International Journal of Managing Projects in Bu

A shared leadership framework based on boundary spanners in megaprojects

Journal:	*International Journal of Managing Projects in Business*
Manuscript ID	IJMPB-03-2020-0090.R1
Manuscript Type:	Research Paper
Keywords:	Complex Projects, Horizontal leadership, Inter-organizational collaboration

SCHOLARONE™
Manuscripts

A shared leadership framework based on boundary spanners in megaprojects

Subtitle: Shared leadership topology in megaprojects

Abstract

Purpose- Megaprojects present an intricated pattern of leadership activities, which evolve over their planning and delivery and comprises several stakeholders. A framework is useful to navigate this complexity; it allows to identify and cluster the key elements. This paper aims to introduce a novel framework based on boundary spanners to describe the structural pattern of shared leadership in megaprojects.

Design/methodology/approach- A systematic literature review about boundary spanning and shared leadership is used to identify and cluster the key elements of shared leadership in megaprojects. The systematic literature review provides a rich theoretical background to develop the novel shared leadership framework based on boundary spanners.

Findings- There are three key dimensions characterising shared leadership topology in megaprojects: stakeholders, boundary spanning leadership roles and project phases. The novel framework shows how project leadership dynamically transfers among different stakeholders, showing the importance of shared leadership as a leadership paradigm in megaprojects.

Research implications- The novel framework epitomizes shared leadership in

1   megaprojects by exploring its antecedents with social network metrics. This paper

2   stresses that shared leadership is the envisaged form of leadership in megaprojects. By

3   modelling complex project leadership in a simple, yet effective way, the framework

4   fosters critical thinking for future research. The modelling introduced by this

5   framework would also benefit practitioners in charge of megaprojects.

6   **Originality/value-** The paper moves the project leadership research to the network-

7   level by taking boundary spanners as shared leadership roles in megaprojects. It shows

8   how shared leadership is a valuable management tool for planning and delivery

9   megaprojects.

10

11   **Keywords:** shared leadership, boundary spanners, leadership topology, megaprojects

12

1 Introduction

2   Megaprojects are projects characterised by large investment commitment (usually

3   above \$1 billion), complexity (particularly from the organisational perspective), and

4   long-term influence on the environment, society and economy (Flyvbjerg, 2014). The

5   planning and delivery of megaprojects require the collaboration of several teams

6   (Invernizzi *et al.*, 2019).There are, therefore, multiple interfaces leading to a complex

7   network of stakeholders that evolves and changes over the megaproject life-cycle

8   (Fellows and Liu, 2012). In this context, leadership is continuously transferred and

9   shared among different actors. Boundary spanners are key actors working at the

10   interorganizational interface to align project teams and can take various leadership roles

11   (Lee and Sawang, 2016). So far, in the context of projects in general and megaprojects

12   in particular, very little attention has been paid to the leadership attributes of boundary

13   spanners and shared leadership structure.

14   The attributes of traditional leadership are conceptualised as peculiar of single

15   individuals or teams (He *et al.*, 2019). While this conceptualisation can be appropriated

16   for small or standard projects, leadership in megaprojects cannot be attributed to a

17   single person nor single team. Considering the length and complexity of megaprojects,

18   it is impossible to rely on single team or leader to guarantee the successful planning and

19   delivery (Zhu *et al.*, 2019). Team members can be empowered as horizontal leaders and

20   execute complementary leadership tasks through social interaction within the project

21   team (Müller *et al.*, 2018a;b). Leadership in megaprojects is dynamically transferred

22   and shared through specific individuals or teams controlling key knowledge and

1   resources across the project lifecycle (Scott-young, 2019). Therefore, traditional

2   leadership falls short in meeting the requrements of integrating different experts and

3   knowledge in megaprojects leading activities.

4   Shared leadership is a novel project leadership paradigm that contributes to both

5   individual development and project effectiveness, as well as the inter-organisational

6   outcomes (Scott-young, 2019). The body of literature about shared leadership,

7   considering multiple leadership roles and sets of behaviours (Lord *et al.*, 2017), is an

8   emerging and effective approach to conceptualise complex environments (Sweeney et

9   al., 2019). Boundary spanners play a pivotal role in coordinating with stakeholders and

10   knowledge, bringing together potential shared leaders (Marrone, 2010). Previous

11   studies implicate a trend into the field of distributed project leadership network, which

12   is becoming increasingly important, as projects are becoming more complex. Despite

13   the advancements in studying shared leadership and boundary spanners in executing

14   leadership roles, there is a relevant gap in knowledge regarding the shared leadership

15   structural pattern created by multiple boundary spanners in leading megaprojects.

16   According to the boundary spanning theory (Aldrich and Herker, 1977) (Marrone,

17   2010), boundary spanners are key actors working at the organisational interface,

18   engaging in information processing and external representation. They can act as shared

19   leaders to tighten the loose-knit relational network among different teams. Boundary

20   spanners facilitate collaboration effectiveness in global engineering project networks

21   (Marco *et al.*, 2010) through relationships building with external stakeholders

22   (Korschun, 2015). Project leaders are typical boundary spanners and can leverage their

1 key position in the project network to promote cooperation among stakeholders and

2 establish a sound boundary spanning environment (Meerkerk and Edelenbos, 2018). In

3 megaprojects, boundary spanners are potential and capable shared leaders since they

4 are usually located in the key positions of the social network. Shared leadership

5 performed by boundary spanners motivates and coordinates tasks within contemporary

6 originations (Denis et al., 2012). Leadership roles are held by specific boundary

7 spanners possessing the most important resources or knowledge and dynamically

8 transferred from one to another according to the requirements emerging during the

9 megaproject lifecycle. Therefore, leadership in megaprojects is dynamically shared by

10 multiple stakeholders and is conceptualised as boundary spanners' dual role for both

11 internal and external interactions.

12   Until now, the concepts of "shared leadership" and "boundary spanners" in the

13 context of megaproject have been investigated in isolation. A search on Scopus in

14 March 2020 return only two journal papers:

15   (1) Bienefeld et al. (2014) argued that shared leadership by boundary spanners' dual

16   leadership role positively relates to the success of multi-team aircrews.

17   (2) Bolden and Petrov (2014) show that the hybrid configurations of vertical and

18   shared leadership are required in cross-boundary environments, and the

19   boundary spanners can take shared leadership roles in tertiary education.

20   The literature, including these two papers, reveals that shared leadership is

21 originated in the context of boundary spanning and determined by boundary spanners'

22 leadership roles. However, little is known about how boundary spanners become shared

1   leaders and the development of the shared leadership network in megaprojects.

2   Studying the leadership attributes of boundary spanners in megaprojects helps to

3   conceptualise the leadership relations among multiple stakeholders, thus advancing the

4   understanding of shared leadership as a network in megaprojects. In this pape shared

5   leadership topology is defined as the structural patterning of leadership activities and is

6   conceptualised with a network approach.The leadership network is very important since

7   it enables to identify the antecedents of shared leadership and clarify the specific

8   leadership activities in different megaprojects phases.

9   This paper assumes that shared leadership in megaprojects is a network-level

10   construct, in which boundary spanners located at key network positions act as shared

11   leaders. Thus, the unit of analysis of this paper is the shared leadership network in

12   megaprojects. As an initial step to investigate shared leadership network in

13   megaprojects, this paper aims to provide a topological shared leadership framework

14   taking the boundary spanning perspective. The framework is a novel structural pattern

15   of shared leadership in megaprojects, uncovering its antecedents using network analysis.

16   The key contribution to theory is, therefore, the topological foundation for analysing

17   shared leadership research in megaprojects. The aforementioned aim is operationalised

18   into three objectives:

19   • To identify the common theoretical lens linking shared leadership and boundary

20   spanning research (section 2).

21   • To identify the key elements for shared leadership topology in megaprojects

22   (section 4).

1   • To develop a shared leadership topological framework in megaprojects (section 5).

2

3 ## 2   Theoretical background

4   A prerequisite for studying shared leadership in megaprojects is the identification

5 of the theoretical lens to analyse the link between shared leadership and boundary

6 spanning. Table 1 summarises relevant theories dealing with shared leadership and

7 boundary spanning. Network theory, social identity theory, social exchange theory and

8 contingency theory were introduced by Hult (2011) and Road and Kingdom (2014).

9 Role theory is introduced by Biddle (2013) and explains how boundary spanning and

10 shared leadership roles are created in the interaction process by multiple actors. These

11 five theories are, in principle, appropriate to explore leadership in megaprojects since

12 these theories bring together shared leadership, boundary spanning activates and can

13 deal with the dynamic and complex attributes of megaprojects.

14

1   Table 1 Summary of dominant theories to deal with shared leadership and boundary spanning

Theory	General Focus in the theory	Boundary spanning insights	Shared leadership insights	Application in Megaprojects
Network theory	Explaining the creation of ties and relations among linked entities (Granovetter, 1973)(Thorelli, 1986).	Boundary spanners need to maintain intensive interactions with both internal and external members through their network position (Marrone et al., 2007).	Describing a set of non-hierarchical relationships from the distribution of leadership influence across multiple team members (Fu and Liu, 2018) (Derue and Ashford, 2010).	Applied to examine how project stakeholders can be integrated and governed; how various informal networks are produced and evolve in megaprojects
Social identity theory	Theorising how people conceptualise themselves in organisational contexts and how a system of social categorisations defines an individuals' place (Tajfel H., 1982).	The overall composition of one group formed based on the social identity of members' impacts on the property and degree of boundary spanning (Korschun, 2015).	Describing leadership as a group process generated by social categorisation (Hatch and Schultz, 2002)(Homans, 1958).	Applied to classify different responsibilities and positions of multiple stakeholders in megaprojects.
Social exchange theory	Social exchange comprises actions contingent on the rewarding reactions of others (Homans, 1958); and these actions are interdepend and may generate high-quality relationships (Cropanzano et al., 2005)(Pulles and Hartman, 2017).	Interpersonal interactions between boundary spanners have a critical impact on how interorganizational interactions develop (Pulles and Hartman, 2017)	Similarly to the leader-member exchange, the behavioural dimension of shared leadership is the exchange of leadership influence between different team members (Hoch, 2014)	Applied to examine the perceived justice, risk allocation and knowledge sharing among different stakeholders in megaprojects
Contingency theory	Suggesting that organisations whose internal features best match the requirement of environment will achieve the best adaptation(Donaldson, 2001)	The marketing organisations have to operate in the boundary spanning network formed by internal and external stakeholders (Hult, 2011)	Leadership is a process of motivating others to collaborate, in which the contextual variables are very important (Jago, 2007)	Applied to choose the optimal organisational structure or governmentality for managing megaprojects including multiple subprojects
Role theory	The role is a set of tasks and bounded clusters (Biddle, 1986), acting as an expression carrier in the interaction process (Solomon et al., 1985).	Boundary spanning roles act as the communication linkages with the internal and external environment (Aldrich and Herker, 1977), which may cause high levels of role pressures.	Leadership can be viewed as the holistic concretive action of role taking in which leadership roles are informally adopted and enacted by team members (Peter 2002)(Hiller et al., 2006).	Applied to solve the role conflict of specific individuals, for instance, the project manager due to the multiple interfaces in the megaprojects.

2

1   2.1   Network theory

2

3   According to the network theory, all individuals, groups and organisations are

4   embedded in social networks formed by intricate relationships and ties (Thorelli, 1986).

5   Marrone (2010) suggest that boundary spanners build social networks with external

6   stakeholders to qualify their critical position in the networks. Boundary spanning

7   activities promote the relationship quality with external key stakeholders. From the

8   network perspective, shared leadership is a set of non-hierarchical relationships derived

9   from the distribution of leadership influence across multiple team members (Kozlowski

10   2016). Leadership is an emergent network of relations influenced by the informal social

11   networks (White et al., 2016). Network theory can be applied in megaprojects since

12   megaprojects require multiple partners, including specialists and managers, to

13   contribute with their knowledge and resources by forming a temporary network (van

14   Fenema, Rietjens and van Baalen, 2016). Network theory is appropriate for

15   investigating the governance of megaproject-based organisation since it conceptualises

16   the nature of networks as cooperative endeavours (Tsaturyan and Müller, 2015). Social

17   network analysis can be leveraged to investigate various connections and relations

18   intertwined by multiple stakeholders in megaprojects (Lu *et al.*, 2015). Building on

19   Zheng *et al.*, (2016), social network analysis is especially efficient in megaprojects

20   since the megaproject networks are characterised by a complex collaboration of

21   multiple project partners. Therefore, network theory can provide the theoretical lens to

22   describe and measure leadership and boundary spanning activities in megaprojects.

1

2.2 Social identity theory

3   Social identity theory sheds light on how individuals recognise their membership

4   to social groups (Tajfel H., 1982). Individuals acquire their memberships to other

5   organisational groups through the social identification process, thus forming boundary

6   spanning relationships (Joshi et al., 2009). The social identity processes of boundary

7   spanners are activated when they interact with external stakeholders manifesting as

8   boundary spanning behaviours (Korschun, 2015). Building on Derue et al. (2010),

9   leadership roles of boundary spanners have high in identity complexity, and the social

10   boundary spanning process is important for the construction of leadership. Shared

11   leadership can be viewed as a group process generated by social identity categorisation

12   (Hogg, 2015). Therefore, leadership identity theory considers shared leadership as a

13   social process in which multiple stakeholders develop leadership identities and generate

14   mutual influence through their boundary spanning behaviours. Social identity theory

15   can be applied to classify different responsibilities and positions of stakeholders in

16   megaprojects.

17

2.3 Social exchange theory

19

20   Social exchange describes how individuals enter into new relationships based on

21   their expectations and perceived rewards (Homans, 1958). On the one hand, the

22   interaction between boundary spanners has a critical impact on how interorganizational

1   exchanges develop (Pulles and Hartman, 2017). The exchange partners evaluate both

2   economic and social outcomes from their boundary spanning transactions and compare

3   the valuation provided by other partners with their own expectations (Jago, 2007). Thus,

4   social exchange theory provides the theoretical lens to investigate how interpersonal

5   interactions between boundary spanners motivate the interorganizational exchange

6   (Ellegaard, 2012; Huang *et al.*, 2016). This theory is applicable to investigate the impact

7   of bilateral exchange among different stakeholders on the project outcomes, for instance,

8   the social exchange norms on megaproject success (Wang, Fang and Fu, 2019), or the

9   perceived justice on cooperation(Liu *et al.*, 2017).

10   On the other hand, social exchange theory implicates that the transaction of a

11   person from engineer to manager and leader is embedded in the complex social

12   exchange process (Müller *et al.*, 2018 b). It is a suitable theory to explore shared

13   leadership since the latter reflects the nature of member-member exchange in terms of

14   leadership influence (Hoch, 2014). Thus, social exchange theory lays the theoretical

15   cornerstone to explore how boundary spanning affect performance outcomes and how

16   shared leadership cope with complex challenges in megaprojects.

17

18   2.4   Contingency theory

19

20   Contingency theory explains how organisations with internal features matching the

21   requirement of environment achieve good performance (Donaldson, 2001).

22   Organisations tend to promote their marketing competitiveness through ongoing

1   boundary spanning activities (Godé-Sanchez, 2010). The leadership style depends on

2   the situation (Jago, 2007) and shared leadership is appropriate when partners play

3   distinct but complementary roles (Bolden, 2011). Contingency theory is appropriate for

4   the investigation of organisations managing project-based organisation (Aubry and

5   Lavoie-tremblay, 2018), thus contributing to the governance arrangements in

6   megaprojects. Further, according to Tsaturyan and Müller, (2015), contingency theory

7   can be applied to the different forms of governance on megaproject success. Thus,

8   contingency theory provides the contextual conditions to study shared leadership and

9   boundary spanning activities in megaprojects.

10

11   2.5   Role theory

12   Role theory considers roles as bounded clusters in which individuals have different

13   social status (Biddle, 1986) and are responsible for the social arrangements construct

14   through interactions (Solomon *et al.*, 1985). Taking the role theory perspective,

15   boundary spanners have crucial roles in executing boundary spanning activities,

16   including interactions. Boundary spanners prompt the information exchange and

17   organisational adaptation to changes through their boundary spanning roles -

18   information processing and external representation (Aldrich and Herker, 1977). Based

19   on role theory, shared leadership is the holistic concretive action of role taking in which

20   leadership roles are informally adopted and enacted by different individuals (Gronn,

21   2002). The individuals who can permeate boundaries are ideal candidates for shared

22   leadership (Marrone, 2010)(Vecchio, 2010). However, the intensive interaction raised

1   by shared leadership and boundary spanning may cause a high level of role pressure

2   leading to producing negative performance (Huang *et al.*, 2016). Therefore, role theory

3   provides the ideal conceptualisation to link shared leadership and boundary spanning

4   roles promoting the collaboration between different entities to deliver common goals.

5   It can be applied to solve the role conflict of specific individuals, for instance, the

6   project manager, due to the multiple interfaces in the megaprojects.

7   In this section, we identified network theory, social identity theory, social exchange

8   theory, contingency theory and role theory as the theoretical lens to study boundary

9   spanning and shared leadership in megaprojects. These theories are appropriate to

10   explore leadership in megaprojects since they can support the conceptualisation of the

11   high complesixity of megaprojects. Even if all these five theories can be applicated to

12   investigate megaproject leadership or boundary spanning activities, this paper considers

13   network theory and role theory to develop the shared leadership topology in

14   megaproject. Network theory is chosen because networks exist in a multitude of

15   topologies (Pathak et al., 2007) and can be applied to examine how multiple

16   stakeholders form the leadership network. Role theory conceptualises shared leadership

17   as a set of tasks and roles seved by boundary spanners, thus providing the possibility to

18   elicit shared leadership topology.

3 Methodology

Through a Systematic Literature Review (SLR), this section identifies the key elements to describe the shared leadership topology in megaprojects. SLR is a transparent, rigid and comprehensive methodology used to build theory by accumulating knowledge and evidence from numerous pieces of literature (Tranfield, Denyer, and Smart 2003). Compared to the traditional literature review, SLR is more effective due to its ability to reduce bias by reducing a pre-defined, transparent and replicable reviewing procedure. SLR is getting more and more popular in the project management field since project scholars are seeking to build a series of theories specific to project attributes. SLR is especially acclaimed by project scientists while exploring two raw constructs and the relationships between them (e.g. Musawir et al., (2020) and Xia et al., (2018)).Similarly, there are three key reasons to employ an SLR in this paper:

(1) Shared leadership and boundary spanning research is fragmented across disciplines (Denyer et al.,2008);

(2) Shared leadership and boundary spanning research in project management is limited and under-developed (Scott-young, 2019);

(3) The systematic literature review provides a high-quality and evidence-based approach to minimise bias and errors (Moher *et al.*, 2009).

By mapping and investigating the interfaces between shared leadership and boundary spanning, this paper lays the theoretical foundation for analysing shared leadership in megaprojects from the boundary spanning perspective (Figure 1). As discussed in the introduction, there few studies combining shared leadership and

1   boundary spanning. Thus, this paper chooses "boundary spanning and project" together

2   with "shared leadership and project" as the literature review foundation to uncover the

3   relevant knowledge in megaproject context.
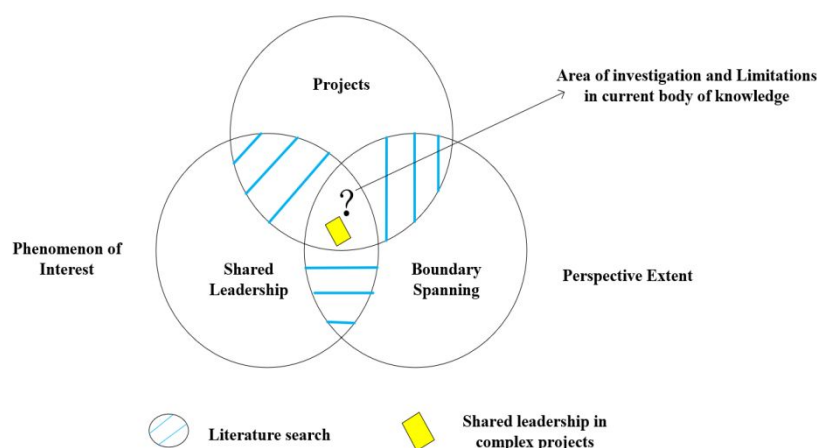
4

5   Figure 1. Organising framework (Adapted from Maddaloni and Davis (2017))

6

7   This paper follows the rigorous search criteria suggested by Mok *et al.* (2015) to

8   conduct the systematic literature review. Figure 2 shows the flow chart of the

9   publication retrieval process based on the Preferred Reporting Items for Systematic

10   reviews and Meta-Analysis (PRISMA) (Moher *et al.*, 2009). The four major stages of

11   conducting the systematic literature review are outlined in the following sections.

12   The first stage identifies keywords related to shared leadership and boundary

13   spanning in project contexts. The provisional list of relevant keywords has three clusters:

14   • *Shared leadership: shared leadership; horizontal leadership; distributed*

15   *leadership*

16   • *Boundary spanning: boundary spanning; boundary spanner*

17   • *Project: project; complex project; megaproject*

18   It's worth noting that this paper is focused on megaprojects, but we used "project,

1   complex project, megaproject" as keywords in our SLR process. This is because 1)

2   authors, particularly until 3-4 years ago, used several synonyms for megaprojects (e.g.

3   "large projects", "mega projects", "giga projects" "mega infrastructure") etc. There

4   might be papers about, for instance, a "nuclear reactor" project (clearly a megaproject)

5   that might not be detected even considering all the synonyms of megaprojects. 2) There

6   are papers about "projects" (particularly complex projects) that might have knowledge

7   relevant for megaprojects. Excluding those papers, for the sake of keywords, would

8   lead us to ignore relevant knowledge. Furthermore, the SLR combines as keywords

9   both "boundary spanning/spanner" and "project" which indicates the complex attributes

10   of megaprojects involving multiple stakeholders. Consequently, we decided to take the

11   "long way" of reviewing all the papers dealing with projects, shared leadership, and

12   boundary spanning and check, one by one if those papers were relevant. By doing so,

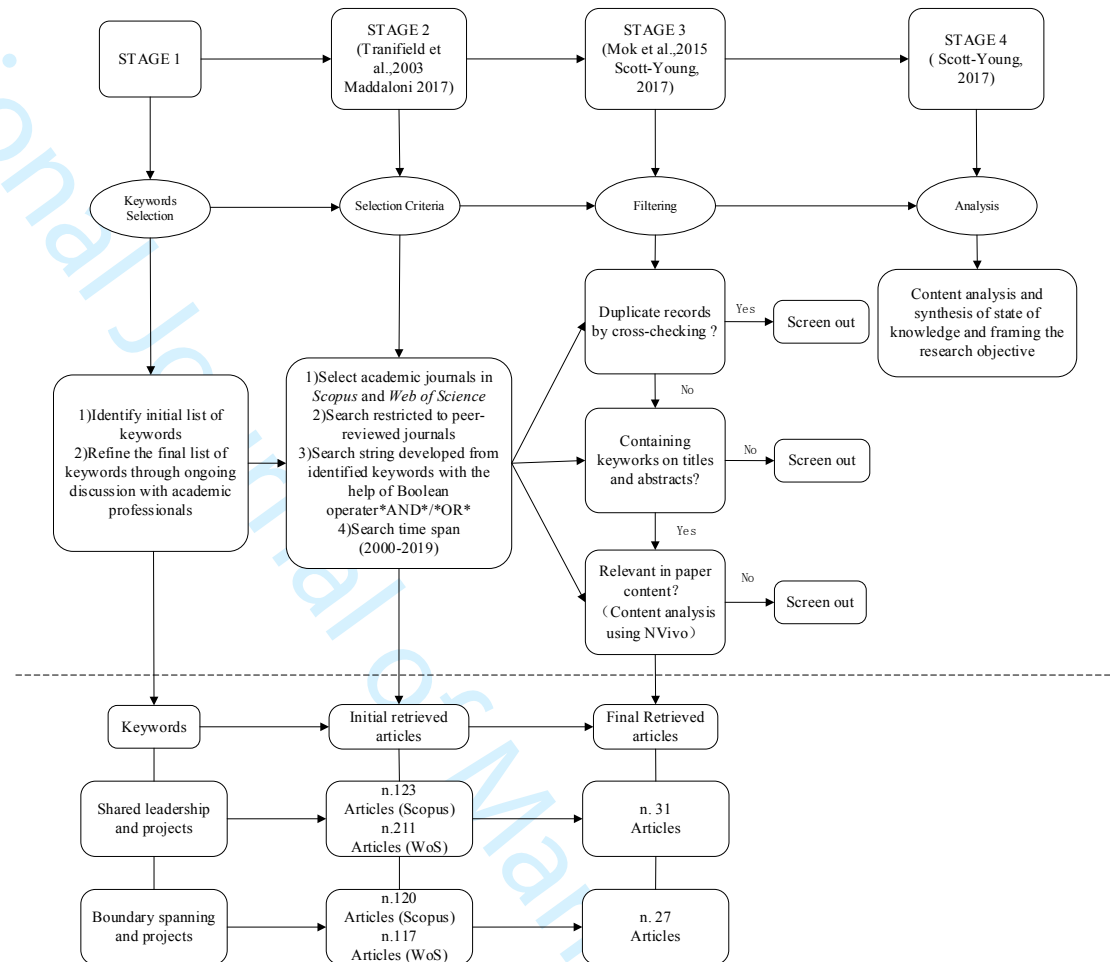13   the SLR used in this paper would cover the entire literature related to megaprojects.

14

Figure.2. Publications retrieval process (Adapted from Maddaloni and Davis (2017))

In the second stage, the authors selected two major online academic databases - Scopus and Web of Science. The timeframe was from January 1, 2000, until June 31, 2019 (the day of the search), since the number of shared leadership studies rapidly increased since the year 2000 (Bolden, 2011). Search strings were developed from the aforementioned keywords using the Boolean operators *AND*/*OR*. Search strings employed in the review were:

1. *"shared leadership" OR "horizontal leadership" OR" distributed leadership"*

AND "project" OR "complex project" OR "megaproject."

1   *2. "boundary span*" AND "project" OR "complex project" OR "megaproject".*

2

3   Similarly to Scott-young (2019), this paper narrowed the journal scope to high

4   raking journals- Quartile 1 in the Scientific Journal Rankings (SJR) (Guerrero-Bote and

5   Moya-Anegón, 2012) to ensure the quality of methodological rigour and validity. The

6   first search strings yielded 123 peer-reviewed records in a title, abstract and keyword

7   research of Scopus, and 211 records in Web of Science. The second search strings

8   identified 120 records in Scopus and 117 results in the title of Web of science.

9   The third stage is a three-step filtering process adopted from Mok (2015) and

10   Scott-Young (2019). Firstly, the authors consolidated the results from the

11   aforementioned two databases leading to 118 records regarding shared leadership and

12   projects and 99 records regarding boundary spanning and projects. The second filtering

13   by identifying keywords on titles and abstracts yielded 73 results on the topic of shared

14   leadership and projects, and 56 results on the topic of boundary spanning and projects.

15   Lastly, a review of the paper contexts using NVivo excluded the less relevant papers.

16   The exclusion criteria were based on the results gained through the content analysis.

17   Table 2 is the codebook for the content analysis of the study adapted from Maddaloni

18   and Davis (2017). Finally, 58 papers including 31 papers on shared leadership and

19   projects and 27 papers on boundary spanning and projects were identified and leveraged

20   to achieve the second goal of this study.

21

22

1   Table 2   Codebook for the content analysis of the study (Adapted from Maddaloni and Davis 2017)

Code	Definition of code
Quantitative variables	
Year	Year of publication
Author	List of authors
Title	Title of the paper or book
Journal	Publication in which the paper was published
Concern	Shared, horizontal, balanced and distributed leadership
Perspective	Team, project or organisational perspective
Methodology	Quantitative, qualitative and mixed-method
Data source	Survey, interview, secondary data
Qualitative variables	
Research questions	Research question explicitly stated in the paper
Contributions	Contribution explicitly stated in the paper
Findings	Major findings stated in the paper

2

4   Key findings from the literature review

This section contains the bibliometrics (section 4.1) and conceptual findings of systematic literature review (section 4.2). The analysis of the papers emerging from the systematic literature review show stakeholders, boundary spanning leadership roles and project phases are the three key elements to study the shared leadership topology in megaprojects. The coding process is shown in table 3 in section 4.3.

4.1   Bibliometrics

Figure 3 demonstrates the interest in shared leadership, and boundary spanning in project settings has been rising in the last decades, especially in the last five years. Most of the literature about shared leadership deals with general management. The leading reference for project studies is Scott-young (2019), proposing an integrative multilevel conceptual model of shared leadership in project teams.
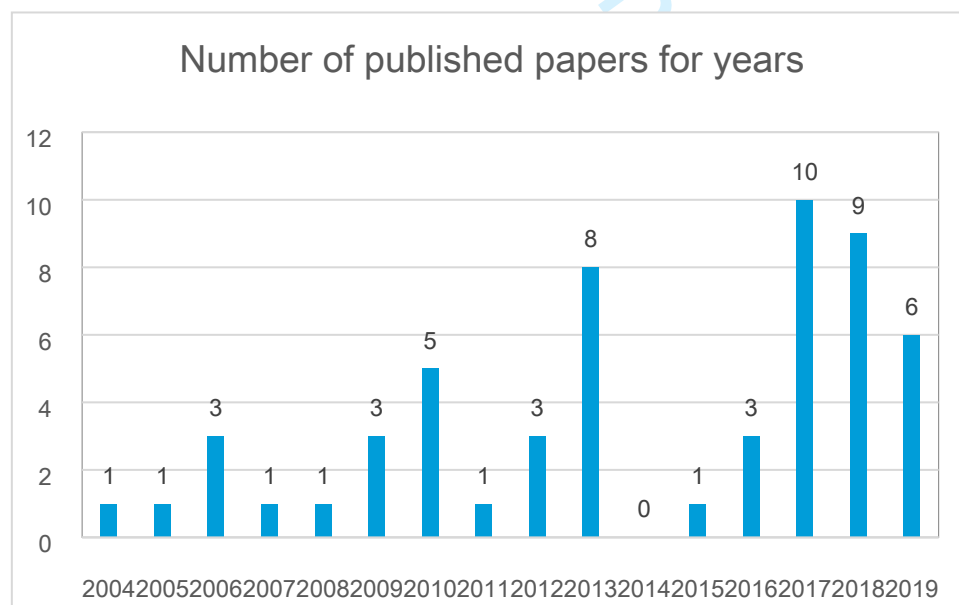

Figure 3 Number of relevant papers published from 2004 to 2019

1   As shown in Table 3, 59% of the selected papers adopted a qualitative approach,

2   34% favouring a quantitative approach and only 7% employing mixed methods. The

3   leading work using mixed methods is Drouin and Müller (2018), employing a

4   sequential mixed method to identify the horizontal leaders and how they execute the

5   leadership tasks. Within the 34 qualitative papers, the majority (41%) are based on case

6   studies; others used conceptual approach, literature review and interviews to investigate

7   shared leadership and boundary spanning in project teams. The papers based on case

8   studies deal with complex projects (21.5%), knowledge production (29%), innovation

9   (21.5%), multidisciplinary project (14%) and global engineering project (14%). These

10   project cases demonstrated that the cross-study of shared leadership and boundary

11   spanning might pave a new way to leadership in megaprojects which needs diverse

12   knowledge, interdisciplinary or global collaboration.

13

14   Table 3 Classification and summary of selected papers

Methods	Number of papers	Percentage of selected papers
Qualitative	34	59%
Quantitative	20	34%
Mixed	4	7%
Total	58	100%
Qualitative methods	**Number of papers**	**Percentage of selected papers**
No. of papers	34	59%
Case study	14	41%
Conceptual approach	10	29%
Literature review	5	15%
Interview survey	5	15%
Research context in case studies	14	
Complex projects	3	21.5%
Knowledge production	4	29%
Innovative process	3	21.5%
Multidisciplinary project	2	14%
Global engineering project	2	14%

1   4.2   Conceptual findings from the literature

2

3   4.2.1 Shared leadership in projects

4   Scott-young (2019) discussed a lack of conceptual coherence in the definition of

5   shared leadership. Within the shared leadership definition, schools of thoughts can be

6   clustered according to the shared leadership measurement approach: aggregation, social

7   network analysis (SNA density and SNA centralisation), and team consensus. This

8   theoretical distinction of shared leadership can be traced back to a meta-analysis of

9   different forms of shared leadership and team performance (Lauren, 2016). The

10   aggregation theoretical scholars claim that shared leadership is a collective influence of

11   all team members rather than an element of a traditional vertical leader (Pearce and

12   Sims, 2002). The sharing process is exercised by empowering and developing different

13   individuals (Hoch and Kozlowski, 2014). SNA density scholars (Carson et al., 2007;

14   Wang *et al.*, 2017) defined shared leadership as an emergent and relational phenomenon

15   resulting from leadership distribution across multiple individuals. The SNA

16   centralisation researchers argued that leadership is a shared, distributed phenomenon

17   executed by several team members, including formally appointed and emergent

18   informal leaders (Mehra *et al.*, 2006). The other researchers take shared leadership as a

19   team consensus process in which the influence exertion and acceptation are rotated

20   between specific individuals (Hoch and Dulebohn, 2013).

21   Despite the differentiation in shared leadership definition and measures, leadership

22   scholars substantially agree on specific points. Firstly, shared leadership usually

1   originates from diversity and complexity. It is hard for a single person to be an expert

2   on all aspects of knowledge to the work requiring the integration of independent and

3   varied teams (Faraj and Sambamurthy, 2006). Hoegl *et al*.,(2012) contended that team

4   members are an additional leadership source to address the challenges of geographical

5   dispersion and task uncertainty in dispersed virtual project teams. The shared leadership

6   can deal with the uncertainty, fast-changing environments and increasingly complex

7   tasks in team-based structures (Hoch *et al.*, 2010).

8   Secondly, shared leadership is more dynamic than traditional vertical leadership.

9   When leadership is shared, the roles of team members transfer between leaders and

10   followers (McIntyre and Foti, 2013). The focus on the dynamism is critical, because the

11   leadership roles may experience construction, deconstruction and reconstruction along

12   the project lifecycle. This dynamic process boosts different leadership roles within one

13   team (Fransen *et al.*, 2016). The dynamic attributes of shared leadership may provide

14   deeper insights into the mechanism of shared leadership and performance relationships

15   (Drescher *et al.*, 2014).

16   Lastly, vertical leaders and shared/horizontal leaders coexist in shared leadership

17   research. Leadership in teams is placed in the continuum between two extremes:

18   vertical leadership with a single hierarchical leader and shared leadership with a

19   pervasive horizontal leadership (Kakar, 2017). The traditional leadership styles of

20   formal leaders impact shared leadership, both directly and indirectly (Ishikawa, 2012).

21   Vertical leaders can act as external coaches to boost shared leadership atmosphere in

22   the team (Carson *et al.*, 2007). The intervention by vertical leaders mitigates the value

1   diversity, thus, contributing to the adoption of shared leadership (Hsu *et al.,* 2017). The

2   vertical leaders have the responsibility of assigning leadership roles to others and re-

3   assuming the leadership role when no team members are willing to shoulder leadership

4   responsibilities (Yu *et al.*, 2018).

5   Shared leadership research based on project studies deals mainly with knowledge

6   sharing and virtual collaborations. For example, shared leadership is important for team

7   effectiveness in virtual project teams since members collaborate with each other

8   crossing the spatial, temporal and cultural boundaries (Nordbäck and Espinosa, 2019).

9   Shared leadership intensifies the ties between team members and exerts an inverse U-

10   shaped curve between-group dynamic consensus and project performance in business

11   process reengineering (Bruccoleri et al., 2019). Hoegl and Muethel (2012) discussed

12   how to enable shared leadership in virtual teams and how the team may profit from

13   shared leadership. Müller *et al.* (2018a) developed a cycling framework of balanced

14   leadership, emphasising the balance, dynamic and situational contingency of vertical

15   and horizontal leadership. The balanced leadership framework paves the way for setting

16   up further studies on the interaction of vertical leadership and horizontal/shared

17   leadership in projects. The identification of horizontal/shared leaders depends on the

18   professionality, personality and attitudinal traits of team members (Müller *et al.*, 2018b).

19   The key to horizontal leadership is empowerment from vertical leaders (Yu *et al.*, 2018).

20   High job complexity, intrinsic rewards, self-efficacy and personal expectations were

21   positively related to the strong role identity of horizontal leaders (Zhu *et al.*, 2019).

22

1   4.2.2 Boundary spanning in projects

2   Increased globalisation of markets and organisations calls for simultaneously

3   crossing multiple boundaries including cultural, spatial, institutional and temporal

4   boundaries (Tortoriello and Krackhardt, 2010). Boundary spanning is a key process in

5   producing organisational innovation (Houman *et al.*, 2013)(Drach-zahavy, 2011),

6   knowledge integration (Ratcheva, 2009), outsourcing of products and services (Marco

7   *et al.*, 2010)(Du and Pan, 2013). The boundary spanning activities, including scouting,

8   ambassadorial and coordinating, were positively related to the inter-organisational team

9   outcomes (Drach-zahavy, 2011).

10   Scholars use different theoretical lens to explore boundary spanning such as social

11   networks information processing (Marco *et al.*, 2010), social identity theory (Kane and

12   Levina, 2017), and small group research (Carlile, 2002). The practice perspective

13   combing the understanding of knowledge and power is popular in project studies

14   (Levina and Vaast 2006; Warner *et al,*. 2010). For example, Warner *et al*. ,(2010)

15   introduced boundary spanning in water management and found that boundary spanning

16   strategies should be applied in the early stages of a project. Sandal *et al.,* (2018)

17   identified three practices - framing, synchronising and hyping - to move a project

18   toward the benign collaborative relationships across the supply chain. The practice

19   approach facilities the understanding of space and time dimensions in projects

20   (Maaninen-olsson and Mu, 2009). Thus, this approach is complementary to traditional

21   project management research investigating how different partners collaborated crossing

22   diverse boundaries to execute a project (Ramalingam and Mahalingam, 2018). This

1   perspective of boundary spanning in project settings calls for more focus on the actions

2   rather than the formal role of boundary spanner (Houman *et al.*, 2013).

3   The high complexity caused by multiple boundaries in projects stimulated research

4   on various boundary objects. Boundary objects can be used for individual needs and

5   promote interaction and communication between different stakeholders. IT-based

6   boundary objects facilitate the integration of manufacture and services organisational

7   sub-process, contributing to the boundary spanning and business process management

8   (Becker *et al.*, 2013). Merminod and Rowe (2012) suggested integrating different

9   digital tools to support project information objects using object storage and workflows.

10   Virtual tools such as CAD and BIM systems are efficient boundary objects to promote

11   knowledge sharing among designer, constructors and other project users (Fellows and

12   Liu, 2012). BIM technological solutions benefit the boundary spanning engagement

13   and successful BIM-compliance project delivery (Sackey and Akotia, 2017). The

14   Integrated Master Schedule is a critical boundary object for megaprojects with long

15   construction periods and a high degree of complexity and uncertainty (Chang, *et al.* ,

16   2013).

17   Boundary spanners and boundary spanning roles are also important research topics

18   in project studies. Marco *et al.,* (2010) found expatriates are ideal boundary spanners

19   for dealing with cross-cultural knowledge conflicts and increase collaboration

20   effectiveness in global engineering project networks. Brion *et al.,* (2014) suggest that

21   the project leaders' position contributes their boundary spanning roles, and stronger

22   social network ties are effective to induce boundary spanning activities. Project

1   managers can not only play a direct boundary spanning role but also help trigger the

2   cooperation of other actors to establish a sound boundary spanning environment

3   (Meerkerk and Edelenbos, 2018).

4   Boundary spanners can be nominated or automatically emerge from practice in the

5   project context (Levina and Vaast, 2005). The primary boundary spanning roles in

6   construction projects are traditionally allocated to engineers and/or architects. These

7   boundary spanners are particularly important because they can trigger emergent

8   boundary spanning processes (Marco *et al.*, 2010). The emergent boundary spanners

9   located at the peripheral for the specialist activities can facilitate relationship

10   negotiation with external stakeholders (Fellows and Liu, 2012). Project members with

11   unique skills can emerge as boundary spanners-in-practice (Du and Pan, 2013). They

12   engage in relationship negotiation occurred in special circumstances and help to build

13   a shared atmosphere between different stakeholders (Seijger *et al.*, 2015).

14   Building on Lehtonen and Martinsuo (2008), boundary spanning activities in

15   megaprojects can be divided into five categories: defining and shaping the boundary,

16   representing the project organisation and creating legitimacy, information scouting and

17   negotiating,   ensuring continuity, and guarding and isolating. Maaninen-olsson (2009)

18   indicated that both the spatial context and dynamic relationship network are the drivers

19   of boundary spanning activities. According to Brion *et al.,* (2012), the main activities

20   of project managers' boundary spanning includes coordinating with external actors,

21   scanning for information, obtaining political support and protecting the team. Houman

22   *et al.* (2013) identified three groups of boundaries panning activities – selecting and

1 mobilising talents, creating the shared identity, combing and integrating knowledge

2 across different fields – to manage the creative process. Romani (2017) presented three

3 boundary spanning activities that the vendor managers engage in: boundary

4 management, common ground forge and new frontiers development. Therefore,

5 research on boundary spanning activities needs to adopt a contextual perspective in

6 different project settings.

7 To further orient readers to the literature review on boundary spanning and projects,

8 the authors present a multilevel concept map. Figure 4 shows boundary spanning

9 literature focusing mainly on four aspects: people (boundary spanners), boundary

10 objects, roles and behaviours. Figure 4 summarised the relevance of current boundary

11 spanning literature pointing that boundary spanning study is divided into three levels:

12 individual-level, team-level and project-level. The project-level is extracted as the

13 highest level in extant literature since these studies focus on the common attributes of

14 project triggering boundary spanning activities. Boundary spanners or boundary

15 spanning activities are beneficial for the outcomes at higher-level projects, programs

16 and portfolios. The benefit of boundary spanning yields different performance or

17 improvement at the three levels. Arrows in Table 4 represents the relationship between

18 boundary spanning roles, boundary spanning behaviour and boundary objects. Time is

19 also relevant since temporary boundary spanners may emerge with the contingent event.

20
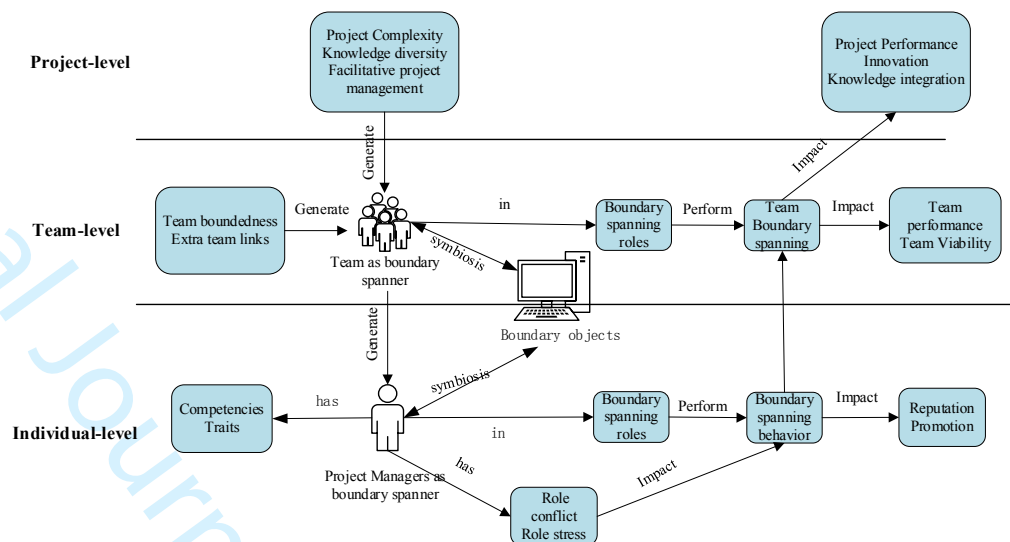
Figure 4 Multilevel map of boundary spanning concepts in project

## 4.3   Identification of key elements of shared leadership topology in megaprojects

As presented in section 4.2, people, roles, and time are key factors for the research linking shared leadership and boundary spanning in projects. This is the theoretical background to develop the shared leadership topology for megaprojects, which is consistent with network theory involving actors and ties as the most important attributes. Table 4 shows the coding process of three key elements of shared leadership topology in megaprojects. Stakeholders are the key actors to contribute their diverse knowledge and expertise for the project objectives. The ties between stakeholders are established by different boundary spanners during their interactions. Time is also relevant since both shared leadership and boundary spanners are evolving along the project lifecycle. The time attribute is coded as project phases, considering that shared leadership transfer happens mostly according to the resources and knowledge required by the project (Müller *et al.*, 2018b).

Table 4 Elements for shared leadership topology based on boundary spanners in megaprojects

Elements in megaprojects	Elements in general research	Description in megaprojects	literature evidence	
			Shared leadership in projects	*Boundary spanning in projects*
Stakeholders	Individual/team	Leadership in megaprojects is presented as a network tied by boundary spanners from different organisations, in which vertical and shared leaders coexist.	•Shared leadership is performed by multiple individuals (Pearce and Sims 2002; Hoch and Kozlowski, 2014). •Shared leadership includes formally appointed leaders (vertical leaders) and emergent informal leaders who are empowered and developed by the formal leaders(Yu et al. 2018; Müller et al. 2018a, 2018b). •Vertical leaders and shared leaders coexist within one team (Kakar, 2017; Carson et al., 2007).	•Project leaders are the primary boundary spanners, and other members with specific skills act as emergent boundary spanners (Brion et al. 2014; Meerkerk and Edelenbos, 2018). •Expatriate is the best candidate of boundary spanner in a global engineering project network (Carson et al., 2007).
Project phases	Time	Shared leadership in megaprojects is dynamic evolving through the project lifecycle with the leadership rotation among different boundary spanners.	• Shared leadership is dynamic evolving over time (Contractor 2012; Drescher et al., 2014; Klein 2006; Kozlowski & Chao).	•Boundary spanners can emerge in practice during the interaction with external stakeholders (Fellows et al. 2012; Levina and Vaast 2005).
Boundary spanning leadership roles	Roles	Boundary spanners in megaprojects take the shared leadership roles for information exchanging and	•Vertical leaders act as an external coach to boost shared leadership atmosphere (Carson et al., 2007), and empower the leadership to others(Yu et al. 2018; Müller	• Boundary spanners in projects take the role of coordinating, information scanning, support asking and team protecting (Brion et al. 2014; Martinsuo 2008;

| | | coordinating process, leading the complex project jointly. | et al. 2018b). • Shared leaders in the Board are engaged in strategic making and taking (Pitelis and Wagner, 2018). | Drach-zahavy, 2011). • Boundary spanners are responsible for - selecting and mobilising talents, creating the shared identity, combing and integrating knowledge (Houman et al. 2013). |
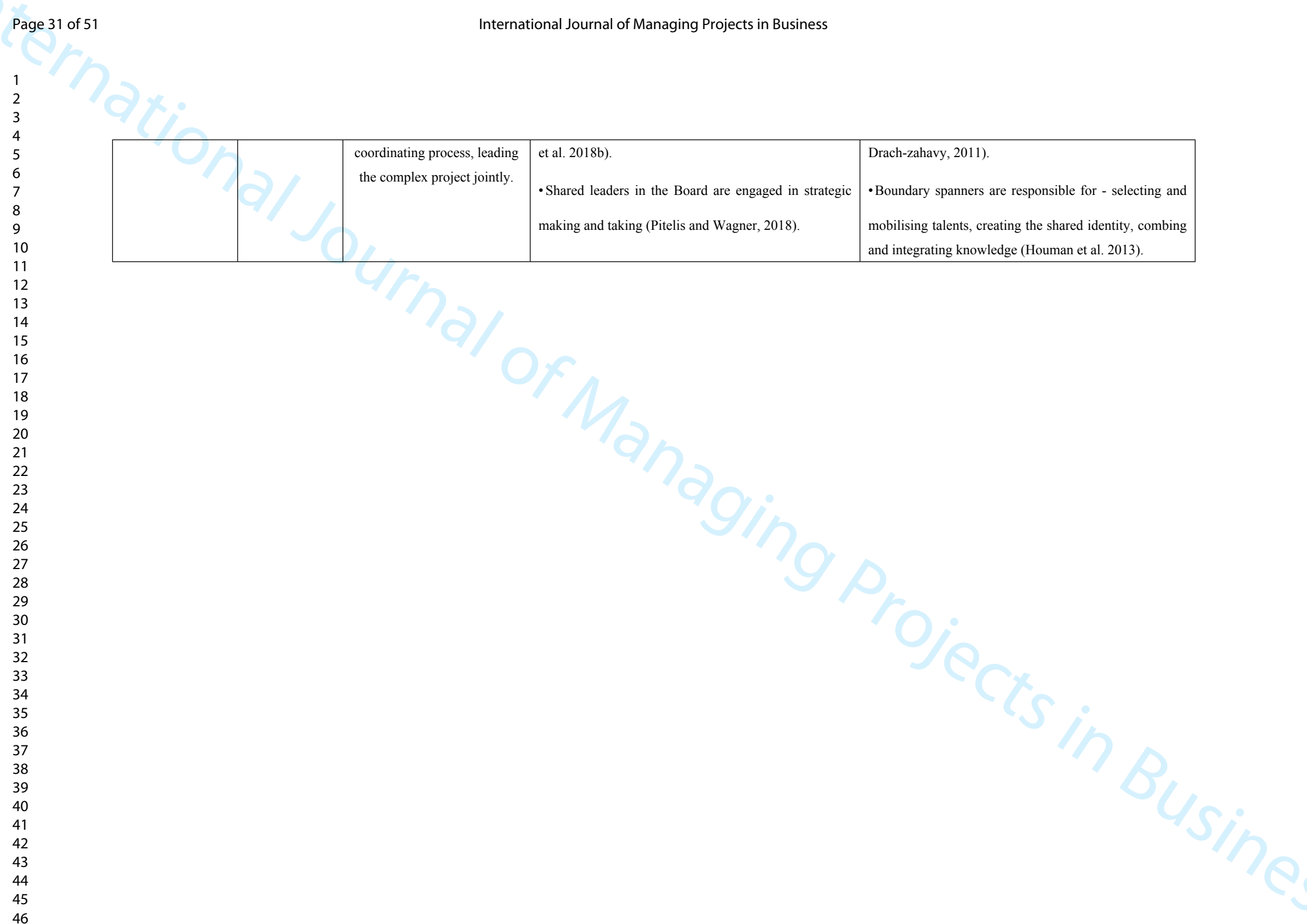
5 Conceptualisation of shared leadership in megaprojects

5.1 Generic topology of shared leadership in megaprojects

This section presents the topology of shared leadership in megaprojects. Section 2 reviewed five theories appropriate for shared leadership research taking the boundary spanning perspective. Among these theories, network theory and role theory are selected for developing the shared leadership topology in megaprojects. These theories have been selected because networks exist in a multitude of topologies (Pathak *et al.*, 2007) and role theory provides the possibilities to merge shared leadership and boundary spanning roles. Section 4 identified the essential aspects of shared leadership and boundary spanning: people, roles and time. Based on section 4, this section develops three dimensions of shared leadership in megaprojects: stakeholders, boundary spanning leadership roles, and project phase. Building on Contractor *et al.*, (2012), this paper represents shared leadership in megaprojects as a three-dimensional cube (see Figure 5). The x-axis of the shared leadership cube represents the stakeholders. The z-axis of the cube represents the different phases in the project lifecycle. The y-axis deals with Boundary Spanners Leadership (BSL).

BSL is the critical skill leading in for problem-solving, driving innovation and transforming organisations (Ernst *et al.*, 2011). Schotter (2017) explained that boundary spanners are not just top managers (i.e., top executives from project alliance board) but also the middle managers and employees at lower levels (i.e. project managers from each site and project staff at operational level). Different-level boundary spanners have

different boundary spanning roles. The y-axis lists three-levels BSL roles, depending on their hierarchical positions and job titles. "Top BSL role" includes boundary spanners that are setting overall project planning and addressing strategic decision-making (Pitelis and Wagner, 2018). "Middle BSL roles" refers to the typical boundary spanning roles in resource flows and information circulation between internal and external organisational environment (Sébastien Brion, Vincent Chauvet, Barthelemy Chollet, 2012). "Middle BSL roles" are also the bridge between top and lower BSL roles in the hierarchical organisational perspective due to their central network position (Kane and Levina, 2017). "Low BSL roles" refers to the operational or day to day roles for problem-solving and coordinating in projects. For example, typical project leaders assumed the top BSL roles, such as shared strategic leadership among different stakeholders. Middle BSL roles such as project or program managers keep the most vertical ties with both the top and the low boundary spanners in their own organisation, whereas the same-level BSL roles from different partners produce more horizontal interactions.
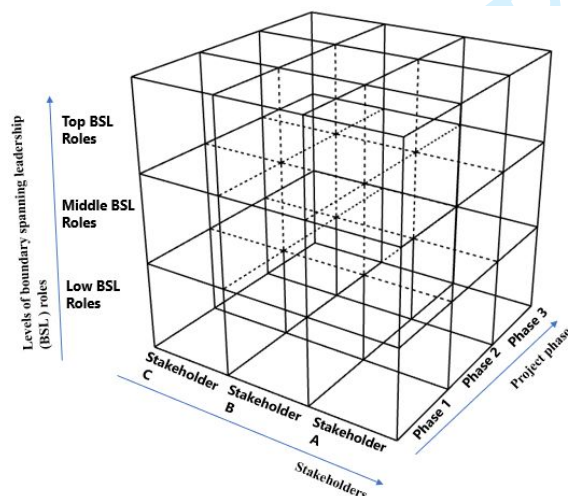
Figure 5 Framework to study the topology of shred leadership in megaprojects.
(Derived from Contractor *et al.*, (2012))

5.2 Possible configuration of shared leadership

The aforementioned framework of shared leadership in megaprojects assumes different configurations depending on the specific megaproject. In the following sections, three specific cases are presented and discussed.

5.2.1 High vs Low stakeholder centralisation

The first case deals with the x-stakeholder axis and the member centralisation of shared leadership topology in megaprojects, considering the network formed by different stakeholders as the communication channel. Mehra *et al.*,(2006) proposed different topologies of collective leadership: leader cantered, distributed-coordinated and distributed-fragmented according to the relative influence of vertical and horizontal/shared leaders. Carson (2007) divided shared leadership sociograms using density as a metric. The shared leadership topology presented in this paper depicts high vs low stakeholder centralisation in megaprojects. Centralisation in megaprojects describes the locus of leadership rights; specifically, which stakeholder holds the authority to enact the specific BSL roles. The centralisation of shared leadership is high when BSL roles are concentrated in just one stakeholder. In this case, the cube has one flat horizontal slice, as shown in Figure 6a. The centralisation is low when every stakeholder shared simultaneous leadership. In this latter case, every stakeholder is enacting all BSL roles in all the project phases, as in Figure 6b.
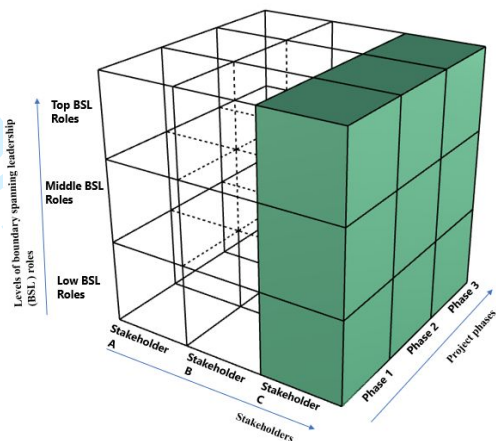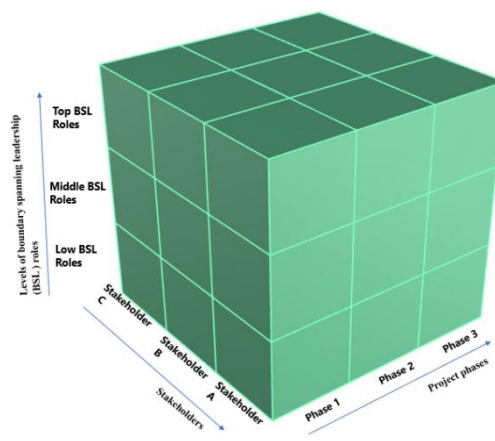
Figure 6a High member centralisation   Figure 6b Low member centralisation

5.2.2   Strategic vs Operational shared leadership

The second case deals with the axis of different-level BSL roles. This configuration of shared leadership stems from the fact that different levels of boundary spanners take different leadership roles and functions. Hiller *et al.,*(2006) presented four dimensions of shared leadership, including planning and organising, problem-solving, support and consideration, and developing and mentoring. Contractor et al. (2012) and Carson (2007) identified four distinct roles relevant for shared leadership: Navigator, Engineer, Social Integrator and Liaison. Top boundary spanning roles may take the shared leadership roles for strategic making and enable the shared network to establish a clear purpose and direction. This can be depicted as *strategic shared leadership*, which means the strategic leadership is shared among the high-level managers from different partner organisations or in the Top Management Team (Pitelis and Wagner, 2018). This is depicted in Figure 7a, where the leadership is concentrated in the boundary spanners. The middle-shared leadership roles may serve as the engineer

and social integrator for structuring the task, and coordinating the members, also keeping healthy relationships. Project managers are typical middle boundary spanners in megaprojects. The low boundary spanners may also share the leadership for conflict solving emerging on the first line of the project. The BSL roles taken by the middle and low boundary spanners are depicted as *Operational shared leadership* in this paper as Figure 7b. Thus, boundary spanners from different stakeholder teams are endowed by different shared leadership roles in megaprojects.
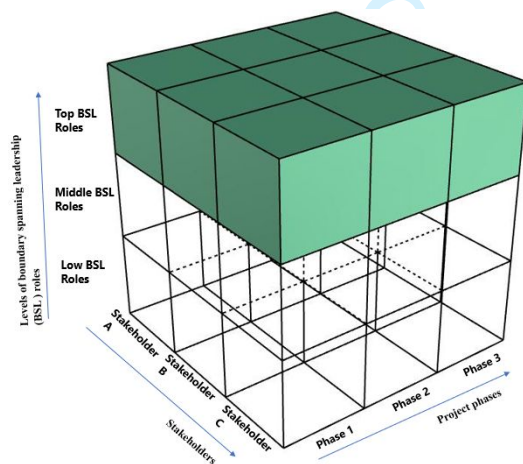
Figure 7a Strategic shared leadership   Figure 7b Operational shared leadership
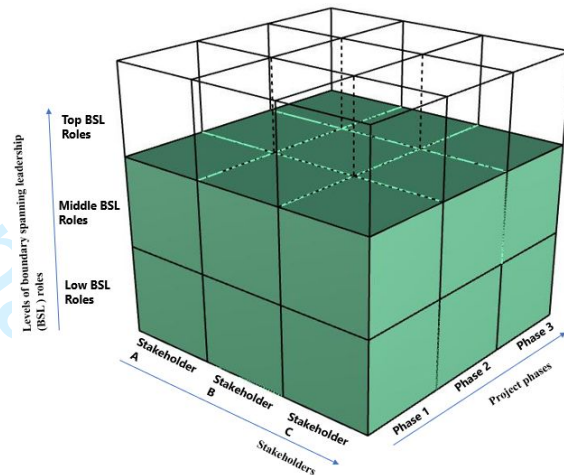
5.2.3   *High rotation vs Low rotation leadership*

The third case deals with the degree of leadership rotation in the project cycle. Shared leadership derives from dynamic characteristic and interactions among different stakeholders and takes time to develop (Aime *et al.*, 2014). Focusing on the dynamic characteristic is critical because the leadership roles experience a dynamic construction, deconstruction and reconstruction process along with the project development (Denis

et al., 2001). Moreover, boundary spanning roles with specific leadership roles (e.g. consultants) appears and disappears across all the project lifecycle (Marrewijk *et al.,* 2016). Figure 8a presents the case when each stakeholder enacts the same BSL roles throughout all the project phases. In this case, leadership roles are stability concentrated in one stakeholder. For instance, owners often hold the absolute authority for strategic decision-making in the whole project lifecycle. There is no rotation in roles among stakeholders over time. Figure 8b gives the situation when the same level BSL roles rotated across both the stakeholders and different-level boundary spanners during in the project lifecycle. Here, for instance, shared leadership can be transferred from top boundary spanners in stakeholder A at phase 1 to middle boundary spanners in stakeholder B at phase 2.
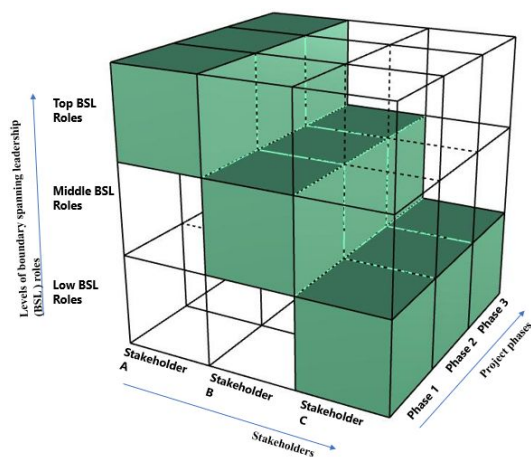

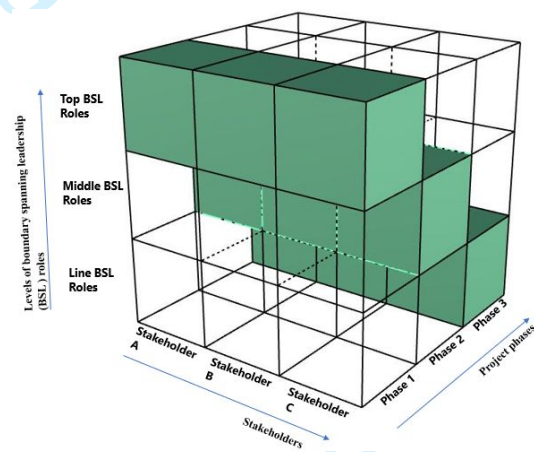Figure 8a High Leadership rotation   Figure 8b Low Leadership rotation

6 Discussions

Shared leadership is effective in complex, dynamic and interdependent contexts (Scott-young, 2019), yet there is a lack of literature of shared leadership in project studies, especial for megaprojects. Previous studies on project leadership mostly concentrated on vertical leadership or leadership skills, styles and capacities of single individuals. Leading project leadership scholars are exploring alternative leadership forms such as balanced leadership (Müller, *et al.*, 2018a,b) and shared leadership (Scott-young, 2019). However, the study of leadership network in project management is still scarce, despite its crucial role to drive performance (Mehra *et al.*, 2006). This paper addresses this gap in knowledge by developing a framework to study shared leadership topology in megaprojects with three dimensions: stakeholders, boundary spanning leadership roles and project phases. The framework uncovered the attendants of structural patterns of shared leadership in megaprojects and displayed leadership activity in megaprojects as social network patterns. The novel framework complements prior research in project leadership and responds to the need of investigating shared leadership in a variety of project contexts (Scott-young, 2019).

This paper provides three main theoretical contributions:

1 - Boundary spanners and ties as cornerstones of the shared leadership network

Drawing on social network theory, boundary spanners hold critical connections to external stakeholders and provide unique sources of power and influence in the project network (Marrone, 2010). The novel framework presented in this paper describes the

leadership influence of boundary spanners, introducing the concept of shared leadership network in megaprojects. Boundary spanners and their relationships are the two critical components of the shared leadership framework in megaprojects.

Describing the leadership network with boundary spanners helps to resolve the convoluted variability of project leadership, in which leaders may emerge to take and shift leadership roles through the entire project (Müller *et al.*, 2018a). Boundary spanners can be located based on the interaction topology analysis (Jiang, 2008). The leadership topology with the BSL roles as a key dimension provides an individual-level perspective to study the leadership network across the stakeholders' boundaries. Describing the leadership network with boundary spanners answers to the call to investigate shared leadership from individual-level (Scott-young, 2019). The leadership transition in projects is a complex process involving: evaluation of vertical leaders, peer competition, personal development and finally guidance (Müller *et al.*, 2018a). More research is needed to study why, when and how specific individuals, becoming boundary spanners, take the leadership roles in projects.

Boundary spanners can be characterised according to their leadership roles. This role-based view for shared leadership allows identifying potential shared leaders in megaprojects. The leadership network of complex projects is intricate; experienced project practitioners experience transitions to develop their competencies and skills (Floris and Cuganesan, 2019). The role-based view of shared leadership provides a complementary perspective to address this complexity. Future research may focus on the leadership roles classification in megaprojects and how they drive project

performance.

In the novel framework, the ties between different boundary spanners in megaprojects are a critical component. The ties are an important dimension of the inter-organisational structure, contributing to the analyse how the partnership is structured and managed (Manev and Stevenson, 2001). The influence of the network on performance depends on ties strength and leading-edge boundary spanners get great profit from strong ties (Schultz and Schreyogg, 2013). According to Contractor (2012) and Marrone (2007), the strength of leadership ties between different boundary spanners affects the leadership effectiveness in megaprojects. However, the mechanisms linking these ties to the project performance are vastly unexplored. Thus, the shared leadership framework is a theoretical compass for scholars researching the influence of ties between boundary spanners or stakeholders on project performance.

2 - Linking shared leadership topology to project performance

The shared leadership framework presented in this paper brings the social network perspective into the field of the leadership of megaprojects. Building on Fransen (2015) , social network analysis can be the most suitable tools to study shared leadership in megaprojects for three reasons: it can model patterns of ties among boundary spanners; it can reflect how leadership is distributed among stakeholders, and it can identify emergent shared leaders. However, the emergence of multiple leaders in the project context may increase transaction costs, including the communication cost and duration (Nordback and Espinosa, 2019). Hence the shared leadership in megaprojects may

result in negative consequences such as team conflict and decreased project performance. Thus, the link between leadership and project performance cannot be expressed by the simple rule: "the *more leadership is distributed, the better will be the performance"*.

Different shared leadership topologies might lead to different performance outcomes (Mehra *et al.*, 2006)(McIntyre and Foti, 2013). Generally, distributed-coordinated leadership is more effective for team performance than distributed-fragmented leadership (Mehra *et al.*, 2006). The shared leadership framework in megaprojects provides various project leadership topology configurations. However, the link between leadership structures and project performance still needs further research. Since "one size fit all" rule is usually unrealistic, it will be necessary to investigate different leadership structure in different project contexts.

3 - Dynamic view of leadership in megaprojects

The novel framework underlines the dynamic property of shared leadership during project development. Research linking shared leadership and performance is inconsistent (Drescher *et al.*, 2014). Therefore, a focus on the dynamic characteristic of shared leadership could support a better understating of the phenomenon. Longitudinal studies allow to investigating the antecedents and consequences of shared leadership in megaprojects and could be suitable to study the dynamic trends of shared leadership across the entire project lifecycle (Scott-young, 2019). This longitudinal perspective may provide crucial insights into mechanisms by which shared leadership benefits

project performance. However, little is known about how the topologies grow, evolve

and adapt over time and how such dynamic changes impact the network performance.

Future research could leverage the dynamic shared leadership topology to study project

leadership and to improve the understanding of shared leadership topologies in

megaprojects.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

7. Conclusions

Management scholars are evolving their research interests from traditional leadership to alternative new leadership forms. The literature shows that shared leadership is the envisaged leadership form in contexts with high complexity. However, shared leadership is vastly underexplored in megaprojects. This paper contributes to this body of knowledge about project complexity by proposing a novel shared leadership framework based on boundary spanners. This framework builds on network and role theories and identifies three dimensions to map the shared leadership topology in megaprojects: stakeholders, boundary spanning leadership roles and project phases. The shared leadership framework about the network of stakeholders involved in megaprojects highlights different topologies.

The novelty of this framework consists of uncovering the structural antecedents of shared leadership in megaprojects using social network metrics. The framework will enable researchers to investigate how leadership transfers through boundary spanners (based on their roles or knowledge), or "rotate" between different stakeholders according to which resources and expertise are most needed in specific project stages. This novel representation would benefit managers and leaders in charge of managing and leading organisations in complex projects. By modelling leadership of megaprojects in a simple, yet effective way, the framework will foster manager's critical thinking.

References

Aime, F. , Humphrey, S., Derue, D S. and Paul, J. B. (2014) 'The Riddle of Heterarchy Power Transitions in Cross-functional Teams', *Academy of Management Journal*, 57(2), pp. 327–352.

Aldrich, H. and Herker, D. (1977) 'Boundary Spanning roles and Organization Structure.', *Academy of Management Review*, 2(2), pp. 217–230.

Anne-Marie Søderberg and Romani, L. (2017) 'Boundary Spanners in Global Partnerships : A Case Study of an Indian Vendor ' s Collaboration With Western Clients', *Group and Organization Management*, 42(2), pp. 237–278.

Aubry, M. and Lavoie-tremblay, M. (2018) 'Rethinking organizational design for managing multiple projects', *International Journal of Project Management*. 36(1), pp. 12–26.

Becker, J., Beverungen, D., Knackstedt, R.,Matzner, M., Müller, O and Poppelbub, Jens (2013) 'Bridging the gap between manufacturing and service through IT-based boundary objects', *IEEE Transactions on Engineering Management*, 60(3), pp. 468–482.

Biddle, B. J. (1986) 'Recent developments in role theory', *Annual review of sociology*, 12(1), pp. 67–92.

Biddle, B. J. (2013) *Role theory: Expectations, identities,and behaviors*.

Bienefeld, N., Grote, G. and Zurich, E. T. H. (2013) 'Shared Leadership in Multiteam Systems : How Cockpit and Cabin Crews Lead Each Other to Safety', *Human Factors*, 56(2), pp. 270–286.

Bolden, R. (2011) 'Distributed leadership in organizations: A review of theory and research', *International Journal of Management Reviews*, 13(3), pp. 251–269.

Bolden, R. and Petrov, G. (2014) 'Hybrid configurations of leadership in higher education employer engagement', *Journal of Higher Education Policy and Management*, 36(4), pp. 408–417.

Bruccoleri, M., Riccobono, F. and Größler, A. (2019) 'Shared Leadership Regulates Operational Team Performance in the Presence of Extreme Decisional Consensus/Conflict: Evidences from Business Process Reengineering', *Decision Sciences*, 50(1), pp. 46–83.

Carlile, P. R. (2002) 'A Pragmatic View of Knowledge and Boundaries : Boundary Objects in New Product Development *', *Organization Science*, 13(4), pp. 442–455.

Carson, J. B., Tesluk, P. E. and Marrone, J. A. (2007) 'Shared leadership in teams: An investigation of antecednt conditions and performance', *Academy of Management Journal*, 50(5), pp. 1217–1234.

Chang, A., Hatcher, C. and Kim, J. (2013) 'Temporal boundary objects in megaprojects : Mapping the system with the Integrated Master Schedule', *International Journal of Project Management*. 31(3), pp. 323–332.

Contractor, N., DeChurch, L., Carson, J., Carter D. R. and Keegan, Brian (2012) 'The topology of collective leadership', *Leadership Quarterly*, 23(6), pp. 994–1011.

Cropanzano, R. and Mitchell, M. S. (2005) 'Social Exchange Theory : An Interdisciplinary Review', *Journal of Management*, 31(December 2005), pp. 874–900.

David Denyer, David Tranfield, J. E. van A. (2008) 'Developing Design Propositions through Research Synthesis', *Organization Studies*, 29(3), pp. 393–413.

Denis, J.-L., Langley, A. and Sergi, V. (2012) 'Leadership in the Plural', *Academy Of Management Annals*, 6, pp. 211–283.

Denis, J. L., Lamothe, L. and Langley, A. (2001) 'The dynamics of collective leadership and strategic change in pluralistic organizations', *Academy of Management Journal*, 44(4), pp. 809–837.

Derue, D. S. and Ashford, S. J. (2010) 'Who Will Lead and Who Will Follow ? a Social Process of Leadership Identity Construction in Organizations', *Academy of Management Review*, 35(4), pp. 627–647.

Donaldson (2001) *The contingency theory of organizations*. Sage.

Drach-zahavy, A. (2011) 'Interorganizational teams as boundary spanners : The role of team diversity , boundedness , and extrateam links', *European Journal of Work and Organizational Psychology*, 20(1), pp. 89–118.

Drescher, M. A.,Korsgaard, M. A., Welpe, I. M. and Picot, A. (2014) 'The dynamics of shared leadership: Building trust and enhancing performance', *Journal of Applied Psychology*, 99(5), pp. 771–783.

Drouin, N. and Müller, R. (2018) 'Balancing vertical and horizontal leadership in projects : Empirical studies from Australia,Canada,Norway and Sweden', *International Journal of managing Projects in Business*, 11(4), pp. 986–1006.

Du, W. D. and Pan, S. L. (2013) 'Boundary spanning by design: Toward aligning boundary-spanning capacity and strategy in it outsourcing', *IEEE Transactions on Engineering Management*, 60(1), pp. 59–76.

Ellegaard, C. (2012) 'Interpersonal attraction in buyer-supplier relationships: A cyclical model rooted in social psychology', *Industrial Marketing Management*, 41(8), pp. 1219–1227.

Ernst, C., and C.-M. D. (2011) *Boudnary Spanning Leadership: Six Practices for Solving Problems, Driving Innovation and Transforming Organziations*.

Faraj, S. and Sambamurthy, V. (2006) 'Leadership of Information Systems Development Projects', *IEEE Transactions on Engineering Management*, 53(2), pp. 238–249.

Fellows, R. and Liu, A. M. M. (2012) 'Managing organizational interfaces in engineering construction projects : addressing fragmentation and boundary issues across multiple interfaces', *Construction Management and Economics*, 30(8), pp. 653–671.

van Fenema, P. C., Rietjens, S. and van Baalen, P. (2016) 'Stability and reconstruction operations as mega projects: Drivers of temporary network effectiveness', *International Journal of Project Management*. 34(5), pp. 839–861.

Floris, M. and Cuganesan, S. (2019) 'Project leaders in transition: Manifestations of cognitive and emotional capacity', *International Journal of Project Management*, 37(3), pp. 517–532.

Flyvbjerg, B. (2014) 'What You Should Know About Megaprojects,and Why : An Overview', 45(2), pp. 6–19.

Fransen, K., Puyenbroeck, S. V.,Loughead, T.M., Vanbeselaere, N.,B.D., Cuyer,Broek,

G. V. and Boen, F. (2015) 'Who takes the lead? Social network analysis as a pioneering tool to investigate shared leadership within sports teams', *Social Networks*, 43, pp. 28–38.

Fransen, K., Decroos, S, Vande Broek, G and Boen, F (2016) 'Leading from the top or leading from within? A comparison between coaches' and athletes' leadership as predictors of team identification, team confidence, and team cohesion', *International Journal of Sports Science and Coaching*, 11(6), pp. 757–771.

Fu, L. and Liu, Z. (2018) 'Distributed leadership in organizations: an investigation of antecedent conditions', *Chinese Management Studies*, 12(4), pp. 682–700.

Godé-Sanchez, C. (2010) 'Leveraging Coordination in Project- Based Activities : What Can We Learn', *Project Management Journal*, 41(3), pp. 69–78.

Granovetter, M. S. (1973) 'The Strenght of Weak TIes', *Granovetter, Mark S.*, pp. 1360–1380.

Gronn, P. (2002) 'Distributed leadership as a unit of analysis', *The Leadership Quarterly*, 13(4), pp. 423–451.

Guerrero-Bote, V. P. and Moya-Anegón, F. (2012) 'A further step forward in measuring journals' scientific prestige: The SJR2 indicator', *Journal of Informetrics*, 6(4), pp. 674–688.

Hatch, mary J. and Schultz, M. (2002) 'The dynamics of organizational identity', *Human Relations*, 15(10), pp. 52–53.

He, W., Hao, P, Huang, X, Long, L.-R., Hiller, N J, Li, S.-L. (2019) 'Different roles of shared and vertical leadership in promoting team creativity: Cultivating and synthesizing team members' individual creativity', *Personnel Psychology*.

Hiller, N. J., Day, D. V. and Vance, R. J. (2006) 'Collective enactment of leadership roles and team effectiveness: A field study', *Leadership Quarterly*, 17(4), pp. 387–397.

Hoch, J. E. (2014) 'Shared leadership, diversity, and information sharing in teams', *Journal of Managerial Psychology*, 29(5), pp. 541–564.

Hoch, J. E. and Dulebohn, J. H. (2013) 'Human Resource Management Review Shared leadership in enterprise resource planning and human resource management system implementation', *Human Resource Management Review*, 23(1), pp. 114–125.

Hoch, J. E. and Kozlowski, S. W. J. (2014) 'Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership', *Journal of Applied Psychology*, pp. 390–403.

Hoch, J. E., Pearce, C. L. and Welzel, L. (2010) 'Is the Most Effective Team Leadership Shared? The Impact of Shared Leadership, Age Diversity, and Coordination on Team Performance', *Journal of Personnel Psychology*, 9(3), pp. 105–116.

Hoegl, M. and Muethel, M. (2012) 'Enabling Shared Leadership in Virtual Project Teams: A Practitioners' Guide', *Project Management Journal*, 47(1), pp. 7–12.

Hoegl, M., Muethel, M. and Gemuenden, H. G. (2011) *Leadership And Teamwork In Dispersed Projects*, *The Oxford Handbook of Project Management*.

Hogg, M. A. (2015) 'A Social Identity Theory of Leadership', *Personalilty and Social Psychology Review*, 5(3), pp. 184–200.

Homans, G. C. (1958) 'Social Behavior as Exchange', *American Journal of Sociology*, 63(6), pp. 597–606.

Houman, P., Kragh, H. and Lettl, C. (2013) 'Spanning organizational boundaries to manage creative processes : The case of the LEGO Group', *Industrial Marketing Management*, 42(1), pp. 125–134.

Hsu, J. S.-C., Li, Y. and Sun, H. (2017) 'Exploring the interaction between vertical and shared leadership in information systems development projects', *International Journal of Project Management*, 35(8), pp. 1557–1572.

Huang, Y. , Luo, Y.,Liu, Y. and Yang, Q. (2016) 'An Investigation of Interpersonal Ties in Interorganizational Exchanges in Emerging Markets: A Boundary-Spanning Perspective', *Journal of Management*, 42(6), pp. 1557–1587.

Hult, G. T. M. (2011) 'Toward a Theory of the Boundary-Spanning Marketing Organization and insights from 31 organization theories', (39), pp. 509–536.

Invernizzi, D. C. Locatelli, G., Grönqvist, M. and Brookes, N. J. (2019) 'Applying value management when it seems that there is no value to be managed : the case of nuclear decommissioning', *International Journal of Project Management*, 37, pp. 668–683.

Ishikawa, J. (2012) 'Transformational leadership and gatekeeping leadership: The roles of norm for maintaining consensus and shared leadership in team performance', *Asia Pacific Journal of Management*, 29(2), pp. 265–283.

Jago, A. G. (2007) 'The Role of the Situation in Leadership', *The Leadership Quarterly*, 62(1), pp. 17–24.

Jiang, Y. (2008) 'Locating active actors in the scientific collaboration communities based on interaction topology analyses', *Scientometrics*, 74(3), pp. 471–482.

Joshi, A., Pandey, N. and Han, G. (2009) 'Bracketing team boundary spanning: An examination of task-based, team-level, and contextual antecedents', *Journal of Organizational Behavior*, 30(6), pp. 731–759.

Kakar, A. K. (2017) 'Investigating the Prevalence and Performance Correlates of Vertical Versus Shared Leadership in Emergent Software Development Teams', *Information Systems Management*, 34(2), pp. 172–184.

Kane, A. and Levina, N. (2017) "Am I Still One of Them ?": Bicultural Immigrant Managers Navigating Social Identity Threats When Spanning Global Boundaries Aim', *Journal of Management Studies*, 54(4), pp. 540–577.

Korschun, D. (2015) 'Boundary-spanning employees and relationships with external stakeholders: A social identity approach', *Academy of Management Review*, 40(4), pp. 611–629.

Kozlowski, S. W. J., Mak, S. and Chao, G. T. (2016) 'Team-Centric Leadership: An Integrative Review', *Annual Review of Organizational Psychology and Organizational Behavior*, 3, pp. 21–54.

Lauren, D., Mathieu, J. E. and Kukenberger, M. R. (2016) 'A Meta-Analysis of Different Forms of Shared Leadership–Team Performance Relations', *Journal of Management*, 42(7), pp. 1964–1991.

Lee, S. and Sawang, S. (2016) 'Unpacking the impact of attachment to project teams on boundary-spanning behaviors', *International Journal of Project Management*. 34(3), pp. 444–451.

Lehtonen, P. and Martinsuo, M. (2008) 'Change program initiation : Defining and

managing the program – organization boundary', *International Journal of Project Management*, 26, pp. 21–29.

Levina, N. and Vaast, E. (2005) 'The Emergence of Boundary Spanning Competence in Practice : Implications for Information Systems 'Implementation and Use*', *MIS Quarterly*, pp. 335–363.

Levina, N. and Vaast, E. (2006) 'A Field-of-Practice View of Boundary-Spanning in and across Organizations', in *Boundary-spanning inorganizations : Network,influence and conflict*.

Liu, J. , Yang, P.,Xia, B. and Skitmore, M. (2017) 'Effect of Perceived Justice on Subcontractor Willingness to Cooperate: The Mediating Role of Relationship Value', *Journal of Construction Engineering and Management*, 143(9), pp. 1–8.

Lord, R. G. Day, D.V., Zaccaro, S. J. and Avolio, B. J. Eagly, A. H. (2017) 'Leadership in Applied Psychology : Three Waves of Theory and Research', *Journal of Applied Psychology*, 102(3), pp. 434–451.

Lu, Y., Li, Y. Pang, D., Zhang, Y. (2015) 'Organizational network evolution and governance strategies in megaprojects', *Construction Economics and Building*, 15(3), pp. 19–33.

Maaninen-olsson, E. and Mu, T. (2009) 'A contextual understanding of projects - The importance of space and time', *Scandinavian Journal of Management*, 25, pp. 327–339.

Maddaloni, F. Di and Davis, K. (2017) 'The influence of local community stakeholders in megaprojects : Rethinking their inclusiveness to improve project performance', *International Journal of Project Management*, 35(8), pp. 1537–1556.

Manev, I. M. and Stevenson, W. B. (2001) 'Balancing Ties : Boundaiy Spanning and Influence in the Organization's Extended Network of Communication', *The Journal of Business Communication*, 38(2), pp. 183–205.

Marco, M. K. Di, Taylor, J. E., Asce, A. M. and Alin, P. (2010) 'Emergence and Role of Cultural Boundary Spanners in Global Engineering Project Networks', *Journal of Management in Engineering*, (July), pp. 123–132.

Marrewijk, A. Van, Smits, K. and Clegg, S. (2016) 'Clash of the Titans : Temporal Organizing and Collaborative Dynamics in the Panama Canal Megaproject', *Organization Studies*, 37(12), pp. 1745–1769.

Marrone, J. A. (2010) 'Team boundary spanning: A multilevel review of past research and proposals for the future', *Journal of Management*, 36(4), pp. 911–940.

Marrone, J. a, Tesluk, P. E. and Carson, J. B. (2007) 'A Multilevel Investigation of Antecedents and Consequences of Team Member Boundary- Spanning Behavior', *Academy of Management Journal*, 50(6), pp. 1423–1439.

McIntyre, H. H. and Foti, R. J. (2013) 'The impact of shared leadership on teamwork mental models and performance in self-directed teams', *Group Processes and Intergroup Relations*, 16(1), pp. 46–57.

Meerkerk, I. Van and Edelenbos, J. (2018) 'Facilitating conditions for boundary-spanning behaviour in governance networks', *Public Management Review*. Routledge, 20(4), pp. 503–524.

Mehra, A. Smith, B. R., Dixon, A.L., RobertsonB (2006) 'Distributed leadership in teams: The network of leadership perceptions and team performance', *Leadership Quarterly*, 17(3), pp. 232–245.

Merminod, V. and Rowe, F. (2012) 'How does PLM technology support knowledge transfer and translation in new product development ? Transparency and boundary spanners in an international context', *Information and Organization*. 22(4), pp. 295–322.

Moher, D. Liberati, A., Tetzlaff, J., Altman, D. G. (2009) 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement (Reprinted from Annals of Internal Medicine)', *Physical Therapy*, 89(9), pp. 873–880.

Mok, K. Y., Shen, G. Q. and Yang, J. (2015) 'Stakeholder management studies in mega construction projects : A review and future directions', *International Journal of Project Management*. 33(2), pp. 446–457.

Müller, R., Sankaran, S., Drouin, N., Anne-Live V., Bekker, M. C. and Karuna J. (2018) 'A theory framework for balancing vertical and horizontal leadership in projects', *International Journal of Project Management*, 36(1), pp. 83–94.

Müller, R., Zhu, F., Sun, X., Wang, L.and Yu, M. (2018) 'The identification of temporary horizontal leaders in projects: The case of China', *International Journal of Project Management*, 36(1), pp. 95–107.

Musawir, A. ul, Abd-Karim, S. B. and Mohd-Danuri, M. S. (2020) 'Project governance and its role in enabling organizational strategy implementation: A systematic literature review', *International Journal of Project Management*, 38(1), pp. 1–16.

Nordback, E. S. and Espinosa, J. A. (2019) 'Effective Coordination of Shared Leadership in Global Virtual Teams', *Journal Of Management Information Systems*, 36(1), pp. 321–350.

Nordbäck, E. S. and Espinosa, J. A. (2019) 'Effective Coordination of Shared Leadership in Global Virtual Teams Effective Coordination of Shared Leadership in Global Virtual Teams', *Journal of Management Information Systems*, 36(1), pp. 321–350.

Pathak, S. D., Dilts, D. M. and Biswas, G. (2007) 'On the evolutionary dynamics of supply network topologies', *IEEE Transactions on Engineering Management*, 54(4), pp. 662–672.

Pearce, C. L. and Sims, H. P. (2002) 'Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational, and empowering leader behaviors', *Group Dynamics*, 6(2), pp. 172–197.

Pitelis, C. N. and Wagner, J. D. (2018) 'Strategic Shared Leadership and Organizational Dynamic Capabilities', *Leadership Quarterly*, 30(2), pp. 233–242.

Pulles, N. J. and Hartman, P. (2017) 'Likeability and its effect on outcomes of interpersonal interaction', *Industrial Marketing Management*, 66, pp. 56–63.

Ramalingam, S. and Mahalingam, A. (2018) 'Knowledge coordination in transnational engineering projects : a practice-based study', *Construction Management and Economics*, 36(12), pp. 700–715.

Ratcheva, V. (2009) 'Integrating diverse knowledge through boundary spanning

processes - The case of multidisciplinary project teams', *International Journal of Project Management*, 27(3), pp. 206–215.

Road, S. and Kingdom, U. (2014) 'Leadership Theory and Research in the New Millennium: Current Theoretical Trends and Changing Perspectives', 44(March), pp. 0–95.

Sackey, E. and Akotia, J. (2017) 'Spanning the multilevel boundaries of construction organisations : towards the delivery of BIM-compliant projects', *Construction Innovation*, 17(3), pp. 1–22.

Sandal, I., Söderlund, J. and Minbaeva, D. (2018) 'Crossing times : Temporal tensions and temporal boundary spanning practices in interorganizational projects', *International Journal of Project Management*, 37(2), pp. 327–365.

Schotter, A. P. J. Mudambi, R., Doz, Y. L. and Gaur, A. (2017) 'Boundary Spanning in Global Organizations', *Journal of Management Studies*, 54(4), pp. 403–421.

Schultz, C. and Schreyogg, J. (2013) 'The impact of network ties and resource input on research performance: An empirical investigation among surgeons in academic medical centers', *IEEE Transactions on Engineering Management*, 60(3), pp. 457–467.

Scott-young, C. M. (2019) 'Shared leadership in project teams : An integrative multi-level conceptual model and research agenda', *International Journal of Project Management*, 37(March), pp. 565–581.

Sébastien Brion, Vincent Chauvet, Barthelemy Chollet, C. M. (2012) 'Project leaders as team boundary spanners : Relational antecedents and performance outcomes', *International Journal of Project Management*, 30(6), pp. 708–722.

Seijger, C., Otter, H. S., Tatenhove, V.J. and Dewulf, G. (2015).'Socially robust knowledge in coastal projects', 5.

Solomon, M. R. Surprenant, C., Czepiel, J. A., Gutman, E. G. (1985) 'A role theory perspective on dyadic interactions: the service encounter', *Journal of Marketing*, 49(1), pp. 99–111.

Sweeney, A., Clarke, N. and Higgs, M. (2019) 'Shared Leadership in Commercial Organizations: A Systematic Review of Definitions, Theoretical Frameworks and Organizational Outcomes', *International Journal of Management Reviews*, 21(1), pp. 115–136.

Tajfel H. (1982) *Social identity and intergroup behavior*. Cambridge University Press.

Thorelli, H. B. (1986) 'Networks: Between markets and hierarchies', *Strategic Management Journal*, 7(1), pp. 37–51.

Tortoriello, M. and Krackhardt, D. (2010) 'Activating cross-boundary knowledge: the role of simmelian ties in the generation of innovations', *Academy of Management Journal*, 53(1), pp. 167–181.

Tranfield, D., Denyer, D. and Smart, P. (2003) 'Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review *', *British Journal of Management*, 14.

Tsaturyan, T. and Müller, R. (2015) 'Integration and governance of multiple project management offices (PMOs) at large organizations', *International Journal of Project Management*. 33(5), pp. 1098–1110.

Vecchio, R. P., Justin, J. E. and Pearce, C. L. (2010) 'Empowering leadership: An

examination of mediating mechanisms within a hierarchical structure', *Leadership Quarterly*, 21(3), pp. 530–542.

Wang, D., Fang, S. and Fu, H. (2019) 'Impact of Control and Trust on Megaproject Success: The Mediating Role of Social Exchange Norms', *Advances in Civil Engineering*, 2019.

Wang, L, Han J., Fisher, C.M., and Pan Y. (2017) 'Learning to share: Exploring temporality in shared leadership and team learning', *Small Group Research*, 48(2), pp. 165–189.

Warner, J., Lulofs, K. and Bressers, H. (2010) 'The Fine Art of Boundary Spanning : Making Space for Water in the East Netherlands', 3(1), pp. 137–153.

White, L., Currie, G. and Lockett, A. (2016) 'Pluralized leadership in complex organizations: Exploring the cross network effects between formal and informal leadership relations', *Leadership Quarterly*, 27(2, SI), pp. 280–297.

Xia, N. Zou, P. X. W., Griffin, M.A., Wang, X.and Zhong, R. (2018) 'Towards integrating construction risk management and stakeholder management: A systematic literature review and future research agendas', *International Journal of Project Management*, 36(5), pp. 701–715.

Yu, M. Vaagaasar *A. L.,* Müller R., Wang L.and Zhu F. (2018) 'Empowerment : The key to horizontal leadership in projects', *International Journal of Project Management*, 36(7), pp. 992–1006.

Zheng, X., Le, Y., Chan, A. P.C.,Hu, Y.and Li, Y. (2016) 'Review of the application of social network analysis (SNA) in construction project management research', *International Journal of Project Management*, 34(7), pp. 1214–1225.

Zhu, F., Wang, L. Sun, M., Sun, X. and Müller, R (2019) 'Influencing factors of horizontal leaders ' role identity in projects : A sequential mixed method approach', *International Journal of Project Management*, 37, pp. 582–598.