Kujala J., Aaltonen K., Gotcheva N., Lahdenperä P. (2020). Dimensions of governance in inter-organizational project networks. International Journal of Managing Projects in Business (fortcoming).

Dimensions of governance in inter-organizational project networks

Jaakko Kujala, Dr., Professor *(corresponding author)*
University of Oulu
Industrial Engineering and Management
P.O. Box 4610 FI-90014 University of Oulu, Finland
Cell: + 358 40 839 1717
Email: jaakko.kujala@oulu.fi

Kirsi Aaltonen, Dr., Associate Professor
University of Oulu
Industrial Engineering and Management
P.O. Box 4610 FI-90014 University of Oulu, Finland
Cell: + 358 50 3576077
Email: kirsi.aaltonen@oulu.fi

Nadezhda Gotcheva, Dr.
VTT Technical Research Centre of Finland Ltd.
P.O. Box 1300 FI-33101 VTT, Finland
Cell: +358 40 1326030
Email: nadezhda.gotcheva@vtt.fi

Pertti Lahdenperä, Dr.
VTT Technical Research Centre of Finland Ltd.
P.O. Box 1300 FI-33101 VTT, Finland
Cell: +358 40 552 9151
Email: pertti.lahdenpera@vtt.fi

Dimensions of governance in inter-organizational project networks

Abstract

Purpose – The purpose of this study is to create a framework to analyze approaches for coordination, adaptation, and safeguarding of exchanges in inter-organizational project networks.

Design/methodology/approach – An analysis framework to analyze governance in project networks was created based on a systematic review of existing literature. The framework was applied to analyze governance approaches used in a large infrastructure project implemented with an alliance project delivery method to illustrate the practical validity of the framework.

Findings – The analysis framework categorized governance in project networks in six dimensions: goal setting, rewarding, monitoring, roles and decision-making, coordination, and capability building. A set of questions for each governance dimension was created and the analysis framework was applied in the context of a project alliance.

Research limitations/implications – The focus of this research is on governance internal to a project network. We identified dimensions of governance in project networks and related governance approaches based on a systematic literature review. The practical applicability of the framework was validated in a single case study setting.

Practical implications – The paper introduces a concept of governance in project networks, which takes the perspective that all actors that have an influence on project implementation are part of an inter-organizational project network. The focal organization may have had a significant role in the design of governance, but governance also emerged from the network structure of companies and the interactions among them. The analysis framework created in this research can be used to design and analyze governance in different type of project context.

Originality value – The paper introduces a concept of governance in project networks, which takes the perspective that all actors that have an influence on project implementation are part of an inter-organizational project network.

Keywords Inter-organizational projects, Project network, Governance framework, Systematic Literature review, Project Alliance

Paper type Research paper

1. Introduction

The main challenges in the implementation of a complex infrastructure project are not technical, but are rather those related to how to govern the work in a complex inter-organizational setting that brings together a diverse set of actors who differ in their values, knowledge, culture, traditions, goals, and business models. Aligning multiple perspectives and interests to achieve a shared understanding of project goals and methods on how to reach those goals is extremely challenging. The well described failures of implementing large infrastructure projects within a budget and on time using traditional turn-key contracts and competitive tendering approaches have led to a search for better delivery methods, such as project partnering, integrated project delivery, or project alliance (Lahdenperä, 2012). The aim of this research is to create a framework that can be used for analyzing different types of organizational arrangements to deliver projects in a multi-organizational context from a governance perspective.

The governance literature in the project context has mainly focused on defining governance as a method for external control of projects, programs, or a portfolio of projects either from a single organization point of view (Müller, 2009; Biesenthal and Wilden, 2014; Too and Weaver, 2014) or from the perspective ofpublic projects (Klakegg *et al.*, 2008; Williams *et al.*, 2010). However, a stream of research recognizes that projects are implemented in a network of organizations, in which no single authority has a legitimate authority and power to control the network as a whole (Hellgren and Stenberg, 1995, Winch 2006, von Danwitz, 2017). This line of literature focuses alignment and coordination of work among participants in a project network, that is, how governance is organized in multi-firm project networks. Increasing amount of research on collaborative project delivery methods, such as integrated project deliveries and project alliances has also brought up this internal perspective how to motivate and to enable actors to work toward shared project goals (Pargar et al., 2019).

These two research streams of project governance literature define governance as mechanisms used for coordination, adaptation and safeguarding exchanges (Williamson 1979). However, as governance is a multi-faceted concept, it is not completely clear what are these governance mechanisms, in practical terms of approaches and practices in coordinating complex inter-organizational project networks. Thus, we aim to complement this line of research by conducting a systematic literature review of project governance mechanisms used for coordination, adaptation, and safeguarding exchanges in project networks. The research question developed to guide the literature review was as follows: *What are the key dimensions and related mechanisms of governance in inter-organizational project networks?*

Based on the results of the literature review, we created an analysis framework to study governance in inter-organizational project networks. Furthermore, we applied the framework in the context of an alliance project to illustrate the practical validity of the model.

The paper is structured as follows. Following an introduction to the theoretical background and key concepts referred, we present a comprehensive review of project governance articles published in three leading non-field specific project management journals (the *International Journal of Project Management*, the *Project Management Journal*, and the *International Journal of Managing Projects in Business*) to identify the key dimensions and mechanisms of governance in inter-organizational project networks. The literature review was not confined to a specifically collaborative form of project delivery, such as project alliance, but sought a comprehensive understanding of the different governance mechanisms applied in the context of project networks. The results of the literature review were used to create an analysis framework to study governance in project networks. The framework was applied in an empirical case study on how governance is implemented in the alliance type of

project delivery. Finally, we identified themes that we considered important for future research to advance understanding of governance in project networks.

2. Theoretical background and key concepts

2.1 Governance in inter-organizational project networks

Governance literature focuses on how to coordinate, adapt, and safeguard economic exchanges among actors, based on a loose set of theories from economics, law, sociology, and management that includes agency theory (Eisenhardt, 1989), transaction cost economics (Williamson, 1979, 1985, 1996), property rights and incomplete contracting (Hart and Moore, 1990; Hart, 1999), and relational contracting (Macaulay, 1963; Macneil, 1978; Baker, Gibbons and Murphy, 2002). These theories rely on the underlying assumptions that the actors aim to create utility for themselves; their goals are not always aligned; they may also disagree on what is the best way to achieve goals; contracts between actors are to some extent incomplete and may need to be modified during implementation; and that there are costs in creating contracts and monitoring to ensure that they are implemented as agreed. The main focus in research has been on dyadic relationships, but literature on the network form of governance has also considered governance in a network of organizations (Jones *et al.*, 1997). In addition to addressing the challenge of how to align the interests of all parties and how to limit opportunistic behavior, some authors have also emphasized the role of governance in enabling actors to better coordinate their work (Gulati *et al.*, 2005). The coordination of work is especially relevant in the context of complex transactions such as project deliveries. These projects often include multiple actors, who have to accomplish complex set of interrelated tasks in a limited timeframe.

In a project context, two distinct streams of governance research can be identified: project governance as *external* to any specific project and project governance as *internal* to a specific project (Ahola *et al.*, 2014). However, recent research explicitly specifying the definition of project governance takes the external perspective that it is "the system by which a project is directed and controlled and held to account" (McGrath and Whitty, 2015). As our research focus was on internal coordination of activities in a project, to avoid confusion, we used the concept of *governance in project networks*, which includes coordination, adaptation, and safeguarding mechanisms internal to a project network that enable multiple more or less independent organizational actors in project networks to work toward shared goals. These networks typically entail different modes or structures of governance, such as market, hybrid, or hierarchy (Williamson, 1996), which are applied in parallel. Each of these enables the implementation of different governance mechanisms—approaches and concrete practices that are applied to align the interests of project parties to enable them to work toward shared goals.

There is no clear distinction between the concepts of *project management* and *governance in project networks*, as they partly overlap. While *project management* focuses mainly on the rational planning, technical implementation of a project and contracting work from external sub-contractors and suppliers from a single actor's perspective, *governance in project networks* focuses on the challenges posed by a multi-organizational setup, in which each organization may have their own goals related to the project and which cannot be fully controlled by a single organization. This view accords with Turner and Simister (2001), who argued that a core function of project governance is to align project stakeholders to work together toward shared goals. In such systems, multiple organizations are often making decisions that influence the project's success (Helgren and Stjernberg 1995). In this regard, governance is often defined to include contractual governance referring to explicit and written contracts, which is complemented with relational governance emerging from the values and processes in the exchange relationship (Roehrich and Lewis 2012). In a more detailed level, governance includes the determination of roles, responsibilities, and accountabilities among stakeholders in order to achieve an ethical, cohesive, and transparent decision-making process that

will achieve the mission of the (project) organization (Badewi, 2015). In most project networks, there are focal actor(s), such as owner or main contractor, which has more influence, in the selection of formal governance approaches. The approaches are often explicitly defined in project contracts. This type of networks can be defined as organized, which involves management actions to establish and sustain project networks (Thomson, 2003). However, governance in project networks is also related to the emergence of social order within a network of independent actors, which relates to self-organizing networks. For example, conflict resolution in project networks is influenced by multiple issues such as explicit mechanisms defined in the contract(s) between actors, values and social norms established in the project network, previous experience and expected future business relationships between project actors. How actors collaborate also dynamically changes during the project lifecycle as actors work together, assume different roles in the project and solve emergent problems (Chakkol *et al.* 2018; Benitez-Avila *et al.* 2019). As such, governance is influenced by factors beyond the control of any single organization. It emerges from the network structure of companies and the interactions among them (Adami and Verschoore, 2018), as well as from the institutional context, in which the project is embedded.

The definition of governance in project networks is also based on assumption that all relevant stakeholders that can influence meeting project performance goals are included in the network. In practice, project networks are open systems, and it is difficult to draw boundaries that delineate which organizations belong to the network (Helgren and Stjarnberg 1995; Olsen *et al.,* 2005). However, from a network governance perspective, all firms and organizations that participate in the design and implementation of a project are considered as members of the project network. Each of the stakeholders has different roles, responsibilities, and relationships within the network; in governance terms, they are part of a complex system.

3. Systematic literature review to map dimensions of governance in project networks

3.1 Methodology and data

The framework developed to synthesize the dimensions of project governance was based on a detailed study of the relevant project management literature. In the first stage of the framework's development, the concept of project governance and the scope of the literature review were defined in accordance with the review article by Ahola *et al.* (2014). Based from these findings, the aim of this study was to identify which types of mechanisms for coordination, adaptation, and safeguarding exchanges among multiple organizational actors are used in project networks.

We conducted a systematic review of the project governance literature to identify, position, and categorize prior research. A systematic literature review follows a structured approach to analyze and categorize the literature, thus enabling replication. The purpose of any such review is to provide collective insights by synthesizing and analyzing existing research (Tranfield *et al.,* 2003). The process of systematic literature review includes identification, evaluation, summarizing of the relevant individual studies, and providing the researchers with a holistic overview of prior evidence (Gopalakrishnan and Ganeshkumar, 2013).

The systematic literature review was conducted as follows. Three leading peer-reviewed journals in this field, the *International Journal of Project Management* (*IJPM*), *Project Management Journal* (*PMJ*), and *International Journal of Managing Projects in Business* (*IJMPiB*), were selected for the purpose of capturing relevant research on governance in inter-organizational project networks. This choice was justified as these journals represent the main body of knowledge in project management research. Field-specific management journals, such as specific journals from information systems and construction industry were deliberately omitted at this point. Typically, the search sources of systematic literature reviews are specialized databases but field-specific journals may also act as the

main data source (Papaioannou et al., 2010). The use of the three leading journals of project management as the data source has been an established approach in prior systematic literature review studies conducted within the project management field, as they have been considered to provide a wider coverage and typify the larger literature (see e.g. Derakshan *et al.*, 2019). The literature search encompassed papers published in *IJPM* during the period 1984-5/2020, in *PMJ* during the period 1997-5/2020, and in *IJMPiB* during the period 2008-5/2020. The keywords used were "project" and "governance," and the search focused on abstracts, keywords, and titles. Sample selection and analysis involved the following procedure:

1. The first stage of the search returned a total of 288 research papers from *IJPM*, *PMJ*, and *IJMPiB*.
2. A structured Excel database was created, comprising the 288 papers. During this stage of the analysis, all papers were read and reviewed by three reviewers to determine whether their content fell within the scope of project governance as defined here. The exclusion criteria for this process was defined as "papers that do not address project governance in inter-organizational project network context". A majority of the papers used the term *governance* to discuss governance of project portfolios or governance of project-based firms and all these papers were excluded from the sample. The qualified papers needed to address governance in a context where various organizations are involved in project activities. First, the authors excluded papers individually and then each researcher's analysis results were discussed jointly to determine the papers to be included in the final sample. There were no significant differences between the researchers. On completing this process, we identified a total of 34 papers that we considered relevant for our analysis.
3. In the third step, we carefully reviewed the content of the 34 papers to identify the specific governance mechanisms they discussed. The focus was on approaches that related to coordination, safeguarding, or adaptation of exchange or project work. Each of the researchers made the analysis individually and results were discussed to create 136 individual findings, which were categorized into six key dimensions and related sub-categories,based on a thematic analysis.
4. Finally, the analysis framework was completed by providing a brief description and forming questions for each dimension to guide the analysis of governance mechanisms in practical applications.

3.2 Dimensions of governance in project networks

Based on this categorization, the complete framework was formulated to include key dimensions and mechanisms of project governance. Figure 1 presents overall result of a detailed analysis of governance practices identified in the reviewed articles. The framework categorizes governance in project networks under six key dimensions: goal setting, incentives, monitoring, coordination, roles and decision-making power, and capability building. The focus and relevance of each category are discussed in more detail below. In addition, in each dimension there is a table describing governance approaches identified in the literature and how they were categorized in sub-categories.

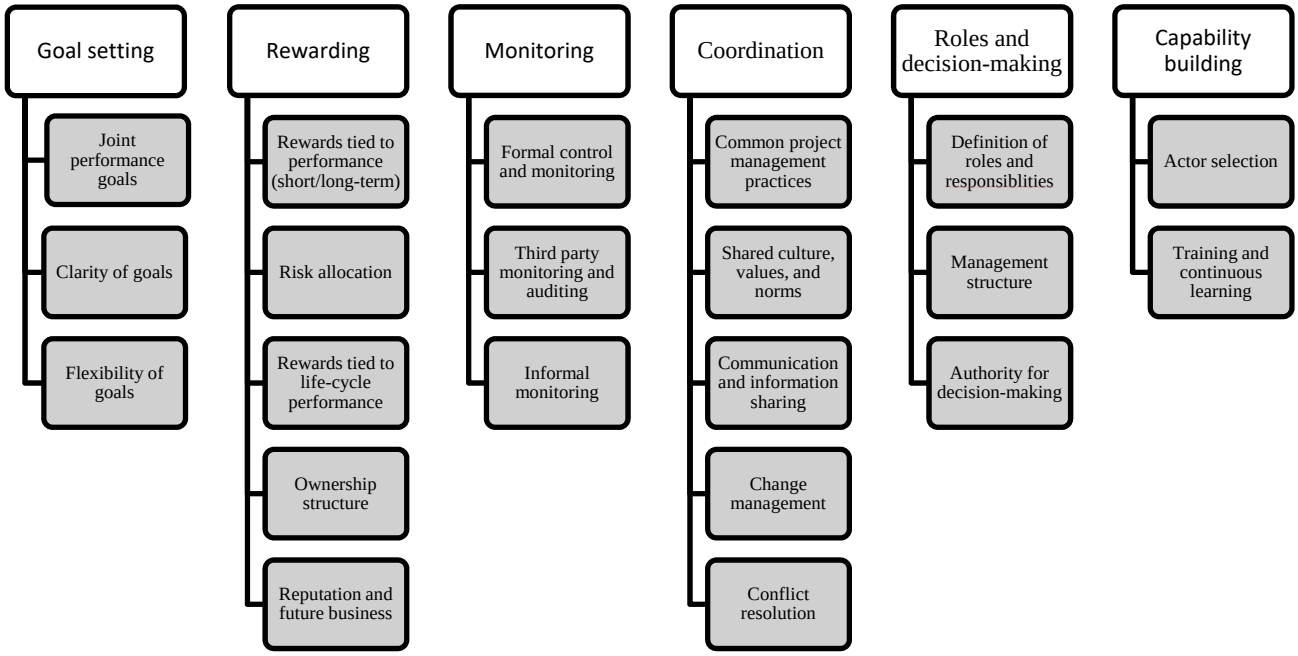

Figure 1. Dimensions and mechanisms of governance in inter-organizational project networks.

Goal setting seeks to create shared performance goals for the project that will be understood by all project actors. Project goals include both short-term goals focusing on the project implementation process and long-term goals related to the use and benefits gained from the project product (Nisar, 2013). The existing research acknowledges the importance of early involvement of all project actors in this process (Davies *et al.*, 2014; Guo *et al.*, 2014). Without this early involvement or parties having versatile expertise and a thorough understanding of needs and requirements, any ensuing project solutions are unlikely to be optimal. In complex project networks, the presence of actors who differ in their knowledge and understanding of project requirements emphasizes the need for clarity of objectives to ensure that they will be similarly interpreted by all project actors. In addition, if performance goals are sufficiently clear to be included in a contract, they are legally binding and so increase the cost of opportunistic behavior (Lu *et al.*, 2014). As complex projects always involve changes that cannot be anticipated, project goals and the contracting process must also be sufficiently flexible to respond to unforeseen risks and opportunities (Davies *et al.*, 2014

Table I. Governance practices and sub-categories related to goals setting

Governance approaches identified in the literature	Sub-category	Main dimension
	Joint performance goal	Goal setting
Contract as legally binding documents - contractually determined outcomes or outputs to be delivered within the schedule and the budget, and as accepted behavior (Lu *et al*., 2015)		
Cost-benefit analysis to justify the need (Liu and Wilkinson, 2014)		
Early relationship building workshop to agree on schedule planning and objectives (Guo *et al*., 2014)		
Early collaboration and involvement of key stakeholders (e.g., owners, contractors, users, local community) (Nisar, 2013; Davies *et al*., 2014; Lehtinen and Aaltonen, 2020)		
Entailing a strategic overview to ensure consideration of long-term issues (Nisar, 2013)		
Alignment of business and service plans (Nisar, 2013)		
Conflicts over project objectives or lack of commitment as main problems that need to be handled to achieve relevance and sustainability (Klakegg, 2011).		
Involve subcontractors early, potentially to facilitate informal communication (Nevstad *et al*., 2018)		
Early involvement of the contractor in the design and estimation of costs (Cardenas *et al*., 2017)		
Goal orientation: clear service standards and performance targets (Nisar, 2013)	Clarity of goals	
Owner's organization responsibility to clearly articulate the need for and mission of a project to all stakeholders involved (Sergeeva 2020).		
Measurable results to enable progress monitoring (Nisar, 2013)		
Challenge of achieving relevance and sustainability if project objectives are unknown or misunderstood (Klakegg, 2010).		
Engagement indicators to measure the success of external stakeholder engagement (Lehtinen and Aaltonen, 2020)		
Rendezvous clauses: revisiting parts of a contract by officially deferring decision-making on which agreement cannot be reached at the outset (Sanderson, 2012)	Flexibility of goals	
Flexibility in bid requirements to allow contractors to employ their skills and propose innovative solutions (Davies *et al*., 2014; Liu and Wilkinson, 2014)		
Sequential tendering of work to allow changes at a later stage (Chang, 2015)		

Rewarding refers to aligning actors' goals with project goals by means of incentives. These may include monetary rewards (or penalties) linked to joint performance goals (Davies *et al*., 2014), conditional future payments and work prompting a life cycle approach (Nisar, 2013; van den Hurk and Verhoest, 2015), as well as reputational scoring systems (Guo *et al.*, 2014). Project contracts determine the outcomes or outputs to be delivered within the given time, budget, and acceptable behavior; as legally binding documents, they are designed to restrict opportunism (Lu *et al.*, 2015). The choice of contract form effectively shifts risk exposure between parties (Smith *et al.*, 2006; Chang, 2015). In large and complex projects, risk allocation practices play an important role in aligning parties to work toward shared objectives. These practices vary from complete risk transfer, in which one organization bears the risk, to decentralized practices, where actors share both pains and gains (Guo *et al.*, 2014). However, as contracts cannot identify every potential contingency and offer only limited protection, relational governance is also needed to adjust actors' behavior (Lu *et al.*, 2015), and creating a sense of ownership among participating organizations and individuals is

therefore important (Guo *et al.*, 2014). As contracts cannot be written to anticipate all possible contingencies, the literature on property rights and ownership also suggests that an alternative to contractual risk sharing is to create ownership structures in which key project actors own part of the firm established to implement and maintain the project product (Sanderson, 2012).

Table II. Governance practices and sub-categories related to rewarding

Governance approaches identified in the literature	Sub-category	Main dimension
Bonus for completing project ahead of schedule or fine for being late (van Marrewijk and Smits, 2015)	Rewarding tied to performance (short/long-term)	Rewarding
Using target cost and pain/gain share contracts to drive performance (Davies *et al*., 2014)		
Integrated project teams with financial incentives to stimulate innovation (Sanderson, 2012)		
Performance-based control through incentives (Toivonen and Toivonen, 2014)		
Use of life cycle approach in which project parties are paid by performance and availability of project product (van den Hurk and Verhoest, 2015)		
Reductions in payments due to performance (e.g., failure to maintain service standards will result in payment deductions or financial damages) (Nisar, 2013)		
Focus on incentives in design and implementation of a whole-life approach (e.g., annual payments for use of the facility) (Nisar, 2013)		
A profit sharing mechanism which specifies that parties are entitled to share distributable profits if revenues reach a certain level (Liu and Wilkinson, 2014)		
Risk/reward regime based on monetized key performance indicators (Sanderson, 2012)	Risk allocation	
Choice of contract forms (e.g., lump-sum, cost-plus) can shift risk exposure between and among parties (Chang and Ivy, 2007; Chang, 2015)		
The choice of financial protection (e.g., bonds, insurance, guarantee, compensation for default) can reduce a project's overall risk exposure (Chang, 2015)		
Sharing cost savings (Guo *et al*., 2014)		
Risk transfer to enable the operator to maximize its business potential (e.g., in sales and marketing) (Liu and Wilkinson, 2014)		
How risks are managed and shared by project actors (Ruuska *et al*., 2011)		
An alliance ownership structure, combining balanced equity positions with a strong leader (Miller and Floricel, 2000, cited in Sanderson, 2012)	Ownership structure	
Ownership structure/share in arrangements (van Marrewijk and Smits, 2015)		
Creating sense of ownership for participating organizations and individuals (e.g., by retaining an ownership stake in the asset) (Sanderson, 2012; Nisar, 2013; Guo *et al*., 2014)		
Publishing reputation scoring for individual organizations (Guo *et al*., 2014)	Reputation and future business	
Reputation as an incentive to sacrifice short-term interests in exchange for long-term goals (Chang and Ivy, 2007)		
Conditioning the award of future work on current performance to mitigate holdup threats and attract a discount in bidding prices (Chang, 2015)		
Expectation that collaboration would lead to more harmonious conditions for the future of interactions (Benitez-Avila *et al*. 2019)		
Flexible design of a project, which can be modularized and used in future projects to build sustainable competitiveness (Qui *et al*., 2019)		

Monitoring seeks to ensure that all actors behave as expected, and it enables the use of performance-based incentives. To be useful, project milestones and performance targets must not only be realistic but must also be monitored (Nisar, 2013). Abednego and Ogunlana (2006) highlighted the importance of continuous project control and monitoring in pursuit of common goals and to satisfy all interests. According to Reve and Levitt (1984), the challenge of monitoring is to prevent or impede purposeful manipulation of progress data. A project contract usually specifies formal monitoring procedures (Lu *et al.*, 2015), as well as a performance measurement system and key performance indicators to be monitored throughout (Nisar, 2013). If owners lack the technical competence to supervise and monitor work effectively, specialized agents such as consultants are hired to perform these functions on their behalf, and a trilateral governance structure emerges (Reve and Levitt, 1984).

Table III. Governance practices and sub-categories related to monitoring

Governance approaches identified in the literature	**Sub-category**	**Main dimension**
Contractually specified monitoring and reporting procedures (Nisar, 2013; Lu *et al*., 2015)	Formal control and monitoring	Monitoring
Contracts setting out comprehensive performance measurement systems, including key performance indicators (Nisar, 2013)		
Only realistic and monitored project milestones and performance targets considered useful (Nisar, 2013)		
Continuous project control and monitoring to achieve the common goal and satisfy all interests (Abednego and Ogunlana, 2006)		
Steering group to oversee overall progress and to provide guidance (Nisar, 2013)		
Periodic progress monitoring (Nisar, 2013) (e.g., cost and quality reviews) (Guo *et al*., 2014)		
Systems and mechanisms for monitoring, controlling, and reporting progress of the work (Reve and Levitt, 1984; Ruuska *et al*., 2011; Pitsis *et al*., 2014)		
Each team manager in charge of reporting and monitoring risks (Guo *et al*., 2014)		
Regular client inspections and site visits (Guo *et al*., 2014)		
Longer time horizons may require more elaborate authority structures or monitoring processes (von Danwitz, 2018)		
Sustainable project management is implemented using not only indicators but also a holistic control package in which control mechanisms are used differently for different sustainability dimensions (Kivilä *et al*., 2017)	Informal monitoring	
Informal means such as common working premises “Big Room” for enabling project partners to interact, and to respond chances in a project (Matinheikki *et al*., 2018)		
Development of informal processes and personal relationships, which enable actors to informally understand performance of each party (Hietajärvi *et al*., 2017a)		
Value-based solutions including workshops and training sessions, that facilitate community spirit and implementation and internalizing of collaborative values external stakeholders (Lehtinen and Aaltonen, 2020)		
Use of informal controls based on clan control based on dynamics of social compliance, or self-control based individual intrinsic values (Ferrer *et al.*, 2020)		
Use of external parties to monitor performance (Guo *et al*., 2014)	Third Party monitoring and auditing	
Independent costing estimator (Guo *et al*., 2014)		
Auditing mechanisms (Pitsis *et al*., 2014)		

Coordination is required to align the behavior of each actor so they can effectively work together. For effective coordination, actors need to adapt tools and work processes that are to a certain extent standardized, or at least compatible, across project actors. Brady and Davies (2006), for instance, described the process used to create standardized best practices for implementation of the Heathrow T5 Project. Project contracts and project plans define formal processes for implementing project work, as well as specifying tools and the practices to be used to coordinate project work. However, informal types of coordination, such as shared values and behavioral norms, can have a significant impact on how project actors work together (Lu *et al.*, 2015; van Marrewijk and Smits, 2015). These behavioral norms may also be included as part of the contract document, which may include values, norms, and expectations for a project (Caldwell *et al.*, 2009). The challenge posed by these informal coordination mechanisms is that cultural and organizational boundaries can hinder the creation of shared behavioral norms for a project, regardless of contractual agreements (Bresnen and Marshall, 2000; Dossick and Neff, 2011). Another important aspect of coordination is to ensure that all parties have all the information they need to complete their work in collaboration with other project parties. Information sharing can be enhanced by formal and informal practices, such as regular meetings or co-location of project teams. The use of appropriate systems can also facilitate information sharing among project actors—for example, Brady and Davies (2014) described a single model environment, which ensured that all parties could access a central repository for all digital data, as one of the key success factors in the Heathrow T5 project. A final important component of coordination in this context is a process for responding to change and unexpected situations. Where there are conflicts between or among project actors, they may agree to resolve these inside the project team or through a legal process in which an independent external actor makes decisions. For example, in the alliance type of project, contracts' parties agree to solve any disagreements inside the project team (Sanderson, 2012).

Table IV. Governance practices and sub-categories related to coordination

Governance approaches identified in the literature	Sub-category	Main dimension
Contractually specified key principles and agreements among parties (e.g., budget, delivery deadline, quality standards, safety requirements) (Lu *et al*., 2015)	Common project management practices	Coordination
Strategy document outlining the project vision and organizational processes that will enable it to be achieved (Davies *et al*., 2014)		
Formalized relationships, such as boards and group structures, that allow a degree of control over required outcomes (Nisar, 2013)		
A shared set of values, objectives and beliefs about how to coordinate the organization's efforts to reach common objectives (van Marrewijk and Smits, 2015)	Shared culture, values, and norms	
A consciously designed project culture (Sanderson, 2012)		
Relational norms that define expected behavior (Lu *et al*., 2015)		
Building a single culture across key participating organizations (Guo, 2014)		
Democratic mechanisms of coordination to achieve trust and confidence in PPP relationships (Nisar, 2013)		
Trust (vs contract) for enhancing quality management practices and inter-organizational project performance (Lu *et al*., 2019)		
Joint organizational development and training strategies to ensure cultural change issues are planned and delivered effectively (Nisar, 2013)		
Democratic systems of coordination and collaboration to integrate the range of skills, resources, and networks which a project requires (Nisar, 2013)		
Structures and procedures that ensure collaborative working relationships (Nisar, 2013)		
Expected high ethical standards to ensure that commercial or sectarian interests do not dominate project delivery at the expense of other project goals (Walker and Walker (2014).		
Both economic incentives and hierarchical relationships formalized in contract agreements require being internalized in working practices by means of informal and socially-based mechanisms (Benítez-Ávila *et al*., 2018)		
The effect of specific investments on performance is mainly influenced by relational trust (Wu *et al*., 2017)		
Formal and informal interaction skill, which is enhanced by co-locating people in the common working premises (the "Big Room"), diminished the physical and cultural distance between partners and were central in building trust (Hietajärvi *et al*., 2017a; Hietajärvi *et al*., 2017b).		
Regular meetings with project participants to confirm target schedules (Guo, 2014)	Communication and information sharing	
Stakeholder engagement and meetings to identify possible environmental damage that might be caused by construction activities (Nisar, 2013; Guo *et al*., 2014)		
Meetings to facilitate communication and decision-making (Liu and Wilkinson, 2014)		
The role of integrated teams as a mechanism for managing interdependency of activities in project contexts (Brady *et al*., 2007, cited in Ahola *et al*., 2014)		
Information dissemination and communication systems (Abednego and Ogunlana, 2006)		
Lines of communication (Ruuska *et al*., 2011; Pitsis *et al*., 2014)		
Online tools for submitting, communicating, and sharing innovations (Davies *et al*., 2014)		
Building information modeling (Davies *et al*., 2014)		
Efficient document management system: an open interface for automated transfer of data between organizational document management systems (Davies *et al*., 2014)		
Information transparency (Abednego and Ogunlana, 2006)		

Contractual terms associated with specified principles, tactics, organizational structures, and processes for resolving unforeseeable events (Lu *et al*., 2015)	Change management	
Communicating risk using a top-down approach or directly between or among project participants (Guo *et al*., 2014)		
Situational logic predisposes actors to different modes of interaction based on exploitation mutual gain, leading to structural changes (Benitez-Avila et al. 2019).		
Change management strategy using re-location and co-location of services (Nisar, 2013)		
Flexible partnerships enabling changes to be made smoothly (Nisar, 2013)		
Innovation team to identify, evaluate, and develop ideas (Davies *et al*., 2014)		
Task-focused groups to attend to specific deliverables (Nisar, 2013)		
Innovation forum: practitioner team responsible for strategic direction and day-to-day implementation and management of the innovation program (Davies *et al*., 2014)		
Court injunction to settle disputes legally (Chang and Ivy, 2007)	Conflict resolution	
Out-of-court negotiations to settle disputes (Chang and Ivy, 2007)		
Disputes settled by a panel of experts, led by a leader acceptable to both sides (Chang and Ivy, 2007)		
Personal relationships between and among actors to resolve conflicts effectively (Lu *et al*., 2015)		
Formal statement of values as a basis for resolving disputes internally (Sanderson, 2012)		
Fully developed performance requirements and service providers' method statements to avoid conflicts (Nisar, 2013)		
Clear performance measurement system, arrangements, and incentives to articulate practical implications for risk management (Nisar, 2013)		
Open discussion (Nisar, 2013)		
Collaborative problem resolution methodology: a systematic approach with realistic timescales for resolutions (Nisar, 2013)		

Roles and decision-making refers to giving actors the necessary information to understand the effect of decisions on overall performance, enabling them to make appropriate decisions. The formal roles and responsibilities of each party are defined contractually (Lu *et al.*, 2015), but effective governance also requires suitable project management structures and decentralized decision-making principles (Abednego and Ogunlana, 2006; Nisar, 2013; Pitsis *et al*., 2014). For example, creating a leadership team that is legally and spatially separate from the parent organizations may help in coping with unknowable future events and avoiding disputes (Sanderson, 2012), while a clearly defined management team can support and assume responsibility for daily execution of the project (van Marrewijk and Smits, 2015). Effective governance requires that decision-making power is appropriately distributed among actors and that an appropriate degree of that power is delegated to the project team (Eriksson, 2010; Nisar, 2013). According to Ruuska *et al*. (2011), responsibilities should be allocated on the basis of competence and risk-bearing capacity, while Abednego and Ogunlana (2006) highlight the importance of equality and active participation in making the "right decisions at the right time." In projects emphasizing relational governance, democratic decision-making mechanisms are needed to build trust and confidence in relationships (Nisar, 2013).

Table V. Governance practices and sub-categories related to roles and decision-making

Governance approaches identified in the literature	Sub-category	Main dimension
Contractually defined roles and responsibilities for each party and influence of roles in interactions (Lu *et al*., 2015; Benitez-Alvila 2019))	Definition of roles and responsibilities	Roles and decision-making
Competence and risk-carrying capacity as basis for allocating responsibility (Ruuska *et al.*, 2011)		
There is a need for formal and clear project governance, where roles and responsibilities need to be clearly defined (Sergeeva 2020).		
Roles and responsibilities of boards and management (Pitsis *et al*., 2014)		
Clear governance structure, in which the work management team is responsible for daily execution of the project (van Marrewijk and Smits, 2015)		
Creation of a suitable project management structure: establishing reporting lines to the top level of the project board (Nisar, 2013)	Management structure	
Project alliance leadership team (PALT) that is legally and spatially separate from parent organizations (Sanderson, 2012)		
Right decision at the right time: a form of active participation (Abednego and Ogunlana, 2006)		
Actors (central) position in the informational networks influence their power and influence over other members (Adami and Verschoore, 2018)		
Equality between and among parties to create true partnerships (Abednego and Ogunlana, 2006)	Authority for decision-making	
Right decision at the right time: a form of active participation (Abednego and Ogunlana, 2006)		
Democratic decision-making mechanisms to build trust and confidence (Nisar, 2013)		
Delegation of power to project team and empowering people to make decisions (Eriksson, 2010; Sergeeva, 2020)		

Capability building ensures that project actors have both the ability and power to meet performance expectations. The aim is to ensure that appropriate skills and expertise are identified and tied to the project at an early stage, and that sufficient attention is devoted to resourcing the project team (Nisar, 2013). The use of suitable competitive tendering processes and selection criteria play an important role in capability building (van den Hurk and Verhoest, 2015), ranging from price-based bidding to value- and ability-based selection procedures (Ruuska *et al*., 2011; Liu and Wilkinson, 2014), which can greatly affect a project team's capability and potential. For example, Davies *et al.* (2014) described the concept of optimized contractor involvement—that is, early enough to encourage innovation. Beyond procurement, systematic training and continuous learning during projects can also enhance team capability (Ruuska *et al*., 2011; Davies *et al*., 2014; Guo *et al*., 2014), although this can sometimes be ineffective and costly because of the high turnover rate of people and organizations in temporary project networks.

Table VI. Governance practices and sub-categories related to capability building

Governance approaches identified in the literature	Sub-category	Main dimension
How procurement is organized and carried out (e.g., price-based competition, value-based bid evaluation, or ability-based selection) (Ruuska *et al*., 2011; Liu and Wilkinson, 2014; van den Hurk and Verhoest, 2015)	Actor selection	Capability building
Selecting people with experience and excellent quality performance records (Guo *et al*., 2014)		
Identifying necessary skills and expertise early and ensuring adequate attention to resourcing of project teams (Nisar, 2013)		
Learning lessons and recruiting managers capable of applying experience gained from other projects (Davies *et al.*, 2015)		
Improving competition and access to capable suppliers by conducting extensive market soundings (e.g., international road show to approach market players, promote project, and solicit practical solutions) (Liu and Wilkinson, 2014)		
Tendering process to encourage innovation (optimized contractor involvement, "early enough") (Davies *et al.*, 2014)		
Use of pre-project training to support capability building of key suppliers in a project (Lappi and Aaltonen, 2017)		
Contractors trained to address environmental and social concerns (Guo *et al.*, 2014)	Training and continuous improvement	
Providing training to suppliers (e.g., safety culture) (Ruuska *et al.*, 2011)		
Systematic collaboration and practice development (Ruuska *et al.*, 2011)		
Exchange of innovation successes and learning from failures (Davies *et al.*, 2014)		
Identifying, articulating, and codifying innovative practices for the future (Davies *et al.*, 2014)		

3.2 Analysis framework

Governance mechanisms influence how work is coordinated and organized in inter-organizational project networks, and they ultimately determine the project actors' commitment and capability to work toward achieving the project goals (Kujala *et al*., 2016). An analysis framework that can be used to describe and analyze governance in project networks is presented in Table VII. The aim of the framework was to bring up questions that are relevant for a well-functioning governance system. The framework is not normative in the sense that it does not suggest that any specific governance practice should be selected. The effectiveness of any governance approach depends on the context, and different mechanisms can be used to achieve the same objective. For example, in a project where project actors expect to work together in the future, "shadow of the future" (Heide and Miner, 1992) motivates actors to contribute to project success, thus reducing the need for other types of rewards.

The governance in project networks is a combination of different mechanisms and practices. Some of these practices, such as implementation of an information system to facilitate coordination, can be designed and implemented by project actors. However, coordination is also facilitated by a similar cultural background and existing relationships between or among actors that emerge from the network structure and cannot be directly controlled.

Table VII. Governance analysis **framework**.

Governance dimension	Guiding questions for analysis
Goal setting	
• Joint performance goal	• Do project actors have a clear understanding of the project's goals? • Have actors had an adequate opportunity to influence/participate in project goal setting?
• Clarity of goals	• Are there well-defined performance goals aligned with project goals for each project actor? • Do project actors understand the importance of meeting the performance goals and their impact on overall project performance?
• Flexibility of goals	• Are processes to update/change project goals, such as timetables, well defined, and do project contracts enable flexible adjustment of project goals to meet the overall project performance targets?
Rewarding	
• Rewarding tied to performance (short/long-term)	• Are rewards tied to actors' performance in meeting their own goals, or project goals? • Does the rewarding system ensure that all stakeholders are motivated to work toward the project's goals and can allocate adequate resources for the project?
• Risk allocation	• Are risks collectively shared, or are they allocated to different actors?
• Ownership structure	• Do project actors have a stake/ownership in the project product?
• Reputation and future business	• Is it important for actors to do good work in a project as they want to maintain a good reputation and/or maintain relationships with other actors in the project network?
Monitoring	
• Formal control and monitoring	• Are there formal practices for monitoring the performance of each actor? • Does the monitoring system provide up-to-date information about project performance and performance of each stakeholder?
• Informal monitoring	• Are there informal practices that help us to understand project performance and the performance of each stakeholder? • Does the project have an adequate monitoring system to keep track of the project and each actor's performance?
• Third Party monitoring and auditing	• Are third-party monitoring and auditing practices used to track project performance?
Coordination	
• Common project management practices	• Are there defined and agreed upon project management practices that are used by project actors?

	• Are there tools and work processes that enable project actors to effectively work together?
• Shared culture, values, and norms	• Do project parties have a similar cultural background, and/or have they developed a shared culture, values, and norms in previous projects?
• Communication and information sharing	• Does the project have well defined and adequate practices to ensure that all information is up-to-date, transparent, and available to all relevant actors?
• Change management	• Does the project have a system to detect deviations from the plan early enough and an efficient change management process?
• Conflict resolution	• How are conflicts in a project managed?
Roles and decision-making	
• Definition of roles and responsibilities	• Are roles and responsibilities for each actor well defined, and do they support effective implementation of a project? • Are relevant actors included in the decision-making system?
• Management structure	• How does project management structure ensure that decisions are made in the right level, using best available information and in time?
• Authority for decision-making	• Can actors effectively participate in the project's decision-making with adequate authority?
Capability building	
• Actor selection	• Is all necessary capability involved in the project and does each stakeholder have adequate capabilities to meet the project performance expectations? • Are the processes for actor selection such as tendering practices efficiency used to foster project objectives as regards resource capability, innovative solutions and/or price-efficiency?
• Training and continuous improvement	• Does the project provide adequate support and training for actors that do not have adequate skills for meeting the project performance expectations? • Are processes and practices for continuous improvement and learning in the project defined and used in the project?

4. Empirical case study

4.1 Research approach and case description

In order to illustrate the use of the developed framework, a single case study method (Yin, 2009) was chosen. According to Siggelkow (2007), single case studies are highly valuable for illustrating key concepts or frameworks as they provide concrete examples of the developed constructs and offer ideas of how the conceptual arguments can be applied in empirical settings.

We conducted a study of a complex tunnel construction project, Rantatunneli (further referred to as the Lakeside project), which was built under a medium-sized Finnish city, Tampere. It was selected for the following reasons. First, at the time of its construction, the 2.3-kilometer tunnel was the longest and most complex tunnel ever built in Finland, involving a complex network of organizations that needed to be governed. The aim of the tunnel was to promote the development of the city's central areas in terms of housing and businesses, while improving traffic flow and safety. Furthermore, the Lakeside project was the first complex and large infrastructure project in the country that adopted an Australia originating project alliance approach as its delivery method, and the value of the alliance contract was 180 million euros. In the project alliance model, the alliance organizations are tied together through a multi-party alliance contract, and the traditional boundaries and roles of the organizations are eliminated as parties work together for the joint project goals and what is best for the project. In this mode of co-operation, the customer, designers, and contractors are integrated early on into the co-operative development of the project concept. In this case, the alliance arrangement made the project extremely revealing in terms of the dimensions of governance in an inter-organizational network context. Finally, we had the opportunity to collect in-depth data concerning the project, including interviews and various informal discussions.

The case project alliance consisted of five members: the city, the national transport infrastructure agency, the main constructor, a designer for infrastructure engineering, and a designer for underground structures. The parties entered into a multi-party joint contract involving all the focal actors. The project alliance's delivery form was relatively new to all the participants and it required significant knowledge development and capability building. The project's procurement phase was started in December 2011, after which the service provider consortium was selected, and a project development agreement was signed in July 2012. The development phase ended in September 2013, after which the execution phase started. The tunnel was opened for traffic in November 2016 and completed by the end of 2017 under schedule and under budget. The case project was rewarded with the IPMA Global Project Excellence Award in the category of megaprojects in 2018 because of its successful governance approach

4.2 Data collection and analysis

Data collection and analysis process utilized all relevant material, which provided information about governance approaches used in the project. The starting point for the analysis was a rich project documentation, such as official project plans, innovation reports, and press releases. Project documentation was complemented by interviewing representatives of the five alliance organizations, altogether 11 individuals in March 2015 during the project's implementation stage, when experiences from the governance approach had already been accumulated. The interviewees included representatives from different alliance member organizations including project manager, HSE coordinator, assistant project manager, two procurement managers, chairman of the alliance executive team, planning manager, PR manager, technical project director, chief structural designer and project cost engineer. The variety of the interviewees ensured a holistic perspective into the governance approaches used in the project.

Two researchers were present in each of the interviews that covered themes related to the governance of the project, including key events over the life cycle, managerial processes, organizational arrangements, and tools and methods used in the project to align the objectives of the participating organizations. In addition, more focused questions related to the identified key dimensions of governance were posed. All the interviews were recorded and transcribed verbatim for later analysis.

Empirical data were content analyzed by using the developed conceptual framework on dimensions of governance in project networks. Therefore, we applied a directed content analysis approach (Hsieh and Shannon, 2005), where the relevant research findings from our systematic literature review were used as guidance for initial codes. The content of each key dimension and the use of related governance mechanisms in the Lakeside project were analyzed by systematically categorizing empirical data into the six key dimensions of the developed governance framework. During this process two of the researches that were more closely involved with the case coded the content independently into the different categories and after this the results were compared and discussed by each of the researchers to find a consensus. As the purpose of the empirical case is to illustrate the potential use of the framework, not to inductively develop new knowledge, we did not continue with following coding rounds to divide the data into more fine-grained sub-categories.

4.3 Empirical analysis

In the following, a brief description of the key findings structured according to the governance dimensions is provided. This description is based on both project reports and interview data. A more detailed overview of the project, which is well aligned with our research findings, is provided in Rantatunneli: The value for money report (Finnish Transport Agency, 2018).

Goal setting

Joint goal setting was considered one of the key mechanisms of aligning the actors' interests in the Lakeside project. During the development phase of the project, the alliance organizations, based on the owners' main targets, jointly defined and formed the key results areas and goals of the project, which provided the basis for the core of the commercial model of the project. The defined key results areas of safety, schedule, operations, and usability were agreed upon to ultimately guide the sharing of the bonuses and sanctions at the end of the project. The target values with regard to each key result area and their indicators were set to be high enough in order to motivate the alliance participants toward excellent performance. Early integration of actors to jointly design the key results areas and goals of the project also ensured the clarity of goals for each of the alliance participants. The flexibility related to the goals was facilitated through a joint development phase of the organizations that lasted a year and was safeguarded through a development phase contract. The development phase allowed the organizations to flexibly develop and elaborate the project concept and design iteratively through cross-disciplinary cooperation and innovations, and this ensured that the organizations did not need to fix the project goals too early.

Rewarding

The alliance contract for the project execution phase included a commercial model that aimed to align the actors' goals through a joint project-related incentive system. Bonuses and sanctions were tied to the key performance areas and their indicators and the set target goals. For example, if the safety performance was exceptionally high, the alliance contract parties would receive a joint bonus. The incentive system was planned in a manner that ensured that all the parties felt that they were in the same boat in the Lakeside project. In case someone underperformed, this would have monetary implications for all alliance parties. Risks were also analyzed and managed jointly, which safeguarded

the project's goals, as the actors shared both pains and gains together. The life cycle approach was not applied in terms of the reward system, but a joint guarantee period of five years was set that would prevent the short-term optimization of the project alliance parties. The owners of the project, namely, the Finnish Transport Agency and the City of Tampere, were also integrated into the project structure and the joint project organization in which the organizations had representatives. This ensured that the owners' voices were considered in the project-related decision-making. In the project alliance type of operations, the shadow of the future also plays a central role: as alliancing was a novel form of collaborative project delivery at the time of the Lakeside project and the project served as a flagship project in the industry, the project actors were well aware of the reputational and business benefits that participation in the project would bring in the construction and infrastructure market if the project performed well.

Monitoring

Informal interaction and joint behavioral guidelines with regard to collaboration were the cornerstones that acted as key monitoring mechanisms in the Lakeside project. For example, jointly defined collaborative values of the project were visible on the walls of the joint co-locational space of the alliance organization in order to remind all actors of the importance of cooperation in the project. High degrees of formal monitoring and third-party control were avoided, and instead of those, trust among the parties was highlighted. Transparency and the use of open-book accounting meant that sharing the project's financial information among the alliance organizations could also be considered a monitoring mechanism. In addition, performance of the project in key results areas were systematically and visibly shared by all project participants through. These practices also also supported the self-monitoring of the parties.

Coordination

In the Lakeside project, much effort was dedicated to cross-functional coordination. Not only did the project have a joint project organization, joint co-locational space, and jointly defined project-specific project management processes, values, and norms, but also a joint databank, procedures for change management, and conflict resolution policies were in place. A number of different types of cross-functional coordination groups, committees, and task forces were established, in addition to dedicated integrator roles, to ensure a deeply integrated project structure and align the goals of the actors. At the beginning of the project, a significant amount of time was used to develop and define the joint project-specific coordination practices, and also changes to these were made as the project proceeded. The joint values of cooperation were also defined within the actual project execution contract, which was written using unconventional contract language that included sections where the parties stated, for example, that "We all win or we all lose," which was seen as means to reinforce behavioral cooperation and commitment for collaboration among the alliance organizations. The conflict resolution process was also unconventional as the parties had committed to "no disputes" and to a "best-for-the-project" approach with a unanimous decision-making structure, and they agreed that all conflicts would be handled inside the alliance organization.

Roles and decision-making

The Lakeside project had a joint project organization, which aimed to soften or eliminate any possibly divisive organizational boundaries of the firms participating in the alliance. The roles and responsibilities were defined and agreed upon based on each individual's knowledge, and the decision-making strategy also aimed at decentralization and creating a situation where decisions would be made at as low a level as possible by the professionals, based on their competence. The project's organizational structure included a project management team that was responsible for

operational decisions and led by the project manager and a project leadership team which was responsible for the complete governance of the project. In addition, a number of cross-functional teams and technical committees were established to ensure horizontal integration. One of the guiding principles of the decision-making was the commitment to unanimous decision-making and democracy in order to avoid costly disputes. This ensured that each decision was discussed thoroughly and, thus, supported knowledge integration among the parties.

Capability building

The focus on capabilities and competences was evident from the onset of the tendering process of the project. The City of Tampere and the Finnish Transport Agency aimed to find the most competent and cooperative consortium that would have a project alliance orientation and individuals with a collaboration-oriented mindset and skills. In the selection process, behavioral and cooperative competences were used as two of the selection criteria. Furthermore, the selection process was designed to ensure that a consortium with the potential for value creation would be selected. Continuous learning and capability building were also reflected in the daily practices of the project. For example, lessons learned sessions were organized systematically during the project to ensure the accumulation of knowledge and continuous improvement; for example, alliance trainings were a routinized activity in the project. In addition, an innovation system was set up to optimize the value of the multi-disciplinary integration of designers, constructors, and clients, and to facilitate the development of new ideas, competences, and capabilities.

4.4 Summary of empirical results

The summary of key governance mechanisms applied in the project are provided in Table II. It should be noted that these mechanisms were applied mainly among focal players in the project. In the supply chain, more traditional competitive tendering and the fixed pricing of contracts were used, leading to a different type of approach to govern transactions.

Table VIII. Summary of governance approaches in the case project

Governance dimension	Governance approaches in the case project
Goal setting	
• Joint performance goal	• During the interactive development phase main goals were jointly defined and agreed among focal players in the project (considering the owner's will)
• Clarity of goals	• Four key result areas were set during the development phase: schedule, safety, usability and public image. • Performance goals and related indicators were determined in accordance with project key result areas (but they were common to all key players due to the joint organization) • Performance incentives were also included in subcontractors' contracts in order to support overall project goal achievement.
• Flexibility of goals	• A long joint development phase allowed flexibility in modifying goal to create value for money • The use of target cost based contract is aimed to decrease sensitivity to changes during the implementation phase
Rewarding	
• Rewarding tied to performance	• Rewards were based on the degree key result area objectives and target outturn cost were met • Rewarding system improved motivation and the joint organization enabled them to involve best experts in the project without the company borderlines guiding the staffing • Life cycle performance considered only during guarantee period
• Risk allocation	• All risks of the project (with few exceptions) were carried jointly by the owner and key service providers
• Ownership structure	• Joint ownership concerned the project only, but not the resulting asset and its life cycle performance
• Reputation and future business	• Key actors recognized that there is a good potential for further collaboration/projects
Monitoring	
• Formal control and monitoring	• Indicators for key result areas were followed periodically • Open book accounting was applied to track costs • Owner's involvement in the team meant also real time access to all project information
• Informal monitoring	• Location in the same space and visual management tools were in use to ensure self-monitoring
• Third Party monitoring and auditing	• External advisors used for the auditing of the cost management systems in the competition phase • Tentative target cost by the alliance team were made subject to an assessment by a third party and a third party was used to review the operation during the implementation (plans, cost changes, invoices)
Coordination	
• Common project management practices	• Joint organization led to amalgamation of management practices • Project bank was used for document sharing and BIM facilitated design information management.
• Shared culture, values, and norms	• Creation of shared alliance culture and working practices: facilitator used to enhance alliance culture, behavioral norms brought to the contract

• Communication and information sharing	• Inter-organizational meetings and working sessions were organized continuously and liaison roles (including project manager, safety coordinator, risk management engineer etc.) facilitated information sharing. • Visual management practices in the co-locational space facilitated communications. • Owner's strong involvement in the team meant also real time access to all project information
• Change management	• Owner's participation in the same alliance organization enable flexible and fast decision-making processes related to change management. • Changes in organizational arrangements: roles and responsibilities were also modified during the project in order to best facilitate the achievement of project's goals
• Conflict resolution	• Conflict resolution internally by the alliance joint leadership team based on principle "best for the project" • Requirement for unanimous decision-making combined with the use of external advisors if appropriate in conflict resolution
Roles and decision-making	
• Definition of roles and responsibilities	• Dilution of organizational boundaries, one decision-making system for the project • Decentralization of decision to lowest level as possible to enable fast decision-making processes
• Management structure	• Joint management structure including, e.g., alliance leadership and management teams and discipline-specific teams. • Project manager from the contractor and deputy project manager from the owner • Number of cross-functional teams to included relevant parties in decision making-processes
• Authority for decision-making	• The joint ownership of the project and the joint risk sharing promoted fast enough decision-making since it made it to be beneficial to all parties • Decisions needed to be based on unanimous decision-making and, thus, all key parties were involved/listened to
Capability building	
Actor selection	• Alliance was formed by three companies and two owners to cover all the range of needed capabilities; numerous owners' experts were also employed for the project organization • Selection of focal actors mainly based on capabilities, especially capability to work in an alliance project and innovativeness in bringing up new solutions
• Training and continuous improvement	• Training was arranged to learn collaborative practices • Systematic implementation of practices, such as frequent lessons learned session, existed to support continuous learning and improvement

Table VIII illustrates approaches applied in each of the governance framework dimensions to address questions in the analysis framework. The results indicated that all questions and related mechanisms in the governance frameworks were relevant and reasonable, and that they could be used to analyze which type of governance approaches have been applied and/or should be applied for a particular project setting.

5. Discussion

We introduced the concept of *governance in a project network* and identified dimensions of governance and related governance mechanisms based on a systematic literature review. In the empirical case study, the framework was applied in the context of an alliance project to analyze practical governance approaches used in the project.

5.1. Contribution and theoretical implications

The present study advances and contributes to the research stream aiming to increase our understanding of governance in the context of temporary inter-organizational networks, comprising multiple autonomous organizations, whose interests need to be aligned to achieve a joint system-level goal (von Danwitz, 2018). We identify key dimension of governance, and related governance mechanisms, which enable to coordinate, adapt and safeguard transactions in project networks. It complements and provides a more detailed view to previous literature, which has mainly divided governance into two different types, contractual and relational governance, and placed a lot of focus on interplay between these two types of governance (Roechric and Lewis 2014; Benetiz-Avila *et al.*, 2019). The underlying assumption of the developed governance framework that adopts an internal perspective on the governance of inter-organizational networks is that the parties themselves create the governance structure in the project network through their decision-making processes, capabilities, and interactions.

Based on a systematic literature review of governance approaches in inter-organizational project networks, we identified dimensions of governance and created an analysis framework that can be used for the empirical analysis of governance mechanisms in different inter-organizational settings. The application of the framework in the context of project alliance yielded results that are well aligned with the literature describing key features of an alliance project (see, for example, Chen *et al*., 2012; Chen and Manley, 2014; 2015; Walker and Lloyd-Walker, 2015). Additionally, it complements previous literature by emphasizing some features that have received less attention in the previous research on project alliances, such as clarity and flexibility of goals, reputation and future business, and third-party monitoring and auditing.

In addition to providing a nuanced understanding of governance in projects, the developed framework elaborated our understanding of the management of inter-organizational projects in general. Recent research has particularly emphasized the role of the "strong owner" (Winch and Leiringer, 2016; Sergeeva 2019) in setting the tone for the entire project network. While it is evident from megaproject literature that key project actors serve as system architects and as designers of the governance system, the holistic network perspective investigated in this study also indicates that the diverse stakeholders are active actors in contributing to and shaping the performance of projects. The inclusion of these actors in a way that they are both able to contribute and motivated to do so, increases the possibilities for project success (Clegget *et al*. 2002).

The developed framework of key dimensions of project network governance contributes to the growing stream of studies concerned with defining, conceptualizing, synthesizing, and making sense of project governance and its implications (Ahola *et al*., 2014; Danwitz, 2018) by developing project network governance in a systematic and explicit manner. The contribution of this framework lies in constructing a holistic model that clarifies the many theories, strands, and concepts in the project governance literature.

5.2 Practical implications

From a practical point of view, the framework introduced in this paper would enable managers to better analyze the choices they make in the selection of any specific delivery model. As an analysis tool, project management can use it as a method to design governance approaches, which will be applied during the project, and to communicate it to all relevant stakeholders. In this research, the framework was applied as a tool for post-project analysis to better understand governance approaches used in the case project. For practical purposes, if the tool is used during or after the project, it would enable a more comprehensive discussion about governance choices and ensure that all relevant views will be covered.

However, we want to emphasize that the framework is descriptive in nature. It does not suggest that a specific governance approach should be applied but the framework can be used to ensure that all relevant views have been taken into account in the selection of appropriate governance mechanisms for a project. The implementation of such approaches can be based on contractual governance relying on explicit contract that can be enforced in courts, or it can be complemented by relational governance focusing more on building long-term inter-organizational relationships and trust between actors (Cao and Lumineau, 2015). For example, if there is an opportunity for further collaboration, then all parties are more likely to perform as agreed upon. This reduces the need to design rewarding practices for a specific project as parties are already motivated to make the project successful to ensure further collaboration.

Governance may also vary in the different parts of the network. This was clearly seen in the Lakeside tunnel project, where governance approaches aiming at collaboration were used between focal players, but subcontracting was done using more traditional contracts. From a contingency perspective, this practice can be explained as adapting the governance approach to meet contextual requirements. For example, a simple transaction does not need complex goal setting processes or rewarding schemes, but it can be coordinated and safeguarded using a fixed-price contract, sanctions for poor performance, and formal monitoring.

5.3 Limitations of the research

Our holistic starting point could be seen as a challenge, in that our data were informed by diverse ontological and epistemological assumptions. Moreover, we cannot claim that the developed framework presents an exhaustive list of all the factors of relevance to project governance; as a systematic literature review, it necessarily focused on findings from existing studies in project management literature. A further concern is how the identified mechanisms are to be operationalized—for instance, it is immensely challenging to measure the shared culture and values in a project network and this requires thorough expertise in analyzing organizational culture and leadership (Schein, 1992). Evidently, applying the framework to real-life projects would provide better insights into its validity. Such empirical work would also equip us better to construct project governance typologies from the combinatory profiles of different sub-dimensions. Projects embody a combination of these key dimensions, which are also highly interdependent. For example, rewarding based on performance is dependent on having monitoring and reporting practices that can be used to verify performance.

5.4 Directions for future research

In this research, a generic framework with a specific set of questions for each governance dimension was created using systematic literature review. It can be used to analyze governance in project networks, but it also provides a tool for systematic analysis of different project delivery models which describe how the multiple parties involved in a project are organized and managed to create and capture value (Davies et al. 2019). Our empirical case provides an example how the framework can be used in an empirical setting to analyze alliances type of project delivery. Further empirical research should focus, in particular, on the micro-practices and actual decision-making processes in different type of project delivery models as little research has been conducted in these areas (van Marrewijk and Smits, 2015).

The framework developed here also invites continued research on governance from a contingency perspective—that is, governance mechanisms must be tailored to fully consider a project's context and characteristics (Guo *et al*., 2014; Danwitz, 2018) and the identified project and partner contexts as important factors that influence how different governance approaches affect project performance. We suggest that the dimensions of governance in the project networks presented in this paper could be used in this research to operationalize governance for empirical studies.

Furthermore, a project life cycle perspective on project governance may serve to illuminate the temporal dynamics of how contingency factors and governance mechanisms evolve and influence governance. For example, as project parties create shared culture and practices during the project, this can be considered as a governance mechanism to coordinate work that emerges due to the interaction between project parties during the project life cycle. Also, project characteristics such as level of uncertainty changes in different phases of the project, and in different parts of the inter-organizational project network. Studying the flexibility and dynamics of project governance would therefore prove to be a fruitful endeavor for further research.

References

Abednego, M.P. and Ogunlana, S.O. (2006), "Good project governance for proper risk allocation in public-private partnerships in Indonesia", *International Journal of Project Management*, Vol. 24 No. 7, pp. 622-634.

Ahola, T., Ruuska, I., Artto, K. and Kujala, J. (2014), "What is project governance and what are its origins?", *International Journal of Project Management*, Vol. 32 No. 8, pp. 1321-1332.

Badewi, A. (2015), "The impact of project management (PM) and benefits management (BM) on project success: towards developing a project benefits governance framework", *International Journal of Project Management*, Vol. 34 No. 4, pp. 761-778.

Baker, G., Gibbons, R. and Murphy, K. (2002), "Relational contracts and theory of the firm", *The Quarterly Journal of Economics*, Vol. 117 No. 1, pp. 39-84.

Benítez-Ávila, C., Hartmann, A., Dewulf, G. and Henseler, J. (2018), "Interplay of relational and contractual governance in public-private partnerships: the mediating role of relational norms, trust and partners' contribution", *International Journal of Project Management*, Vol. 36 No.

Benítez-Ávila C., Hartmann A., and Dewulf G. (2019), "Contractual and Relational Governance as Positioned-Practices in Ongoing Public–Private Partnership Projects", *Project Management Journal*, Vol. 50 No. 6, pp. 716-733

Biesenthal, C. and Wilden, R. (2014), "Multi-level project governance: trends and opportunities", *International Journal of Project Management*, Vol. 32 No. 8, pp. 11291-1308.

Brady, T. and Davies, A. (2014), "Managing structural and dynamic complexity: a tale of two projects", *Project Management Journal*, Vol. 45 No. 4, pp. 21-38.

Brady, T., Davies, A., Gann, D. and Rush, T. (2007), "Learning to manage mega projects: the case of BAA and Heathrow Terminal 5", *Project Perspectives*, Vol. 29, pp. 32-39.

Bresnen M. and Marshall N. (2000), "Motivation, commitment and the use of incentives in partnerships and alliances", *Construction Management and Economics*, Vol. 18 No. 5, pp. 587-598.

Bresnen, M. and Marshall, N. (2002), "The engineering or evolution of co-operation? a tale of two partnering projects", *International Journal of Project Management*, Vol. 20 No. 7, pp. 497-505.

Caldwell, N., Roehrich, J. and Davies, A. (2009), "Procuring complex performance in construction: London Heathrow Terminal 5 and a Private Finance Initiative hospital", *Journal of Purchasing and Supply Management*, Vol. 15 No. 3, pp. 178-186.

Cardenas I.C., Voordijk, H. and Dewulf, G. (2017), "Beyond theory: towards a probabilistic causation model to support project governance in infrastructure projects", *International Journal of Project Management*, Vol. 35 No. 3, pp. 432-450.

Cakkol M., Selviaridis K., Finne M. (2018), "The governance of collaboration in complex projects", *International Journal of Operations & Production Management*, Vol. 38 No. 4, pp. 997-1019.

Chang, C.Y. (2015), "Risk-bearing capacity as a new dimension to the analysis of project governance", *International Journal of Project Management*, Vol. 33 No. 6, pp. 1195-1205.

Chang, C.Y. and Ive, G. (2007), "The hold-up problem in the management of construction projects: a case study of the Channel Tunnel", *International Journal of Project Management*, Vol. 25 No. 4, pp. 394-404.

Chen, G., Zhang, G., Xie, Y.-M. and Jin, X.-H. (2012), "Overview of alliancing research and practice in the construction industry", *Architectural Engineering and Design Management*, Vol. 8 No. 2, pp. 103-119.

Chen, L. and Manley, K. (2014), "Validation of an instrument to measure governance and performance on collaborative infrastructure projects", *Journal of Construction Engineering and Management*, Vol. 140 No. 5, 04014006.

Clegg S.R, Pitsis S.T, Rula-Polley T, Mrosszeky M., (2002). "Governmentality Matters: Designing an Alliance culture of Inter-organizational Collaboration for Managing Projects", *Organization Studies.* Vol. 23, No. 3, pp. 317-337.

Davies A, Macaulay, S., Brady T. (2019). Delivery model innovation: Insights from infrastructure projects. *Project management journal,* Vol. 50 No 2, pp. 119-127

Davies, A., Macaulay, S., Debarro, T. and Thurston, M. (2014), "Making innovation happen in a megaproject: London's crossrail suburban railway system", *Project Management Journal*, Vol. 45 No. 6, pp. 25-37.

Dekker, S. (2011), *Drift into Failure. From Hunting Broken Components to Understanding Complex Systems*, Ashgate, Farnham.

Derakhshan, R., Turner, R. and Mancini, M. (2019),"Project governance and stakeholders: a literature review", *International Journal of Project Management*, Volume 37, pp. 98-116.

Dossick, C.S. and Neff, G. (2011), "Messy talk and clean technology: communication, problem-solving and collaboration using building information modelling", *The Engineering Project Organization Journal*, Vol. 1 No. 2, pp. 83-93.

Eisenhardt, K. (1989), "Agency theory: an assessment and review", *Academy of Management Review*, Vol. 14 No. 1, pp. 57-74.

Eriksson, P.E. (2010), "Improving construction supply chain collaboration and performance: a lean construction pilot project", *Supply Chain Management: An International Journal*, Vol. 15 No 5, pp. 394-403.

Fellows, R. and Liu, M.A. (2012), "Managing organizational interfaces in engineering construction projects: addressing fragmentation and boundary issues across multiple interfaces", *Construction Management and Economics*, Vol. 30 No. 8, pp. 653-671.

Finnish Transport Agency(2018), "Rantatunneli – value for money report". Finnish Transport Agency / Projects. Helsinki.

Gopalakrishnan, S., & Ganeshkumar, P. (2013), "Systematic reviews and meta-analysis: understanding the best evidence in primary healthcare". *Journal of Family Medicine and Primary Care*, Vol. 2 No. 1, pp. 9-14.

Gulati, R., Lawrence, P. and Puranam, P. (2005), "Adaptation in vertical relationships: beyond incentive conflict", *Strategic Management Journal*, Vol. 26 No. 5, pp. 415-440.

Guo, F., Chang-Richards, Y., Wilkinson, S. and Li, T.C. (2014), "Effects of project governance structures on the management of risks in major infrastructure projects: a comparative analysis", *International Journal of Project Management*, Vol. 32 No. 5, pp. 815-826.

Hart, O. (1988), "Incomplete contract and theory of the firm", *Journal of Law, Economics, & Organization*, Vol. 4 No. 1, pp. 119-139.

Hietajärvi, A.-M., Aaltonen, K. and Haapasalo, H. (2017a), "Managing integration in infrastructure alliance projects: dynamics of integration mechanisms", *International Journal of Managing Projects in Business*, Vol 10 No. 1, pp. 5-31.

Hietajärvi, A.-M., Aaltonen, K. and Haapasalo, H. (2017b), "What is project alliance capability?", *International Journal of Managing Projects in Business*, Vol. 10 No. 2, pp. 404-422.

Hsieh, H.-F., Shannon, S.E., 2005. Three Approaches to Qualitative Content Analysis. Qual. Health Res. 15, 1277–1288.

Jones, C., Hesterly, W. and Borgatti, S. (1997), "A general theory of network governance: exchange conditions and social mechanisms", *The Academy of Management Review*, Vol. 22 No. 4, pp. 911-945.

Kivilä, J., Martinsuo, M. and Vuorinen, L. (2017), "Sustainable project management through project control in infrastructure projects", *International Journal of Project Management*, Vol. 35 No. 6, pp. 1167-1183.

Klakegg, O.J. (2009), "Pursuing relevance and sustainability", *International Journal of Managing Projects in Business*, Vol. 2 No 4, pp. 499-518.

Klakegg O.J., Williams T., Magnussen O.M. and Glasspool H. (2008), "Governance frameworks for public project development and estimation", *Project Management Journal*, Vol. 39 No. 1 suppl, pp. 27-42.

Lahdenperä, P. (2012), "Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery", *Construction Management and Economics*, Vol. 30 No. 1, pp. 57-79.

Lappi, T. and Aaltonen, K. (2017), "Project governance in public sector agile software projects", *International Journal of Managing Projects in Business*, Vol. 10 No. 2, pp. 263-294.

Lehtinen, J. and Aaltonen, K. (2020), "Organizing external stakeholder engagement in inter-organizational projects: Opening the black box", *International Journal of Project Management*, Vol. 38 No. 2, pp. 85-98

Leufkens, A.S. and Noorderhaven, N.G. (2011), "Learning to collaborate in multi-organizational projects", *International Journal of Project Management*, Vol. 29 No. 4, pp. 432-441.

Liu, T. and Wilkinson, S. (2014), "Large-scale public venue development and the application of Public-Private Partnerships (PPPs)", *International Journal of Project Management*, Vol. 32 No. 1, pp. 88-100.

Lu, P., Cai, X., Wei, Z., Song, Y. and Wu, J. (2019), "Quality management practices and inter-organizational project performance: Moderating effect of governance mechanisms", *International Journal of Project Management*, Vol. 37, No. 6, pp. 855-869

Lu, P., Guo, S., Qian, L., He, P. and Xu, X. (2015), "The effectiveness of contractual and relational governances in construction projects in China", *International Journal of Project Management*, Vol. 33 No. 1, pp. 212-222.

Macaulay, S. (1963), “Non-contractual relations in business: a preliminary study”, *American Sociological Review*, Vol. 28 No. 1, pp. 55-67.

Macneil, I.R. (1978), “Contracts: adjustments of long-term economic relations under classical, neoclassical, and relational contract law”, *Northern University Law Review*, Vol. 72 No. 6, pp. 854-905.

Macneil, I.R. (1980), *The New Social Contract: An Inquiry into Modern Contractual Relations*, Yale University Press, New Haven.

Matinheikki, J., Aaltonen, K. and Walker, D. (2018), “Politics, public servants, and profits: institutional complexity and temporary hybridization in a public infrastructure alliance project”, *International Journal of Project Management*, Vol. 37 No. 2, pp.298-317.

McGrath S. and Whitty S. (2015), “Redefining governance: from confusion to certainty and clarity”, *International Journal of Managing Projects in Business*, Vol. 8 No. 4, pp. 755-787.

Muller, R. (2009), *Project Governance*, Gower, London.

National Alliance Contracting Guidelines (2015), “Guide to alliance contracting”, Canberra, ACT: Australian Government, Department of Infrastructure and Regional Development.

Nevstad, K., Børve, S., Karlsen, A. and Aarseth, W. (2018) “Understanding how to succeed with project partnering”, *International Journal of Managing Projects in Business*, Vol. 11 No. 4, pp. 1044-1065.

Nisar, T.M. (2013), “Implementation constraints in social enterprise and community Public Private Partnerships”, *International Journal of Project Management*, Vol. 31 No. 4, pp. 638-651.

Olsen, B.E., Haugland, S.A., Karlsen, E. and Husey, G.J. (2005), “Governance of complex procurements in the oil and gas industry”, *Journal of Purchasing and Supply Management*, Vol. 11 No. 1, pp. 1-13.

Osmundsen, P., Aven, T. and Vinnem, J. E. (2008), “Safety, economic incentives and insurance in the Norwegian petroleum industry”, *Reliability Engineering and System Safety*, Vol. 93 No. 1, pp. 137-143.

Papaioannou, D., Sutton, A., Carroll, C., Booth, A., & Wong, R. (2010), “Literature searching for social science systematic reviews: consideration of a range of search techniques”, *Health Information & Libraries Journal*, Vol. 27 No. 2, pp. 114-122.

Pitsis, T.S., Sankaran, S., Gudergan, S. and Clegg, S.R. (2014), “Governing projects under complexity: theory and practice in project management”, *International Journal of Project Management*, Vol. 32 No. 8, pp. 1285-1290.

Qiu, Y., Chen, H., Sheng, Z. and Cheng, S. (2019), “Governance of institutional complexity in megaproject organizations”, *International Journal of Project Management*, Vol. 37 No. 3, pp. 425-443

Reve, T. and Levitt, R.E. (1984), “Organization and governance in construction”, *International Journal of Project Management*, Vol. 2 No. 1, pp. 17-25.

Roehrich, J.K. and Lewis, M.A. (2014). Procuring complex performance: Implications for exchange governance complexity. International Journal of Operations & Production Management, Vol. 32 No. 2, pp. 221-241.

Ruuska, I., Ahola, T., Artto, K., Locatelli, G. and Mancini, M. (2011), "A new governance approach for multi-firm projects: lessons from Olkiluoto 3 and Flamanville 3 nuclear power plant projects", *International Journal of Project Management*, Vol. 29 No. 6, pp. 647-660.

Sallinen L., Ruuska I. and Ahola T. (2008), "How governmental stakeholders influence large projects: the case of nuclear power plant projects", *International Journal of Managing Projects in Business*, Vol. 6 No. 1, pp. 51-68.

Sanderson, J. (2012), "Risk, uncertainty and governance in megaprojects: a critical discussion of alternative explanations", *International Journal of Project Management*, Vol. 30 No. 4, pp. 432-443.

Sawacha, E., Naoum, S. and Fong, D. (1999), "Factors affecting safety performance on construction sites", *International Journal of Project Management*, Vol. 17 No. 5, pp. 309-315.

Schein E.H. (1992), *Organizational Culture and Leadership*, 2nd ed., Jossey-Bass, San Francisco.

Ferrer, P., Galvão, G. and de Carvalho, M (2020), "Tensions between compliance, internal controls and ethics in the domain of project governance", *International Journal of Managing Projects in Business*, Vol. 13 No. 4, pp. 845-865

Sergeeva, N. (2019) Towards more flexible approach to governance to allow innovation: the case of UK infrastructure, *International Journal of Managing Projects in Business*, Vol. 13 No. 1, pp. 1-19

Smith, N.J., Merna, T. and Jobling, P. (2006), *Managing Risk in Construction Projects*, Wiley-Blackwell, Oxford.

Thomson G. (2003). *Between hierarchies and markets: The logic and limits of network forms of organization.* Oxford University Press, Oxford.

Toivonen, A. and Toivonen, P.U. (2014), "The transformative effect of top management governance choices on project team identity and relationship with the organization—an agency and stewardship approach", *International Journal of Project Management*, Vol. 32 No. 8, pp. 1358-1370.

Turner, J.R. and Simister, S. (2001), "Project contract management and a theory of organization", *International Journal of Project Management*, Vol. 19 No. 8, pp. 457-464.

Van den Hurk, M. and Verhoest, K. (2015), "The governance of public-private partnerships in sports infrastructure: interfering complexities in Belgium", *International Journal of Project Management*, Vol. 33 No. 1, pp. 201-211.

van Marrewijk, A. and Smits, K. (2016), Cultural practices of governance in the Panama Canal Expansion Megaproject", *International Journal of Project Management*, Vol. 34 No. 3, pp. 533-544.

Adami V. and Verschoore J. (2018) Implications of Network Relations for the Governance of Complex Projects, *Project Management Journal*, Vol. 49 No. 2, pp. 71-88

von Danwitz, S. (2018), "Organizing inter-firm project governance – a contextual model for empirical investigation", *International Journal of Managing Projects in Business*, Vol. 11 No. 1, pp. 144-157.

Walker, D. and Lloyd-Walker, B. (2015), *Collaborative Project Procurement Arrangements*, Project Management Institute, Newtown Square, PA.

Walker, D. and Walker, B.L. (2014), "Client-side project management capabilities: dealing with ethical dilemmas", *International Journal of Managing Projects in Business*, Vol. 7 No. 4, pp. 566-589.

Williams, T., Klakegg, O.J., Magnussen, O.M and Glasspool H. (2009),"An investigation of governance frameworks for public projects in Norway and UK", *International Journal of Project Management*, Vol. 28 No. 1, pp. 40-50.

Williamson, O.E. (1979), "Transaction cost economics: the governance of contractual relations", *Journal of Law and Economics*, Vol. 22 No. 2, pp. 233-261.

Williamson, O.E. (1985), *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, Free Press, New York.

Williamson, O.E. (1996), *The Mechanisms of Governance*, Oxford University Press, New York, NY.

Winch, G. and Leiringer, R. (2016), "Owner project capabilities for infrastructure development: a review and development of the 'strong owner' concept", *International Journal of Project Management*, Vol. 34 No. 2, pp. 271-281.

Wu, A., Wang, Z. and Chen, S. (2017), "Impact of specific investments, governance mechanisms and behaviors on the performance of cooperative innovation projects", *International Journal of Project Management*, Vol. 35 No. 3, pp. 504-515.