bigger company. Other company does not always offer an attractive deal.
- The example of charges from shipping line

Omschrijving	Aantal	Eenh.	Val.	Eenh. Prijs	ROE	Tot.(EUR)
Basic Ocean Freight	2,000	CNT	USD		0,89234	
Controlled Atmosphere Service	2,000	CNT	USD		0,89234	
Cooling service - Origin	2,000	CNT	USD		0,89234	
Documentation Fee- Origin	1,000	BOL	USD		0,89234	
Documentation fee - Destination	1,000	BOL	EUR		1,00000	
Emergency Risk Surcharge	2,000	CNT	USD		0,89234	
Inland Haulage Export	2,000	CNT	USD		0,89234	
Low Sulphur Surcharge	2,000	CNT	USD		0,89234	
Terminal Handling Service - Destination	2,000	CNT	EUR		1,00000	
Terminal Handling Service - Origin	2,000	CNT	USD		0,89234	
Totaal:						

Figure 46. The example of collected charged at destination from the shipping line

- The example of the invoice charge from the trucking company at the destination.

Master bill of lading	:	
Containernumber	:	
Bootnaam / datum vertrek	:	
aankomst datum	:	
Pieces	:	9840 Bags 51960 kg
Nature of goods	:	advocado
Client aangifte	:	EUR
2 X	:	EUR
Dokumentatie	:	EUR
2 X	:	EUR
Inklaringskosten	:	EUR
2 X	:	EUR
Expres	:	EUR
Voor u doen vervoeren	:	EUR
2 X	:	EUR
Diesel toeslag	:	EUR
T O T A A L	:	EUR

Figure 47. The example of the billing charge form the inland domestic transport company at destination

Appendix M : The CLCC model after the first interview at the second stage evaluation

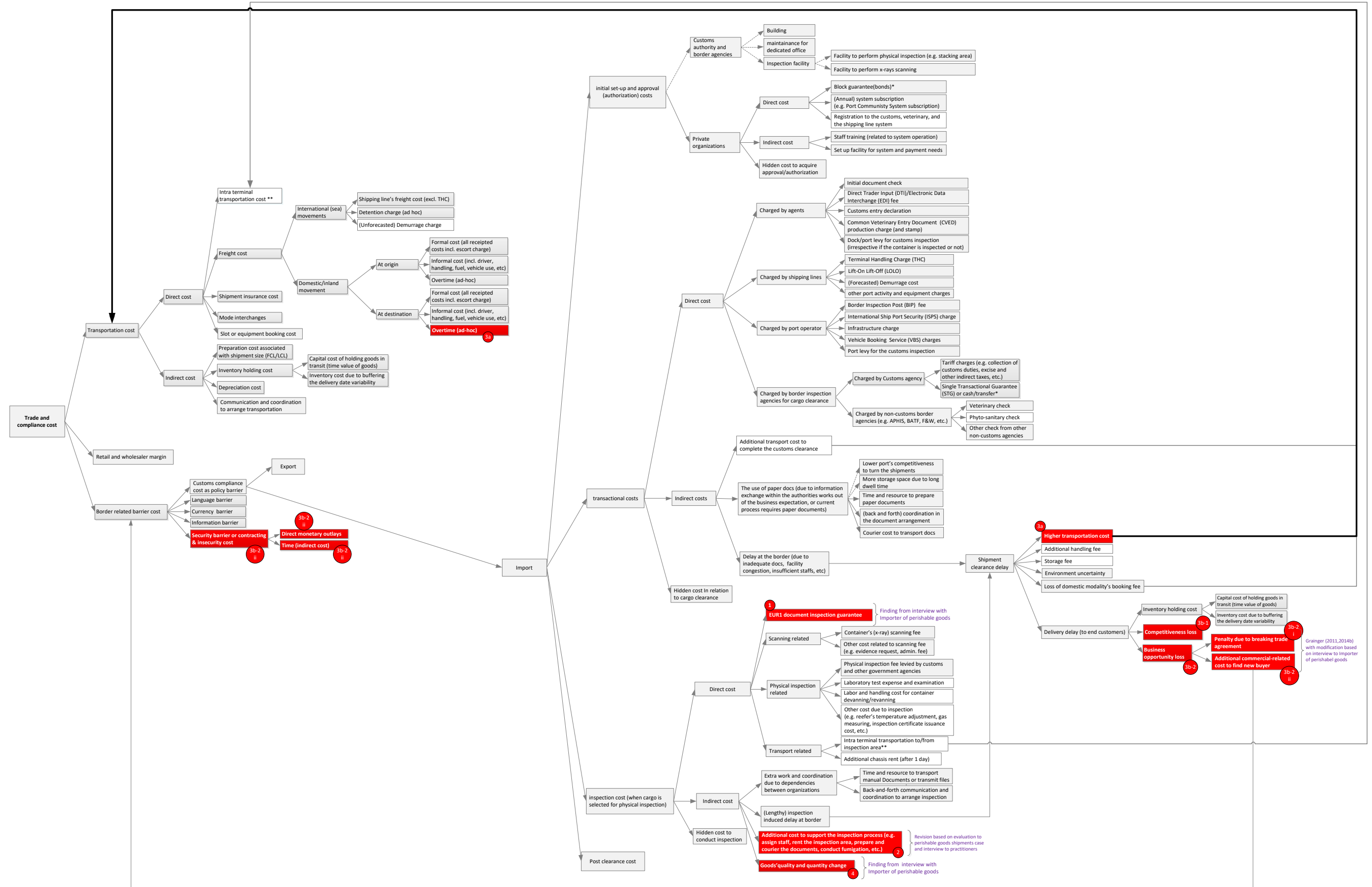


Figure 48. The CLCC model application to map the first interview result to another perishable goods importer (A3 page size)

Appendix N : The interview protocol for the freight forwarder

The interview's question list for Freight Forwarder

Information about the interviewee:

- How long has he/she been working in the related field)?
- What kind of process is he/she responsible for (e.g. import, export, etc.)?
- What are the goods commodities he/she manages?
- What is the country partner he/she handle the shipments from (if import)?

Going to the general research discussion:

- Along with your experience, do you have any incident or problem or challenge you face in relation to the import shipment you were handled?
e.g. customs process issue, documents issue, information issue etc., force majeure issue (e.g. port congestion, system down, vessel delay etc.)
 - What is the case?
 - The occurrence (frequency)
 - What are the impacts/costs did you see?
 - Do you have insight/idea how to solve/prevent such incident occurs in the future
- For each of the commodity you handle, can you explain the import process?
 - The documents needed, or any special treatment/handling
 - The government agencies that are involved in the process. Do you see dependencies between them (gov. customs and non-customs agencies)?
- Compare to the first time you handle the import, do you see any Information and Communication Technology (ICT) improvement applied, either by your company (or other private organization) initiatives or by government/customs? (e.g. the EDI, a new web portal to upload the document, a new website to track shipment status, etc.)
 - If yes, what is it? And what are the advantages you experience from it?
 - And do you know if any initial investment/payment to be made or any training/staff certification requirement before you can enjoy that new ICT application?
- Phytosanitary certificate issuance – how's the practice in Indonesia?
- Have you ever received complained from your customers, in relation to the service you provide? Either due to an external problem or internal problem.

Appendix O : The interview result to the freight forwarder (minutes of meeting)

Date : 14 June 2017

Method : Phone call

Information about the interviewees:

- The interviewee is an employee at a freight forwarder company who handle the trucking service especially for import shipments (freight forwarder at destination country). She has been handling the import since 2014 mostly for the commodity of animal feed, plant products, and animal products imported from US, Australia, and New Zealand, to Semarang, Indonesia.

Keynote of the interview

General shipment information

- Shipments are in 40' dry container, no reefer use. Historically, 90% of the shipments were in 'green' status.
- HTS (Harmonized Tariff Schedule) code is the critical information for customs or other border agency to decide the treatment of the goods, from how much tariff should be paid, to what clearance process or check that should be conducted. Incorrectly informs the HTS code can be a legal/law violation, can be involved in criminal acts.
- Customs clearance status: green (means the goods can be directly cleared from port after complying with standard regulation), yellow (means customs needs to check the document carefully, that may take time), red (means there are documents and inspection (can be scanning or physical)).
- Dwell time is about one week for the cargo that needs a phytosanitary or veterinary check.
- The shipment arrival delay mostly only leads the impact to commercial risks, very few case such incident impact to the transportation costs like to arrange the truck twice because importer can check the arrival through shipping line website. Actual practice, trucking company most likely check the shipping line website first before sending the vehicle or assign a driver to execute.
- Though shipping line has had a website to check the container or vessel status, some of the importers (or freight forwarders or trucking companies or others) prefer to call the shipping line's customer service directly to get the confirmation, which is such ineffective task both for importers and for shipping line's customer service.
- The importer can access customs website to know whether their shipment is subject to the inspection or not (to check their cargo status, whether in green or yellow or red status).
- There was incident in the past. Very rare to happen but once it occurred, it had a big impact. Summary of the case: a shipment of 3 containers that brought sorghum did not get the certificate from the Agricultural Quarantine Agency on behalf of Ministry of Agriculture, due to a sudden protection act from government for domestic goods since the sorghum's availability were excessive in Indonesia at that time (after the corn crop season). The importer knew that the goods could not be imported after the containers discharged at destination port but could not be cleared. The main impacts drawn are the delay for almost two months which leads to other secondary impacts (see Section 4.2.2).
- When the container is subject to inspection, the importer should arrange the transportation to bring the container from Container Yard (CY) to the inspection area. For this need, the importer needs to obtain a certain permit letter to bring the container outside the port temporarily. Then the transportation intra-terminal moves can be executed, with estimated costs of Rp 1,500,000 per container.

Specific information related to animal and/or animal product import.

- Clearance process at import side is much more complicated than the process for export

- The documents needed to clear the cargo are quite a lot, for example:
 - Health certificate, an original paper-based document which is issued by the authority at origin then courier to destination for clearance. This document contains information such as the detail shipments party (shipper, consignee, etc.), detail description of goods, certificate number which is issued by origin's authority, HTS code, etc.
 - Import clearance certificate relates to the import tax duties
 - Shipment release
 - Commercial invoice
 - Packing list
 - Bill of lading
 - Certificate of Origin (COO)
 - Certificate of Analysis (COA)
 - Certificate of cargo insurance, it is the document stating that company x has already insured related shipment. Company x typically another party (third party). It is issued per shipment.
 - Import recommendation letter
- This administration practice (document pouching) can be different between ports, even Semarang and Jakarta port have different practice (though the written regulation might be the same, the practical execution might be different)
- Semarang port's customs clearance process is more flexible than Jakarta. For example, Semarang customs can still accept the scan of revised document (not the paper or original document) to replace the old document that is found contain incorrect information/ discrepancy.
- The banks' system has been 'online' and synchronized with Customs' system so that any payment received by Bank can be automatically read and update the cargo clearance status at Customs website. Once payments have been confirmed received, cargo clearance approval letter (or Surat Persetujuan Pengeluaran Barang/SPPB in Indonesia's language) can be released.
- Once SPPB released, importer then informs Agricultural Quarantine Agency to update that the goods have had the permit to be cleared and to schedule when the pickup date (along with a schedule of inspection). This pickup schedule arrangement can be made through emails, phone call, or directly meet in person (which is the most effective method as the phone calls or emails sometimes are not swiftly answered)
- Veterinary inspection by Agricultural Quarantine Agency (in Indonesia, this organization is responsible for all animal, animal product, plant, and plant product) is applied to all import of animal, animal product, plant, and plant product which is listed in their regulation (based on HTS Code). The costs for completing this veterinary inspection are:
 - 1) Inspection basic cost to the related agency per kilogram goods imported. The rate varies depends on the goods. For example, meat and bone meal import is required to pay Rp 50/kg but applied only to specific containers that get physical (sample) inspection.
 - 2) Laboratory test costs of Rp 1,000/container sampled
 - 3) Inspection certificate issuance that costs Rp 5,000/certificate (per Bill of Lading). This certificate contains the test result that the particular shipment has passed the test which can be used by the importer to prove that their cargo is safe, healthy, etc. when there is an audit.
 - 4) Inspectorate operational cost for around Rp 150,000/person. Typically, an inspection case will involve two inspectorate staff.
- For the animal product import, the products are categorized into low risk and high risk, based on the HTS code submitted.
 - Low-risk cargo's inspection is done at the area of Agricultural Quarantine Agency. Veterinary costs that are applicable are (1), (2), and (3) since the inspectorate staff does not need to travel to the importer's site to conduct the inspection there. For this process,

fortunately, trucking company does not charge for additional transport cost to bring the cargo to the Agricultural Quarantine Agency inspection area since the location is near the port and on the same route with the actual transport route.

- High-risk cargo's inspection is done at the importer's site. All of the veterinary costs mentioned before are all applicable.
- Importers who have high-risk cargo have to register their site area (or warehouse, or another form of the facility) to obtain the permit so-called 'location permit' in conducting the quarantine inspection. The permit is quota-based, for example, an importer requested to issue the permit of veterinary check at the level of 100,000 tones. Means, the importer needs to re-apply the permit when the importer has exceeded this import volume.

Specific information related to plant and/or plant product's import.

- The phytosanitary inspection takes place at the quarantine area (Agricultural Quarantine Agency). No additional transport cost for this process, but inspection cost is applied.

Specific information related to fish (or fishery product) import.

- No phytosanitary inspection
- Other than the standard clearance documents, this import needs health certificate document, permit document from Indonesia's Ministry of Maritime Affairs and Fisheries.

Appendix P : The CLCC model after the second interview at the second stage evaluation

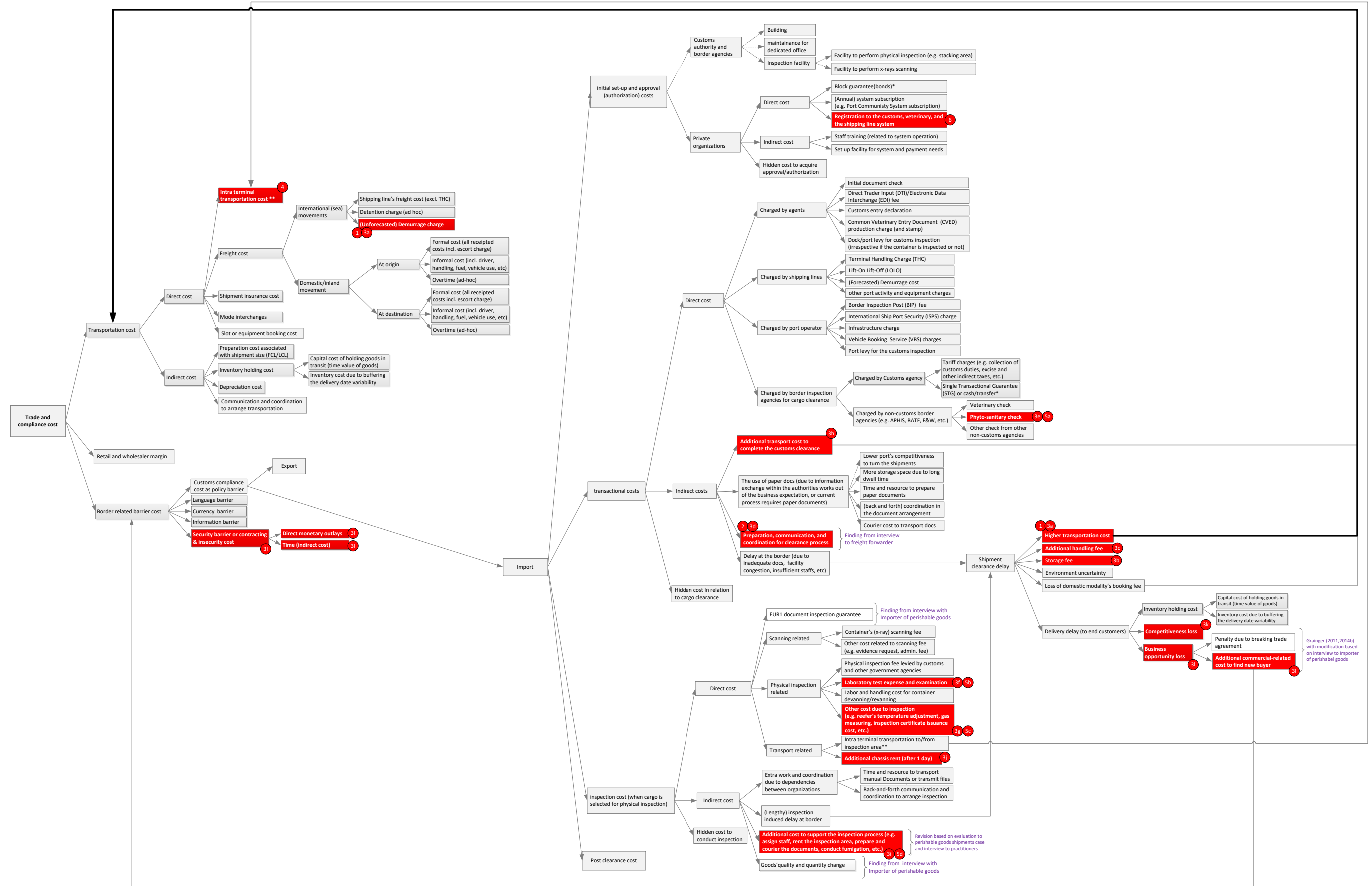


Figure 49. The CLCC model application to map the second interview result to freight forwarder (A3 page size)

Appendix Q : The revised CLCC model

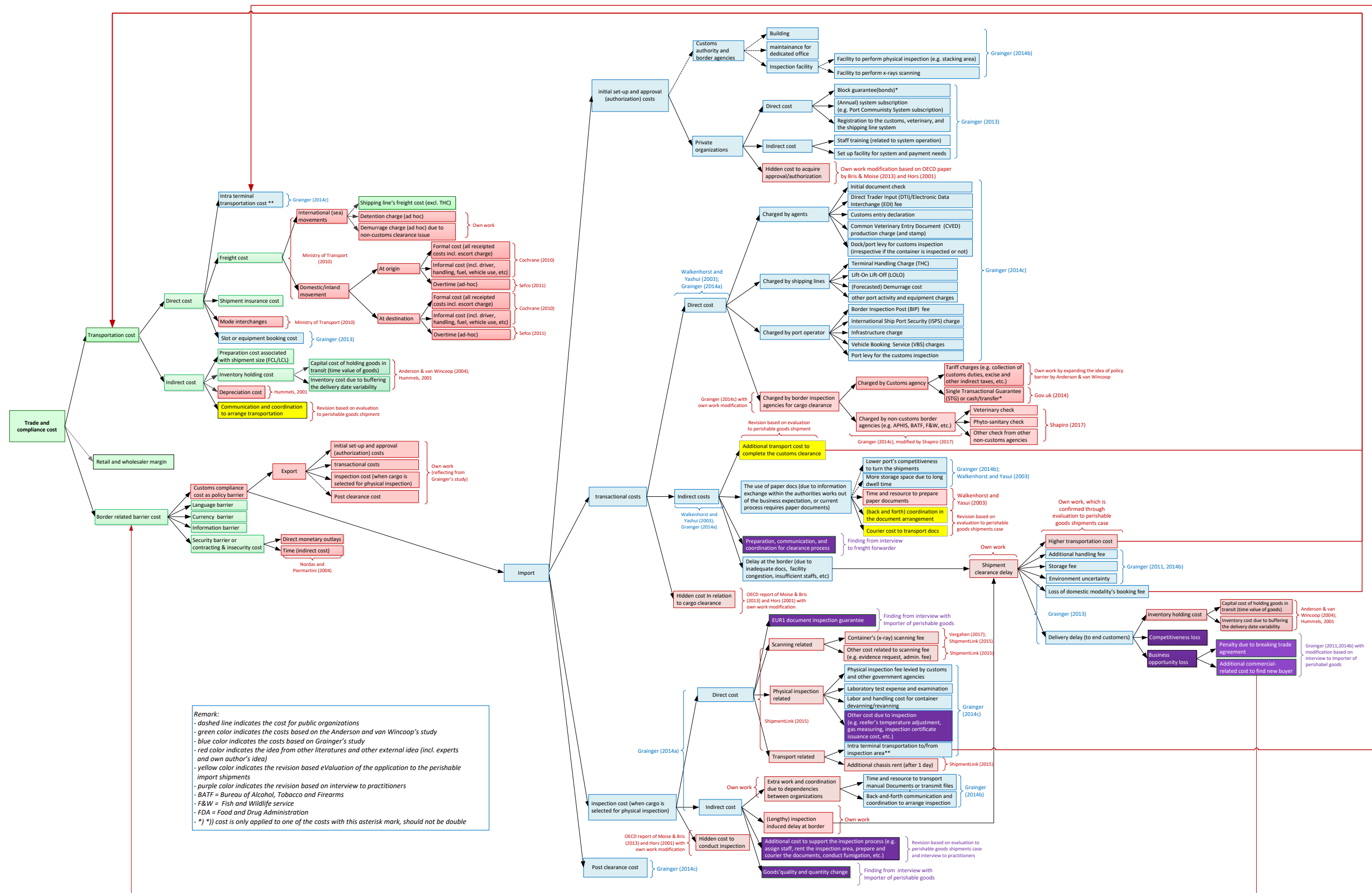


Figure 50. The revised CLCC model that has been modified based on the findings drawn from evaluation process through the application to empirical practice (A3 page size)

Appendix R : The final CLCC model

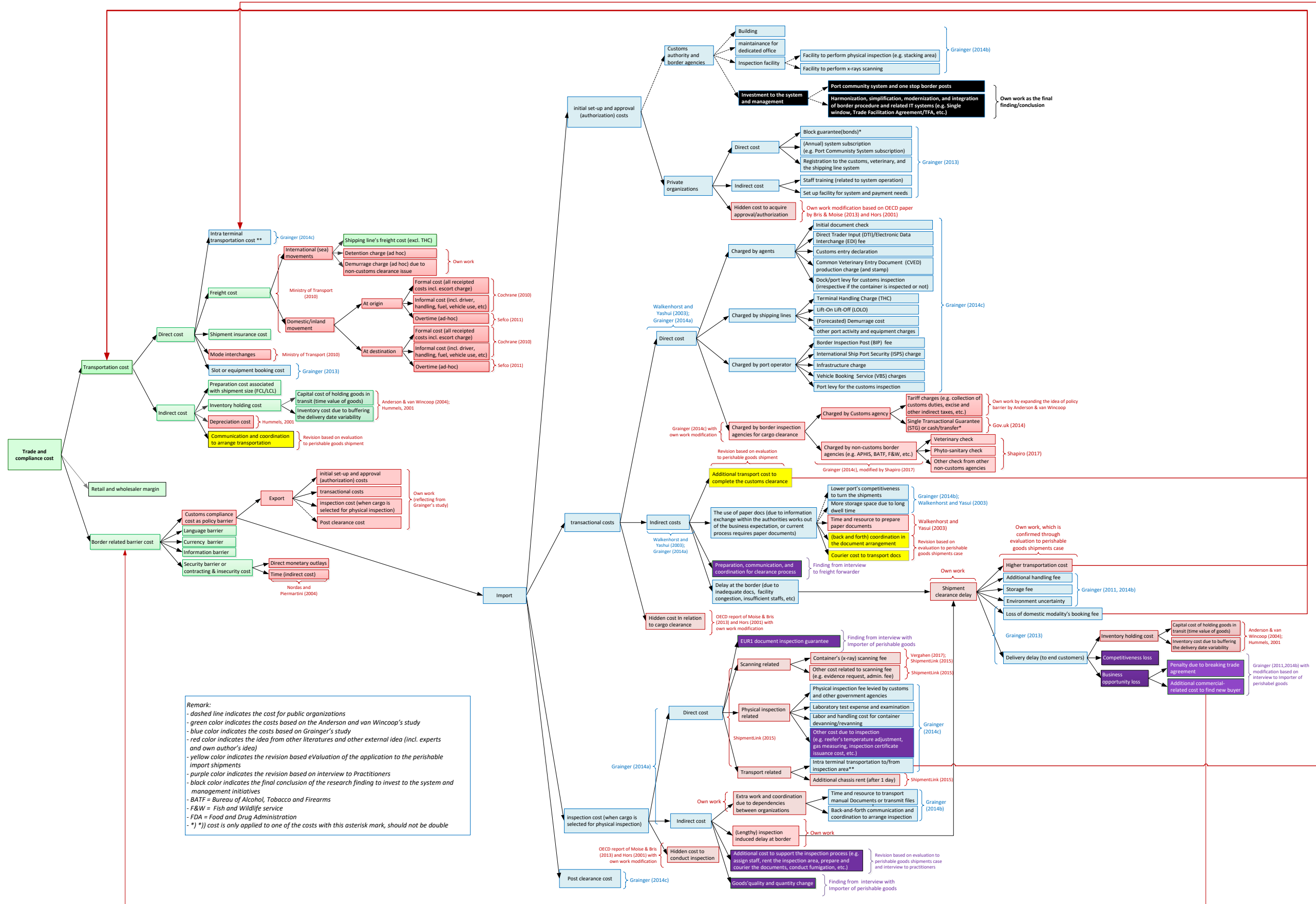


Figure 51. The final CLCC model that covers the investment costs for public organizations as the initiative to reduce the trade compliance costs (A3 page size)

Appendix S : The empirical number of the trade and compliance cost

Some empirical data for the cost categories in the import compliance cost is summarized into below table, mostly based on Grainger (2014c) study

Table 11. The empirical number of the cost in the trade and compliance model

Cost category	Cost value	Paid by	Paid to	Remark
Set up and authorization cost	£ 656.20 - £ 13,735.80	Importer		Based on Grainger's research study to the current meat import procedure into the United Kingdom (UK) from outside European countries
Block guarantee (customs bonds and guarantee)	£ 10,000 annually	Importer	Rural payment agency	Need periodic review
System subscription	Annual defacto subscription £ 14,000 (excluding the staff training);	Agent	PCS operator/ system operator	For annual defacto system subscription
Set up facility for payment of fees and inspection charges	-	Agent	PHA	Need periodic review; might require user to make an upfront credit payment against which fee is deducted
TRACES registration	-	Agent; importer	PHA	Only for first time, the use of system is free; Need periodic training to the user
EORI application	-	Agent; importer	HM Revenue & Customs	Registration on customs computer; occasional notifications about changes to company details
BT's CCS-UK facility fees (for London Heathrow)	Annual £2,246	Agent	Port Operator	Require staff training; reconnection fees (£108 per incident)
MCP's Destin8 system (for Felixstowe port)	One-off payment: £500 for connection per site and £156.20 for a subscription. Annual payment: £572.80-£1,050 for annual subscription	Agent	Port operator	Require staff training £250 per user if provided by system operator
CNS system (for London container terminal and Southampton)	£1,584 for annual connection fee £528 for annual single license subscription	Agent	Port operator	Requires staff training
Payment system registration (e.g. for fees and charges)	-	Agent	Shipping line	Might require user to make an upfront credit payment against which fees are deducted; Requires staff training
VBS set-up Felixstowe	£1 (annual)	Agent	Port operator	Requires staff training
VBS set-up London Container Terminal	-	Agent	Port operator	Requires staff training
VBS set-up Southampton	-	Agent	Port operator	Requires staff training
Transactional cost (direct cost)	£ 382 - £ 673 per container, or 336 - £ 490 per container for meat from New Zealand. It includes:	Importer or their agent	Port operator; shipping line	This cost is irrespective whether the container is selected for inspection or not
Labor and handling charge	£ 10.50 - £ 20.43	Importer	Port Operator	
Terminal Handling Charge (THC)	About £ 220 /20' reefer container	Importer	Port Operator	Largest cost item in the transactional cost. Vary per ports

Table 11. The empirical number of the cost in the trade and compliance model (cont.)

Cost category	Cost value	Paid by	Paid to	Remark
Lift-on Lift Off (LOLO) charge	£50 - £85 / container	Shipping line	Importer	Usually, shipping line passed to agent who will then charge the importer at cost
Direct Trader Input (DTI) fee	£5.7 - £ 50 / declaration	PCS operator	Agent	Often known as EDI transmitting fee which applies when user submit the information manually (instead of using the systems). Usually, pass on to importers with an uplift to recover the expenses and subscription cost
Customs entry declaration making	£ 20 - £ 40 / 20' declaration	Importer	Agent	The charge levied by the agent to recover the subscription expenses and other service costs in preparing the declaration on behalf of the importer. Importer pays case by case (for each of shipment). Created by agent on behalf of the Importer
Dock/Port levy for customs inspection	£10.50 - £20.43 per entry	Importer	Agent	Irrespective of whether the container is subjected to inspection or not
Common Veterinary Entry Document (CVED) production charge	£0 - £20	Importer	Agent	Experienced importers often do this in-house (using TRACES which is free of cost)
Veterinary check (PHA inspection fee)	£86-£96 /container (£86.70-£96.53; £23.86 for the edible meat from NZ)	Port health	Importer	Veterinary checks by Port Health
Border Inspection Post (BIP)	£69.57 - £11.13 per container		Port operator	Irrespective of whether the container is subjected to inspection or not
(ISPS) security charge	£6.38 - £10.50 per container	Importer	Port operator	Or often port operator charge to agent who then passes to importer at cost
Infrastructure charges for rail gauge upgrade	£0 - £5.5 per container	Importer	Port operator	Or often port operator charge to agent who then passes to importer at cost
vehicle booking charges	£27.17-£30.00, excluding £0-£15 for slot booking	Importer	Truck (or other transport modes) operator	Penalty for no-show cargo when truck has been ordered to collect cargo at agreed time
port levy for the customs inspection	£10-£20 per container	Importer	Port operator	
Others				e.g. stamp charge
Transactional cost (indirect cost)				
Physical inspection (direct cost)	£52 - £1,500			This cost includes the demurrage cost which dominates the cost composition
Direct cost due to delay	£0 - £110/day plus further £60 - £110/day	Agent on behalf of importer	Shipping line	Cost varies per shipping line. A case example, a seven-day delay by Port Health with test-lab requirement costs £1,550 of total demurrage fee.
Demurrage cost	£0 - £110 per day (fix rate); £20/day after 3 days and £75/day after 5 days (sliding rate).	Agent on behalf of importer	Shipping line	

Table 11. The empirical number of the cost in the trade and compliance model (cont.)

Cost category	Cost value	Paid by	Paid to	Remark
Container lease	£20/day	Agent on behalf of importer	Shipping line	
Temperature control monitor	£25 - £75 /day	Agent on behalf of importer	Shipping line	Applied for reefer container
Quay rent	£15 /day			
Customs inspection fee	£10.50 - £20.43 per container	Importer	Customs	For picking and delivering the container to and from the customs inspection facility. This cost is charged irrespective of whether the container is selected for physical examination or not (flat rate)
Labor cost for devanning/revanning	£179.20 per case (excluding £38.84 per man hour)	Importer	Customs	The expense for labor in supporting customs in out turning and repacking the container
X-ray scanning	£52.68 - £56.80; Or €133,50 at terminal, or €215 for the external scanning (Port of Rotterdam case)	Port operator	Customs	This cost is excluded from the customs inspection fee
Intra-terminal movement transportation	€200-300 per container			