

Inter-Organisational System Coordination: the e-Customs Case Study

María Laura Ponisio¹, Klaas Sikkel¹, and Lourens Riemens²

¹ Department of Computer Science, University of Twente
P.O. Box 217, 7500 AE Enschede, The Netherlands
m.l.ponisio, k.sikkel@utwente.nl

² Dutch Tax and Customs Administration
Apeldoorn, The Netherlands
lj.riemens@belastingdienst.nl

Abstract. Coordination aspects are key elements to manage inter-organisational systems, as inadequate coordination causes costly problems in the implementation of these systems. Existing research focuses on business networks, but pays little attention to systems composed of non-business organisations. Such organisations are often driven by intangible benefits that are difficult to measure. In this complex context, it is still unclear how to detect obstacles at early stages and how to plan collaboration among peers. This paper reports on a case study that analysed e-customs, a large distributed system that connects the customs organisations of a number of member states of the European Union. The paper summarises key issues detected in this inter-organisational system by analysing data from the e-customs project. The study revealed differences in working styles, up-front obstacles, and opportunities for collaboration. The results indicate two ways to facilitate coordination: starting with small projects, and encouraging collaboration in small groups. We validate our results by showing them to an expert in e-customs who confirmed our findings.

Keywords: coordination, inter-organizational system, networked business

1 Introduction

More and more organizations increasingly form inter-organisational systems to jointly satisfy complex user needs. In such systems, participating organizations use each other's core competencies to offer products or services that each of them can not offer on its own. The coordination of these systems is a complex task, as multiple perspectives of the participating organisations such as Information Technology (IT) or processes have to be properly aligned internally, as well as between the organisations [1].

Existing research focusses on the coordination of business networks. However, if meeting shared unifying goals in networked businesses is a risky unexplored complex field, even more unknown are the dynamics of inter-organisational governmental networks, with their intangible political benefits.

The European Commission has established a network of all its member states aiming to ensure safety of the external borders of the European Community, and to facilitate

trade. Customs organisations of all 27 member states of the European Community have to co-operate as if they form one virtual customs.

In the newly formed network, the question is then not whether to build the network, but how to make the best out of it. Participants (member states) seek to join development efforts with a collaborating peer that has the same problems and ambitions. In this context, it is still unclear how to make use of the power of the network. In other words, we do not know how to govern these networks and we do not know how to participate in them.

The purpose of this paper is to present an analysis of some of the up-front difficulties in co-ordinating inter-organisational systems. In particular, we seek the answer to the following questions:

- Can we identify opportunities for collaboration?
- Can we detect obstacles in network integration?

We do so by reporting on a case study that compares current organisational context, business processes, systems and future ambitions of 10 members states in order to find opportunities for collaboration. We name our case study E-CUSTOMS.

The presentation of our findings is structured as follows. Section 2 refers to related work and relevant problems of co-ordinating inter-organisational systems. Section 3 presents the research settings of E-CUSTOMS and Section 4 presents our approach to characterise participants. Section 5 presents the analysis of E-CUSTOMS and our findings. Section 6 presents a discussion on the implications of our work. In Section 7 we describe our insights for future work before concluding in Section 8.

2 Problems of co-ordinating inter-organisational systems

There are many problems that participating organizations need to face in relation to mutual cooperation. According to resource dependence theory, a theory formulated in the 1970s, organisations create inter-organisational structures that formalize their relations with other organisations [2]. In such a condition, organisations begin to collaborate together for a common purpose, but the inherent complexity of the system poses several challenges. In this section we elaborate on these problems as they are reported in related work. In the rest of this paper, we analyse E-CUSTOMS from the perspective of these problems.

1. Characterisation of participants when planning the network

Inter-organisational system coordination needs the alignment of multiple perspectives *i.e.*, strategic goals, value propositions, processes and information systems, across participating organisations. Figure 1 depicts an inter-organisational alignment framework [1] that stresses the possible alignment issues in networked business settings. But is it realistic to expect the alignment of every perspective? If only some of these perspectives could be aligned, then which ones would they (in a real system) be?

Moreover, we observe that much of discussion in practice while planning a business network is about information systems and levels above such as strategic goals. But

this model lacks concrete description of specific properties of attributes to study when planning the network. In particular it lacks descriptors to characterize participants in the network. Descriptors are needed to compare participants. And comparing participants is a way to spot differences among them, as participants may run their organisations in different manners. Differences between participants indicate spots of possible problems even before the network starts.

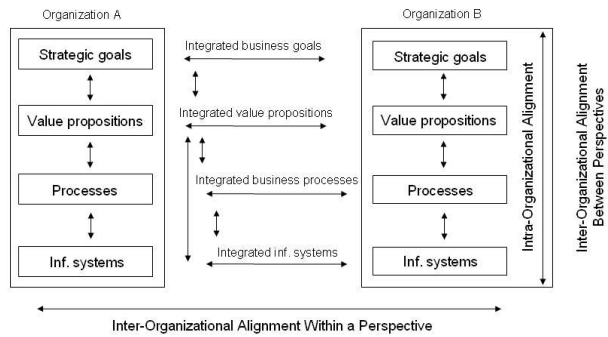


Fig. 1. Inter-organisational alignment framework [1] indicating multiple perspectives to align.

2. Distribution of power

If power relations are unbalanced in a network of power-dependency relations, there are mechanisms to restore the balance. For instance, the weaker actor may withdraw his interest in the relationship, or two weak actors may form a coalition against a stronger actor. Balancing alterations change the power relationship, tending to reduce power advantage [3]. Given the permanent tensions of imbalance in the power relations these changes happen continuously, and the relation moves then towards a temporary state of balance.

Previous work derived a theory of power relations that explains the possible balancing operations [3] and recognised the importance of addressing power relationships to co-ordinate inter-organisational systems [4]. However, understanding the distribution of power is not straightforward. Working out efficient plans for collaboration includes determining which aspects are to count. If power is concentrated in some actors, which perspective will be used to detect them? Which operational definitions will connect generalising concepts from theory with concrete features of a specific system? Therefore, understanding the distribution of power is a big challenge to plan collaboration of members in a network.

3. Opportunistic behaviour

Traditionally, opportunistic behaviour (lack of honesty on transactions) refers to the way an economic agent operates, characterised by exploiting a certain advantage for its benefit and in detriment of other participants of an agreement [5].

In the context of one organisation, opportunism may take several forms such as malversation or negligence. As opportunism is strongly connected to the problem of concentrated power, organisations reduce incentives for opportunistic behaviour by applying internal controls, creating a hierarchy, and transforming themselves in vertical organisations [6].

In the context of a network of organisation, participating organisations take advantage of their strengths for their own interest [7]. An economic agent holding information can deliberately make use of the asymmetric information advantage for its benefit and in detriment of other participants of a contract.

Previous research identified opportunism as a critical transactional factor steering activities between business or governmental organisations. It suggested to solve this problem by understanding the complex interactions between the agents and by advising each participating organisation to give and receive credible commitments [8]. Moreover, the interaction between the individual goals and the group goal, as both evolve, raises the question whose objectives the system is to promote, a question that in turn opens the door to the need to distinguish opportunism from behaviour instrumental to the concretisation of the network goal [9].

4. Resource dependence

Resource dependence theory can be used to understand the system from a power-relation perspective, as it recognises the dependency forces acting inside a networked business [10]. No organisation is self-sufficient, as processes of organisations depend on resources of other organisations. In the context of inter-organisational systems, organisations need to give special attention to external control [11].

5. Development process evaluation

Development processes in these kind of networks are complex and risky, lacking the means to measure sustainable gain. Instead, they have a political benefit as driver of the evaluation. Political benefits are intangible and not measurable in euros. Therefore, evaluating processes in inter-organisational systems becomes a key skill with yet unclear descriptive concepts.

Maturity models can be used to evaluate and improve processes. In the area of collaborative work, examples of maturity models are the interoperability maturity model [12], the supply chain management maturity model [13], and the maturity framework for managing distributed development [14]. However, existing maturity models do not sufficiently address inter-governmental systems and practice shows that descriptive concepts that are more expressive for inter-governmental systems are still missing. We need to extend existing models with concepts specific for inter-governmental systems.

All in all, inter-organisational systems are complex structures with multiple perspectives to co-ordinate. In order to manage them, we must first understand them. Participating organisations still need guidelines on the practice of selecting peers to collaborate with. Governing organisations still need guidelines to balance the common purpose of the system against opportunistic behaviour. To the best of our understanding, co-ordinating governmental organisations lack a general approach to detect problems up-front and to describe hands-on approaches at a theoretical level.

3 The E-CUSTOMS Case Study

The European Commission has established a network of all of its 27 member states to form one virtual customs system. The goal of this network is to ensure safety of the external borders of the European Union and to facilitate trade. Our case study, E-CUSTOMS, is based on “Benchmarking Customs IT Architecture”, a benchmarking study conducted by the Dutch Tax and Customs Administration.

The “Benchmarking Customs IT Architecture” study took place between January 2005 and October 2005, where the Dutch Tax and Customs Administration analysed a sample of ten European countries. The network had been in place for many years, but all the new demands make it necessary to co-operate in order to fulfil the new demands. The goal of the “Benchmarking Customs IT Architecture” study was to find a group of member states willing to collaborate in information technology development activities to achieve the network goal. The goal of E-CUSTOMS is now to find key coordination issues in a concrete inter-organisational system.

This benchmarking study is suitable for our research because it showed the customs-networking profiles of each country. Customs belonging to the sample revealed their profiles by answering questions about their organisation, transaction, technology, and process-and-systems. Each of these profiles contained information on organisational context, staff size, transaction volumes, number of inspections, IT architecture, ambitions and best practices among others.

This information can be used to establish collaboration partnerships. For example, two member states with similar contexts and the same transaction volumes can be partners, since solutions for the same range of volumes facilitate the match. A system for 10.000 declarations is totally different from a system for 10.000.000 declarations.

4 Our approach to characterise participants

We assume that the basis of any attempt to analyse the coordination of a network is to take a point of view that is coherent with the **primary function of the network**. Thus, detection of the features that characterise each participant in the network, *i.e.*, which activities, commitments and investments are relevant, may reveal issues that support or endanger the primary goal of the network. Such characterisation is the basis of our analysis and our starting point.

4.1 Choosing one Dimension to Analyse

When deciding how to characterise the participants in the network and which of the many available aspects to analyse, we choose to analyse transaction volumes (number of import declarations and inspections) and organisation (staff size). In taking this option, we observe customs from a simple point of view: customs is for us a filter protecting the economy of each country against dangerous or forbidden goods and a means to prevent crime. This view matches the goal of the network established by the European Commission.

There are many dimensions of the network to analyse such as organisation, transaction, technology, or processes. We decided to explore only the transaction profile with its import and inspection aspects because it was the most simple and obvious to start with regarding the network goal of ensuring safety and facilitating trade.

4.2 Characterising the Participants

Once our point of view to analyse the network is decided (the network to ensure safety and trade), and based on the matching profiles (transactions and organisation), we select the concrete information to describe each participant. The descriptors for *each* country are:

- *Import declarations*, which is defined as the total number of import declaration form files in one year received by the analysed country.
- *Import inspections*, which is defined as the total number of declared forms that are physically inspected against the imported goods.
- *Staff size*, which is defined as the total number of employees in Full Time Equivalents (FTE).
- *Ratio of control* is defined as the ratio of import inspections over the import declarations.

These descriptors characterise each country. However, they need to be normalised before we can compare the customs of each country with one another. We normalise the numbers by computing the percentage of each descriptor in the total of the sample. The figures for one analysed country are as follows:

- *% import declarations* is defined as the percentage of *import declarations* in the (total import declarations) all countries in the sample.
- *% import inspections in the network* is defined as the percentage of *import inspections* in the (total import inspections of) all countries of the sample.
- *% staff size* is defined as the percentage of *staff size* in all countries .
- *% ratio of control* is defined as above, not needing further normalisation.

Normalisation in percentages allow us to compare customs profiles. Table 1 presents as an example the normalised data describing customs of Country A.

	Import declarations (%)	Import inspections (%)	Staff size (%)	Ratio of control
Country A	24.12	41.15	30.87	11.73

Table 1. Country descriptors.

4.3 Visualising the country descriptors

In the previous paragraph, we defined the descriptors of a country. We can visualise the data by means of Cob-Web Diagrams. Figure 2 gives a visualisation of Table 1 and Cob-Web Diagrams [15]. The chart presents the concrete information to describe the profile of each customs: its axis represent the percentage in import declarations, percentage of import inspections, percentage of staff size and ratio of control of Country A.

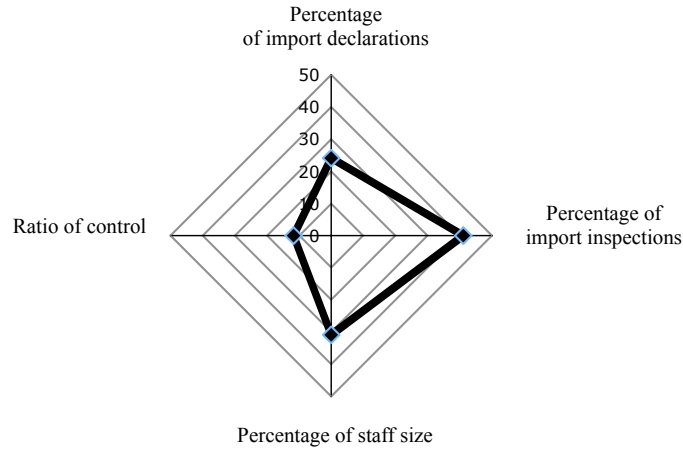


Fig. 2. A chart showing our characterisation of Country A participant of the network.

The axes shown in Figure 2 have a scale from zero to 50. They describe the customs of one country. 50 is a pragmatic upper limit because the highest figure is around 43.

4.4 Limitations

The benchmarking study that E-CUSTOMS analysed consisted of a number of questionnaires that were answered by the countries belonging to the sample. We have to ask ourselves if approximations and even misunderstandings did not changed the information.

One of the problems discovered during the benchmarking study was the lack of a common taxonomy of customs terms. Different member states had different interpretations on terms like declaration, inspection, process, or system. The authors of the

benchmarking study solved that by having a common meeting to adjust the terms as much as possible.

Moreover, we (the researchers analysing E-CUSTOMS) might have misunderstood the data presented by “Benchmarking Customs IT Architecture”, the benchmarking study analysed in our case study. Involvement of the Dutch tax Administration (the third author) in this paper decreases that risk.

5 Results

Calculations showed that countries worked in different styles, making collaboration between countries complex, and therefore making coordination of the network complex. Figure 3 shows the different working styles of ten sample countries in their dealings with imports, inspections and staff.

The following sections elaborate on the working styles of the participants, distribution of power, and the complexity of building towards the common goal of the network.

5.1 Grouping countries according to their working styles

As can be seen in Figure 3, it is possible to group the countries in groups based on the shape of the Cob-Web Diagrams.

Group P consists of countries having large numbers of import declaration forms, inspecting a comparatively high percentage and having large amounts of staff. Group S consists of countries receiving much less import declarations, inspecting less and having less staff. Comparing groups Q and R we observe that countries with similar import volumes assign different *importance to inspections*. The figure also shows that countries in group R have less staff.

Obstacles and facilitators of collaboration

Figure 4 presents an example of countries taking different approaches regarding imports. It shows the Cob-Web Diagrams of Country C, Country D, Country E and Country F. In the upper half we see two countries with different approaches and in the lower half we see two countries with similar approaches.

1. Different Approaches

Country C and Country D appear on the top of Figure 4. Comparing their Cob-Web Diagrams we see that they assign different importance to inspections. Country D inspects more than Country C even though the amount of import declarations that it receives is significantly lower. Nevertheless, both Country C and Country D contribute to the network a similar amount of staff. This configuration indicates a potential obstacle in the collaboration between Country C and Country D, since their approach to handling import is different.

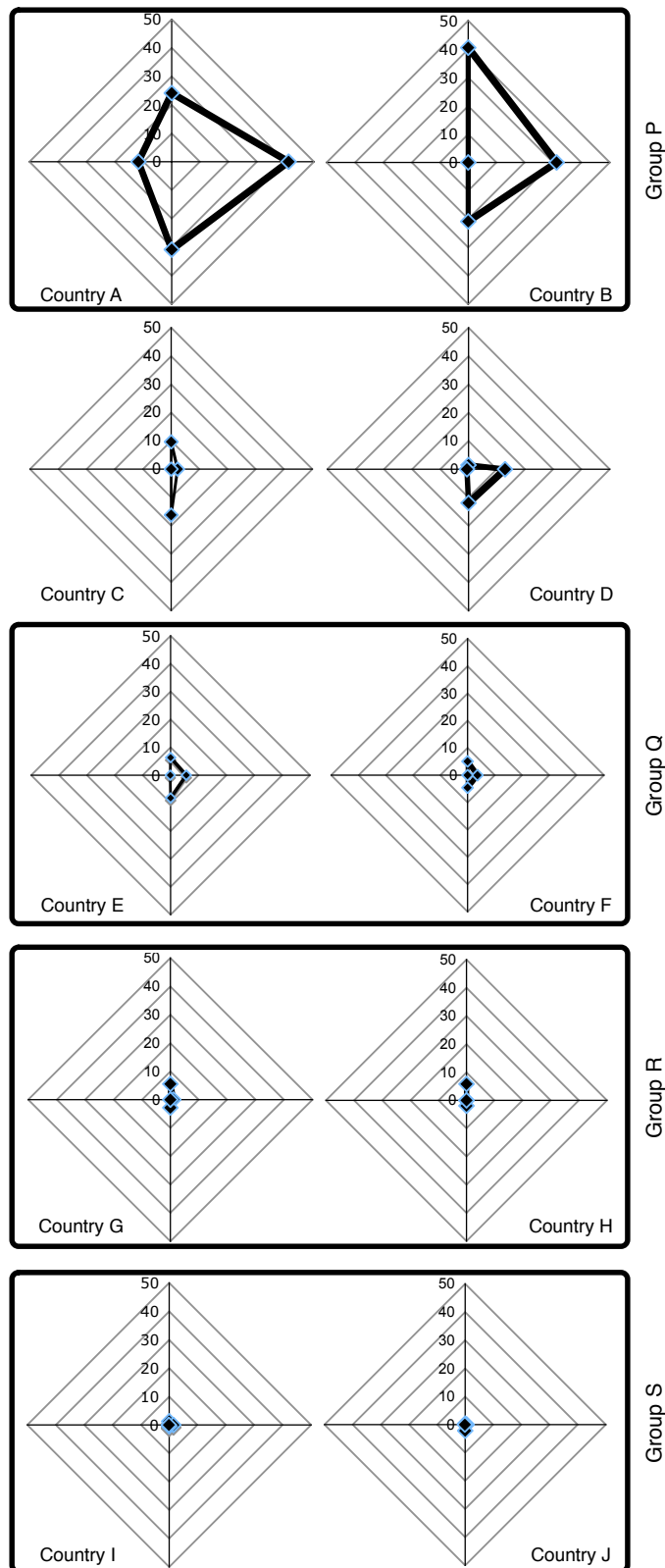


Fig. 3. Ten countries belonging to E-CUSTOMS grouped by their working styles.

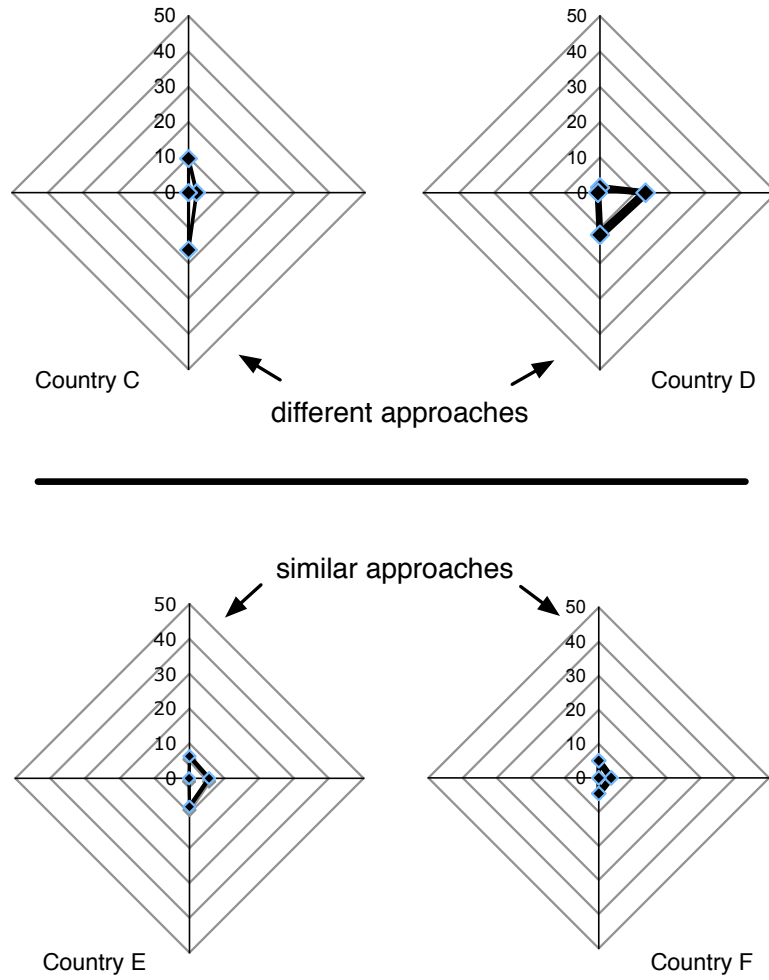


Fig. 4. Example of two different approaches (Country C and Country D) and of two similar approaches (Country E and Country F) in dealing with imports.

2. Similar Approaches

Country E and Country F have similar approaches dealing with imports. Figure 4 shows that inspections on imports and the staff employed are similar and correspond to the volume of their import declarations. This situation indicates that priorities of each customs are compatible, which facilitates collaboration.

5.2 The Distribution of Power of the Participants

We can interpret differences between countries as an issue of power. For us, a powerful player is a participant that excels in the import dimension. As can be seen in Figure 3, two countries stand out in volume of import declarations, inspections and staff. Thus, Figure 3 shows a network with asymmetric power relations, namely with group P containing powerful players.

We have to realise that this network is a complex system with multiple dimensions, and therefore power is not only determined by volume, but is better characterised by the role that a member state plays in the European Community. However, in our approach we are analysing one dimension at a time. In the part of the study we present in this paper, we recognise number of import declarations, inspections and staff. If we take the import dimension, then Figure 3 shows the distribution of power. If we take a different dimension, we would see a different distribution of power.

Powerful players as obstacles and as candidates for collaboration

Powerful players may be regarded as an obstacles for integration. For instance, a burden for integration appears if powerful players develop opportunistic behavior. In that case, powerful players are candidates to be analysed in search for potential obstacles.

Figure 3 shows that Country A and Country B (Group P) receive the most import declarations and apply more inspections; at the same time being able to involve big percentages of the network staff. Having similar volumes and approaches, one is candidate partner to collaborate with the other.

5.3 Types of Collaboration

Figure 3 shows two exceptionally small players, namely Country I and Country J (Group S). These two countries (already members of the network) could potentially collaborate as partners in joint development efforts, having both similar volumes and approaches; since their systems are prepared equally well to afford similar amounts of transactions with similar amounts of staff.

In the same spirit, the potential collaboration between Country I and Country A is not so favourable, given the differences between the amount of transactions expected by Country I and Country B, and their differences in staff size.

General characteristics of collaborations

One would expect that the charts of two countries have to be similar for the countries to be candidates for collaboration. However, information gathered during our case study proved that this is not the case: there are currently collaborations taking place between Country F and Country J, even with the differences in the import dimensions spotted in Figure 3. Why is this so?

Joint development is possible if two partners have the same problems and the same ambitions of improving in the same areas. *Ambition* in this context is the distance from the current level to the desired level that a country x has in a given dimension. Common problems and ambitions are indicators of a potential good candidate partner.

The collaboration detected between participant members pointed us to a general characteristic of all collaborations, namely a member state A would like to collaborate with a member state B in the following cases:

- **Peer-to-peer**: It refers to the case in which B has the same volume and approach to deal with imports as A , because they have compatible approaches to handling imports.
- **Transfer-of-assets**: It refers to the case in which A has a high current level, whereas B has the ambition to grow in the same dimension as A . In this case B benefits from transferred experience, whereas A tells and sells its solution (technology and processes) to a problem that it already solved. In extreme cases, A might benefit from establishing a relationship of dependency of resources with B , too.

Peer-to-peer and transfer-of-assets partnerships

Figure 3 shows Country E and Country F in group Q, as good candidates to collaborate, catalogued into **Peer-to-peer** (the first kind of collaboration). The groups described in Figure 3 are more examples of candidates to *peer-to-peer partnerships*. We hypothesise that networks contain subgroups of participants with shared commonalities, facilitating opportunities for collaboration, and that the presence or absence of peer-to-peer-partnerships in a network is one of its attributes describing how easy it is to manage and co-ordinate that network. If there are peer-to-peer relations, one advice is to start with small subgroups consisting of those peers.

The case study documents contained an example of collaboration transferring best practices (**Transfer-of-assets**). We use the name *transfer-of-asset-partnerships* for groups inside the network where the relations between participants is as described in transfer-of-assets. We believe that the presence of these groups in a network also helps to determine its co-ordination possibilities. However, we leave the proof of this for future experiments.

5.4 The Complexity of getting to the Common Goal

The study suggest that the goal of the network is a force balancing opportunistic behaviour. The goal or primary function of the network is key to manage its co-ordination as it is the force that drives the participants together. In E-CUSTOMS, all the participants are doing the same thing, namely processing imports with the common goal of ensuring safety and facilitating trade.

However, our Cob-Web Diagrams show that these countries work towards this goal in different ways. We take this as an indication that countries interpret their common goal in an opportunistic way (for instance have much staff for inspections), and that opportunistic behaviour forces are real.

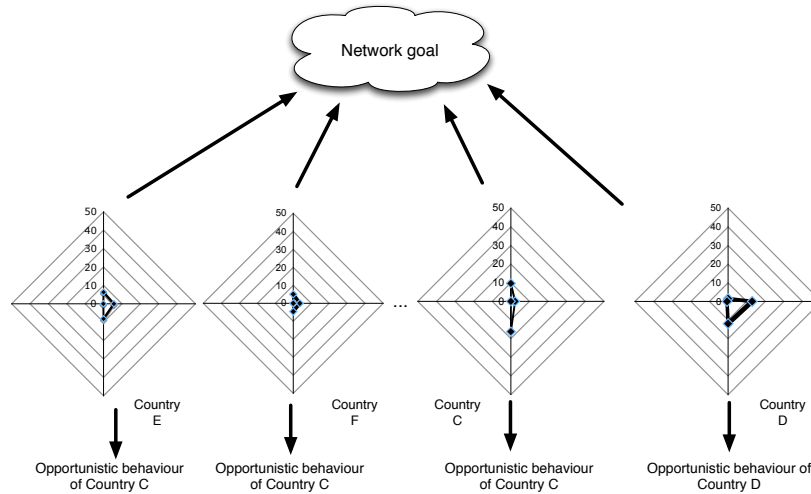


Fig. 5. Network goal and opportunistic behaviour as driving forces that shape collaboration.

Figure Figure 5 depicts the situation where participating organisations engage into mutual co-operation aiming to a given goal, but at the same time opportunistic behaviour pulls the efforts of the participants to their own gains. The cob-web diagrams show that these forces are real.

6 Discussion

To solve the problem of choosing favourable partners to collaborate with, we have applied metrics and visualisation, focussing on the import dimension which involves volume of imports, inspections and staff. This approach offers areas for discussion such as how do Cob-Web Diagrams help to improve understanding of collaboration, the implication for existing models of collaboration of the system properties that are revealed in our case study, up-front detection of coordination problems, and the generality of our findings. This section elaborates on these issues.

6.1 Improving understanding of collaboration

Our relative metrics indicate the weight or power in the import dimension of a single member state, but not directly a partner for collaboration. It is difficult to draw conclusions from comparing member states from quantifiable descriptors, for we need

to understand as well the organisational context and the corresponding business processes. As a consequence, one could argue that quantifiable descriptors are not enough to automatically select the best partner, needing some heuristics to complete the process. Moreover, some descriptors might prove to be useless for deriving any kind of conclusion. For example, we could not derive useful conclusions from the import-control ratio, and therefore it does not play a role in our conclusions. However, Cob-Web Diagrams show that quantifiable descriptors increase the level of automatization by providing information as to which partner to exclude and to have a better understanding of the possibilities for collaboration.

6.2 Implications for models of collaboration

E-CUSTOMS revealed qualities of the network or *properties* of the network that facilitate understanding and management of collaboration. We believe that these properties in the network should be included in models used to evaluate inter-organisational system coordination. Those properties are:

- presence of peer-to-peer partnerships
- presence of transfer-of-assets partnerships
- presence of quantifiable benefits
- presence of a common goal in the participants

Peer-to-peer partnerships and transfer-of-assets partnerships have been analysed in Section 5.3. The following paragraphs elaborate on quantifiable benefits and common goal.

Quantifiable benefits

With *quantifiable benefits* we mean the quality of the network of having quantifiable descriptors that can eventually automate the process of describing the network. Our results indicate that in order to introduce some automatization to meet the network goal, we need to be able to put the benefits in a quantifiable way. Without quantifiable benefits, decisions would be taken upon subjective opinions. But with quantifiable benefit, decisions can be supported by semiautomatic visualisation methods (such as the one presented in this paper).

Common goal

In government settings, capturing the common goal is at least one level more complex than in business networks. In a business networks the common goal is most often a financial one, which is easy to describe and evaluate. However, in a government setting, the common goal is often a political one, which cannot be expressed in a one-dimensional, quantifiable construct (such as money). Therefore, we believe that the presence or absence of a network property called *common goal* indicates how feasible it is to co-ordinate the network.

At an abstract level, the alignment of strategic goals between organisations in inter-organisational systems is complex, and in itself strategic. We believe that it must therefore be an explicit entity in any model used to evaluate the co-ordination of the system. Previous work considered it an implicit property, but we believe that it must be explicit if we will attempt to control it.

At a concrete level, in our case study, we observe 27 countries that are doing the same thing, namely processing imports. However, our study also tells us that these countries are working in different ways. This may be an indicator that the stated common goal is not the real common goal. We will then hypothesise that finding a common goal is not trivial given the characteristics of the constellation and the differences among the participants. Only by specifying clearly the network goal we can align the strategies, or what Derzsi and Gordijn [1] call “perspectives” (see Figure 1), to co-ordinate the system.

The justification of an inter-organisational system is in the expected benefits. In a business context business benefits are expected, indicated by the business logic of is-there-gain or not. However, in the governmental context political benefits are expected, which may be intangible and not measurable as the business benefits. We need then a driving force balancing opportunistic behaviour in favour of mutual co-operation towards the common goal.

6.3 Spotting possible problems up-front

Our study indicates that one solution to the complex coordination of inter-organisational systems is to acknowledge the primary function of the network and based on this ground to:

- **to start networking in some aspect** not wanting to have everything well established before starting the network,
- **to emphasise and organise work in smaller groups** either with peer-to-peer or with transfer-of-assets partnerships, and
- **to be aware of the similarities and differences**, such as organisational, technological or cultural, executing small projects as a way to know each other.

Partnerships are never chosen on one dimension alone. Other dimensions, such as organisational, technological or cultural, are also taken into account. All in all the key seems to be to execute small projects in small groups, searching for opportunities for collaboration.

6.4 The problem of generalisation and how useful our work is to other people rather than those involved in e-customs

Our case study is based on a concrete inter-organisational system of customs organisations. Nevertheless, our long term goal is to understand and to learn how to make use of the power of the network.

The features characterising each participant in the network such as import declarations are not easy to generalise. However, in our case study, they were easy to derive

and we expect that it will be easy to derive them in any other concrete instance of a network.

We believe that the findings of the E-CUSTOMS case study such as the types of collaboration, the semi-automatic detection of powerful players, the key role of the network goal to form internal collaborations and the properties candidates to extend co-ordination models can be applied to other networks. Grouping members according to their context and ambition might help to structure a large business network. Given that small projects are easier to manage, smaller organisational groups inside the business network increase interoperability.

In general, solutions come in the shape of opportunities for collaboration. The insights revealed in our case study are applicable to general cases of inter-organisational networks. Collaboration can be achieved by building smaller peer-to-peer groups, or transferring assets to dependent participants. Running smaller projects first rather than trying to do everything at once makes sense, since smaller projects have, for instance, the advantage of capturing cultural differences without increasing risk.

7 Future Work

The documents supporting E-CUSTOMS included some profiles and descriptors that are not discussed in this paper. Examples of these are: import traffic volumes, transit traffic volumes, export traffic volumes, internet communication channels, network communication channels and paper communication channels.

The findings in our case study suggest that more attributes to enrich models for coordination are waiting to appear. This section elaborates on possible dimensions and potential novel properties for co-ordination models. We leave the analysis to future work.

Analysing other dimensions of the network. In future work we plan to analyse different sets of dimensions of the network, for example the information technology (IT) dimension, the communication and cultural dimension, the internal dimension of the country (*i.e.*, the factors that indicate the internal support of each member to participate in the network). A member state with the same IT architecture or technical infrastructure makes it easier to share solutions; *e.g.*, the study suggested that `COUNTRY E` needed less effort of adaptation to join development efforts with a partner because it had already unified its processes.

However, we decided to start the analysis with the import dimension, wanting to tackle one aspect at a time, and to start with a simple approach that was easy to validate. Following the validation of this simple approach, future work will present findings about other dimensions, such as the IT landscape of each country.

Extending models to manage co-ordination with attributes derived from real case studies. The E-CUSTOMS case study suggested properties that can be used to derive conclusions in models for co-ordination such as the presence of candidates to peer-to-peer partnerships. However, E-CUSTOMS revealed other candidate properties such as *internal support*. Internal support is the support that a member of the network has from its

internal components. In our case study, it would be the support of the ministries of the country. Internal support determines the degree to which this member can achieve the network goal.

8 Conclusion

This paper reports on the findings of the E-CUSTOMS case study, a study of an inter-organisational system formed by customs organisations of the European Community . The goal of the E-CUSTOMS case study was to find key co-ordination issues in a concrete inter-governmental system, as inter-governmental systems are more complex than in a networked business and yet receiving less attention from the research community.

The European Community wants to ensure safety and security of the external borders of the European Community, and to facilitate trade, with customs organisations of all its 27 member states of the European Community co-operating as if they form one virtual customs. Recently, new demands have appeared forcing member states to search for partners to collaborate in joint systems development efforts to achieve the network goal. But how to choose such partners in such a complex system with multiple dimensions as this inter-governmental system?

We have characterised member states in a transactional and an organisational dimension (*i.e.*, acknowledging only their dealings with imports, inspections and staff), compared customs organisations, and applied a visualisation approach to describe opportunities for collaboration. We can summarise our findings in this way:

- We could group countries according to their working styles.
- We could spot two powerful players (*i.e.*, a participant excelling in the dimensions of the network that we analysed). Powerful players increase the risk of opportunistic behaviour, indicating potential obstacles for collaboration.
- We have observed two different types of collaboration, namely peer-to-peer and transfer-of-assets. In peer-to-peer collaboration, the charts of the countries have similar shapes. In transfer-of-assets collaboration, the charts of the countries show their different approaches.
- We have spotted in our Cob-Web Diagrams candidates for peer-to-peer partnerships.
- We have detected in E-CUSTOMS a concrete example of transfer-of-assets collaboration in the form of transfer of best practices between two countries.

Moreover, we have identified examples of opportunities for collaboration and obstacles in network integration, namely . We validate our approach by showing the results to an expert in the e-customs project analysed who confirmed the relationships that we saw.

Furthermore, this paper presented ideas for potentially interesting future work. For instance, four qualities of networks have been found in our case study with potential implications for models of collaboration. Those properties, supporting decisions about collaboration inside the network, are:

- Peer-to-peer partnerships

- Transfer-of-assets partnerships
- Quantifiable benefits
- Common goal

This paper presents these properties and our study supports why they can be attributes of models for co-ordination.

Finally, our results suggest that the primary function of our inter-organisational system (its goal) is key to manage its complex structure, being both a driving force for collaboration among members and a force balancing opportunistic behaviour. Our results suggest to manage collaboration of inter-organisational systems by doing small projects (*i.e.*, not wanting to achieve all at once), and collaborating in small groups (*e.g.*, based on similarity). We leave the validation of this idea in other inter-organisational systems to future work.

Acknowledgments

We gratefully thank Pascal van Eck for the many interesting discussions and for reviewing this paper. Many thanks also to Roberto Santana Tapia for his comments and advise in the related work. We would like to thank as well the Dutch Tax and Customs Administration for its support. Finally, we gratefully acknowledge the financial support of the Dutch Jacquard program for the project “QuadREAD”.

References

1. Derzsi, Z., Gordijn, J.: A framework for business/it alignment in networked value constellations. In Latour, T., Petit, M., eds.: Proceedings of the workshops of the 18th International Conference on Advanced Information Systems Engineering (CAiSE 2006), Namur, B, Namur University Press (2006) 219–226
2. Pfeffer, J., Salancik, G.R.: The external control of organizations: A resource dependence perspective. Stanford business classics. Stanford Business Books, New York, NY. (2003) Originally published: New York : Harper & Row, 1978.
3. Emerson, R.M.: Power-dependence relations. *American Sociological Review* **27** (1962) 31–41
4. Evermann, J.: Organizational paradigms and organizational modelling. In Latour, T., Petit, M., eds.: Proceedings of the workshops of the 18th International Conference on Advanced Information Systems Engineering (CAiSE 2006), Namur, B, Namur University Press (2006) 230–239
5. Williamson, O.E.: Markets and hierarchies, analysis and antitrust implications: a study in the economics of internal organization. First edn. The Free Press (1975)
6. Popov, E.V., Simonova, V.L.: Forms of opportunism between principals and agents. *Journal International Advances in Economic Research* **12** (2006) 115–123
7. Moulaert, F., Cabaret, K.: Planning, networks and power relations: is democratic planning under capitalism possible? *Planning Theory* **5** (2006) 51–70
8. Williamson, O.E.: *Opportunism and Its Critics*. Volume 14. Emerald Group Publishing Limited (1993)
9. Samuels, W.: Book review. *Journal of Economic Literature* **15** (1977) 137–139

10. Á. Montoro Sánchez: El desarrollo de redes organizativas. fundamentos teóricos y enfoques metodológicos. Cuadernos de Estudios Empresariales de la Universidad Complutense de Madrid **10** (2000) 185–204 In Spanish.
11. R. Santana Tapia, M. Daneva and P. van Eck: Challenges and solutions in developing a cross-organizational alignment maturity model. First International Conference on Research Challenges in Information Science (RCIS). Accepted (2006)
12. Clark, T., Jones, R.: Organizational interoperability maturity model. In: Proceedings of the 1999 Command and Control Research and Technology Symposium, United States Naval War College, Newport (1999)
13. III, A.L., McCormack, K.: The development of a supply chain management process maturity model using the concepts of business process orientation. Supply Chain Management Journal **9** (2004)
14. Ramasubbu, N., Krishnan, M., Kompalli, P.: A process maturity framework for managing distributed development. IEEE Software **22** (2005) 80–86
15. Henderson-Sellers, B.: Object-Oriented Metrics: Measures of Complexity. Prentice-Hall (1996)