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Governance lifecycles of inter-organizational collaboration: A case study of the Port of Rotterdam

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Abstract

An increasing use of inter-organizational collaboration systems can be observed. As multiple organizations often rely on these systems, even for business-critical processes, proper governance of these systems is crucial. This study aims to explain governance of inter-organizational collaboration systems by describing roles in collaborations, governance lifecycles, governance models, and how these roles affect the governance model in the lifecycles. A case study in Port of Rotterdam is described. The port collaboration in Rotterdam has gone through one full governance lifecycle and has entered the second iteration after the set-up of Portbase. During both cycles, the collaboration has maintained its Network Administrative Organization governance model. The case study analysis of Rotterdam's port community provides an example of how a systematic approach could help to discuss and communicate the governance of inter-organizational collaboration systems.

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1. Introduction

Inter-organizational collaboration systems have emerged to address the operational and information system related challenges of traditional collaborations[1]. Companies expect benefits and competitive advantages from their collaborations, such as network expansion, business process simplification, cost reduction, or other benefits that are unique for each domain. As multiple organizations often rely on these systems, even for business-critical processes, effective governance of these systems is crucial.

Inter-organizational governance is the act of coordinating a collaboration of multiple companies[2, 3]. Current literature has acknowledged the lack of attention on governance of inter-organizational collaborations which are supported by information systems[2]. The governance ensures that the diverse coordination needs of the different members in a collaboration are met. Moreover, the paradigm of governance of collaboration is shifted from a static perspective towards a dynamic context-dependent perspective[4]. This lack of knowledge has been exacerbated by the increasing complexity of collaborations. Despite being the result of joint agreements between companies, inter-organizational collaborations do not eliminate the competition between these companies. Moreover, the global competition nowadays has urged collaborations to expand over the boundary of industry sectors, countries, and continents.

In a maritime port collaboration, this complexity of inter-organizational collaboration is apparent. Ports are critical hubs in which Supply Chain (SC) activities are drawn together. The performance of the port authorities, companies, government, and other entities in carrying out their SC activities largely depends on the effectiveness of their collaborations. SC activities at ports are increasing, but so is competition in global SCs[5]. Port collaborations are commonly supported by a Port Community System (PCS), which is the state of the art in information systems that connects SC actors in port environments using inter-organizational services. Designing governance is viewed as a crucial step in developing a PCS[6]. Thus, to design effective PCSs, an understanding of inter-organizational governance is needed. A study by De Langen[7] has focused on the governance of port collaboration, but this study only addresses the governance as coordination mechanisms. Another study by Srour et al.[8] discusses the lifecycles of port collaborations, but this study has not shown how the theory of dynamic governance could be used in analyzing an in-depth case study. This study aims to demonstrate the theory of dynamics governance by analyzing the governance of an inter-organizational collaboration in the Port of Rotterdam; this case study gives an understanding of the port's changing governance and how the roles of each actor involved form the dynamic behavior.

2. Inter-organizational Port Collaborations

A port collaboration is the act of independent companies working together to execute their SC activities related to one or multiple ports. To coordinate this cooperation, port collaborations can adopt a PCS. "A PCS is an electronic platform which connects the multiple systems operated by a variety of organizations that make up a seaport, airport or inland port community. It is shared in the sense that it is set up, organized and used by firms in the same sector – in this case, a port community"[6].

In explaining the inter-organizational collaborations in ports, it is important to understand the roles of each company related to the collaborations. Chandra and Hillegersberg[1] proposed five general roles based on the analysis of several Supply Chain Collaborations (SCCs). This classification is suitable to be used to analyze the port collaboration context and as a structured way to communicate the collaborations' boundary design, business model, and governance to their potential members or other parties. The five roles are:

- *Members*. Entities which are the members of a port collaboration can be involved in the operational, tactical, *or* strategic activities of the collaboration. The members adopt the shared services to support their SC activities in the port environment. In order to maintain their access to these services, the members can invest into the PCS or pay per transaction. This category may include port authorities, customs, stevedores and terminal operators, freight forwarders and maritime agents, pre- and on-carriage operators, importers, exporters, and shippers.
- *PCS operators*, are providers who deliver the PCS, either software and/or platform as a service, for supporting the coordinated SC activities of port collaborations' members and enabling the collaborations. PCS operators are responsible to manage and maintain the PCS according to Service Level Agreements (SLA) with members [6].

- *SC partners*. Outside port collaborations there are companies which perform SC activities to support the collaborations. These companies are not members of port collaborations, but may get access to the shared system. However, their benefits are not a priority for the collaborations. As a consequence, these companies will not be expected to pay fees for using the system.
- *Other partners*, are companies that support port collaborations besides the SC partners and providers. Examples of companies with this role are internet providers, IS developers to whom PCS operators outsource a part or all of their software and/or platform development, universities, research institutes, associations, and employee organizations.
- *Orchestrators*, are control-tower-like companies that coordinate the SC activities inside the port collaborations.

These roles can be classified into *essential roles* − members and PCS operators − and *potential roles* − SC partners, other partners, and orchestrators. The existence of companies with the essential roles in collaborations indicates that the collaborations are port collaborations as shown in Figure 1. On the other hand, port collaborations do not necessarily have any SC partners, other partners, or orchestrators.
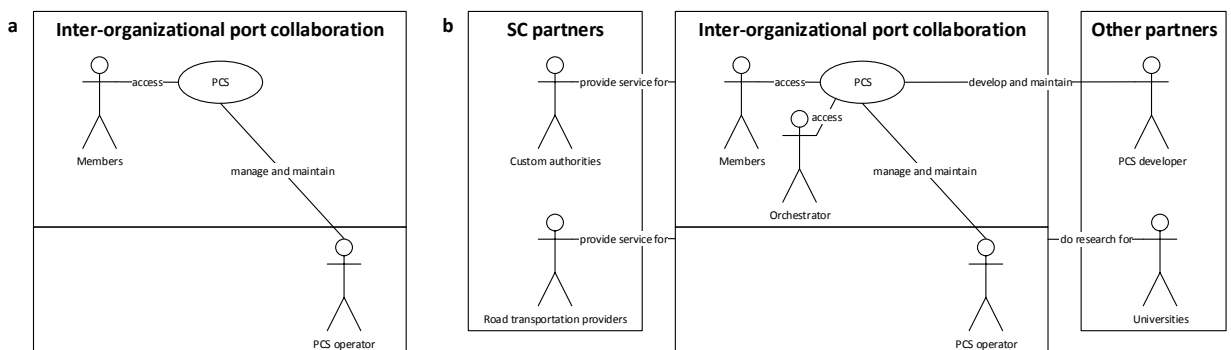

Fig. 1. (a) Essential roles in a port collaboration; (b) Potential roles in a port collaboration.

3. Inter-organizational Governance

Generally, there is a consensus on the definition of governance of inter-organizational collaborations. However, prior studies have been using the term "governance" but actually only address a specific part of governance. Some studies focus on the governance lifecycle[4], the governance mechanism[9], the governance aspects[2], or the governance models[3]. Most studies do not specify their points of view on inter-organizational governance and often jump on the trend of "governance" as a buzzword. To address the dynamic and context-dependent governance in inter-organizational collaboration, this study focuses on the governance lifecycle and models in analyzing the dynamics of inter-organizational governance.

3.1 Governance Lifecycles

Below, we describe 4 phases in the lifecycles of inter-organizational collaborations, adapted from Lowndes and Skelcher[10]:
- *Pre-partnership collaboration.* A collaboration's lifecycle begins when an initiator decides to dedicate its resources – e.g. finance, human resources, and network – to develop a collaboration. In this initial phase, the scope of the collaboration is defined by assigning roles to each company involved, inviting potential companies, and defining the business requirements. Next, how to govern the collaboration is discussed. During these activities, collaborations initially rely mostly on informal governance mechanisms[4], supported by trust and a sense of common purpose[10]. This is against the common view that collaborations start with formalized governance and proceed to cycles which reinforce trust between actors[4].

- *Partnership creation and consolidation*. After the partnerships are established, collaborations which decided on hierarchical governance design an assertion of status and authority differentials, as well as the formalization of procedures[10]. The design of formalized governance mechanisms can also occur in other collaborations which aim at less hierarchical governance. However, the less hierarchical collaborations will focus on intensifying the partnership between the companies to prepare for the program delivery. During this phase, the alternative services are assessed. At the end of this phase, the selected service should be implemented and made ready to be used. The success of collaborations in this phase depends on the members' willingness to financially contribute to the set up as well as the willingness to exchange their information with other partners[8].
- *Partnership program delivery*. In this phase, after connecting the collaborations' members using inter-organizational services, the business processes of the partners are executed. The market (or quasi-market) mechanisms of tendering and contract, with low levels of cooperation between providers dominate collaboration in this phase[10]. These mechanisms can be reinforced by informal governance, depending on the collaboration design. During this phase, the system providers, such as a PCS operator, can request members to pay fees for accessing the system. Usually, this fee is mainly meant to cover the development and maintenance expenses[11].
- *Partnership termination or succession* is characterized by a re-assertion of an inter-organizational governance mode as a means to maintain the actor's commitment, community involvement, and staff employment[10]. This phase can be triggered by any changes inside the collaboration or around the collaboration.

3.2. Governance Models

Even though differences in naming and classification are present, there are 4 basic governance models for inter-organizational collaborations[1]. These models are illustrated in Figure 2.
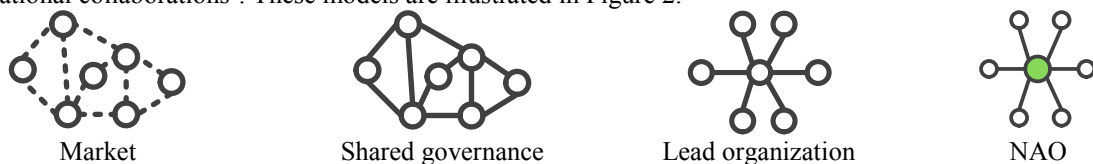

Fig. 2. Governance models

- *Market,* is formed by contractual relationships between suppliers and buyers[10]. A market has certain features such as multiple suppliers of the same product or service[12] and short-term partnerships which mainly occur during the transaction. In this governance model, inter-organizational system providers can be seen as suppliers of a coordinating service and members can be seen as customers.
- *Shared governance*, in which members participate in network governance without a separate and unique governance entity[3]. Collaborations applying this governance model are governed by regular meetings among members. In these collaborations, the members are collectively responsible for making decisions.
- *Lead organization*, in which a particular member coordinates major network-level activities and decision making in a network[3]. This particular member takes sole responsibility of its inter-organizational collaboration. In collaborations applying a lead organization governance model, the leading member should have adequate power – which could be acquired through market domination, law enactment, or buyer-supplier relationship dependencies – over the remaining members. Centralized data in the inter-organizational system could be used by the leading member to gain a competitive advantage. For this reason, a study predicts that inter-organizational collaborations will most likely be governed by organizations that are not one of the members[2].
- *Network Administrative Organization* (*NAO)*, which is a separate entity that is established to govern the network[3]. "Capturing and leveraging a position in a business network does not mean one must own or control, the platform on which those networks run"[13]. The NAO model provides inter-organizational collaborations with the benefits of having a neutral governance entity.

4. The Governance of Rotterdam's Port Community

Port of Rotterdam and the community around it have been selected as a case study that will be conducted by applying the theory of dynamic governance of inter-organizational collaboration. This port community is selected because: (1) it has a fairly long history in operating a PCS, (2) Port of Rotterdam is the largest port in Europe and it is one of the leading ports in the world[14], and (3) many studies on this port have been published, which enriches the analysis in this study. Data used in this study is a combination of an interview with the Managing Director at Portbase (the PCS of the Port of Rotterdam) and secondary data collected by reviewing reports, studies, as well as industry magazines and journals.

4.1. Port Infolink

By the end of the 1990s, there was general discontent with the state of the Port of Rotterdam's information system[8]. Port Infolink B.V. was set up in 2002 as a separated governance entity. This arrangement established the port community of Rotterdam as a collaboration with a *NAO governance model*.

The *pre-partnership collaboration phase* was initiated by the Port of Rotterdam Authority[5]. It began by identifying the most critical problem hampering the efficient flow of goods through the port, which is the import processes[8]. The import SC was the focus of Dutch government at that time. The Customs department and the Association of Rotterdam Shipbrokers and Agents, Deltalinqs, joined the initiative informally in the *partnership creation and consolidation phase*[15]. It was decided that the Port Authority will be the one and only owner of Port Infolink[15]. This ownership means that the Port Authority will bear the initial investments to develop the information system[8]. This project involved other stakeholders in the *partnership program delivery phase*, such as Customs as one of the lead users and software development firms based in Rotterdam[8] working with Port Infolink based on contracts.

Prior to the PCS implementation, data was managed on a bilateral basis via an assortment of electronic data interchange (EDI) tools, faxes, emails, or by making telephone calls[5]. In 2005, Port Infolink had been in the middle of developing a single PCS. The challenge was to transform a wide range of message formats to a single, common XML format, which is enabled by Xenos terminalONE solutions[5]. The developed PCS succeed to leverage the existing dissatisfaction of the Port Authority and Customs in order to promote a paperless import process[8]. As the two main parties agreed on the urgency of the problem, the first services of the new PCS were developed and implemented successfully[8].

The PCS provided by Port Infolink was developed using a modular implementation approach, which is referred to as the next generation of PCS that was getting implemented[11]. The PCS was designed to[5]:

- Provide any-to-any data exchange connectivity between any disparate platforms, which is the foundation of the PCS service
- Provide regulations, policies, and procedural approaches for data governance

With the new system, the SC activities in the Port of Rotterdam were getting faster and more efficient. The Port Authority could pass along the significant cost reductions to other entities in the port environment[5]. The benefit sharing was controlled by Port Infolink. Lower costs increased traffic and additional savings realized when the electronic transaction systems were integrated with e-Government systems for Customs[5]. "At that time we stepped in the middle, [we do] not only automate and optimize the business-to-government flow but also make it more attractive to re-use the information", Portbase Managing Director. Only three years after the establishment, the enthusiasm for Port-Infolink was mutual between the Port of Rotterdam and Deltalinqs. "At the most recent consultation, Deltalinqs, the Association of Rotterdam Shipbrokers and Agents, quite unequivocally called Port Infolink a great success" Pieter Struijs, Rotterdam's director of infrastructure and maritime[5].

Next, the Port Authority believed that the market itself needs to invest[5]. Thus, Port Infolink started to charge the *members* for accessing the services in 2007. "In the beginning, there were some resistances, but we were strict on what we were going to charge and how we were going to charge, so no companies left us", Portbase Managing Director. During this *partnership program delivery phase*, Port Infolink also maintained close formal and informal relationships with other actors in Dutch SCs.

In the end of Port Infolink's lifecycle, the collaboration entered the *partnership succession phase*. This succession was incited by the thriving Dutch maritime SC activities and the growing concern to preserve the competitive position of Dutch ports. By this point in time, Port Infolink had already offered 24 different services, with around 4500 users who sent more than 20 million electronic messages a year[15]. This last phase of Port Infolink overlapped the *pre-partnership phase* of its successor, Portbase.

4.2. Portbase

As of early 2009, the next governance lifecycle was marked by the merger of Port Infolink in Rotterdam and PortNET in Amsterdam, which provided the Ports of Rotterdam and Amsterdam with one joint PCS[15]. PortNET's history started eight years before the merger – in 2000. PortNET was a public-private partnership organization which successfully encouraged the development and use of ICT in the Ports of the Amsterdam North Sea Canal area[15]. Even though Port Infolink was younger than PortNET, Port Infolink had developed more functions in its PCS, which were logistic and navigation functions[11]. The merger contract guaranteed that the PortNET *members* would be able to use the services of Port Infolink for the exchange of data in the mid-2009[16]. Even though PortNET had maintained a centralized governmental PCS for business and various government agencies for six years[11], it was decided that Port Infolink's PCS would be the foundation for their future service.

It was after the Portbase B.V. established that the "neutral" notion began to be used in describing the company. Portbase has roles as a neutral *PCS operator* and *orchestrator* for Dutch port communities. Thus, the port community of Rotterdam preserved its *NAO governance model*. At its' launching, Portbase offered 25 different information services and had approximately 1300 clients in all port sectors[17]. "Portbase's main objective is to create a competitive edge for Dutch ports by reducing SC costs and increasing the quality. We provide better information in [an] easier way for all its users", Portbase Managing Director.

At present, Portbase is in the *partnership program delivery phase*. The ownership is shared between the Port of Rotterdam Authority (75%) and Port of Amsterdam Authority (25%). Portbase's Management Board and its team are supported by a Supervisory Board and an Advisory Board. Both Port Authorities are represented on the Supervisory Board, together with other Portbase's main business partners. The Supervisory Board is responsible for evaluating Portbase's performance and deciding on its PCS development strategy[18]. This responsibility regarding the development of Portbase's PCS is shared with the Advisory Board, which is initiated by Deltalinqs. The Advisory Board gives advice, proactively or reactively, on the Portbase's PCS and the services that are to be developed in the PCS[18].

Portbase' PCS has four PCS functions: dangerous goods declaration, customs, logistics, and navigation[11]. The major development in the PCS is the digitalization of export processes. The services provided through each function are available by using several application modules[11]. These services are built on top of a platform provided by Oracle. Besides the main services members also have access to build their own services on top of Portbase's platform – e.g. ProRail's Wagonload Information System. In order to develop these services, Portbase collaborates with IT companies and service providers which support its members. The services are used in all Dutch ports to guarantee synchronized data between its *members*. Nowadays Portbase offers 43 services to support its community. By offering these services, Portbase provides a standardization of information that is being exchanged in the port community.

The generic infrastructure and services are developed in-house by Portbase in project working groups. The infrastructure and platform are supported financially by its shareholders – i.e. the Port Authorities. Meanwhile, the *members* pay Portbase access fees based on their transaction for exploitation and development of the services on Portbase' platform. The *members* can decide to pay subscription fees for the services for lower transaction fees. M*embers* that do not subscribe will pay higher transaction fees for using the services. With this revenue flow, Portbase's balance sheet is break-even and proves its standing as a non-for-profit company.

Nowadays, Portbase's community has expanded – i.e. agents, barge operators, Customs, empty depots, exporters, importers, forwarders, Food & Consumer Product Safety Authority, inspection stations, Port Authority, rail infrastructure operators, road haulers, terminals, skippers, and shipping companies. Port of Rotterdam still maintains its influences in the import and export SCs that pass through the port. The Port Authority is one of the founding members of a cooperation which aimed to reduce traffic on the main road leading to the port during rush hours[19]. By

the end of 2016, Portbase had 3900 companies as members and 14000 users that were involved in 82 million transactions within the system[20].

5. Analysis and Summary

Rotterdam's port community had been through a full lifecycle of inter-organizational governance and is now in the second lifecycle as illustrated in Figure 3. The first lifecycle occurred from the end of the 1990s until Port Infolink was merged with PortNET in 2009. In this cycle, Port Infolink adopted EDI-based PCS and later web-based PCS. Port Infolink connected the Port of Rotterdam Authority, shipping lines, and the port terminal, mainly throughout the import processes. In the second lifecycle, Portbase was established to substitute Port Infolink and PortNET. Portbase maintains the governance best practices from Port Infolink, preserving the *NAO governance model*. Portbase enlarged its community; the data sources – the shippers and the forwarders in import and export SC – are included in current Portbase's community. Today Portbase's organization structure consists of a Management Board and its team, a Supervisory Board, as well as an Advisory Board. Supported by the board of directors from both prior companies, Portbase has become a successful *orchestrator* in European maritime port collaboration.
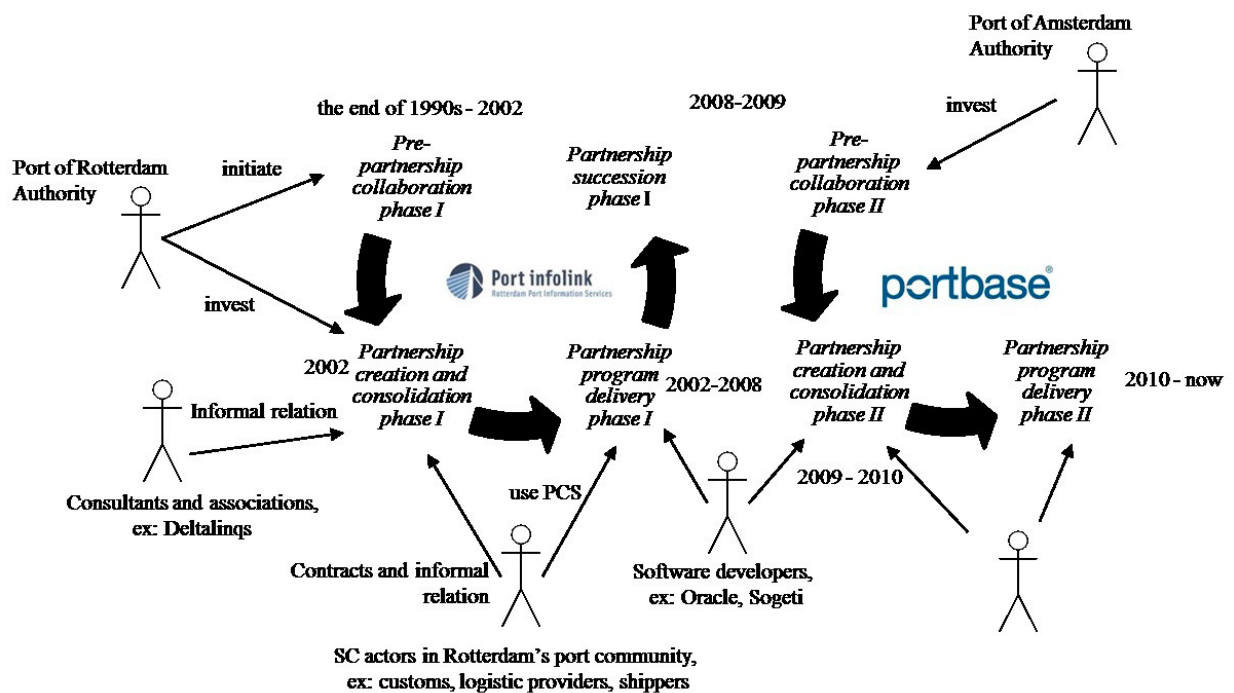

Fig. 3. The governance lifecycles of Rotterdam's port community and the actors involved

The case study analysis of Rotterdam's port community gives an example of how a systematic approach could help to communicate and give a comprehensive overview of the governance of inter-organizational collaboration. This analysis can also serve to discuss future adaptations to the governance model and as an inspiration to other inter-organizational governance designs. The systematic approach proposed in this study could be beneficial for researchers, consultants, and companies that are working on establishing an inter-organizational collaboration to identify the important roles of each party involved in both pre-partnership collaboration and partnership creation as well as consolidation phases. Having the roles clearly defined, all parties can decide on the suitable governance model for the collaboration. In the subsequent phases, the approach can be beneficial to explain the dynamic governance within the collaboration. This study is limited to one case study. In the future, a cross-case analysis will be conducted using different points of view in defining inter-organizational governance.

Acknowledgements

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