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Value creation in capital waterway projects: Application of a transaction cost and transaction benefit framework for the Miami River and the New Orleans Inner Harbour Navigation Canal

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Keywords; waterways, transaction cost, transaction benefits, value creation, infrastructure, Miami river, Inner Harbor Navigation Canal.

ABSTRACT

Waterways have many more ties with society than as a medium for the transportation of goods alone. Waterway systems offer society many kinds of socio-economic value. Waterway authorities responsible for management and (re)development need to optimize the public benefits for the investments made. However, due to the many trade-offs in the system these agencies have multiple options for achieving this goal. Because they can invest resources in a great many different ways, they need a way to calculate the efficiency of the decisions they make. Transaction cost theory, and the analysis that goes with it, has emerged as an important means of justifying efficiency decisions in the economic arena. To improve our understanding of the value-creating and coordination problems for waterway authorities, such a framework is applied to this sector. This paper describes the findings for two cases, which reflect two common multi trade-off situations for waterway (re)development. Our first case study focuses on the Miami River, an urban revitalized waterway. The second case describes the Inner Harbor Navigation canal in New Orleans, a canal and lock in an industrialized zone, in need of an upgrade to keep pace with market developments. The transaction cost framework appears to be useful in exposing a wide variety of value-creating opportunities and the resistances that come with it. These insights can offer infrastructure managers guidance on how to seize these opportunities.

1 Introduction

Infrastructure (re)development by public agencies seems headed for trouble. A great many public assets are aging and funds to replace or redevelop them are limited. Nevertheless, because highways, railways waterways and the like play a vital role in urban and regional economies, a way must be found to maintain or upgrade these assets. For waterways like canals and heavily modified rivers, one of the earliest forms of

infrastructure, this is most certainly the case (ASCE, 2006; Heijer et al, 2010; Hijdra, 2013; Pointon & Grier, 2004; US Army Corps of Engineers, 2009). In maintaining, rebuilding or revising infrastructure projects, a wide variety of pathways to implementation is possible. Variations are possible in time, space and the actors involved. Because maintenance and improvement of these assets can have enormous social and environmental consequences, many trade-offs must be made. These trade-offs should reflect concerns about efficiency, that is, maximize the ratio between the services provided to the public and the resources used. This is a common definition of value.

Interestingly enough, a focus on value does not come naturally for public entities, although a movement in that direction is noticeable (Stoker, 2006). Many governmental infrastructure projects are developed in a siloed approach with a restricted view on related issues, which are valued by other stakeholders (Bateman, 2009). Auxiliary values are covered by the obliged compensatory and mitigative measures. This raises a few questions. First of all it is not clear why agencies are not actively pursuing solutions, which are considered to be more valuable for a broader group of stakeholders, perhaps including the agency itself. In other words; opportunities to be more efficient are not seized. Secondly, in the cases where additional gains beyond a singular goal were employed and captured, the question can be posed: what circumstances led to this behaviour leading to more efficient outcomes?

These questions address the problem of infrastructure development, which often leads to highly specialized structures but with a wide range of externalities, which are not traded off in a multi-stakeholder setting. Public agencies are often bound to deliver projects within the legal context, achieving a pre-agreed level of service for the minimum cost. This leads to the paradox that the agency, as a public body, is striving for delivering a specific service in order to reduce inefficiencies for society, but at the same time this specific service obstructs the process of achieving efficiency in a broader sense.

The above-mentioned situation could be characterized as a classical economic problem. The opportunities for public agencies to create value are not that different from options available to the private sector. Firms tend to pursue the best value proposition they can, minimizing the cost relative to the products sold or services delivered. Transaction costs are at the heart of this calculation (Coase, 1937; Williamson, 1979, 1981, 1998). Transaction costs are defined as costs, which result from a transaction itself and describe the sacrifices for a party in relation to the transaction activities. Or in other words, transactions cost focuses on the resistances and frictions necessary for a transaction to take place. Through this lens in- or outsource dilemma's can be analysed. Expanding the framework with transaction benefits broadens the analytical value towards cooperative strategies (Blomqvist 2002).

This paper focuses on the realization of value for infrastructure projects, seen through the lens of transaction cost and transaction benefits. However, further insight and clarification, and subsequent operationalization of

such a framework for the infrastructure sector could help to analyse smart strategies to address the challenges that lie ahead. Evidently, the design of the physical product should find its proper place in this framework, as it is the physical object, and its use, that delivers value and externalities. The transaction cost and transaction benefit framework is applied on two case studies to explore the explanatory character when applied to waterway redevelopment. In the following section the methodology will be described in further detail. Section 3 will describe the theoretical background. In section 4 the application of the framework in two case studies is shown and the results are described in section 5. Discussion and conclusions follow in section 6.

2 Material and Methods

Transaction cost theory assumes the presence of markets and free choice. The domain of public policy delivery is different, requiring the approach to be tailored to this sector and to keep a keen eye on the limitations (Alexander, 1992). On the basis of theory on value creation for firms, using a transaction cost and transaction benefit framework, the relevant elements for developing infrastructure in a multi-party setting are used to set up a tailor-made framework for this sector. This framework is then analysed from the perspective of the derived characteristics of public agencies compared to firms to identify the validity and limitations of the application of such a framework in the sector of infrastructure development. This leads to a framework similar to the framework of firm behaviour in creating value through its governance structure and product development related to that, but with the addition of the role of the design of the infrastructure in delivering value, and with the restrictions of free choice for the involved public entities.

The above-mentioned framework is tested by applying it to two empirical case studies in the sector of waterway development. Amongst the different infrastructure sectors, waterways are particularly illustrative here for three reasons: First, water is a medium, which relates to many societal values, functions and interests. The potential for value creation by making smart combinations, functionally and institutionally, is therefore relatively large compared to other infrastructure settings. Second, in many countries institutions governing water have a narrowly defined assignment, which creates a tension between this assignment and the potential societal economic value of the water. Efforts to employ the diversity of values by applying an Integrated Water Resources Management approach remain troublesome (Biswas, 2004). And third, waterways are widely regarded as a common good which indeed should be managed taking the 'greater good' into account, meaning socio-economic value creation should be a goal (Global Water Partnership, 2005; UN Water and Global Water Partnership, 2007; Ward, 2009).

Selection of the case studies was based on four criteria:

1. Maturity of the projects. Both projects selected have gone through the entire approval process and are being implemented, or are approved for implementation. This condition was set to make the distinction between ideas and plans which are very successful in creating value on paper but which

somehow never made it to implementation, and the projects, which can be considered the 'proof of the pudding'.

2. The project had to be located in areas with intensive multiple land use, having significant potential for cooperation and value creation. Settings in which multiple parties have multiple interests meet this condition. This condition was set in order to be able to analyse the value creating capabilities of the organizations involved.
3. The projects had to be of a size that ensures significant attention by stakeholders. Otherwise a project could be implemented as a 'routine' operation without much thought about alternatives. Projects above a \$100 million have been selected to avoid any concerns about this condition.
4. The projects had to be in the field of navigation. Such projects typically serve economic purposes, creating an opening for bringing other beneficial interests into the decision making process. The tradition of a siloed approach by waterway authorities provided situations where there is room for broad optimization.

Based on these criteria, two case studies were selected which represent two distinct situations common in western countries where redevelopment of waterways play a role: an urban waterway and an industrial waterway respectively, represented by the Miami River and the New Orleans Inner Harbor Navigation Canal. The Miami River restoration project, about to reach completion, addressed interests like navigation, ecology, recreation, waterfront development, stormwater improvement, cultural heritage and more. Total investment exceeds \$ 200 million and come from multiple sources. The waterway is an important link for the seagoing vessels serving the many islands in the region. For the New Orleans Inner Harbor Navigation Canal, a project for enlargement of the canal and its navigation lock is planned. The project has been approved and is under preparation. The total project costs are estimated at around \$ 1.2 billion. The project combines two purposes of two organizations; inland navigation for the US corps of engineers and deep draft shipping for the port authority. Due to its location within the flood prone area of New Orleans, it correlates to many other issues. The first case, the Miami river, shows a highly integrated approach, both in governance and in the product. The second one, the Inner Harbor Navigation Canal in New Orleans, shows a specialized approach, with a limited institutional interaction.

The case studies have been based on documents, website postings, local observations by the authors themselves, and through semi-structured interviews with several members of the project teams responsible for planning these projects. The interview questions were structured according to the framework of analysis (see appendix B). Per project, 5 to 8 officials were interviewed (appendix 1). The interview transcripts have been screened on remarks matching the theoretical framework elements. Documents, website postings and local observations have been used to cross check statements and remarks where possible. Generalized conclusions have been drawn on the basis of the results for each element of the framework.

3 Theory

3.1 A transaction costs and benefits perspective on optimization of governance structures

The roots of transaction cost theory lie in the domain of markets and free choice. Before discussing the relevance of this theory for optimization of governance structures in the domain of infrastructure development, we will consider the significance in its classic domain: the private domain. Ronald Coase asked himself the question why do firms exist (Coase, 1937)? This is a fundamental question as one could assume that if markets were the most efficient way of organization, there would be no use in founding a firm. Value could be created by the sole existence of transactions. However, firms are ubiquitous, and transaction costs are assumed to be the cause of this. Depending on multiple variables, within a firm a decision is made based on whether it is more valuable to include an activity within the firm's own boundaries, a hierarchy, or to get this delivered by the market. In this sense, firms economize on the set of internal cost, transaction cost, and cost coming from market purchases.

Williamson extended this framework by including types of organization which are neither firms nor markets (Williamson, 1979, 1981). These can be joint ventures, alliances, co-operations, third party arbitrated contracted relations etc. Again, in choosing the most beneficial form of organization, the transaction costs seem to be a determining factor. These intermediate forms in the spectrum ranging between markets and hierarchies can be beneficial for different kinds of reasons, but share the common value that these cooperative arrangements are perceived as beneficial for both parties as otherwise there would be no rationale for continuing them. In other words: increasing the value proposition from the organizational perspective can be achieved by choosing the most efficient form in the spectrum between markets and hierarchical organizations.

However, a focus on minimizing transaction costs alone might be deceiving if one pursues maximizing the value proposition. As Zajac and Olsen argued:

'...when the pursuit of transactional value necessitates higher transaction costs, and expected joint gains outweigh transaction cost considerations (both criteria, it is argued here, are commonly met for arrangements such as joint ventures), inter organizational strategies having greater joint value will typically require the use of less efficient (from a transaction cost perspective) governance structures.' (Zajac & Olsen, 1993).

Zajac and Olsen argued that for revealing value, one should not only focus on minimizing the transaction cost for a single firm, but rather take into account the maximization of co-operative joint gains of the

transaction as well. The general argument is that transaction cost theory takes a single-firm perspective on minimizing transaction cost in deciding between the market or hierarchy. If this would lead to vertical integration of one firm incorporating the activities of a second firm, the transaction cost of the second firm would not be considered. Following similar reasoning the second firm could just as well incorporate the activities of the first firm when trying to minimize its own transaction cost. If both firms would decide to cooperate by creating a joint venture, transaction costs could be reduced as well, however, it would become quite problematic how a transaction cost minimization approach of such a case would have to be performed. Would this be the transaction cost of the first firm, the second one or a combination of both? On the latter case this would be a fundamentally different way of treating these costs compared to hierarchy or market decisions. In short, one could state that a focus on efficient operations could lead to the neglect of more valuable propositions for which a certain degree of inefficiency needs to be tolerated.

The above means the crucial transactional issue for an inter-organizational strategy is more than just the single firm's transaction cost optimization process; it has to include the benefits of the cooperation as well (Blomqvist, 2002; Zajac & Olsen, 1993). This might lead to a situation where certain arrangements are preferable due to high pay-offs to both parties in terms of benefits, while transaction costs are not necessarily at a minimum for either party. Nevertheless, in a rational valuation, each individual firm will join the cooperation only on the condition that the surplus of benefits flowing back will outweigh the extra transaction costs of the proposed cooperative strategy. The analysis of multiple organizations cooperating should therefore include the creating and claiming of value in the relationship between those partners.

3.2 Application of the transaction cost and transaction value model to infrastructure development

If we take a closer look at public agencies responsible for infrastructure, we find that delivery of these physical assets is one of their primary tasks. The performance of the agency is in fact closely related to, and to a large extent determined by, these assets. In its most straightforward form, the agency has a highly specialized focus, the project organization resembles a hierarchy, and costs are covered by a single funding source. However, in contemporary planning of new, or renewal of, infrastructure, many different models for development can be chosen from to fulfil the agencies' task. It may seem advantageous to find a public or private partner for a project, to outsource design activities, to in-source others, or to contract out multiple stages of the project. These choices greatly influence the outline of the physical product to be delivered. For example; a hierarchical type of organization by the agency itself will almost inevitably lead to a specialization within the limits of the agencies' assignment. A navigation authority tasked with renovating the embankments of a canal would be driven towards least-cost solutions serving the purpose of safe and efficient shipping only, for instance new sheet-piling. If the same agency were in a partnership, this could for instance lead to ecologically optimized embankments, development of recreational opportunities or waterfront developments by real estate developers.

Ultimately, Pareto efficiency can only be achieved if the broad set of stakeholder issues is included in the process. For infrastructure development, this would logically lead to a diversified cost recovery scheme, as generally no single source of funding would be willing to pay for benefits enjoyed by each and all of the individual stakeholders. In other words; a higher degree of project integration can lead to a multitude of beneficiaries willing to compensate others. Considering the significance of the physical assets themselves in many of the tradeoffs between stakeholders, it is argued here that the design of these cannot be left out of the analysis of value creation. On the contrary, the value creation in the design and development of infrastructure has received considerable attention in the engineering disciplines since value engineering was introduced in the 1960s (Miles, 1961). Other concepts followed, such as probabilistic approaches, scenario planning, adaptive management, and real options strategies (Scholtes and Neufville, 2011). Taking into account the significance of the assets itself, a simplified model for development could be described as follows:

An organization develops a product and delivers it to the public.

This model has three distinct elements: (1) the organization, (2) the development of a product, and (3) capturing or claiming the value of this product. It is in fact a closed loop in which value is created and, directly or indirectly, flows back into the organization. It takes an organization to develop a product, and the product is the focal point of value creation and the vehicle to convey value to society. In return, society will fund the organization, either directly or indirectly. In order to economically optimize, all three elements should be taken into account. Deployment of resources should be kept to a minimum while the maximum of returns should be achieved. Considering the fact that value can come from smart design strategies and smart intra-organizational strategies, and appreciation of value comes from the ability to capture it, all three should be thought of when maximizing value. In fact, the relationships between these are determining factors. In figure 1, a schematization of infrastructure development is given through a singular organization with a specialized focus, and through a joint organizational structure. The joint form can only be realized if both, or even multiple parties, will all benefit (Axelrod & Hamilton, 1981). The attractiveness of this co-operation is determined by the transaction costs and transaction benefits. Both are influenced by, and themselves influence, the design and valued aspects of the product, the infrastructure project. The product itself and the relation between the parties determine the way value is captured for each individual organization. Below, the three steps of the model are described in more detail.

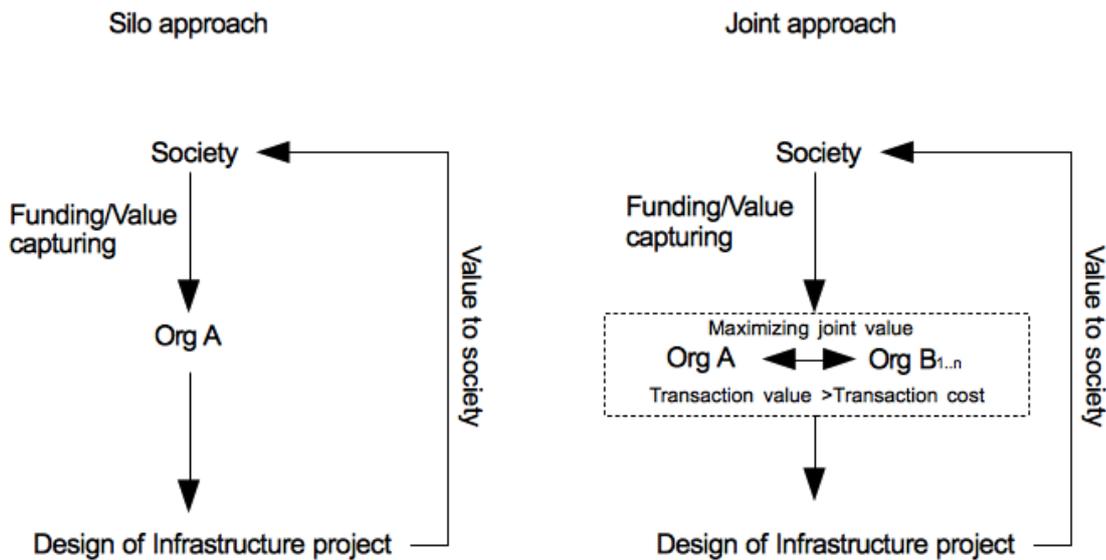


Figure 1: Value realization in siloed and joint approach

Step 1: Organization

The inter-organizational links between Org. A and B can take several forms depending on the governance structure chosen. In principle the forms could range from a straight market purchase, to full integration of both; a hierarchy (Alexander, 2001; Williamson, 1999). In the practise of development of infrastructure, projects are not bought from the shelves, neither are these projects developed without contracting or collaboration of some sort. The unique nature of the projects and the long term relationship required for development often lead to ‘in between’ variants of governance; hybrids. One step deeper, these hybrids can be described by the degree of inter-organizational integration. The integration can be based on sharing of capacities, data, facilities, financing or risks, or a combination of these. This integration could either be formal or informal. The organizations taking part in this cooperation can be either public or private.

Organization A may have the ability to do the project on its own, according to its assignment, and making use of legislation empowering it to do so, but a cooperative strategy may seem appealing. However, if this cooperation requests the spending of valuable internal resources, or if it means increased risk or uncertainty, the organization may shy away. So, organization A will make a trade-off between the aspects of the cooperation, which it deems favourable, and the aspects, which could be unfavourable to its position.

Insight into the unfavourable aspects, i.e. transaction costs, in the field of land planning has been offered by Alexander (2001) reflecting on the three dimensional nature of transaction costs; interdependency, uncertainty and timing. Various publications of further operationalization have come forward on this basis (Buitelaar, 2004; Paavola, Adger, 2005; Widmark et al, 2013). In the field of project development related to capital projects the costs can be broken down into the following elements:

Transaction costs

- Exploring and evaluation cooperative options
- Preparing, crafting, negotiating an agreement
- Inter-agency coordination: local representation, preparing and attending meetings, communicating
- Intra-agency coordination: communicating, administrating, and addressing partnership issues internally
- Education and training related to the cooperation
- Monitoring interagency issues
- Transaction enforcement (e.g. dispute resolution, litigation, financial hostage)
- Activities to build trust

The above mentioned elements all refer to actual costs, but there might be 'resistances' which do not translate to costs but certainly add to the balance. This might be the case when collaboration leads to the perception of higher risks, uncertainty or complexity without having any tools to counter these effects.

Inversely, the transaction benefits could be drawn from the field of negotiation theory (Lax, 1986; Raiffa, 1982). These can be considered to be very general, but no framework including transaction value has been applied to the specifics of the infrastructure sector yet in literature. Tailored definitions are therefore lacking. However, for the communication industry, where products and cooperation are equally important, Blomqvist (2002) described applicable elements which create benefits in transactions, and which can be used here.

Transaction Benefits

- Joint assets value surplus. This is the case when the joint use of (complementary) assets generate more value than when used separately.
- Joint surplus of complementary skills, routines and capabilities. Joint surplus comes from the melting of these instead of isolated deployment.
- Cooperative use of asset x increasing pay-off generated through asset y.
- Economies of scope. This is based on cost advantages which come forward through the integration of various elements or subsequent steps of a project and stimulates tighter vertical integration.
- Economies of scale. When cost advantages or learning effects can be found through scale effects this would drive horizontal integration.
- Level of trust. Mutual trust eliminates the fear for opportunistic behaviour, the source of transaction cost. Therefore trust paves the way to capture the above-mentioned benefits and reduces the costs

related to cooperation.

The elements mentioned above can be used as the basis for an analytical framework for the infrastructure sector to analyze value creation in (re)development projects.

Step 2: Product design

The second step in the process model is the development of a product. Although the model defines the organization as a body which creates a product, in reality these two will interact. This interaction can affect the effectiveness of solutions, the spectrum of functionalities included, or the perceived value of the product. Product development can take place within the organization itself, or can be (partly) outsourced, altering the governance structure. Here, the fundamental difference between a public agency and a firm is that, once again, the agency can only direct its resources to the functionalities, which fall within its - often narrowly-defined assignment. Making arrangements for future alternative uses, or making use of the wide range of societal functions and related interests of waterways, will not be beneficial for the agency unless some of the value can be claimed through an agreement with another party. Outsourcing design, construction and operation, and perhaps even funding, could ease this limitation and open up new opportunities to create value. PPP projects are an example of such efforts. Such arrangements influence the physical and functional design of the project. The projected Seine-Escout canal, a PPP project of 70 km new canal from Paris to the Belgium Border, includes the development of industrial zones along the canal. Such an activity is beyond the tasks of the national waterway authority, but for the private consortium responsible for development, these zones are important elements to focus on. For waterways in general, functionalities can be very diverse; in addition to navigation one might think of flood protection, hydropower, irrigation, drainage, recreation and ecological services.

The earlier mentioned perceived value of the product is also often referred to as 'esteem value' (Miles, 1961). The aesthetics of infrastructure is a way to increase this type of value. Architecture and attractive landscaping can add to this, just as well as camouflaging, or making assets invisible (tunnels, underground assets) can improve the value by reducing its downsides. Assets can also carry symbolic value. This could add to the value of the asset itself, or to other entities in which the asset is embedded. The famously elegant and high Millau bridge in France certainly carries more value than its functionality alone. The enlargement of the Panama Canal puts Panama on the map for investments in a broad sense and is often seen as a symbol of progress of the nation.

Apart from the functionality and physical or spatial aspects of the design, the dimension of time is a second determining factor. The design determines the distribution of costs and benefits in time through the stages of construction, operation and demolition. Large-scale construction works are not easy to adapt later on, and the

upfront capital cost for construction often far outweighs the operational cost expressed in terms of net present value. In the design phase, most of the other costs down the road will be determined, so this is a critical phase when it comes to creating value for a project. Accurate predictions of future developments allow for sharp optimization of the design, increasing the efficiency of the solution. High sunken costs in inflexible designs are, however, vulnerable for changes in circumstances. If uncertainty of future developments plays a significant role, incorporating flexibility into the design could enable the parties to reduce risks and capture upward potential if possible (Scholtes, 2010). But if uncertainty of future developments becomes considerable, it might even be more effective to invest as little as possible, and address the urgent needs only. In this way the risk for ineffectiveness of a chosen design is reduced (Pahl-Wostl, 2006). Specifically for infrastructure development these considerations play a significant role. The technical lifetime of assets often exceeds 50 years, and choice of locations or alignments create a web of linked interests, which can make it almost impossible to ever change this. Examples are alignments of railroads and highways or the location of weirs and dams. Selecting one option automatically implies that many future options are excluded.

Step 3: Claiming and capturing value

The creation of value, either by smart governance structures or by design methodologies or choices, is only of use for a contributing organization if this value can be claimed or captured. In some ways this might be very indirect, as an agency might receive funding to develop a certain piece of infrastructure, which was mandated through a political process. Such a project might even be considered as non-beneficial in itself, as is often the case with public projects. However, improving the value of such a project should deliver benefits to its initiator, as otherwise there would be no incentive to do so.

From the organizational point of view, ultimately, three basic categories can be defined in which value can be captured to the benefit of this same organisation. This is either through reduced spending, increased returns, or an improved strategic position. A further division can be made on the basis of the elements in step 1 and 2, providing the following breakdown;

- (a) *reduced cost/risk*
- (b) *cost/risk sharing*
- (c) *increased return flows*
- (d) *additional return flows*
- (e) *strategic benefits (reputation, skills, knowledge, access to new opportunities)*

Claiming or capturing can come 'naturally' by the effects of the infrastructure itself, or results from the arrangement between the participating organizations. In the silo approach the value could e.g. be captured by general taxes, special taxes (ship fuel tax), tolls, shadow tolls, leases etc. In a joint approach, the value might

come from society, or equally likely from the partnering organization. If, e.g, renewal of canal embankments can be combined with a waterfront development project envisaged by one of the towns along the canal, the opportunity of cost sharing may arise. And if another town were interested in having the embankments renewed for a side canal under their own authority, it may be interested in joining the project and hence generate economies of scale. But in the end, the agency intending to renew the canal embankments will have to be convinced that the benefits of such a transaction outweigh the increased complexity of the contract, the extra internal resources required, additional risks etc. To illustrate the potential complexity in this example; issues which are commonly linked to navigable waterways, which can therefore be used in the context of value creation, are flood protection, hydropower, ecosystem services, water storage, drainage, recreation, aesthetic/landscape values, cooling water, irrigation, sand and gravel mining, defence purposes, social cohesion, cultural heritage and others. Capturing value related to recreation or aesthetic values will be much easier for a municipality than for a navigation authority.

3.3 Differences and limitations of a transaction cost and transaction benefits optimization when public agencies are part of the structure.

In many aspects, governments and their institutions can be considered different from private sector organizations and institutions. If we consider public agencies responsible for developing infrastructure in western countries, most of these fit the contemporary paradigm of New Public Management. Typically, these organizations can be characterized as agencies focussing on the efficient delivery of services and products to the public. Kelly and Muers (Kelly & Muers, 2002) described the characteristics of these agencies as shown in table 1.

Table 1: Characteristics of New Public Management (Kelly & Muers, 2002)

Key objectives	Managing inputs and outputs in a way that ensures economy and responsiveness to consumers
Role of managers	To help define and meet agreed performance targets
Definition of public interest	Aggregation of individual preferences, captured in practice by senior politicians or managers supported by evidence about consumer choice
Approach to public service ethos	Sceptical of public sector ethos (leads to inefficiency and empire building); favours customer service.
Preferred system of delivery	Private sector or tightly defined arms-length public agency
Contribution to the democratic process	Delivers objectives: Limited to setting objectives and checking performance, leaving managers to determine the means.

Although some characteristics are typical of governments, many organizational features have become similar to market structures. These agencies strive to maximize their output deploying a minimum amount of

resources. This is very similar to the way companies behave. Essentially, both types of organizations strive for maximizing their value proposition.

The scope of an organization is determined differently for public organizations than for private ones. A private organization has fewer restrictions in changing its scope than public organizations do. Within a firm, management can decide to change, expand or narrow its scope to increase the creation of value. Public organizations, however, have an obligation to provide certain services, and are limited in changing, expanding or narrowing its scope. This does not mean public organizations do not have any flexibility at all to seize opportunities related to their own objectives. For many objectives cooperation with other organizations is to be sought. These partners can be either public or private parties. The joint scope of these organizations can be used to capture value, which is otherwise not within reach. The metrics for optimizing could be different for a public agency compared to a firm, as would its set of parameters expressing success. But fundamentally, there appears to be no reason why a public agency should not be economizing using its possibilities while still respecting its limitations.

In the context of this study the question is how this would play out for a public agency in infrastructure development. If the perspective of such an agency would be the creation of maximum value for the public in general, a less efficient governance structure could be regarded as acceptable, from a transaction cost perspective. But if the agency would focus solely on limiting its internal costs, for instance due to political pressure, value maximization through partnerships would be less attractive.

The theoretical considerations above need further operationalization in order to be able to gather information and analyse case studies. The steps of a waterway authority seeking a value-creating strategy for (re)developing a waterway may be seen as described in section 3.2. The organization can seek an arrangement with other stakeholders, develop the product and try to capture the value of it. The steps taken in this process should give each partner a perspective of increased gains compared to their Best Alternative To Negotiated Agreement (BATNA). Table 2 shows the operationalization of such a framework.

Table 2: Operationalization characteristics of value creation for infrastructure.

	<i>Organization A Market type</i>	<i>Organization B, Governmental agency type</i>
<i>Institutional setting</i>		
<i>Description of interests</i>	The formal interest of A for which the partnership is supposed to be beneficial. Interests can be e.g.: profit, continuity, visibility, strategic.	The formal interest of B for which the partnership is supposed to be beneficial. Interests can be e.g.: fulfilling assignment, continuity, strategic, political or power gain.
<i>Description of form of governance.</i>	The inter-organizational structure with regard to the project	

	undertaken This could be formal or informal.	
<i>Interlinkages addressed</i>	The interlinkages between the partners reflecting the degree of inter-organizational integration. The integration can be based on sharing of capacities, data, facilities, financing and risks or a combination of these. A myriad of combinations is found in practice and literature.	
Step 1: The organization		
<i>Transaction Costs relate to:</i> (a) <i>Exploring cooperative options</i> (b) <i>Preparing agreement</i> (c) <i>Inter-agency coordination</i> (d) <i>Intra-agency coordination</i> (e) <i>Education and Training</i> (f) <i>Monitoring interagency delivery/efforts</i> (g) <i>Transaction enforcement</i> (h) <i>Activities to build trust</i>	The investments A has to make, or drawbacks it has to accept specifically correlated to the transactions with others. Examples of costs; human resources to prepare bid-documents, local office/representation, hiring legal support, bank guaranties.	The investments B has to make, or drawbacks it has to accept specifically correlated to the transaction with others. Examples of costs: manhours to manage complex contracting, administrative activities for payments, verification of progress and quality in the works.
<i>Transaction Benefits relate to:</i> (a) <i>joint assets value surplus,</i> (b) <i>complementary skills, routines, capabilities,</i> (c) <i>payoff x increased by y,</i> (d) <i>economies of scope,</i> (e) <i>economies of scale,</i> (f) <i>level of trust</i>	The benefits A expects to get in return by teaming up with others. Examples are: delivering expertise (b), sharing mobilization cost of equipment with nearby projects (e), build track record for major clients (f), improved revenues on real estate development.	The benefits B expects to get in return by teaming up with others. Examples are; linking networks (a), high expertise and efficiency in works by experienced or specialized partner (b), increased tax revenues (c), combine projects with earth shortage and earth excess (d).
Step 2: The design of infrastructure		
<i>Value creation through design relates to:</i> (a) <i>functional effectiveness of the design</i> (b) <i>spectrum of functions included</i> (c) <i>esteem value: design aesthetics</i> (d) <i>esteem value: symbolic value</i> (e) <i>value in time: life cycle cost optimization</i> (f) <i>value in time: build-in flexibility (preparing for uncertainties)</i> (g) <i>value in time: adaptive, step by step, approach</i>	The way value is employed or increased through its physical, functional and esteem value aspects and the choices made to optimize value during the lifetime of the works. Examples are an integrated design, asset management, embedding possibilities for adaptation, monitoring efforts to adjust plans.	
Step 3: Value capturing		
<i>Value to society</i>	General value which is created by the joint effort	
<i>Value capturing relates to:</i> (a) <i>reduced cost/risk</i> (b) <i>cost/risk sharing</i> (c) <i>increased return flows</i> (d) <i>additional return flows</i> (e) <i>strategic benefits (reputation, skills, access to new opportunities)</i>	Elements of the created value which are directly beneficial for A, tangible or intangible. Capturing can take place through new cost reduction opportunities through partner choice, shifting cost to the partner, increased or new income streams, or a better (market) position of the organization in general	Elements of the created value which are directly beneficial for B, tangible or intangible. Capturing can take place through new cost reduction opportunities through partner choice, shifting cost to the partner, increased tax/toll revenue, new income streams, or a better (political/power) position of the organization in general.
Verification of beneficial character of cooperation: $TB > TC$?		
<i>BATNA (no cooperation between any of the parties)</i>	The Best Alternative To a Negotiated Agreement is the	The Best Alternative To a Negotiated Agreement is the

	verification of value creation in the partnership. The transaction benefits should outweigh the transaction costs in order to create value on top of the general profits in case the project (or a part of it) was done without others.	verification of value creation in the partnership. The transaction benefits should outweigh the transaction costs in order to create value on top of the general profits in case the project (or a part of it) was done without others.
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In the following section the framework as described is used for the analysis of two case studies; the Miami River and the New Orleans Inner Harbor Navigation Canal. These cases happen to be dominated by public entities, the ‘market type’ organizations as described in the framework are therefore not reflected in these cases.

4 Case Studies

4.1 Case study Miami River

The Miami River runs through the highly urbanized area of Miami, Florida. The stretch of the river of interest to this case study is its first 5.5 miles, which are navigable for seagoing ships. This stretch can be described as a canalized river, straightened and with artificial embankments (figure 2). The river’s discharge is very low, to zero. The inflow of water comes from the Everglades, and eventually the river flows into Biscayne Bay. This bay is located between the Miami Beach peninsula and mainland Miami and has an open connection to the Atlantic Ocean. The bay is also part of the Intracoastal Waterway route. The Miami River has several port facilities along its embankments. The main port business is dedicated to trade with Caribbean islands and super yacht maintenance. In the 80s and 90s of the 20th century, the river was neglected. It was polluted, navigation depth was reduced by sedimentation, it gathered derelict vessels and the neighbourhoods along the river were deprived. During the 1990s the river’s condition became part of the public debate, primarily due to pollution and the loss of functionality for commercial shipping. Around 32 agencies had some kind of authority over one or more aspects of the river, which made the situation institutionally highly complicated.

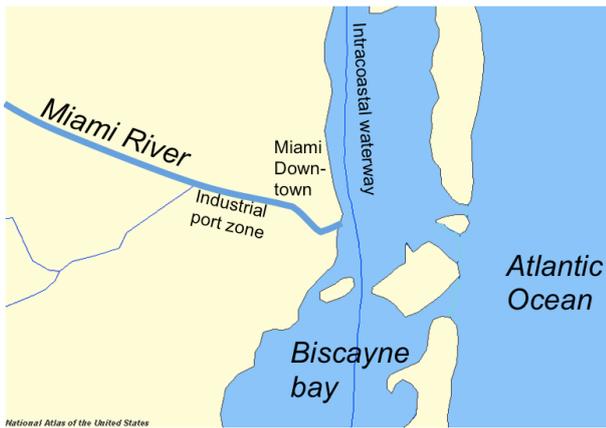


Figure 2: Miami River

The most pressing and costly question was the one of dredging the river. The City of Miami was, in fact, the authority for the Miami river port and had a direct interest. However, the river was just one of many urban issues the city had to deal with. The Florida Inland Water District, closely cooperating with the US Corps of Engineers was responsible for maintaining the intracoastal waterway in the Biscayne Bay, and these organizations were confronted with fast inclining dredging costs as sediments in the Bay became contaminated by the Miami River outflow. Eliminating the source of pollution was considered far more efficient than continually coping with the dispersed contamination throughout the bay. The public increased the pressure to act on the situation as Biscayne Bay, unlike the Miami River, is considered one of the region's most valuable assets. The State of Florida added extra pressure, being of the opinion that a river should add to the attractiveness of a city and a region, as is the case in many cities around the world. Yet the complexity was not easily resolved.

Proposals for a port authority were introduced in 1996 and 1997 in the Florida legislative sessions. However, these proposals met substantial resistance from local interest groups, businesses, residents and the City of Miami Commission. The controversy concerned the lack of local representation. To address these issues the State Legislature took initiative by creating the Miami River Coordination Commission (MRCC) through Specific Appropriation 1196. This committee facilitated the debate by conducting a study based on input from all affected parties. The MRCC concluded that river related issues would not be advanced by an authority, however, it did recommend that a study should be conducted to the appropriate type of entity required to address the wide array of issues related to the river. A 14-member study commission (MRSC) was appointed in 1997, its members represented public and private sector interest groups. In 1998 the MRSC presented its conclusions and recommendations; the problems can be solved, the payoffs can be enormous, but absolute commitment and cooperation is required. Furthermore they proposed to establish a permanent Miami River Commission (MRC). In 1998 the State creates the MRC, which became the official coordinating platform responsible for the redevelopment of the Miami River. The MRC is the official coordinating clearinghouse for all public policy and projects related to the Miami River and it acts as the

principal advocate and watchdog to ensure that river projects are funded and implemented in a proper and timely manner. The commission may seek and receive funding to further its coordinating functions regarding river improvement projects of the commission. Regulatory authority and responsibility remained as it exists with city, county, state and federal government. The MRC will use powers of persuasion to achieve its objectives through the process of building a consensus work plan. After 12 years of acting on this basis, the MRC is widely acknowledged for its accomplishments. The river has been dredged, pollution is tremendously reduced, a river walk along the water has been partly established, and the river has become a recreational destination and a place attracting commercial and residential investments.

Table 3 shows the results of applying the previously described value model to the three most influential cooperation partners. The partnership included several other parties, which played a less significant role.

Table 3: value creation in the Miami River Project

	<i>Downtown Development Authority (agency of City of Miami)</i>	<i>Florida Inland Navigation District</i>	<i>City of Miami</i>
<i>Institutional setting</i>			
<i>Description of interests</i>	Improve local economy, create jobs, increase tax base, improve 'liveability', traffic circulation all related to highly urbanized area at the river mouth.	Act as a "local sponsor" of the Atlantic Intracoastal Waterway project.	Improve local economy, create jobs, increase tax base, improve 'liveability', traffic circulation with a focus on the mixed urban industrial and industrial zone.
<i>Description of form of governance</i>	The MRC is the linkage between all river related interest groups. It has to unite all governmental agencies, businesses, and residents in the area to speak with one voice on river issues. The commission may seek and receive funding to support its coordinating functions regarding river improvement projects of the commission. Regulatory authority and responsibility will remain as it exists with city, county, state and federal government. The Miami River Commission will use powers of persuasion to achieve its objectives through the process of building a consensus work plan. The MRC does have a three-tiered structure: (1) a policy committee consisting of elected officials, stakeholders and citizens as listed below, (2) a Managing Director who has the responsibility to implement plans and programs, and (3) a working group consisting of all governmental agencies that have jurisdiction in the river area, as well as representatives from business and civic associations.		
<i>Interlinkages addressed</i>	The interlinkages are concentrated around sharing financing, data, risks and capacities.		
<i>Step 1: The organization</i>			
<i>Transaction Cost relate to:</i> (a) <i>Exploring cooperative options</i> (b) <i>Preparing agreement</i> (c) <i>Inter-agency coordination</i> (d) <i>Intra-agency coordination</i> (e) <i>Monitoring interagency</i>	Bring DDA objectives into the agreement (b) Attending meetings of the MRC (c). Dispute resolution with partners about access	Evaluating whether it is more profitable to join the river collaborative than to focus on its primary task: the intracoastal canal (a), attending meetings of the MRC (c), Monitoring effects	Evaluating why a focus on the river in a collaboration is a better option than other city development possibilities (a). The efforts of the Miami River Study group (a). Dispute

<p><i>delivery/efforts</i></p> <p>(f) <i>Transaction enforcement</i></p> <p>(g) <i>Activities to build trust</i></p>	<p>to waterfront and bridge-opening disrupting downtown traffic (f). Joint boat trips on the river (g).</p>	<p>for the intracoastal canal (e). Joint boat trips on the river (g).</p>	<p>resolution and litigation with partners about magnitude of marine activities in the total balance of the project (f). Joint boat trips on the river (g).</p>
<p><i>Transaction Benefits</i></p> <p><i>Relate to:</i></p> <p>(a) <i>joint assets value surplus,</i></p> <p>(b) <i>complementary skills, routines, capabilities,</i></p> <p>(c) <i>payoff x increased by y,</i></p> <p>(d) <i>economies of scope</i></p> <p>(e) <i>economies of scale,</i></p> <p>(f) <i>level of trust</i></p>	<p>Progress on several goals where no resources were available for (=e). Dredging and water-quality issues are specialties of other participants (=b) Cooperating with other representatives on long term on a regular basis improved mutual trust (=f)</p>	<p>Improving the navigability of the river improves the quality of the navigation system as a whole (a) Co-operating on dredging the river would be far more effective in reducing contamination of sediments in Intracoastal waterways than dredging this waterway itself (c) Cooperating with other representatives on long term on a regular basis improved mutual trust (=f)</p>	<p>Progress on several goals where no resources were available for (=e). Dredging and water-quality issues are specialties of other participants (=b) Cooperating with other representatives on long term on a regular basis improved mutual trust (=f)</p>
<p>Step 2: The design of infrastructure</p>			
<p><i>Value creation through design</i></p> <p>(a) <i>functional effectiveness of the design</i></p> <p>(b) <i>spectrum of functions included</i></p> <p>(c) <i>esteem value: design aesthetics</i></p> <p>(d) <i>esteem value: symbolic value</i></p> <p>(e) <i>value in time: life cycle cost optimization.</i></p> <p>(f) <i>value in time: build-in flexibility (preparing for uncertainties)</i></p> <p>(g) <i>value in time: adaptive, step by step, approach</i></p>	<p>Broad participatory design approach. Urban Infill plan as main design product. Relevant elements, emergence of a river walk (c), revealing and showing historic areas and elements along the river. Pinpointing origin of the city of Miami along the riverbanks (d), recreational opportunities (b), small business development like restaurant along the river (b), public space design (c), stormwater management (a). Urban orientation towards the river (c). Some plots along the river were deliberately left open for future development (g). To remove contamination dredging from upstream to downstream was required, for navigation dredging from downstream to upstream is most profitable. The first prevailed delivering lowest overall cost, but delaying increased (navigation) revenues. An unanticipated delay of several years occurred as funds were redirected for emergency relief in the Katrina hit region. This delayed navigation revenues even further.</p>		
<p>Step 3: Value capturing</p>			
<p><i>Value to society</i></p>	<p>Aesthetics, jobs, health, improved recreational opportunities, safety, preserved cultural identity, ecological improvements, preserving trade hub function of the river port to islands.</p>		
<p><i>Value capturing relates to;</i></p> <p>(a) <i>reduced cost/risk</i></p> <p>(b) <i>cost/risk sharing</i></p> <p>(c) <i>increased return flows</i></p> <p>(d) <i>additional return flows</i></p> <p>(e) <i>strategic benefits (reputation, skills, access to new opportunities)</i></p>	<p>Tangible: Increase in tax base (c), Intangible: Appreciation by the public, consolidating position as an authority (e)</p>	<p>Tangible: Cost reduction of dredging program intra-coastal canal by eliminating contamination source (a), (b).</p>	<p>Tangible: improve local economy, create jobs, improve attractiveness of the city for residents and businesses resulting in enlarging the tax base (c), (e).</p>
<p>Verification of beneficial character of cooperation</p>			
<p><i>BATNA (no cooperation between any of the parties)</i></p>	<p><i>Initiate some minor improvements related to accessibility of the river and some aesthetic improvements.</i></p>	<p><i>Maintain status quo. Face the extra costs of continued inflow of polluted sediments in the ICW. Accept reduced use of the ICW due to shallow Miami river. Focus on other navigation projects.</i></p>	<p><i>Gradually lose port activities. Project elements outside the water can be performed on own authority, but with reduced payoff.</i></p>

4.2 Case Study of the Inner Harbor Navigation Canal in New Orleans

The Inner Harbor Navigation Canal (IHNC) is the official name of the 9 km canal connecting the Mississippi river to Lake Ponchartrain (see figure 3). The canal is often referred to as the Industrial Canal, and indeed serves the industry along its embankments. The Intracoastal Waterway bisects the canal and connects it to Lake Borgne. At the canal's south entrance, the Industrial Canal Lock provides a connection with the Mississippi River. The lock dates back to the 1920s and has become a bottleneck in the system both in terms of capacity and size. The pushing convoys sailing the Mississippi need to break down their convoys to get through. A larger lock could also serve a larger part of the world's ocean- going fleet in terms of size. This is particularly interesting, as the industry along the canal has direct access to a class I railway, a unique feature in the area. A class I railway connection allows competition between railway firms on those tracks which is a highly favourable situation for the industry along the canal. Most other ports in the region, which are connected to the railway system, either lack a deep draft facility, or lack competition on the railways for hinterland transport.



Figure 3: Inner Harbor Navigation Canal in New Orleans

The deal between the Corps and the Port is based on the concept that the Corps needs to improve the shallow draft shipping route, and the Port needs the deep draft ships to get access to the port zone. The agreement states that the Corps pays 50% of the costs for a shallow draft navigation lock, the other 50% will be supplied by the Inland Navigation Trust Fund, which is funded by a tax on barge fuel. The additional cost for upgrading the facility for deep draft vessels has to be paid for by the Port of New Orleans. So, the facility in fact combines two types of transport: inland navigation and deep see shipping, funded by multiple sources. Table 4 shows the results of applying the value creation framework for the New Orleans Inner Harbor Navigation project.

Table 4: value creation in the Inner Harbor Navigation Canal project.

	<i>US Corps or Engineers</i>	<i>Port of New Orleans</i>
<i>Institutional setting</i>		
<i>Description of formal interests</i>	Providing quality navigation routes for shallow draft shipping traffic	Having a reliable, large scale, non-congested access to the deep draft industrial zone creating greater more revenues and more opportunity for local economic development.
<i>Description of form of governance</i>	The project was authorized by an act in 1956 ¹ , cost sharing with the Port of New Orleans was arranged in the WRDA of 1986 ² . In 1991, the US House of Representatives, committee on Appropriations enacted the Energy and Water Appropriations Bill which directed the US Army Corps of Engineers, in conjunction with the local sponsor to develop a community impact mitigation plan to ensure that the communities adjacent to the project remain complete, liveable neighbourhoods during and after construction. The agreement was therefore based on cost sharing of the civil works, and a joint responsibility of the impact mitigation.	
<i>Interlinkages addressed</i>	The interlinkages concern sharing of financing and capacities.	
<i>Step 1: The organization</i>		
<i>Transaction Cost relate to:</i> (a) <i>Exploring cooperative options</i> (b) <i>Preparing agreement</i> (c) <i>Inter-agency coordination</i> (d) <i>Intra-agency coordination</i> (e) <i>Monitoring interagency delivery/efforts</i> (f) <i>Dispute resolution, litigation</i> (g) <i>Activities to build trust</i>	The partnership was natural; no other options were to be evaluated. Large cost and many linkages to the area were involved which required careful crafting of the agreement (b).	The partnership was natural; no other options were to be evaluated. Large cost and many linkages to the area were involved which required careful crafting of the agreement (b).
<i>Transaction Benefits Relate to:</i> (a) <i>joint assets value surplus,</i> (b) <i>complementary skills, routines, capabilities,</i> (c) <i>payoff x increased by y,</i> (d) <i>economies of scope</i> (e) <i>economies of scale,</i> (f) <i>level of trust</i>	Support and funding by the Port is mandatory for the Corps to proceed (b).	The linkage of deep draft facilities to a class I railway system is enforced (a), the corps knows about locks (b), the port does only have to pay for the additional cost for a deep draft lock (d) there is a long standing and mutual beneficial cooperation through many projects (f).
<i>Step 2: The design of infrastructure</i>		
<i>Value creation through design</i> (a) <i>functional effectiveness of the design</i> (b) <i>spectrum of functions included</i> (c) <i>esteem value: design aesthetics</i> (d) <i>esteem value: symbolic value</i> (e) <i>value in time: life cycle cost optimization.</i> (f) <i>value in time: build-in flexibility (preparing for uncertainties)</i> (g) <i>value in time: adaptive, step by</i>	The design options are mainly focusing on finding methods of construction, which have the least adverse impacts on the local communities (a). Off site construction is considered to avoid hindrance to shipping and neighbourhood. In addition a very rich compensatory program is set up to help local neighbourhoods still struggling with the aftermath of hurricane Katrina (b). A low-cost solution is an important goal (a). The symbolic (marketing) and functional value of having the deepest draft facilities of the Gulf coast with direct access to a class I railway system is an important value for the Port (a) and (d).	

¹ Public Law 84-455

² Water Resources Development Act, Public Law 99-662

<i>step, approach</i>		
Step 3: Value capturing		
<i>Value to society</i>	Cost savings shallow draft shipping, cost savings deep draft shipping, increased reliability. Local job creation, economic growth.	
<i>Value capturing;</i> <i>(a) reduced cost/risk</i> <i>(b) cost/risk sharing</i> <i>(c) increased return flows</i> <i>(d) additional return flows</i> <i>(e) strategic benefits (reputation, skills, access to new opportunities)</i>	Funding for the Corps comes from federal funds. No additional capturing in terms of cost or revenues takes place. However, involvement in such a big project on the core competence of the corps is important for its reputation (e)	Increased revenues from leases (c). The city is represented in the board of commissioners of the port and has a stake at increased tax base during construction for the city (c), an increased tax base for the city due to job creation (c). The costs for the project are being shared with the corps due to the duo function as a shallow and deep draft lock (b).
Verification of beneficial character of cooperation		
<i>BATNA (no cooperation between any of the parties)</i>	Status quo without new lock. Weak link continues to hinder performance of regional waterway network.	Status quo without new lock. Optimization of commercial interests will take place based on current lock dimensions.

5 Results

The two case studies described reflect two common situations for waterway (re)development: a problematic waterway in an urbanized setting and a waterway in an industrialized setting where economies of scale dictate performance. The results of the cases will be described according to the elements of the framework.

The formal interests of the individual parties are clear and easy to capture in the framework. A distinction is found between special interest organizations (US Corps of Engineers, Florida Inland Navigation District, Port of New Orleans) and the organizations focused on broad interests in a constrained area (Downtown Development Agency, City of Miami). For the latter type, the choices for optimization are much more flexible.

The form of governance in the Miami river case can be described as a public-public partnership. Coordination, funding and monitoring is a joint effort under the MRC umbrella, authorization, contracting and construction remained at the individual partners. From the MRC perspective the chosen form was described by one of the interviewees: *'I think people would say it would have been better we had regulatory authority, but then we would not have been there as there would have been too much resistance against that. That was not the reality. It is better they created the MRC without authority than not having the MRC at all. They would have to do it by intergovernmental coordination and you would assume they would communicate a lot, but they don't, they are busy with their own things, in their own offices.'*

In the New Orleans case the partnership was initially based on cost-sharing for the civil works needed to

improve navigation, but in a later stage this was expanded by joint responsibility of the mitigation measures. However, contracting, construction and monitoring remained at the Corps of engineers. This type of cooperation can be described as an intergovernmental agreement.

A commonly encountered obstacle for getting to a transaction was the assignment and commitment of man-hours related to a form of collaboration. This played a role for all entities. Especially in the smaller organizations with limited staff, like the DDA and FIND, the deployment of man-hours was carefully considered. A striking difference between the two cases, in terms of transaction cost, is found in the efforts to come to a form of cooperation. In the Miami case the accent was on exploring the options for a collaborative approach, while in the New Orleans case the partners could find each other almost blindfolded. However, due to the complex situation in the neighbourhoods around the New Orleans lock project, the crafting and negotiating of the agreement asked considerable attention there. A second interesting difference is the fact that the Miami agreement brought parties together for a single unique event, whilst in New Orleans cooperation was a *modus operandi* for successive projects undertaken jointly by both parties. The evidence revealed a high level of trust amongst the parties in New Orleans, in Miami this had to be built. It seemed that the Miami River Commission played an important role in bringing the parties together and building trust. The commission played a significant role in dispute resolution as well. All together both cases revealed to include a mechanism to keep transaction costs at low levels, for Miami the commission played this role, for New Orleans it was the trust build in the recurrence of joint projects in the region.

The transaction benefits are much less homogeneous. All elements of the framework are present in the studied cases. In the Miami case, parties seem to have found and valued each other through a variety of ways, and for a variety of reasons. Or in other words as stated by one of the interviewees: *'Both sides [environmental and navigation] have been able to view the benefits of the other side and be proud that one project can produce multiple benefits.'*

In the New Orleans case, the situation is more straightforward. The institutional set-up, funding resources and the local situation tie both parties together like a forced marriage. However, benefits of this collaboration are felt and valued by both parties. The long-term cooperation on a variety of projects has established a basis of trust between the two parties making it easier to use each other's qualities.

The infrastructure design had many aspects in the Miami Case; the New Orleans case was much more straightforward. In Miami, there was an overall design master plan, which was broken up into many elements. Some elements were designed by individual project developers and architects, others came from engineering firms focusing on the waterway itself, and in some cases areas were left undeveloped to allow for future developments. The overall design could therefore be described as a mixed process, involving various stakeholders and taking into account some degree of adaptation. This method allowed many

stakeholders to influence the value capturing opportunities of the design to some degree. The brochures and communications to the public showed that the river project represented a symbolic value as well. It is represented as the origin of the city and bringing back liveliness to the area and strengthening the community. Contextual, the New Orleans project can be considered very similar. Both are large waterway projects, bringing the infrastructure up to date, in a deprived urban/industrial environment. Nevertheless, the New Orleans case showed an entirely different way of translating value into the design. Two factors played a major role in the New Orleans approach. One was the enormous up-front cost and the desire to find a design minimizing these costs, the other was gaining support from local neighbourhoods and their representative institutions. Therefore, the design had to be optimized in such a way that the burden for the surrounding neighbourhoods was minimal, significant parts of the work could be carried out by local companies, and a broad set of compensatory elements was included. Adaptation or flexibility did not seem to play a role, minimizing construction cost was key.

In the Miami case, value was expected to be captured in a variety of ways, spread over a long period. This value was mostly expected to be captured indirectly. Value capturing was very obvious in the New Orleans case. Integrating two projects, a deep draft shipping solution and a shallow draft shipping solution, allowed for construction cost sharing. This made value capturing direct and tangible. For the Port of New Orleans, the project increased the value of their leases and generated second order effects for the community. These effects were important due to the city's stake in the port.

The verification of the beneficial character of the cooperation should logically indicate that cooperation in the two cases was indeed beneficial, as otherwise the cooperation would not have been logical. In the Miami River project, the cooperation seems to have created a valuable relationship for all three organizations. The design allowed them to capture values for their individual interests. The question arising from this case is the nature of the role of the Miami River Commission. It could be regarded as an additional party, but through the lens of this framework the commission presents itself as a broker searching for value in the relations. Perhaps even more importantly, the commission takes the lead in organizing monthly meetings during which the most pressing issues are discussed amongst the participating partners. The evidence indicates this is considered a low-threshold way for participants to stay involved and make sure their individual interests are served. So, the commission in fact appears to be a force in reducing transaction costs, making it attractive for partners to participate and make trade-offs happen.

For the New Orleans Inner Harbor Navigation Canal project, the development appears to be based on one functionality only: navigation. But when regarding the case in more detail, a significant distinction between shallow draft and deep draft navigation can be made. Although funded by different systems, cooperation appears to have a very high pay-off for the Port Authority. The benefits of such a transaction for the Corps of Engineers are less obvious, however, ignoring the interests of the port and focussing on shallow draft only

would certainly lead to high-level repercussions and damage to the Corps' reputation. No decision maker would be interested in taking that position and taking the burden. The design incorporates interests of both parties in a fully integrated and seamless way.

The similarities between these two cases lie in the fact that cooperation pays off, and trying to move forward on an individual basis is hard to imagine. In other words, the BATNAs have very low value. Transaction costs could cause thresholds for seeking cooperation or hold back the process. In Miami, the broker function of the MRC lowered these thresholds; in the New Orleans case cooperation between the port and the Corps has traditionally been beneficial due to the value capturing capabilities of both parties. The federal government raises funds from the shipping community through the Inland Navigation Trust Fund. These funds flow directly to the US Corps of Engineers for their navigation projects. Therefore it is highly beneficial for the port to cooperate with the Corps. Vice versa, the Corps needs to receive local co-funding to get approval for their projects. The long-standing relationship between both parties also lowered the thresholds for cooperation.

6 Conclusions and discussion

Waterways relate to many societal and economic functions and interests. Therefore, waterway projects offer opportunities for the creation of value by finding synergetic combinations of functions and cooperative strategies. Waterway authorities, however, often have a narrowly defined assignment, which may lead to a focus on specialization. This seems particularly true in the planning of major waterway projects. Revealing, employing and creating value in these projects could solve stakeholder conflicts and ease funding problems. Such a focus on value in cooperative strategies and developing projects is a common strategy in market-like environments and is often analysed using a transaction cost and transaction benefits framework.

Transferring a transaction cost and transaction benefit framework to the sector of waterway development mean applying a well-known framework to a sector distinctively different from the private sector. The participating organizations are public, or are a mixture of public and private parties, the product has significant spatial implications, affects many stakeholders, and value capturing may be indirect and non-monetary. Nevertheless, the application of a transaction cost and transaction benefit framework appears to be a tool, which can improve insight in the complex system of value creation in waterway projects.

The framework has been applied to two case studies, which represent two distinct but common situations in waterway (re)development in Western countries; a neglected waterway in an urban setting, and a waterway in an industrial setting where economies of scale call for investments. The case studies conducted were the Miami River project, and the New Orleans Inner Harbor Navigation Canal project. The case studies showed

that value can be created but transaction costs related to cooperation have to be overcome. This obstacle was overcome by the fact that BATNAs represented less value, transaction benefits were substantial, and transaction costs were kept low. The Miami River case study showed the usefulness of an agent, the Miami River Commission, whose assignment implicitly focuses on decreasing transaction cost in a complex cooperative development. In the New Orleans case the cooperation was focussed on a more narrow set of goals. The benefits of cooperation were high in terms of cost-sharing and economies of scope, transaction costs for cooperation were low due to a high level of trust, and the BATNAs represented a non-appealing outcome for both parties. The arrangements of both cases therefore represented high benefits, low transaction costs, and negative BATNA's. Or in other words: both represent fertile grounds for joint value creation.

The application of a transaction cost and transaction benefit framework in the public sector has some limitations. The framework relies on voluntary partnerships based on the beneficial elements for each. This is not always the case in the public sector as certain partnerships can be mandated for other reasons. However, if this is the case, it can be argued the involved parties will still strive for getting the most benefits against the least costs for themselves. So although the partnerships are not a result of free choice, the mechanisms can be expected to work similarly.

Keeping in mind its limitations, the framework sheds light on infrastructural projects from a perspective that differs from engineering perspectives or macro-economic perspectives. It could therefore aid learning about ways to strengthen such projects, making them more efficient and enabling these investments to cope with changing circumstances. And although this is only a first step in the application of this framework to the infrastructure sector, it seems to be fit well for the analysis of cooperative strategies to create value in infrastructure projects in general, and waterway projects in particular. For practitioners it could help in supporting decision making for these projects or selecting partners for project planning and development. Through more detailed empirical evidence (Hijdra, forthcoming), further validation and elaboration of the transaction cost and transaction benefit framework can be achieved.

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Appendix A:

Interviewed officials:

Miami River:

Deputy Director Miami Downtown Development Agency
Manager Florida Inland Navigation District
Miami River Commission Chairman
Miami River Commission Director
Former Miami River Commission Chairman

New Orleans Inner Harbor Navigation Canal:

Project Manager Navigation lock, US Corps of Engineer
Project Engineer Navigation Lock, US Corps of Engineers
Project Engineer Navigation Lock, US Corps of Engineers
Project Manager Storm Surge Barrier, US Corps of Engineers
Chris Gilmore, Sr. Project Manager Storm surge barrier, US Corps of Engineers
Director Business Development, Port of New Orleans
Director Business Development, Port of New Orleans
Real Estate Development Manager, Port of New Orleans

Appendix B

Interview questions

General questions

Q1: For the record; date, location, organisation and name interviewee.

Q2: Thinking about the project, what makes you most proud?

Q3: This research project is about the way value is created in water projects. Can you describe what in your opinion are the societal values or functions this project is creating?

Q4: Can you describe how these values got integrated in one project/program?

Q5: What were the key moments or agreements where integration of values took place?

Transaction cost and benefits

Q6: What is the key goal of your organisation related to this project?

Q7: How would you describe the way your organisation is involved in this project?

Q8: can you describe the reasons or drivers for your organisation to participate in this project?

Q9: Were there any hurdles, costs, hesitations, doubts or alike which had to be overcome?

Q10: how do these relate to the key moments as mentioned in Q4?

Value creation, capturing and alternatives (Batna, Mutual Gains):

Q11: Were there any alternatives for your organisation to accomplish the organisational own goals?

Q12: if so, what would have been the difference for your organisation?

Q13: is the overall result delivering what was expected?

Q14: did the cooperation deliver the expected results for your own organisation?

Q15: How is the value, which is created, captured by your organisation?

Q16: How did the overall design develop?

Closing questions

Q16: are there any remaining issues which you feel are relevant which have not been discussed?

Q17: If you could do it all over again, what would you do differently?

Q19: What was the key to success in this project?