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COMPARING COORDINATION ARRANGEMENTS ENABLED BY WEB SERVICES AND WEB SERVICE ORCHESTRATION TECHNOLOGY

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Abstr1act

Web services create interoperability among information systems and web service orchestration enables the coordination of activities. Both enable public agencies to cooperate more and more in chains to deliver services to their constituents. There are various ways to organize the coordination of cross-agency processes. In general it can be done in either a centralized or a decentralized way. Yet there is much confusion about which type of arrangement best fits public administration.

In this paper we report two case studies; the first one takes a decentralized way to coordinate activities and the other takes a centralized approach. Using interviews we identified the main pros and cons of each approach and compared them with each other. We found that decentralized orchestration takes a shorter lead time, and requires less structural and organizational transformation, however, is less transparent for users. Whereas centralized orchestration makes responsibilities and dependencies clear and avoids duplications of activities, however, it not only needs a longer implementation period to realize its potential benefits but also requires additional communication and creation of new cross-agency interfaces.

Keywords: Coordination theory, Web Services, Web Service Orchestration, Control, Case study, e-Government, Evaluation

1 INTRODUCTION

Citizens and business demand a one-stop shop of government. This requires agencies to collaborate with each other by creating cross-organizational processes. A cross-agency process concerns the chained execution of tasks performed by different organizations that are responsible for their respective tasks and are often part of different hierarchies. Within public administrations many different more-or-less autonomous agencies exist, each responsible for a certain set of tasks. Fountain (2001) argued that cross-agency processes require substantial changes to public institutions, enabled by an enactment of technology. Due to this fragmented nature of governments, the activities that make up a governmental service such as the processing of an application of a building permit, are often performed by different governmental agencies. Agencies involved in such a cross-agency process are often part of different hierarchies that are governed in isolation of each other. The creation of cross-agency processes is therefore a complicated endeavour and many different organizational arrangements are possible.

Already in 2003 the Netherlands Ministry of Spatial planning, Housing and Environment decided to integrate the various permits into one environmental permit (MinVROM, 2005). The environmental permit replaces all former permits that were necessary to build or change buildings. The plan is to oblige the environmental permit by 2007. Since then, many municipalities of Netherlands have been looking for ways to introduce such a system. The underlying rationale is by having one organization to serve as the one-stop shop, customers can request all necessary permits as part of one procedure. They do not have to go to another shop of another public agency, nor do they have to come back to ask for additional permits. The one stop shop creates a single entry point for citizens and business. However, it is unclear how the processes across different agencies can be effectively managed.

Since its inception, the MinVROM has stimulated several projects related to the introduction of the environmental permit (e.g. http://omgevingsvergunning.vrom.nl/). All projects focussed on a different aspect in relation to the architecture, technology and the management and coordination of the business processes. The architecture is oriented towards service deliveries through the use of service oriented architectures using web services technologies. The services-oriented architecture offers many benefits to enterprises, and the creation of a class of enterprise services allows creation of new services that are modular, accessible, well-described, implementation-independent and interoperable (Fremantle et al., 2002). Web services seek to create interoperability among information systems. Web service orchestration enables the coordination of activities, makes agencies internal processes accessible using web services, orchestrates the loosely coupled web services using the process model and creates integrated cross-agency processes (Janssen et al., 2006). The technological aspects provide the necessary infrastructure for cooperation, however, the cross-agency process needs to be coordinated. In the cross-agency processes, the public organizations work together in a loosely coupled structure, where the overall process performance depends on the weakest link in the chain. The arrangements can have various forms. Yet the discussion has been revolved around the choice between centralized and decentralized forms of coordination.

Strategies concerning centralized and decentralized commercial computing have been a major issue for more than two decades. With the advent of the Internet, web services technology has become viable to centralize functions that are currently or were formerly performed at a decentralized level. There is some disagreement in the literature about the driving forces behind centralization decisions (e.g. King, 1983; Peak & Azadmanesh, 1997; Sambamurthy & Zmud, 1999). King found that changes in technology merely alter the options that are available and the economies surrounding them. Therefore there is a need for constant re-assessment of centralization/decentralization options. This *goal* of this research is to compare and evaluate the centralized and decentralized coordination of cross-organizational processes enabled by web service technology. As such it continues the debate about the added value of centralization and decentralization, and contributes to knowledge about new coordination arrangements enabled by web services technology.

In the next section we discuss the theoretical background. Thereafter we report two case studies, one having a centralized and another having a decentralized way to coordinate the cross-agency process. In the third section, we compare the case studies by discussing the typical problems, benefits and disadvantages of each arrangement. We discuss the results in section five and finally, we draw conclusions.

2   THEORETICAL BACKGROUND

Coordination of the interdependent activities of the organizations involved in the cross-agency process is essential. Organizations use capacity and consume goods for performing their activities. Business processes are commonly divided into tasks as the resources of one person, department or organization are limited and there is a need for the separations of concerns. The division of the business processes into tasks creates a need for the coordination of these tasks

Coordination is a broad concept that is widely described in the literature (e.g. Thompson, 1967; Malone et al., 1999). Clemons and Row (1993) highlight the need for coordination beyond the realm of technology. Improving coordination requires investments in information and communication technology (ICT), and leads to significant changes in the mechanisms used to manage the interactions that take place within and between organizations. Clemons and Row (1993) argue that the ability to coordinate the movement of information is of key importance to both external and internal coordination. Organizations are looking for better ways to coordinate the information flow with their trading partners to profit from ICT (Janssen & Verbraeck, 2005). Coordination theory emphasizes two aspects to improve information flows. They include activities used to process information and commitments in the inter-organizational relationships.

Malone and Crowston (1990) found that the need for coordination arises from constraints imposed on the performance of tasks by the interdependent nature of these tasks. These interdependencies arise from the mutual use of common resources to carry out a task. In their view, coordination theory provides an approach to the study of processes within a wider context of the decision-making and communication structures within and between organizations (Malone et al., 1999).

Wellman (1995) argues that without loss of generality, every decision is really about *resource* allocation. The restricted availability of resources can cause conflict and ask for coordination. Coordination of resources involves defining which activities are carried out, and which are not, using which resources and which priority. Making such choices involves weighing the benefits of the activities done against the opportunity cost of the activities not done. Wellman found that without considering resources explicitly, it is difficult to express the range of courses of action available. And without acknowledging gradations in value or likelihood of outcome allocations, it is impossible to account for the tradeoffs among alternative activities.

The design of a process depends on the coordination mechanism chosen to manage the dependencies among the tasks, decisions and resources involved in the process. Malone and Crowston (1994) assert that coordination is necessary to relate activities performed by various actors to others and to manage the interdependencies arising between tasks. They define coordination as *managing dependencies between activities*. The application for an environment permit falls into the category of producer/consumer type of dependency, in which one task creates a resource needed by another. This dependency comprises three sub-dependencies. They include: *usability* concerns the appropriateness of the resource created by the first task meeting the requirement of the next task; *transfer* concerns the movement of the created resource to where it will be consumed; and *precedence* concerns the communication of timely information of when the created resource is available and when the next task can be started. The role of the actors or units is one of devising a coordination mechanism to effectively manage the coordination challenges inherited in each sub-dependency. Against this, a number of interesting questions arise: What kind of coordination mechanisms are offered respectively

by centralized and decentralized coordination? What are their relative strengths and limitations? How each type of sub-dependency will be affected by centralized and decentralized coordination?

Most of the literature primarily characterizes centralized coordination and implicitly assumes the direct opposite for decentralized coordination. Within this broad assumption, centralized coordination in organizational networks is often associated with the use of a third party, a kind of (electronic) intermediaries to support the coordination of processes performed by independent organizations. Whereas distributed coordination is often associated with bilateral coordination relationships.

Bailey and Bakos (1997) found that coordination arrangements are dependent on organization strategies. Sambmurthy and Zmud (1999) argue that business firms are subject to the pulls and pressures of multiple contingencies forces with influence the mode of centralized and decentralized governance. Based on empirical research, King (1983) found three separate aspects, control, physical location and function that can be either centralized or decentralized.

- Control concerns the locus of decision-making activity in the organization. Centralization implies the concentration of decision-making power, and the opposite is true for decentralization.

- Physical location concerns the sitting of facilities. Centralized physical location has all facilities in one place versus distributed among various locations.

- Function refers to the position of an activity or responsibility within the structure of the organization. For example centralized accounting and control would require all departments and units to report financial data to a single unit and the opposite of that is to have separately managed units.

In terms of King's aspect, we focus on centralized and decentralized loci of control in our research. The organization physical location is not subject to change, nor their position in the hierarchy.

Centralized coordination does not necessarily entail hierarchical control and governance, as the organizations in our case study are in different hierarchies of control. Likewise, decentralized coordination is not necessary implicated distributed control. Centralized coordination can reduce the number of dependencies that need to be managed. In the centralized organization, the centralized unit takes the responsibility of managing the coordination. It collects information and takes care of the process control. Following Lewin and Regine (1999) we hypotheses that centralized coordination is often associated with optimization and decentralized coordination and is also associated with flexibility and self-organization

3   CASE STUDIES

In this section, two case studies will be compared and discussed. We opted for case study research a multiple forces influence the mode of coordination. Two case studies were chosen to cover the extreme modes. The limitations of this approach are that intermediate modes are not investigated, we do not investigate the factors contributing to the type of coordination arrangement and that is limited potential for generalization. In each case study, we interviewed 7 persons including an officer in charge of the public counter (front office), a manager, an administrative staff of all the three departments that were involved, and one application controller.

3.1   Case: Decentralized coordination (or distributed coordination)

A medium-sized municipality introduced what they called the 'transfer' chain. The implementation of the environmental permit is a major operation affecting the front offices. To minimize the risks of failure and the load on the persons working in the organizations, it was decided to minimize the changes that would be necessary in the back office activities. Each department would keep the same

tasks and responsibilities, and should pass the information to the next organization after completing the process. The basis idea is that each organization and department would retain the responsibility of executing its own activities and make their business process accessible using web services. Other organizations would be able to start a business process of an organization by invoking a web service, based on well-defined and pre-agreed interface. Figure 1 shows that in this way a simple chain of activities was created. At the left side of this figure a customer is shown which could be citizens or businesses. Three departments belonging to three different organizations are showed in the remaining part of the figure. A customer submits a request via the Internet or by filling a form at the public counter located at the municipality town hall. The first department checks the data and starts executing the processes. Only after successful completion, the application is handed over to the next organizations by invoking a web service of that organization. The invocation contains the transfer of all information and the results of the business process, so the complete file is transferred. The other organizations acknowledge the receipt of the information by sending a response. The dependencies between agencies processes are coordinated by understanding and invoking their external interface descriptions, without having to know the details of how these internal processes are performed. If the permit is already rejected by this department, no further processes are required, and the process stops. The answer is directly communicated to the customer.
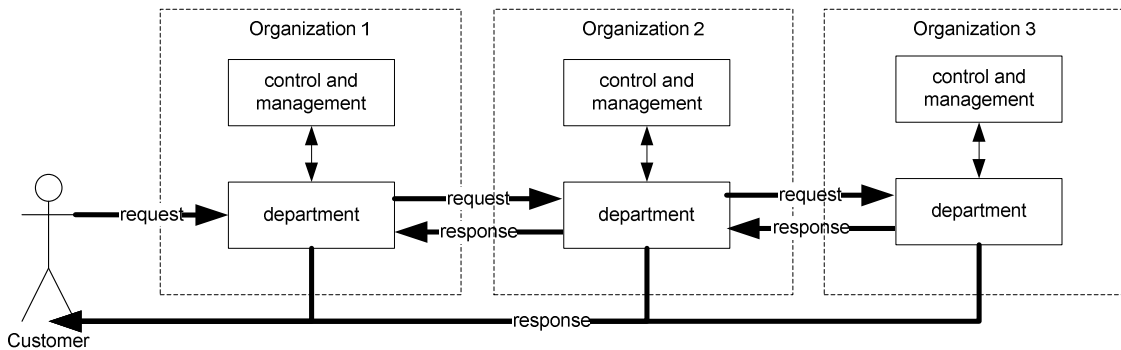

Figure 1.   *Decentralized coordination*

Each department is controlled and managed in a different hierarchy. The administrative staff of organizations 1 and 2, and of organisations 2 and 3 communicate with each other when handing over a permit request. There is hardly any communication between staff of organizations 1 and 3. Occasionally the administrative employees of organizations 1 and 2, and of organizations 2 and 3, phone each other to ask questions if things are unclear. Sometimes the administrative employees meet if a request is very complicated or discussable. Sporadically the administrative staff of all three organizations meets to discuss a permit request. Informally there is sometimes contact between the administrative staff to discuss changes and improvements. Once a month the managers of the three organizations have a meeting to discuss problems, developments and analyse and discuss the progress of permit requests. The meeting is chaired by one of the managers of the three organizations and the chairmanship rotates every six months. If something urgently needs to be done, the administrative staff of each department phones or emails the staff of the other departments.

3.2   Case: Centralized coordination (or orchestrated chain)

A medium-sized municipality decided to introduce the environmental permit based on the concept of having an orchestrator. An orchestrator is a central department that coordinates the processes performed by the various departments. This central orchestrator is responsible for the execution of environmental permit request, to handle complaint procedures and to be accountable for the execution of the complete end-to-end process. The orchestrator invokes a sequence of loosely coupled web services. In fact the orchestrator makes use of web service orchestration technology to create an

executable process by invoking a sequence of web services. Web service orchestration can be defined an "executable process or the rules for a business process flow defined in an XML document which can be given to a business process engine to orchestrate the process, from the viewpoint of one participant" (McDonald, 2003). The orchestrator has an overview of the status of the complete process and invokes web services. We opt for calling the department orchestrator, as it is responsible not only for coordinating the operational process but also for performing management functions.

Figure 2 shows the process schematically. Customers request the environment permit using the Internet or by going to the public counter. After inputting the data by the customer or by a public counter employee, the process orchestrator takes the responsibility for the process. First, the orchestrator selects the organizations that need to be involved and creates a customized business process. Next, it starts executing a business processes by triggering the processes performed by the department in various organizations. The orchestrator tracks and traces the request, and ensures that delivery times are met. The orchestrator belongs to the municipality which is within the same hierarchy as the public counter.
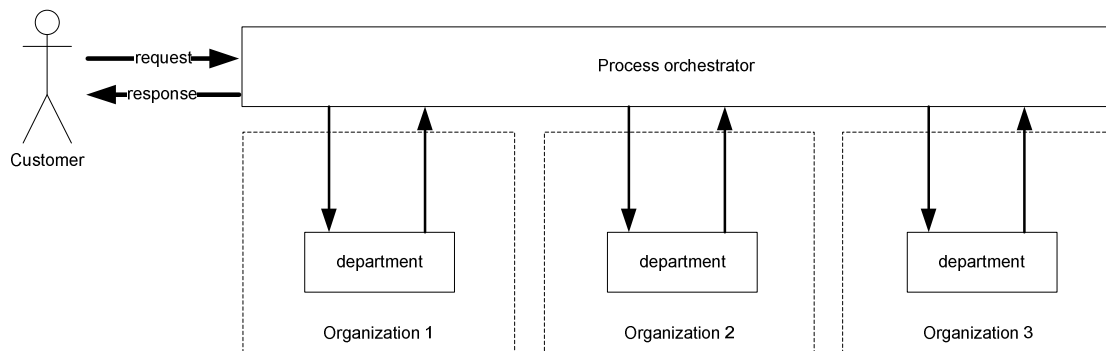

Figure 2.   Central coordination

The orchestrator becomes the department for creating a one-stop shop. Apart from executing the process, the orchestrator performs a number of additional functions, including

1. *Handling of complaints.* Citizens and businesses can complaint about the permits. The orchestrator stores all the decisions made by every agency to ensure that the motivations behind the decisions and the performance and outcomes of the complete cross-agency process can be accounted for.

2. *Making of service level agreements.* The orchestrator makes service level agreements with each organization involved in the cross-organizational process. The service level agreements describe the time for processing an application and what should be done in case of failure.

3. *Monitoring and improving processes.* The execution of the processes is monitored and flaws in the processes are spotted to continuously improve the processes. Often this is the start of complex negotiation processes among different agencies. For example, an interviewee stated that some tasks performed by organization one and two were parallelized to improve lead time. This required reengineering of business processes and negotiation of new interfaces.

In this case study each organization communicates directly with the orchestrator. The interviewees explained that initially the department had direct contact with each other if information was unclear or other questions that can only be directly answered by another organization. Every two weeks the administrative employees meet each other to discuss the progress of the applications and if applications need to be handled differently. Every half a year the managers of the departments of the three organizations meet with each other to discuss the service level agreements, structural problems in the cross-agency process, the buying of new software and the improvement of business processes. The meeting of the administrative staff and of the managers are chaired by the manager of the

orchestrating department. The organizations involved in this chain had a high level of IT-readiness and were already cooperating with each other since they became aware of the environmental permit in 2003.

4   COMPARISON

Although the two case studies tackle the same challenge, i.e. the introduction of the environmental permit, the organizational structure, business processes and information systems were arranged completely different. The decentralized design could be introduced quickly and was running within half a year after the decision was made. The centralized arrangement took much more collaboration efforts and agreements on service levels and standards. The centralized arrangement the dependencies among the tasks were analyzed and new coordination mechanisms used to parallelize and avoid duplication of activities. Consequently it took over 15 months before it was up and running. The interviewees in both case study indicated that they experienced many start-up problems at the beginning and it took over a year to reach maturity.

The general findings of the case studies concur with the literature that the centralized coordination enhances optimization and decentralized coordination is more adaptive (e.g. Lewin & Regine, 1999; White et al., 2005). The decentralized arrangement struggled with ensuring that the end-to-end process was completed within the required lead-time and how to communicate with the customers. Especially at the beginning each department communicated with the customers directly, which sometimes resulted in confusing and even giving contradictory information to the customers. After reaching maturity these problems were reduced and occasionally the departments communicated directly with the customers.

The centralized coordination arrangement struggled especially with the dissemination of tacit knowledge and the accountability in the beginning. As all communication was directed to the orchestrator, this coordination entity had to have more knowledge of the environmental permit than initially expected. Initially it was expected that it had primarily a process management function, however, gradually they became aware that the orchestrator also needed to understand the dependencies among the organizations. This problem is also closely related to the accountability problem. The organizations are part of different hierarchies that are governed in isolation of each other. Cross-agency processes therefore need to rely on networking between stakeholders, with goodwill, mutual trust, and other softer forms of governance mechanisms. At first these aspects were largely ignored, at a later stage the administrative staff of the three departments had a joint trip, met regularly and so on to create a mutual understanding.

Each participating organization in an Internet-enabled interagency collaboration comes to the table with a different level of readiness to participate, due to its own IT infrastructure, supporting processes, performance measures, and other aspects which should be considered when planning and implementing the systems coordinating the cross-agency process and the resulting collaboration. In the centralized case much effort was concentrated on standardization of interfaces between the orchestrator and departments prior to the introduction. Standard web services interfaces were defined to start processes, ask for the status and communicate the results defined prior to the introduction. Also service level agreement and its monitoring mechanisms need to be agreed upon among the participant organizations. This invariably required further redesign of the processes at the back offices.

The public agencies are accountable and responsible for their roles and functions to the higher layers in the hierarchy, but not to the other organizations involved in the cross-agency processes. In the case of decentralized coordination, it is often unclear which agency is responsible for the whole cross-agency process; and who is monitoring service levels, and maintaining and improving the performance of the complete, end-to-end, cross-agency processes. In the centralized coordination, the orchestrator is responsible, yet has hardly any power to enforce compliance. In both case studies the interviewees indicated that the effective functioning is dependent on factors like mutual trust, willingness to

cooperate and a sense of urgency that cooperation is necessary. In the orchestrated case with centralized coordination, a number of organizations wanted to perform the role of orchestrator. This caused a power struggle and induced conflicts, since most parties were reluctant to lose control and to be responsible towards the orchestrator. How the orchestrator was managed and who was in control was found to be a crucial aspect in delaying implementation. Only after the parties agreed about who performed the orchestrator role and the division of voting power over the organizations involved in the cross-agency process, can the implementation start. Table 3 displays the typical problems encountered in our case studies of centralized and decentralized coordination.

Case study:	Centralized coordination	Decentralized coordination
Typical problems	- Creating legitimacy - Creating sense-of-urgency for standardization and implementation - Struggle for acquiring the coordination role - Negotiate revenue model to finance orchestration - Dissemination of tacit knowledge and improvement	- Ensuring lead-time within legal terms - Ensuring changes are communicated and coordinated - Different levels of readiness - Communication with customers, 'one voice' aspect - Overview of number of permit request and status of requests

Table 3.   Overview of the typical problems

At a first glance, the three types of sub-dependencies were not problematic with the decentralized coordination as coordination was restricted to a dyadic level between two units through both formal and ad hoc means in managing and defining their issues related to usability, transfer and precedence. Whereas the introduction of an orchestrator has created extra legitimacy problems; and further compounded by the multiple coordination problems that come with multiple units, and notably in understanding and managing the tacit element of expertise coordination across multiple units.

Case study	Centralized	Decentralized
Advantages	- Overview of the total process - Ensuring lead-times - Accountability for the complete chain is clear - Monitoring of progress and tracking and tracing - Standardization of data, interfaces and process in the complete chain - Change management responsibility is clear - Avoiding of duplication of tasks - Dealing with information asymmetry	- Relative straightforward - Easy to accomplish - Short implementation time - Automating the current way of working - Customers are close to the experts, easy interaction - No redesign and no (less) resistance
Disadvantages	- Many agreements necessary - Needs long-lasting negotiation between the autonomous parties before implementation - Large distance between requesters (customers) and domain experts - Bureaucratic as reaction times are longer than on bilateral basis - Difficult to transfer knowledge from agencies to orchestrator and customers - Another layer adding to the complexity	- Competencies available for agreeing - No overview of total process - Ambiguity about responsibilities. - Each agency can be held accountability, but no chain accountability - Changes affecting the whole chain are difficult to communicates - Duplication of tasks, i.e. each agency checks the same data - Limited synergy between agencies

Table 4.   Comparison of the benefits and disadvantages in the two case studies

The interviewees were asked to provide the advantages and disadvantages using a structured list of topics. A systematic evaluation of the two different modes of integration was performed by categorising them into political, strategic, organizational, business process and technical categories. Benefits and disadvantages were added during the interviews and in a last round all the benefits and disadvantages, including a detailed description were shown to the interviewees. If all agree on the benefit or disadvantage, the item was added to the list as shown in Table 4.

5   DISCUSSION

Although centralized coordination requires extensive defining of activities and their inter-dependencies, the benefits accrued outweigh the costs associated with longer lead time, specifically in satisfying the requirements of the eventual consumers including citizens and the business communities. This is achieved through a clear understanding of various types of task sub-dependencies and a better specification of the roles of the actors and the interfaces to realize the potential values of orchestration. By having an orchestrator, it can greatly facilitate expertise coordination that was once embedded within the communication structures located between 2 adjacent units. Faraj and Sproull (2000) indicate that coordination success often builds upon a strong relationship between expertise coordination and team performance. Hence, the interactions among the units and the orchestrator are desirable in the initial design stage. In doing so, it mitigates a potential problem of indirect interactions where despite the importance of communicating problems to the orchestrator, units might resort to their linkages previously established with other units over the electronic networks. This kind of indirect interaction has proven costly to product design (Sosa et al., 2004) and is likely to have an adverse impact on the service quality.

However, centralized coordination may run the risk of iron casting the dependencies and activities, and the risk of not being agile enough to respond to local differences and policies, and organizational and technical changes. Often conflict arises among actors in terms of power struggle and goal misalignment cross agencies. Specifically, in the centralized arrangement the orchestrator encounters problems of legitimacy for its activities. *Legitimacy* is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions (Uusitalo & Rökman, 2004). Legitimacy thus depends largely on the perception of the other organizations in the cross-agency process. Only after legitimacy and trust is created, the orchestrator can begin to work. Apart form the possible rigidity to respond to local differences, this architecture is adaptive to more macro changes. For instance, the orchestrator can coordinate and concentrate on spotting any changing circumstance due to technology changes, amendments in laws and so forth. The orchestrator can then coordinate the making and execution of a change plan.

Whereas with *decentralized* coordination, which is more of an activity oriented approach, the activities and dependencies are clear, but often the execution of activities are restricted to a small chain of activities. As the chain includes a large number of activities, it is often hard for a single organization to understand the complete end-to-end process and the types of dependencies among activities executed by other organizations. The knowledge might be restricted to the tasks alongside each other. Moreover, there is no clear responsibility for the complete chain. As a result improvements often remain within the boundaries of a single organization. What happens if some non-neighbouring activities could be parallelized to improve speed or to meet a due date determined by law? And there are also issues regarding shared responsibilities when it comes to process monitoring and maintenance.

The chain can adapt to changing circumstances due to the loosely coupled nature. Each organization can change its systems and processes, and its interfaces and relationships with the other organizations can remain the same. However, as each organization communicate only with the neighbouring organization, it is not clear if the changed circumstances are communicated to all.

To harness both the merits of centralized and decentralized coordination, a logical first step is to determine the organizational structures in terms of shared goals and responsibilities, and service levels and transactions across agencies. Situations of goal conflict and misalignment have to be resolved by negotiation with each other, as there is no overarching authority that can determine the decisions. Whereas the interagency collaboration should be given the autonomy and decisions to determine the dependencies and the activities among actors. As clearly indicated in our case studies, agencies often resort to informal in addition to formal channels of communication. Lastly, to resolve the power conflicts among agencies, the management of orchestrator might be maintained on a rotating basis. This might have the disadvantage that the new management have to acquire the necessary knowledge and might face a range of start-up problems. Furthermore, the resources might not be available. In the centralized arrangement, the orchestrator function was completely centralized. Public administrators should also consider whether it is better to create a separate physical entity to govern and manage the hybrid structure of centralized and decentralized arrangements (Markides & Charitou, 2004). This might be dependent on the size of the organizations involved. Small organizations might not have the resources to fund a process orchestrator. On the other hand, once a process orchestrator is established in one chain and succeeds in managing the environmental permit, it can extend its scope and provide its services to others. In this way, economies of scope and scale can be accomplished.

A hybrid approach is aimed at combining centralization and decentralization forms. Our selection process showed that most of the case studies cover mixed approaches. They contain both elements of central and decentralized coordination. Our current ongoing research shows that most mixed approaches do no obtain the benefits of both centralization and decentralization. They might even contain the problems of both centralized and decentralized models and have only a limited number of advantages. Obtaining the advantages and overcoming the problems of both models seems to be dependent on the architecture of the implementation. One fruitful way seemed to have layered approaches in which the top layer has a decentralized approach. In the top layer one organization act as an orchestrator of the organization on a lower layer.

6   CONCLUSIONS

In this paper we investigated two case studies having different coordination forms of cross-agency processes enabled by web service and web services technology. It aims to contribute to the ongoing debate of centralization and decentralization and adds new insights into centralized and decentralized arrangements. Both centralized and decentralized coordination seems to have its own merits, disadvantages and risks. Generally speaking our case studies show that decentralized coordination seems to be a solution for creating cross-agency processes quickly and ensuring adaptability; and centralized takes a longer implementation time and incurs higher expenses of maintenance. Yet centralized coordination is more focused in terms of meeting lead-times, improvement of the end-to-end process, accountability and ensuring quality.

We selected two case studies which took a completely opposing approach to the introduction of a one-stop shop of the application of environmental permits. Our case studies show that the decision about centralized or decentralized coordination is outside the control of a single organization. The technical component is affected by environmental and organizational factors beyond the control of the collaboration's project team. The interactions among environmental, organizational and collaboration-specific factors create enablers and constraints that determine the design of the interagency collaboration. Probably this will require a mixed strategy, where some parts are centralized and others decentralized. Public administration can definitely explore this new possibility of creating a hybrid form of structure. However, the challenges remain one of how to combine the best of both worlds. Obviously, more research is needed to provide further insights into the coordination challenges of such a hybrid approach. We are currently investigating additional case studies which cover several mixed approaches.

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