

1 **A shared leadership framework based on boundary**
2 **spanners in megaprojects**

3
4 Subtitle (less than 8 words):

5 Shared leadership topology in megaprojects

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10 ”

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12
13 **Abstract**

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

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

1 spanners.

2 **Findings-** There are three key dimensions characterising shared leadership topology

3 in megaprojects: stakeholders, boundary spanning leadership roles and project phases.

4 The novel framework shows how project leadership dynamically transfers among

5 different stakeholders, showing the importance of shared leadership as a leadership

6 paradigm in megaprojects.

7 **Research implications-** The novel framework epitomizes shared leadership in

8 megaprojects by exploring its antecedent components with social network metrics. This

9 paper stresses that shared leadership is the envisaged form of leadership in megaprojects.

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

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

12 framework would also benefit practitioners in charge of megaprojects.

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

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

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

16 megaprojects.

17

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

19

1 **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 a single team or leader to guarantee the successful planning
19 and delivery (Zhu *et al.*, 2019). Team members can be empowered as horizontal leaders
20 and execute complementary leadership tasks through social interaction within the
21 project team (Müller *et al.*, 2018a;b). Leadership in megaprojects is dynamically
22 transferred and shared through specific individuals or teams controlling key knowledge

1 and resources across the project lifecycle (Scott-young, 2019). Therefore, traditional
2 leadership falls short in meeting the requirements 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 paper, 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
7 since 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

4 **2 Theoretical background**

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

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

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

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

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

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

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

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

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

14 deal with the dynamic and complex attributes of megaprojects.

15

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
<i>Network theory</i>	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
<i>Social identity theory</i>	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.
<i>Social exchange theory</i>	Social exchange comprises actions contingent on the rewarding reactions of others (Homans, 1958); and these actions are interdependent 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
<i>Contingency theory</i>	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
<i>Role theory</i>	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 concrete 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 Network theory

According to the network theory, all individuals, groups and organisations are embedded in social networks formed by intricate relationships and ties (Thorelli, 1986). Marrone (2010) suggest that boundary spanners build social networks with external stakeholders to qualify their critical position in the networks. Boundary spanning activities promote the relationship quality with external key stakeholders. From the network perspective, shared leadership is a set of non-hierarchical relationships derived from the distribution of leadership influence across multiple team members (Kozlowski 2016). Leadership is an emergent network of relations influenced by the informal social networks (White et al., 2016). Network theory can be applied in megaprojects since megaprojects require multiple partners, including specialists and managers, to contribute with their knowledge and resources by forming a temporary network (van Fenema, Rietjens and van Baalen, 2016). Network theory is appropriate for investigating the governance of megaproject-based organisation since it conceptualises the nature of networks as cooperative endeavours (Tsaturyan and Müller, 2015). Social network analysis can be leveraged to investigate various connections and relations intertwined by multiple stakeholders in megaprojects (Lu *et al.*, 2015). Building on Zheng *et al.*, (2016), social network analysis is especially efficient in megaprojects since the megaproject networks are characterised by a complex collaboration of multiple project partners. Therefore, network theory can provide the theoretical lens to describe and measure leadership and boundary spanning activities in megaprojects.

2.2 Social identity theory

Social identity theory sheds light on how individuals recognise their membership to social groups (Tajfel H., 1982). Individuals acquire their memberships to other organisational groups through the social identification process, thus forming boundary spanning relationships (Joshi et al., 2009). The social identity processes of boundary spanners are activated when they interact with external stakeholders manifesting as boundary spanning behaviours (Korschun, 2015). Building on Derue et al. (2010), leadership roles of boundary spanners have high in identity complexity, and the social boundary spanning process is important for the construction of leadership. Shared leadership can be viewed as a group process generated by social identity categorisation (Hogg, 2015). Therefore, leadership identity theory considers shared leadership as a social process in which multiple stakeholders develop leadership identities and generate mutual influence through their boundary spanning behaviours. Social identity theory can be applied to classify different responsibilities and positions of stakeholders in megaprojects.

2.3 Social exchange theory

Social exchange describes how individuals enter into new relationships based on their expectations and perceived rewards (Homans, 1958). On the one hand, the interaction between boundary spanners has a critical impact on how interorganizational exchanges develop (Pulles and Hartman, 2017). The exchange partners evaluate both economic and social outcomes from their boundary spanning transactions and compare

1 the valuation provided by other partners with their own expectations (Jago, 2007). Thus,
2 social exchange theory provides the theoretical lens to investigate how interpersonal
3 interactions between boundary spanners motivate the interorganizational exchange
4 (Ellegaard, 2012; Huang *et al.*, 2016). This theory is applicable to investigate the impact
5 of bilateral exchange among different stakeholders on the project outcomes, for instance,
6 the social exchange norms on megaproject success (Wang, Fang and Fu, 2019), or the
7 perceived justice on cooperation(Liu *et al.*, 2017).

8 On the other hand, social exchange theory implicates that the transaction of a
9 person from engineer to manager and leader is embedded in the complex social
10 exchange process (Müller *et al.*, 2018 b). It is a suitable theory to explore shared
11 leadership since the latter reflects the nature of member-member exchange in terms of
12 leadership influence (Hoch, 2014). Thus, social exchange theory lays the theoretical
13 cornerstone to explore how boundary spanning affect performance outcomes and how
14 shared leadership cope with complex challenges in megaprojects.

15

16 2.4 Contingency theory

17

18 Contingency theory explains how organisations with internal features matching the
19 requirement of environment achieve good performance (Donaldson, 2001).
20 Organisations tend to promote their marketing competitiveness through ongoing
21 boundary spanning activities (Godé-Sanchez, 2010). The leadership style depends on
22 the situation (Jago, 2007) and shared leadership is appropriate when partners play
23 distinct but complementary roles (Bolden, 2011). Contingency theory is appropriate for

1 the investigation of organisations managing project-based organisation (Aubry and
2 Lavoie-tremblay, 2018), thus contributing to the governance arrangements in
3 megaprojects. Further, according to Tsaturyan and Müller, (2015), contingency theory
4 can be applied to the different forms of governance on megaproject success. Thus,
5 contingency theory provides the contextual conditions to study shared leadership and
6 boundary spanning activities in megaprojects.

7

8 2.5 Role theory

9 Role theory considers roles as bounded clusters in which individuals have different
10 social status (Biddle, 1986) and are responsible for the social arrangements construct
11 through interactions (Solomon *et al.*, 1985). Taking the role theory perspective,
12 boundary spanners have crucial roles in executing boundary spanning activities,
13 including interactions. Boundary spanners prompt the information exchange and
14 organisational adaptation to changes through their boundary spanning roles -
15 information processing and external representation (Aldrich and Herker, 1977). Based
16 on role theory, shared leadership is the holistic concrete action of role taking in which
17 leadership roles are informally adopted and enacted by different individuals (Gronn,
18 2002). The individuals who can permeate boundaries are ideal candidates for shared
19 leadership (Marrone, 2010)(Vecchio, 2010). However, the intensive interaction raised
20 by shared leadership and boundary spanning may cause a high level of role pressure
21 leading to producing negative performance (Huang *et al.*, 2016). Therefore, role theory
22 provides the ideal conceptualisation to link shared leadership and boundary spanning

1 roles promoting the collaboration between different entities to deliver common goals.
2 It can be applied to solve the role conflict of specific individuals, for instance, the
3 project manager, due to the multiple interfaces in the megaprojects.

4 In this section, we identified network theory, social identity theory, social exchange
5 theory, contingency theory and role theory as the theoretical lens to study boundary
6 spanning and shared leadership in megaprojects. These theories are appropriate to
7 explore leadership in megaprojects since they can support the conceptualisation of the
8 complexity of megaprojects. Even if all these five theories can be applicated to
9 investigate megaproject leadership or boundary spanning activities, this paper
10 considers network theory and role theory as the theoretical lens to develop the shared
11 leadership topology in megaproject. Network theory is chosen because networks exist
12 in a multitude of topologies (Pathak et al., 2007) and can be applied to examine how
13 multiple stakeholders form the leadership network. Role theory conceptualises shared
14 leadership as a set of tasks and roles served by boundary spanners, thus providing the
15 possibility to 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 and comprehensive methodology used to build theory by leveraging knowledge and evidence from the literature (Tranfield, Denyer and Smart, 2003). Compared to a traditional literature review, SLR can reduce the researchers' biases (particularly selection bias) by providing a transparent and replicable reviewing procedure. SLR is getting more and more popular in project studies and is particularly valued by project scholar while relationships between constructs (e.g. Musawir et al., (2020) and Xia *et al.*, (2018)). Similarly, there are three key reasons to employ an SLR in this paper:

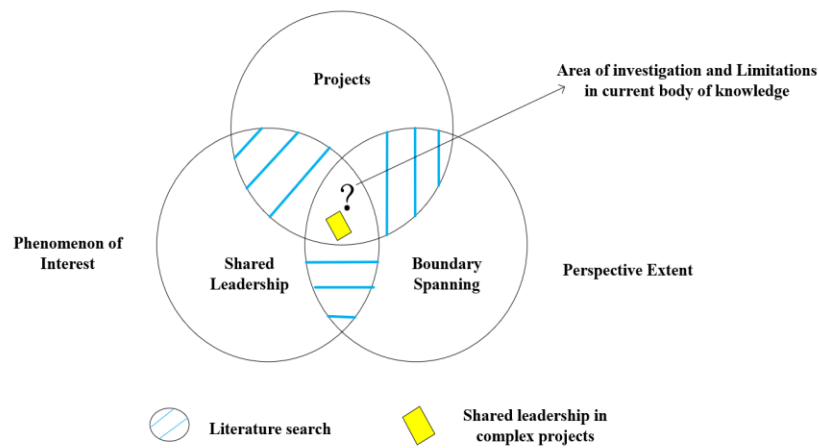
(1) Shared leadership and boundary spanning research is fragmented across disciplines (Denyer et al.,2008);

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

1 with "shared leadership and project" as the literature review foundation to uncover the
2 relevant knowledge in megaproject context.



3

4

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

5

6 This paper follows the rigorous search criteria suggested by Mok *et al.* (2015) to
7 conduct the systematic literature review. Figure 2 shows the flow chart of the
8 publication retrieval process based on the Preferred Reporting Items for Systematic
9 reviews and Meta-Analysis (PRISMA) (Moher *et al.*, 2009). The four major stages of
10 conducting the systematic literature review are outlined in the following sections.

11 The first stage identifies keywords related to shared leadership and boundary
12 spanning in project contexts. The provisional list of relevant keywords has three clusters:

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

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

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

17 It's worth noting that this paper is focused on megaprojects, but we used "project,
18 complex project, megaproject" as keywords in our SLR process. This is because 1)

1 authors, particularly until 3-4 years ago, used several synonyms for megaprojects (e.g.
2 "large projects", "mega projects", "giga projects" "mega infrastructure") etc. There
3 might be papers about, for instance, a "nuclear reactor" project (clearly a megaproject)
4 that might not be detected even considering all the synonyms of megaprojects. 2) There
5 are papers about "projects" (particularly complex projects) that might have knowledge
6 relevant for megaprojects. Excluding those papers, for the sake of keywords, would
7 lead us to ignore relevant knowledge. Furthermore, the SLR combines as keywords
8 both "boundary spanning/spanner" and "project" which indicates the complex attributes
9 of megaprojects involving multiple stakeholders. Consequently, we decided to take the
10 "long way" of reviewing all the papers dealing with projects, shared leadership, and
11 boundary spanning and check, one by one if those papers were relevant. By doing so,
12 the SLR used in this paper would cover the entire literature related to megaprojects.

13

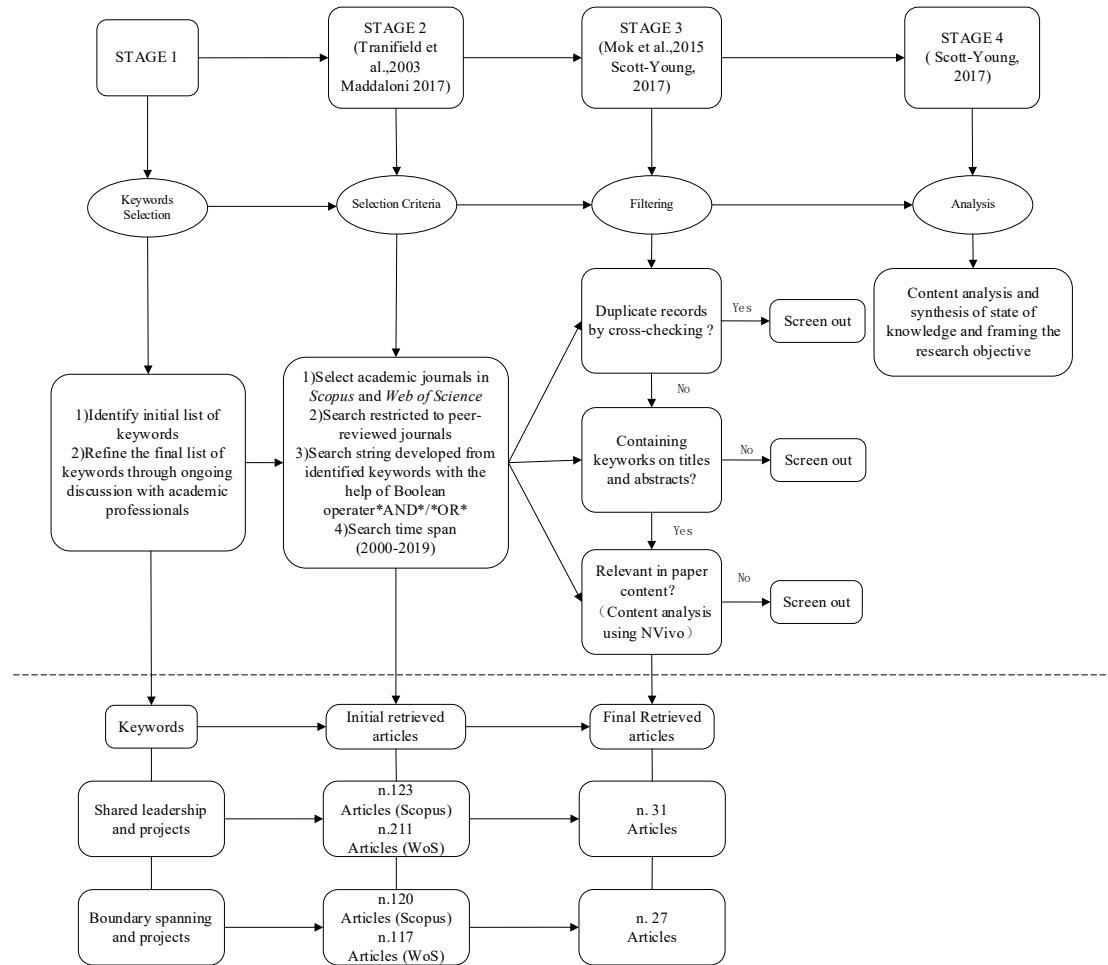


Figure.2. Publications retrieval process (Adapted from Maddaloni and Davis (2017))

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
<i>Quantitative variables</i>	
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
<i>Qualitative variables</i>	
Research questions	Research question explicitly stated in the paper
Contributions	Contribution explicitly stated in the paper
Findings	Major findings stated in the paper

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 multi-level conceptual model of shared leadership in project teams.

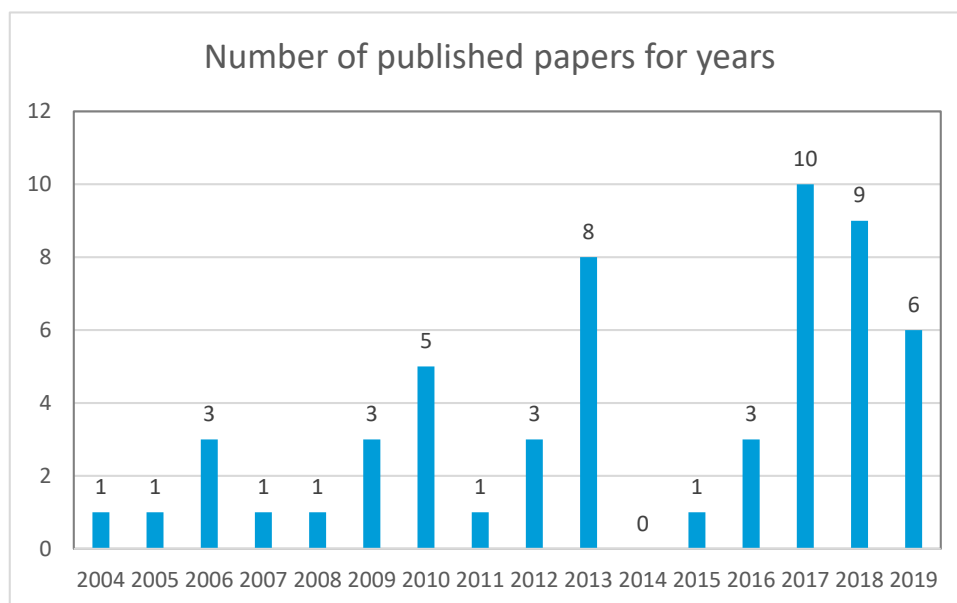


Figure 3 Number of relevant papers published from 2004 to 2019

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
<i>No. of papers</i>	34	59%
Case study	14	41%
Conceptual approach	10	29%
Literature review	5	15%
Interview survey	5	15%
<i>Research context in case studies</i>	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

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

1 on all aspects of knowledge to the work requiring the integration of independent and
2 varied teams (Faraj and Sambamurthy, 2006). Hoegl *et al.*,(2012) contended that team
3 members are an additional leadership source to address the challenges of geographical
4 dispersion and task uncertainty in dispersed virtual project teams. The shared leadership
5 can deal with the uncertainty, fast-changing environments and increasingly complex
6 tasks in team-based structures (Hoch *et al.*, 2010).

7 Secondly, shared leadership is more dynamic than traditional vertical leadership.
8 When leadership is shared, the roles of team members transfer between leaders and
9 followers (McIntyre and Foti, 2013). The focus on the dynamism is critical, because the
10 leadership roles may experience construction, deconstruction and reconstruction along
11 the project lifecycle. This dynamic process boosts different leadership roles within one
12 team (Fransen *et al.*, 2016). The dynamic attributes of shared leadership may provide
13 deeper insights into the mechanism of shared leadership and performance relationships
14 (Drescher *et al.*, 2014).

15 Lastly, vertical leaders and shared/horizontal leaders coexist in shared leadership
16 research. Leadership in teams is placed in the continuum between two extremes:
17 vertical leadership with a single hierarchical leader and shared leadership with a
18 pervasive horizontal leadership (Kakar, 2017). The traditional leadership styles of
19 formal leaders impact shared leadership, both directly and indirectly (Ishikawa, 2012).
20 Vertical leaders can act as external coaches to boost shared leadership atmosphere in
21 the team (Carson *et al.*, 2007). The intervention by vertical leaders mitigates the value
22 diversity, thus, contributing to the adoption of shared leadership (Hsu *et al.*, 2017). The

1 vertical leaders have the responsibility of assigning leadership roles to others and re-
2 assuming the leadership role when no team members are willing to shoulder leadership
3 responsibilities (Yu *et al.*, 2018).

4 Shared leadership research based on project studies deals mainly with knowledge
5 sharing and virtual collaborations. For example, shared leadership is important for team
6 effectiveness in virtual project teams since members collaborate with each other
7 crossing the spatial, temporal and cultural boundaries (Nordbäck and Espinosa, 2019).

8 Shared leadership intensifies the ties between team members and exerts an inverse U-
9 shaped curve between-group dynamic consensus and project performance in business
10 process reengineering (Bruccoleri *et al.*, 2019). Hoegl and Muethel (2012) discussed

11 how to enable shared leadership in virtual teams and how the team may profit from
12 shared leadership. Müller *et al.* (2018a) developed a cycling framework of balanced
13 leadership, emphasising the balance, dynamic and situational contingency of vertical

14 and horizontal leadership. The balanced leadership framework paves the way for setting
15 up further studies on the interaction of vertical leadership and horizontal/shared
16 leadership in projects. The identification of horizontal/shared leaders depends on the

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

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

19 High job complexity, intrinsic rewards, self-efficacy and personal expectations were
20 positively related to the strong role identity of horizontal leaders (Zhu *et al.*, 2019).

21

22 4.2.2 Boundary spanning in projects

1 Increased globalisation of markets and organisations calls for simultaneously
2 crossing multiple boundaries including cultural, spatial, institutional and temporal
3 boundaries (Tortoriello and Krackhardt, 2010). Boundary spanning is a key process in
4 producing organisational innovation (Houman *et al.*, 2013)(Drach-zahavy, 2011),
5 knowledge integration (Ratcheva, 2009), outsourcing of products and services (Marco
6 *et al.*, 2010)(Du and Pan, 2013). The boundary spanning activities, including scouting,
7 ambassadorial and coordinating, were positively related to the inter-organisational team
8 outcomes (Drach-zahavy, 2011).

9 Scholars use different theoretical lens to explore boundary spanning such as social
10 networks information processing (Marco *et al.*, 2010), social identity theory (Kane and
11 Levina, 2017), and small group research (Carlile, 2002). The practice perspective
12 combing the understanding of knowledge and power is popular in project studies
13 (Levina and Vaast 2006; Warner *et al.*, 2010). For example, Warner *et al.*, (2010)
14 introduced boundary spanning in water management and found that boundary spanning
15 strategies should be applied in the early stages of a project. Sandal *et al.*, (2018)
16 identified three practices - framing, synchronising and hyping - to move a project
17 toward the benign collaborative relationships across the supply chain. The practice
18 approach facilitates the understanding of space and time dimensions in projects
19 (Maaninen-olsson and Mu, 2009). Thus, this approach is complementary to traditional
20 project management research investigating how different partners collaborated crossing
21 diverse boundaries to execute a project (Ramalingam and Mahalingam, 2018). This
22 perspective of boundary spanning in project settings calls for more focus on the actions

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

2 The high complexity caused by multiple boundaries in projects stimulated research
3 on various boundary objects. Boundary objects can be used for individual needs and
4 promote interaction and communication between different stakeholders. IT-based
5 boundary objects facilitate the integration of manufacture and services organisational
6 sub-process, contributing to the boundary spanning and business process management
7 (Becker *et al.*, 2013). Merminod and Rowe (2012) suggested integrating different
8 digital tools to support project information objects using object storage and workflows.
9 Virtual tools such as CAD and BIM systems are efficient boundary objects to promote
10 knowledge sharing among designer, constructors and other project users (Fellows and
11 Liu, 2012). BIM technological solutions benefit the boundary spanning engagement
12 and successful BIM-compliance project delivery (Sackey and Akotia, 2017). The
13 Integrated Master Schedule is a critical boundary object for megaprojects with long
14 construction periods and a high degree of complexity and uncertainty (Chang, *et al.* ,
15 2013).

16 Boundary spanners and boundary spanning roles are also important research topics
17 in project studies. Marco *et al.*, (2010) found expatriates are ideal boundary spanners
18 for dealing with cross-cultural knowledge conflicts and increase collaboration
19 effectiveness in global engineering project networks. Brion *et al.*, (2014) suggest that
20 the project leaders' position contributes their boundary spanning roles, and stronger
21 social network ties are effective to induce boundary spanning activities. Project
22 managers can not only play a direct boundary spanning role but also help trigger the

1 cooperation of other actors to establish a sound boundary spanning environment
2 (Meerkerk and Edelenbos, 2018).

3 Boundary spanners can be nominated or automatically emerge from practice in the
4 project context (Levina and Vaast, 2005). The primary boundary spanning roles in
5 construction projects are traditionally allocated to engineers and/or architects. These
6 boundary spanners are particularly important because they can trigger emergent
7 boundary spanning processes (Marco *et al.*, 2010). The emergent boundary spanners
8 located at the peripheral for the specialist activities can facilitate relationship
9 negotiation with external stakeholders (Fellows and Liu, 2012). Project members with
10 unique skills can emerge as boundary spanners-in-practice (Du and Pan, 2013). They
11 engage in relationship negotiation occurred in special circumstances and help to build
12 a shared atmosphere between different stakeholders (Seijger *et al.*, 2015).

13 Building on Lehtonen and Martinsuo (2008), boundary spanning activities in
14 megaprojects can be divided into five categories: defining and shaping the boundary,
15 representing the project organisation and creating legitimacy, information scouting and
16 negotiating, ensuring continuity, and guarding and isolating. Maaninen-olsson (2009)
17 indicated that both the spatial context and dynamic relationship network are the drivers
18 of boundary spanning activities. According to Brion *et al.*, (2012), the main activities
19 of project managers' boundary spanning includes coordinating with external actors,
20 scanning for information, obtaining political support and protecting the team. Houman
21 *et al.* (2013) identified three groups of boundaries panning activities – selecting and
22 mobilising talents, creating the shared identity, combing and integrating knowledge

1 across different fields – to manage the creative process. Romani (2017) presented three
2 boundary spanning activities that the vendor managers engage in: boundary
3 management, common ground forge and new frontiers development. Therefore,
4 research on boundary spanning activities needs to adopt a contextual perspective in
5 different project settings.

6 To further orient readers to the literature review on boundary spanning and projects,
7 the authors present a multi-level concept map. Figure 4 shows boundary spanning
8 literature focusing mainly on four aspects: people (boundary spanners), boundary
9 objects, roles and behaviours. Figure 4 summarised the relevance of current boundary
10 spanning literature pointing that boundary spanning study is divided into three levels:
11 individual-level, team-level and project-level. The project-level is extracted as the
12 highest level in extant literature since these studies focus on the common attributes of
13 project triggering boundary spanning activities. Boundary spanners or boundary
14 spanning activities are beneficial for the outcomes at higher-level projects, programs
15 and portfolios. The benefit of boundary spanning yields different performance or
16 improvement at the three levels. Arrows in Table 4 represents the relationship between
17 boundary spanning roles, boundary spanning behaviour and boundary objects. Time is
18 also relevant since temporary boundary spanners may emerge with the contingent event.

19

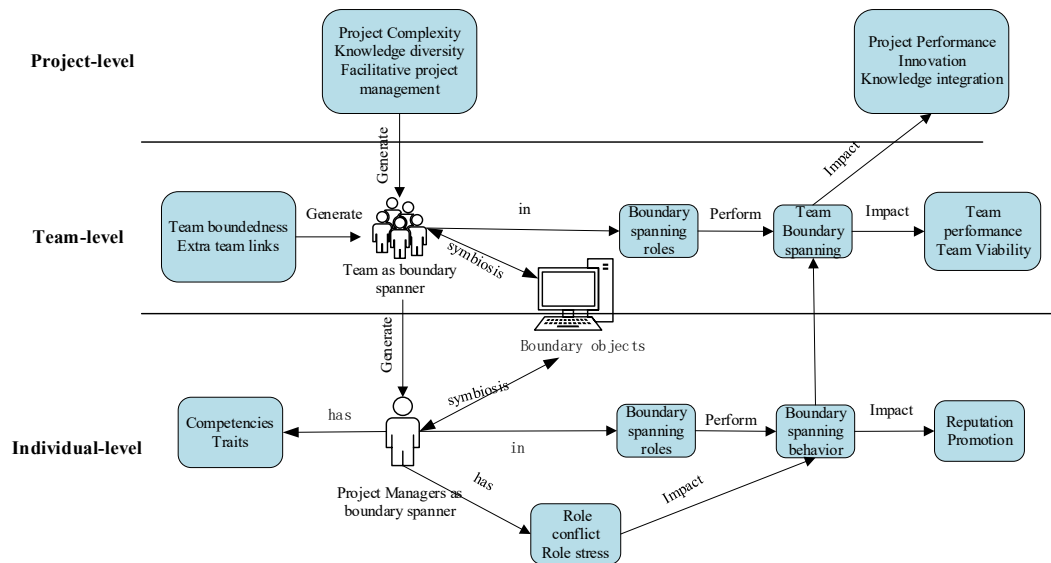


Figure 4 Multi-level map of boundary spanning concepts in project

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	
			<i>Shared leadership in projects</i>	<i>Boundary spanning in projects</i>
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.	<ul style="list-style-type: none"> • 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). 	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Shared leadership is dynamic evolving over time (Contractor 2012; Drescher et al., 2014; Klein 2006; Kozlowski & Chao). 	<ul style="list-style-type: none"> • 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 coordinating process, leading the complex project jointly.	<ul style="list-style-type: none"> • 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 et al. 2018b). • Shared leaders in the Board are engaged in strategic making and taking (Pitelis and Wagner, 2018). 	<ul style="list-style-type: none"> • Boundary spanners in projects take the role of coordinating, information scanning, support asking and team protecting (Brion et al. 2014; Martinsuo 2008; 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.

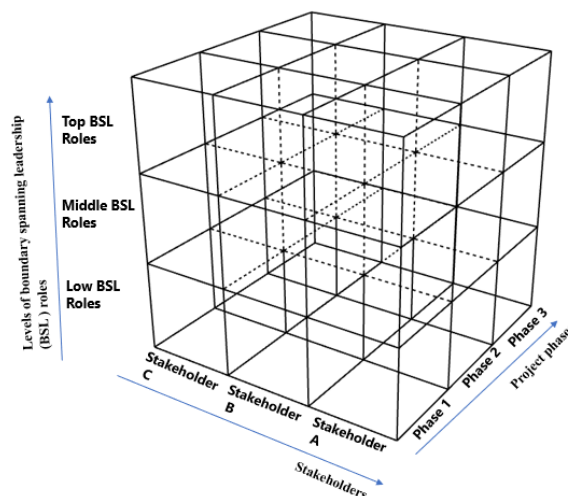


Figure 5 Framework to study the topology of shared leadership in megaprojects.
(Derived from Contractor *et al.*, (2012))

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.

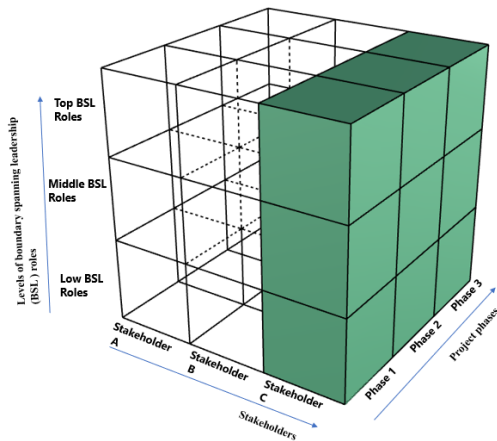


Figure 6a High member centralisation

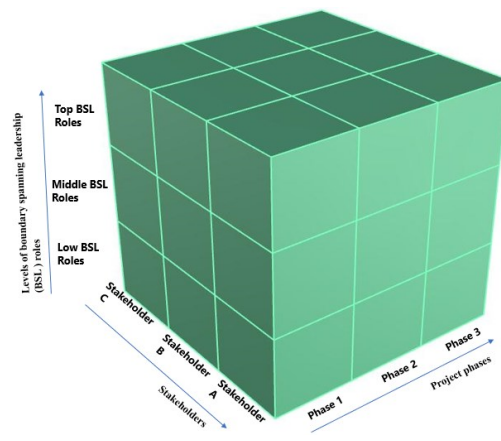


Figure 6b Low member centralisation

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.

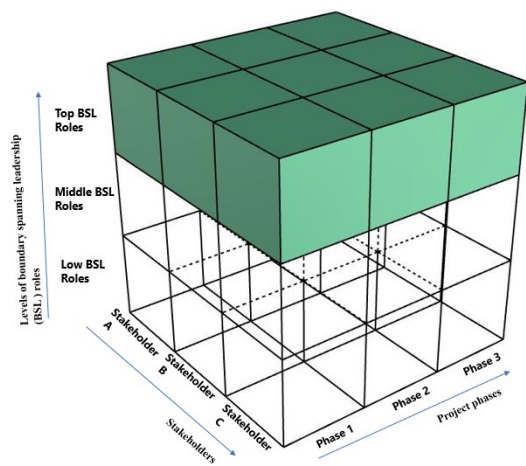


Figure 7a Strategic shared leadership

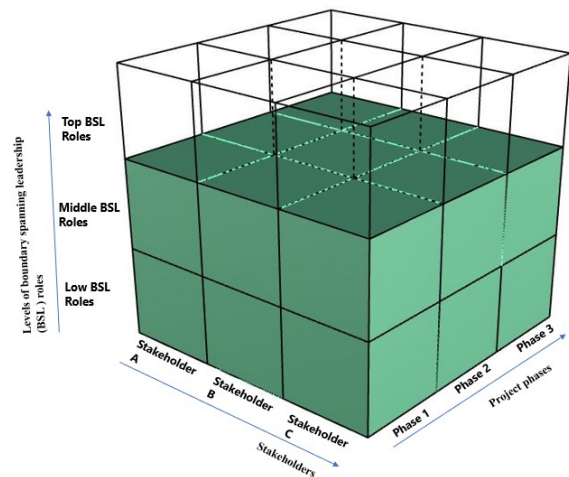


Figure 7b Operational shared leadership

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.

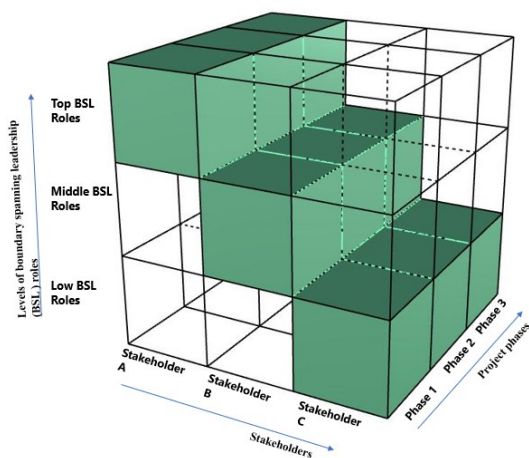


Figure 8a High Leadership rotation

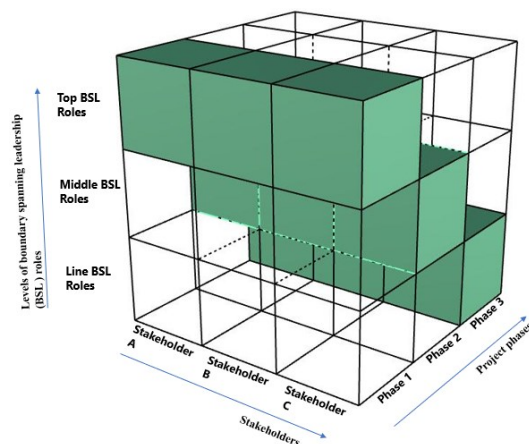


Figure 8b Low Leadership rotation

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.

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.

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