Shared Leadership and Team Effectiveness: A Social Network Analysis in the Project Life Cycle

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Abstract

Many organizations are encouraging a shared leadership approach that meets the increased complexity of today's working environment. It is therefore imperative for scholars to clearly comprehend the nature and mechanism of shared leadership in teams. However, a lack of coherence and clarity in this research field as well as a lack of insights into the dynamic nature of shared leadership, has impeded its theoretical and empirical advancement. Therefore contributing to the burgeoning research in the field of shared leadership, this research aims to 1) provide an integrative and comprehensive review of shared leadership studies; 2) uncover the dynamic nature of shared leadership and explore how it changes across different phases of the project life cycle; and also 3) extend the line of research that examine the relationship between shared leadership and team effectiveness and advance it by studying the moderating role of the project life cycle in such relationship.

In order to do this, a systematic review of shared leadership covering 164 articles spanning 20 years (1999–2018) has been conducted. Moreover, a conceptual model of how shared leadership changes throughout the project life cycle has been developed and empirically tested from a social network analysis. This research also investigated hypotheses regarding the relationship between shared leadership and team effectiveness as well as the moderating role of the project life cycle in such relationship. Data was collected from a sample of 26 engineering design teams (119 respondents) who adopt a shared leadership

approach. The findings show that 1) shared leadership changes across the project life cycle; such changes exist not in the centralization of shared leadership networks, but in the density of shared leadership networks; 2) the density of shared leadership is larger in the early phase than the later phase of the project life cycle; 3) shared leadership is positively related to team task performance, team viability and team effectiveness; 4) moreover, the stage of the project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship is stronger at the early phase than at the later phase of project life cycle.

Overall, the finding of this research makes significant contributions to the field of shared leadership. Firstly, it captures this growing area of research and provides a comprehensive overview of shared leadership studies about where it has been and where it should go into the future. Secondly, it brings valuable insights and empirical evidence into the dynamic nature of shared leadership. It thus helps to gain a better understanding of shared leadership constructs and foster its theoretical and empirical advancement. Thirdly, it offers insightful thoughts into the consequences and moderators of shared leadership and adds to the academic debate in the field of shared leadership. Finally, it pinpoints future research directions to scholars and brings practical suggestions for project managers in industry who seek to implement best practice in organizations toward high team effectiveness.

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Chapter 1: Introduction

1.1 Background to the study

Nowadays, organizations have entered an era that is characterized by dynamic, competitive and high-velocity environments (Ensley et al., 2006; Sirmon et al., 2007). In order to effectively navigate such complex environments, many organizations have transformed from formal bureaucratic structures into team-based designs (Mathieu et al., 2008). Such a pervasive presence of team-based structures has brought researchers to focus on the identification and investigation of factors that foster overall team effectiveness (Elkins & Keller, 2003; Kozlowski & Ilgen, 2006; Mathieu et al., 2008). One enabler that has been frequently mentioned in the literature is leadership (see Aga et al., 2016; Kozlowski et al., 2009). Leadership is essential for enhancing team effectiveness and some scholars have even argued that it is the most component (Zaccaro et al., 2001). Yet, many leadership theories have concentrated on the notion of a single, appointed leader (Pearce & Conger, 2002, p. 12) and explored how the characteristics, behaviors or qualities of designated leaders influence followers as well as the organization (Bass & Bass, 2009; Crossan et al., 2017; Vaccaro et al., 2012). This paradigm has dominated our thinking for decades in the leadership field. Recent approaches to the study of leadership have questioned this narrow focus and argued for the importance of leadership to be shared among group members (e.g., Carson et al., 2007; Nielsen & Daniels, 2012; Pearce & Sims, 2002; Wang et al., 2014). As such, the topic of shared leadership has gained growing interest.

By definition, shared leadership is viewed as "a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both" (Pearce & Conger, 2003, p. 1). It creates environments where the decisions as well as actions of a group are not the result of a singular leader acting toward the group, but of the group itself (Cox et al., 2003). As Pearce et al. (2014) suggest, shared leadership moves beyond the moribund myth of leadership being an exclusively top-down hierarchical affair into the idea that leadership can be distributed around the team equally, unilaterally, or in any other way. As such, conventional vertical leadership depends on the knowledge of a singular leader, while shared leadership extracts from the wisdom of a collective (Ensley et al., 2006). Theory suggests that shared leadership is one of the key contributors that enable team-based organizations to operate effectively in today's complex business environment (Pearce & Sims, 2002; Ramthun & Matkin, 2012). This might be why organizations (e.g., Southwest Airlines, WL Gore & Associates) implementing shared leadership practices continue to surge, propelling research into the concept of shared leadership.

Research on shared leadership has progressed over time. It can be considered in terms of three phases. The first concentrates on the conceptual development of shared leadership. The second stage focuses on developing measures of shared leadership and examining the relationship between shared leadership and different types of team outcomes across various contexts. Presently we are in the third phase of shared leadership studies. This phase

focuses on model development, in which more sophisticated strategies are being employed to go beyond simple correlations with team outcomes in order to understand shared leadership's antecedents, mediating mechanisms and boundary conditions. For instance, internal team environment (shared purpose, social support, voice) and external team environment (coaching) were examined by Carson et al. (2007) as antecedent factors that support the emergence of shared leadership. Chen and Liu (2018) investigated the mediating role of team coordination and goal commitment in the relationship between shared leadership and team performance. Further, the boundary conditions in which shared leadership operates have been unpacked. Such as team members' gender and race (Robert, 2013), power distance (Liang et al., 2017), team culture (Angles, 2007; Erkutlu, 2012), team trust (Angles, 2007), task interdependence (Gu et al., 2016; Nicolaides et al., 2014) as well as job variety (Liu et al., 2014), have been investigated as moderators that influence the effectiveness of shared leadership on the satisfaction, workflow, performance of team, and the creativity of individuals. In summary, the topic of shared leadership has been positioned as a promising field of research in leadership and received considerable attention from leadership scholars.

1.2 Statement of research problems

Notwithstanding the exponential surge of shared leadership studies (with more than 100 articles published in the last four years alone (2014-2018)), there are still some research

problems that need to be addressed. Based on a comprehensive literature review, this research identified these problems and categorized into the following three types.

Research problem (I): Lack of coherence and clarity in the field of shared leadership. The first type of research problems lies in the lack of coherence and clarity in the field of shared leadership. Specifically, studies of shared leadership have been conducted not only in the field of management (e.g. Carson et al., 2007; Serban & Roberts, 2016; Wang et al., 2014), but also in education (Cawthorne, 2010), healthcare (George & Lovering, 2013), sports (Kang & Svensson, 2018), church (Davis, 2015), government organizations (Choi, 2006), police (Masal, 2015) as well as military (Ramthun & Matkin, 2014). However, an integrated analysis across all these disciplines has not yet been conducted. This should be solved because it plays an important role to foster the advancement of shared leadership theories. Moreover, the existing literature has presented a variety of interpretations of shared leadership that focused on its different characteristics. However, there is no a unified definition about what shared leadership is. This gap should therefore be addressed. Additionally, compared to vertical leadership, shared leadership, by providing lateral, supplemental influence in teams, has been advocated to be more effective (Ensley, 2016). However, as Hoch and Dulebohn (2013) suggest, shared leadership is not mutually exclusive, but can be engaged in simultaneously with other approaches, such as vertical leadership. However, the difference and interaction between shared leadership and vertical leadership is unclear. Furthermore, conceptually disentangling shared leadership from

other similar leadership theories, e.g., collective leadership, distributed leadership, emergent leadership and empowering leadership, is also imperative in order to have a better understanding of shared leadership concepts.

This research also found that there is lack of a critical analysis on the measurement techniques of shared leadership. To be specific, there are two major approaches for measuring shared leadership in the literature. One is the aggregation techniques that concentrates on specific leadership behaviors and evaluates a team as a whole as the target of leadership influence; another is the social network approach that measures the extent to which each member is perceived to be involved in the sharing of leadership and the distribution of leadership roles in teams. However, an analysis on these two measurement techniques regarding their strengths and weakness has been ignored. This should also be solved in order to offer some feasible recommendations for future empirical studies to measure the shared leadership construct.

Furthermore, with the emergence of a substantial body of empirical research investigating significant relationships between shared leadership and team outcomes sporadically, a thorough review that provides a nomological network of shared leadership is necessary so as to capture this growing area of research more effectively and to pinpoint future research directions.

Research problem (II): Lack of insights into the dynamics of shared leadership.

The second research problem lies in the lack of insights into the dynamics of shared leadership, which impedes its theoretical and empirical advancement. Whilst the theory suggests that shared leadership is a dynamic influencing process (Carson et al., 2007; Nicolaides et al., 2014), research on the dynamic nature of shared leadership and its consequences is limited. Exploring shared leadership as a dynamic phenomenon is essential. It plays an important role to enhance our understanding of shared leadership. First of all, greater attention to the changes of shared leadership might provide important insights into the underlying mechanisms about the influence of shared leadership on teams. Given that shared leadership varies over time, it is lauded to foster the development of social structures and processes that enable team effectiveness (Drescher et al., 2014). Therefore, studying how shared leadership changes would contribute to the identification of the mediating mechanisms and boundary conditions linking shared leadership and group effectiveness.

Moreover, a dynamic view of shared leadership might benefit addressing inconsistencies in prior studies. Some researchers have considered shared leadership as a way to promote team performance, for example, Carson et al. (2007); Ensley et al. (2006); Nicolaides et al. (2014); Wang et al. (2014); Pearce and Sims (2002) have demonstrated that teams with shared leadership yield higher team-level performance; Mehra et al. (2006) failed to find support for the ideas about the positive relationship between shared leadership and team

performance, and even some researchers found that shared leadership exerts negative influence on team performance (e.g., Boies et al., 2011). Based on the research of Drescher et al. (2014), these discrepant results with regard to the influence of shared leadership may be attributed to a static perspective of shared leadership. At a given time, a certain level of shared leadership could reflect a growth in the sharing of leadership responsibilities among team members, while the same level of shared leadership in another team may reveal a decline. Therefore, studying the dynamics of shared leadership may help to explain these inconsistencies.

Research problem (III): Lack of investigation on the boundary conditions of shared leadership.

The third remaining research problem in the shared leadership literature is the boundary conditions in the relationship between shared leadership and team outcomes. Past empirical studies have investigated some moderators in the effects of shared leadership on teams, like Gu et al. (2016), who examined the moderating role of task interdependence in the relationship between shared leadership and knowledge sharing, such that this relationship is stronger when task interdependence is higher than lower. Findings from the research of Angles (2007) showed that team culture and team trust moderate the influence of shared leadership on team effectiveness. Further, Hoch (2014) demonstrated that demographic diversity moderates the relationship between shared leadership and team performance, such that shared leadership is more strongly related to team performance in more diverse teams

and less in less diverse teams. However, the existing research fails to more fully consider the potential moderating impact of the project life cycle on the relationship between shared leadership and team effectiveness. In particular, as shared leadership is a dynamic process that is affected by the environment of a team (Carson et al., 2007; Travers, 2018; Wu et al., 2018) and characteristics of tasks (Hans & Gupta, 2018; Serban & Roberts, 2016), continuous changes in the inputs and outputs of different phases of the project life cycle would influence shared leadership and its relationship with team effectiveness. This important unaddressed gap needs further attentions so as to provide insights in what conditions shared leadership plays a stronger or weaker role in team effectiveness.

1.3 Purpose of the study

Followed by these research problems, this study proposed three relevant purposes. They are illustrated below.

Research purpose (I): To provide a systematic, integrative literature review on shared leadership.

The first purpose of this research is to provide a systematic, integrative literature review on shared leadership, which has been divided into five specific objectives: 1) to identify the importance of shared leadership for organizations, synthesize the definitions of shared leadership and offer a new definition; 2) to distinguish shared leadership from traditional vertical leadership and other theoretically overlapping leadership concepts; 3) to evaluate the major measurement approaches of shared leadership and offer feasible measurement

recommendations for future empirical research; 4) to map a nomological network of shared leadership from extant empirical studies in terms of its antecedents, consequences, mediating mechanisms and boundary conditions; and 5) to offer some concluding thoughts to shape future shared leadership research and bring the field forward encompassing both theoretical and empirical advancement.

Research purpose (II): To explore how shared leadership changes throughout the project life cycle.

The second purpose of this study is to explore how shared leadership changes throughout the project life cycle. There has been no research so far, that have directly examined the changing pattern of shared leadership across different stages of the project life cycle. Reflecting a perspective on shared leadership as an emergent, dynamic influence process among group members (Avolio et al., 2009; Fletcher & Käufer, 2003; Wang et al., 2014), this study aims to focus on the project life cycle and theoretically delineate and empirical test how shared leadership changes during the project life cycle. The reason why this research studying on the project life cycle lies in the fact that it provides a dynamic team environment that could easily stimulate the changes of shared leadership. To do this, the project life cycle is divided into four phases according to the research of Rose (2013), initiation, early phase, later phase and closeout. Taken these four stages of the project life cycle with the different project inputs, project processes, and project outputs together, this

research aims to advance our understanding of shared leadership by providing a far more fine-grained analysis on the characteristics of shared leadership in each of these phases.

Research purpose (III): To investigate whether and when shared leadership influences team effectiveness.

The third purpose of this research is to investigate whether and when shared leadership influences team effectiveness. Firstly, in response to the calls from Carson et al. (2007); Conger and Pearce (2002); Nicolaides et al. (2014); Wang et al. (2014), this study aims to extend a long line of research that examines the relationship between shared leadership and team effectiveness and advance it by measuring team effectiveness from two perspectives, team viability and team performance, follow by the research of Aubé and Rousseau (2011), Kozlowski and Ilgen (2006), and Mathieu et al. (2008). Here team performance is used to assess the current quantity and quality of team work; team viability refers to the potential of groups retaining its members to keep proper team functioning over time. Taken these two dimensions together, this research will enrich our knowledge of the effects of shared leadership on team outcomes.

Furthermore, the theory and construct of shared leadership has been developed in various contexts, like change management teams (Pearce & Sims, 2002), decision making teams (Bergman et al., 2012), consulting teams (Carson et al., 2007), top management teams (Ensley et al., 2006), independent professional teams (Muethel & Hoegl, 2013), field-based

sales teams (Mehra et al., 2006), cross-functional teams (Sangeetha & Kumaran, 2018) and entrepreneurial teams (Zhou, 2016). In respond to call of Conger and Pearce (2002); D'Innocenzo et al. (2014); Mathieu et al. (2015) to explore shared leadership in a wide variety of contexts, this study intends to extend the external validity of shared leadership theory by examining its relationship with team effectiveness in engineering design project teams. Studying engineering design project teams that comprise knowledge workers with complementary skills in the engineering department is important, because it brings practical arguments for the influence of shared leadership on team effectiveness and adds to the academic debate in the field of shared leadership.

Additionally, another purpose of this research is to investigate the moderating role of project life cycle in the relationship between shared leadership and team effectiveness. While the existing empirical supports have accumulated concerning the association between shared leadership and team effectiveness (Daspit et al., 2013; Pearce & Sims, 2002; Sanders, 2006; Ullah & Park, 2013), the research remains silent about under what conditions shared leadership plays a stronger or weaker role in team effectiveness. Give that shared leadership changes over the different phases of the project life cycle, its relationship with team effectiveness would be moderated by the project life cycle. This serves as another purpose of this research.

1.4 Research questions

Given these research problems and corresponding purposes (see Table 1) for this study, the overarching questions are approached in the following three parts:

Part I:

Q1. How is shared leadership defined and measured in the literature?

Q2. Which kind of antecedents, consequences, mediating mechanisms and boundary conditions of shared leadership have been previously investigated?

Part II:

Q3. How does shared leadership changes during the four phases of the project life cycle, initiation, early phase, later phase and closeout?

Part III:

Q4. What is the relationship between shared leadership and team effectiveness?

Q5. Do the stages of project life cycle moderate the relationship between shared leadership and team effectiveness? If yes, how do they moderate this relationship?

Table 1: Research problems, research purposes and relevant research questions

Research problems	Research purposes	Research questions
◆ Lack of coherence and clarity in field of shared leadership: • There is no unified definition of shared leadership; • The differences and interactions between shared leadership and other leadership theory are unclear; • Lack of a critical analysis on its measurement techniques; • A nomological network of shared leadership has been ignored by researchers.	◆ To provide a systematic literature review on shared leadership: • To synthesize the definitions shared leadership; • To distinguish shared leadership from other leadership concepts; • To evaluate the major measurement approaches of shared leadership; • To map a nomological network of shared leadership in terms of its antecedents, consequences, mediators and moderators.	**Q1**. How is shared leadership defined and measured in the literature? **Q2**. Which kind of antecedents, consequences, mediating mechanisms and boundary conditions of shared leadership have been previously investigated?
◆ Lack of insights into the dynamics of shared leadership.	◆ To theoretically delineate and empirically test a dynamic model of how shared leadership changes throughout the project life cycle.	**Q3**. How does shared leadership changes during four phases of the project life cycle, initiation, early phase, later phase and closeout?
◆ The existing research fails to more fully consider the potential moderating impact of the project life cycle on the relationship between shared leadership and team effectiveness	◆ To explore the relationship between shared leadership and team effectiveness; ◆ To investigate the moderating role of the project life cycle in such relationship.	**Q4**. What is the relationship between shared leadership and team effectiveness? **Q5**. Do the stages of project life cycle moderate the relationship between shared leadership and team effectiveness? If yes, how to moderate?

1.5 Summary of research methodologies

With an effort to solve these research problems, several research methodologies (see Table 2) have been adopted in this study. It includes three parts, literature review, social network analysis and qualitative study. Details of these methods are discussed below.

Table 2: Summary of research methodology

Methodologies	Rationale	Approaches	Research problems related
Literature review	◆ Systematic literature review on shared leadership: • To identify and analyse relevant studies in the field of shared leadership; • To pinpoint research problems; • To depicts a complete picture of where shared leadership has been and where it should go into the future.	A systematic, integrative review of the 164 publications on shared leadership spanning 20 years (1999–2018).	Q1, Q2
	◆ Comprehensive literature review: • To develop conceptual model of how shared leadership changes during the project life cycle; • To generate hypotheses regarding the relationship between shared leadership and team effectiveness, and the moderating role of the project life cycle in such relationship.	Literature review on the topic of team effectiveness and project life cycle.	Q3, Q4, Q5
Social network analysis	To serve as a theoretical lens and measurement technique to assess shared leadership.	◆ Network density and network centralization ◆ Binary matrices ◆ Sociograms	Q3, Q4, Q5
Quantitative analysis	To validate conceptual model and test hypotheses proposed.	◆ Survey development ◆ Pre-test & Pilot test ◆ Data collection ◆ Data analysis • Data aggregation analysis • Internal consistency analysis • Confirmatory factor analysis • One-way ANOVA analysis • Correlation analysis • Regression analysis	Q3, Q4, Q5

1.5.1 Literature review

A systematic literature review was conducted in this study, which is used to identify and analyze relevant studies in the field of shared leadership and to depict a complete picture of where shared leadership has been and where it should go into the future. This approach, which advocates a transparent, reproducible and scientific process (Tranfield et al., 2003),

has gained credence within management research. Accordingly, this research adopted this method to systematically examine and organize the current body of research literature in the shared leadership domain (see details in Chapter 2.1). With the approach of systematic review, this study totally analyzed 164 articles in the area of shared leadership spanning 20 years (1999–2018), which contained 119 empirical articles, 34 conceptual articles and 11 literature reviews. It serves as the basis for our analysis on the research question 1 and question 2.

In addition to an integrated systematic review on shared leadership, this research also critically reviews a substantial volume of recent literature on the topics of team effectiveness and project life cycle. It helps to theoretically create a conceptual model regarding the changing patterns of shared leadership across four phases of the project life cycle, initiation, early phase, later phase and closeout. Moreover, hypotheses regarding the relationship between shared leadership and team effectiveness and the moderating role of the project life cycle in such relationship, are also proposed based on this comprehensive literature review. The details about the conceptual model and hypotheses are shown in Chapter 3.

1.5.2 Social network analysis

Social network analysis has also been employed in this research. According to Mehra et al. (2006), social network analysis is regarded as an intrinsically relational method that

provides complementary perspectives to advance our understanding of the emergent form of leadership. This research thus employs social network analysis to serve as a theoretical lens and measurement technique to assess shared leadership. In detail, based on the research of Carson et al. (2007); Ishikawa (2012); Liu et al. (2014); Robert (2013); Serban and Roberts (2016), this research measures the extent to which team members are perceived to be involved in the sharing of leadership by using network density; and following by the research of McIntyre and Foti (2013); (Mehra et al., 2006); Müller et al. (2018), this study measures the dispersion of leadership roles by using network centralization. As such, the changing patterns of shared leadership across different phases of the project life cycle are indexed by two critical perspectives of social network analysis: network density and network centralization. Further, with social network technique, this research also creates binary matrices to present the presence or absence of relationships between two team members, and then draws sociograms to graphically, visually depict the structure of each shared leadership network based on the codes in the binary matrices. This visual analysis is important to clarify the overall shared leadership network topology and reliably recognize central nodes (see Freeman, 2004; Pastor & Mayo, 2002). All in all, social network analysis is critical for this research that provides a theoretical lens and measurement approach to assess shared leadership, and helps to answer research question 3, question 4 and question 5.

1.5.3 Quantitative analysis

Another important research methodology is quantitative analysis that is used to validate conceptual model and test hypotheses proposed. It comprises the survey development, pilot test, data collection and data analysis. In this research, data were collected from 26 engineering design teams (with 119 participates). The main reason why this study focused on engineering design teams lies in its potential to leverage the expertise of a diverse of group members via pooling their talent and knowledge. This kind of team process is likely to nourish the emergence or development of shared leadership. It thus brings practical arguments for the influence of shared leadership on team effectiveness and adds to the academic debate in the field of shared leadership. After collecting data, a series of data analysis methodologies including data aggregation analysis, internal consistency analysis, confirmatory factor analysis and One-way AVOVA analysis, correlation analysis and regression analysis have been conducted in this research. Details of these methods are illustrated in Chapter 4.5.

Overall, this study conducted a systematic review on shared leadership in order to depict a complete picture of shared leadership studies, together with an integrated literature review on team effectiveness and project life cycle in order to understand how shared leadership changes during the project life cycle and moderating role of the project life cycle in the relationship between shared leadership and team effectiveness. Social network technique has also been employed as so to serve as theoretical lens and measurement technique to

assess shared leadership. Further, a quantitative analysis was conducted to empirically validate conceptual model and test hypotheses proposed. All of these methods have served as a basis to answer all of the research proposed.

1.6 Contribution

This research makes significant contributions to the field of shared leadership: 1) it provides coherence and clarity in this research field and provides scholars an integrated, comprehensive overview of shared leadership studies, including outlining the importance of shared leadership in organizations, offering a new definition, synthesizing differences with other leadership theories, evaluating its measurements approaches, as well as mapping a nomological network of its antecedents, consequences, mediating mechanisms and boundary conditions; 2) it uncovers the dynamic patterns of shared leadership by theoretically delineating and empirically testing a dynamic model of how shared leadership changes throughout the different stages of the project life cycle; 3) by joining a handful of research on the effects of shared leadership, this study reexamines the relationship between shared leadership and team effectiveness and extends a line of research that explored the moderating role of the project life cycle in the relationship between shared leadership and team effectiveness. 4) finally, this research provides concluding thoughts to shape future shared leadership research and brings the field forward encompassing both theoretical and empirical advancement. Furthermore, it provides practical suggestions for project

managers in industry who seek to implement best practice in organizations toward high team effectiveness.

1.7 Summary and thesis structure

In summary, this research concentrates on exploring a promising field of research for scholars in shared leadership. It aims to advance our understanding of shared leadership by providing a systematic, integrative literature review of what has been studied thus far; by uncovering its dynamic nature and exploring how shared leadership changes during the project life cycle; and by examining the relationship between shared leadership and team outcomes as well as investigating the moderating role of the project life cycle in such relationship. It significantly contributes to the field of shared leadership, adds to the valuable insights and academic debates, as well as bringing the insightful implications for both scholars in the shared leadership area and project managers in industry.

The reminder of this thesis is structured as follows: first of all, an indicative literature review on shared leadership is introduced. From this, a conceptual model and two hypotheses are developed and illustrated. Next chapter presents the research methodology employed and research results generated. It is then followed by discussions of research findings and implication for future research. Finally, limitations of the study are identified and the final conclusion is drawn.

Chapter 2: Literature review

This chapter presents systematic review on shared leadership and discuss the findings from it regarding 1) why shared leadership is important for organizations; 2) how shared leadership defined in literature; 3) what are the differences between shared leadership and vertical leadership, as well as other similar leadership theories; 4) how shared leadership was measured; 5) what is the nomological network of shared leadership including its antecedents, consequences, mediating mechanism and boundary conditions. Below the detailed process of systematic review on shared leadership are presented.

2.1 The process of systematic review on shared leadership

A systematic literature review was conducted in this study, which is used to identify and analyze relevant studies in the field of shared leadership and to depict a complete picture of where shared leadership has been and where it should go into the future. Initially the author considered a narrative review, which provides a critical analysis on the state of a specific topic from a theoretical and contextual point of view. However, Tranfield et al. (2003) suggest that it could be biased by researchers without a clear methodological process and often lack thoroughness and rigor. Therefore, a systematic review was conducted as it employs a transparent, reproducible and scientific process that minimizes bias via extensive literature searches of articles (Tranfield et al., 2003). It has gained credence within management research (see Parris and Peachey, 2003; Phillips et al., 2015;

Oc, 2018) and been used to identify and synthesize studies that are directly linked with research questions. Accordingly, this study adopted this method to systematically examine and organize the current body of research literature in the shared leadership domain and answered two key research questions. The detailed process of this systematic review is illustrated in Figure 1.

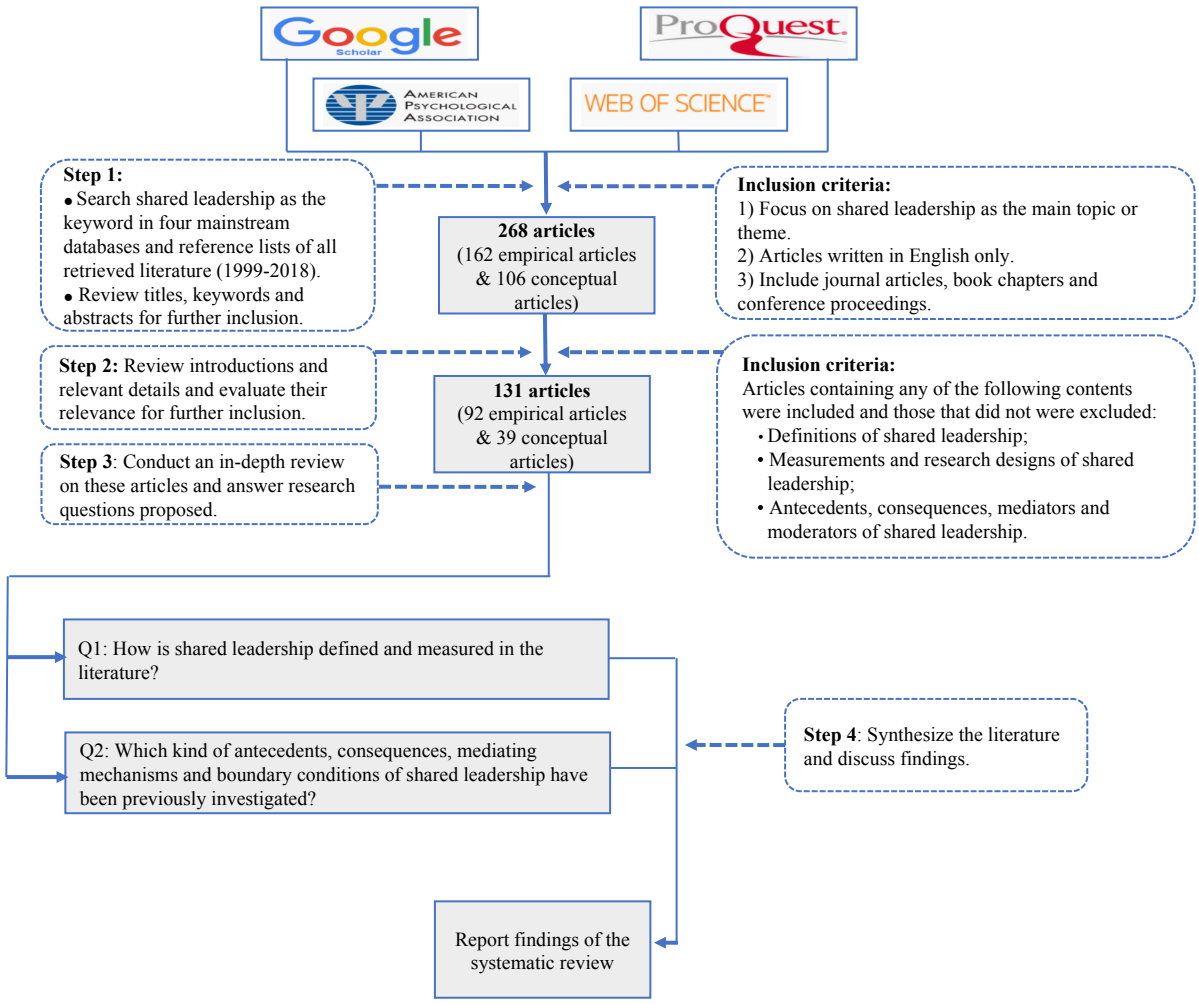


Figure 1: The process of the systematic review

As shown in Figure 1, this research firstly searched for shared leadership as the keyword with four databases (Google Scholar, ProQuest, PsychINFO, and Web of Science). For an article to be included in this review, it must have a focus on shared leadership as the main topic or theme. The search was limited to articles written in English only and comprised journal articles, book chapters, conference proceedings and dissertations. Also, the reference lists of all retrieved literature were reviewed to identify any additional articles that are not included in the initial search (e.g., Barnett & Weidenfeller, 2016; D'Innocenzo et al., 2014; Kang & Svensson, 2018; Nicolaides et al., 2014; Wang et al., 2014). Overall, 293 publications were generated, with 183 empirical articles, 99 conceptual articles and 11 literature reviews. Figure 2 depicts the nature of shared leadership publications over 20 years (1998-2018).

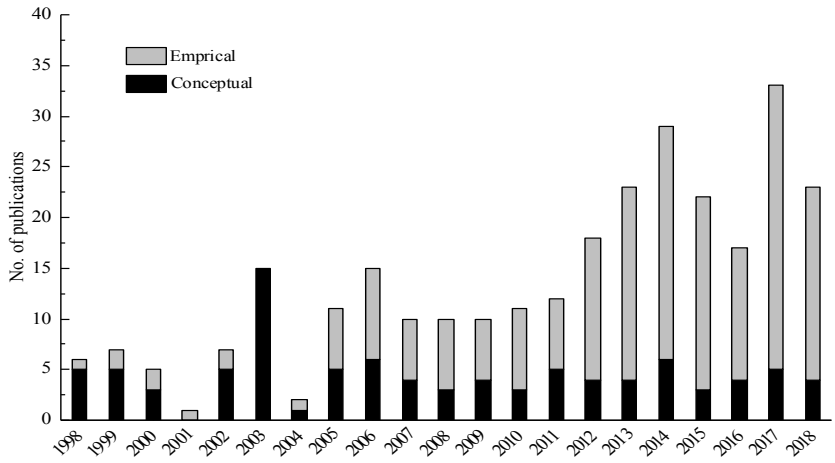


Figure 2: Shared leadership publications by year and type

These publications were then subjected to a review to determine their suitability for inclusion in this study. Specifically, each of the 293 articles were evaluated regarding their

relevance to the research objectives and inclusion criteria. The inclusion criteria were developed based on the research questions namely 1) the importance of shared leadership to organizations; 2) definitions of shared leadership; 3) comparison between shared leadership and traditional leadership; 4) comparison between shared leadership and collective leadership, emergent leadership, distributed leadership and empowering leadership; 5) measurements of shared leadership; and 6) antecedents, consequences, mediators and moderators of shared leadership. Articles containing one of these contents were included for analysis and those that did not were excluded. This process yielded 164 articles, which contained 119 empirical articles, 34 conceptual articles and 11 literature reviews. Finally, an in-depth review on these articles was conducted according to the reading guide for the systemic review on shared leadership (shown in Table 3). The following sections discuss the findings of the systematic review in further detail.

Table 3: Reading guide for the systemic review on shared leadership

No.	Guide for systemic review
1.	Authors & year
2.	Article types & journal names
3.	Purpose of study
4.	Importance of shared leadership for organizations
4.	Definitions of shared leadership
5.	Difference with other concepts
6.	Theoretical model/hypotheses/propositions
7.	Research design
8.	Measurement approaches of shared leadership
9.	Context/Sample
10.	Key findings

2.2 Why shared leadership is important for organizations

As Pearce et al. (2004) stated in their research, the roots of shared leadership date back to the early 1920s when Mary Parker Follett stated that leadership does not merely come from hierarchy-based positions. Follett (1924) further explained that organizational members with particular knowledge and skills for a certain task can demonstrate leadership. Though the need for shared leadership was explicitly illustrated many decades ago, the concept has failed to gain traction within the mainstream leadership literature until the early 2000s (Ensley et al., 2006). For the last 10-20 years, leadership scholars have realized the importance of shared leadership for organizations because of the complexity and ambiguity that teams experience making it improbable that a formal leader can perform all leadership functions successfully (Day et al., 2004). Further, with the employment of self-managed teams (Wolff et al., 2002), members would be more likely to follow the person having the best knowledge and skills for each situation to meet common goals, than depending solely on the vertical influence process of traditional leadership (Ramthun & Matkin, 2012). Moreover, the pervasive presence of flatter organizational structures (Balogun & Johnson, 2004) also emphasizes the need for leadership to be shared by team members. This is particularly relevant for teams composed of knowledge based employees, as people having high levels of expertise and skills seek autonomy in how they apply their specialties, and thus desire more opportunities to shape and participate in the leadership functions for their groups (Carson et al., 2007). As such, the shared leadership approach potentially provides

a more effective solution to team management in today's dynamic, complex and competitive environment than the classical, hierarchical, or vertical leadership approach (Gronn, 2002; Pearce & Conger, 2003; Pearce & Sims, 2002). Consequently, many organizations implement shared leadership practices and scholars are conducting more studies in the domain.

2.3 How shared leadership is defined within the literature

With increasing attention focusing on shared leadership theories, many leadership scholars have proposed definitions to delineate the concept. Table 4 displays the wide variety of interpretations of shared leadership in the literature. As shown in Table 4, shared leadership is conceptualized as "a group process in which leadership is distributed among, and stems from, team members" (Pearce & Sims, 2002, p. 172); "a simultaneous, ongoing, mutual influence process within a team that is characterized by "serial emergence" of official as well as unofficial leaders (Pearce, 2004, p. 48); "an emergent team property that results from the distribution of leadership influence across multiple team members (Carson et al., 2007, p. 1218); as well as being described as "the sharing of leadership roles, responsibilities, and functions (Acar, 2010, p. 1740). Among all of these interpretations, the most widely cited conceptualization of shared leadership comes from Pearce and Conger (2003), who defined it as "a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both" (p. 1). This description emphasizes the dynamic

nature of shared leadership and suggests that shared leadership will lead to goal accomplishment. Accordingly, different definitions represent different characteristics of shared leadership. Therefore, in order to advance our understanding of the concepts of shared leadership, this research summarized 26 definitions and identified their relevant characteristics (see table 4). These characteristics have been categorized into three key characteristics across these various terminologies. Those are (1) distributed among multiple individuals; (2) imbedded in social interaction; (3) dynamics and emergent. These are now discussed in more detail.

Table 4: Selected definitions of shared leadership and its characteristics

Studies	**Definitions**	**Characteristics**
Pearce and Sims (2002)	A group process in which leadership is distributed among, and stems from, team members (p. 172).	・Group process; ・Distributed.
Sivasubramaniam et al. (2002)	Collective influence of members in a team on each other (p. 68).	・Collective;
Cox et al. (2003)	Shared leadership is a collaborative, emergent process of group interaction in which members engage in peer leadership while working together (p. 71).	・Collaborative ・Emergent
Fletcher and Käufer (2003)	A dynamic, multidirectional, collective activity, that like all human action and cognitive sense making, is embedded in the context in which it occurs (p. 23).	・Dynamic; ・Multidirectional; ・Collective.
Pearce and Conger (2003)	A dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both (p. 1).	・Dynamic; ・Interactive.
Day et al. (2004)	An emergent state that develops over the life of the team; dynamic in nature that varies as a function of team inputs, processes, and outcomes (p. 861).	・Emergent; ・Dynamic.
Pearce et al. (2004)	A simultaneous, ongoing, mutual influence process within a team that is characterized by “serial emergence” of official as well as unofficial leaders (p. 48).	・Simultaneous; ・Ongoing; ・Mutual; ・Serial emergence.

Bligh et al. (2006)	A team-level phenomenon where behaviours are enacted by multiple individuals rather than solely by those at the top or by those in formal leadership roles" (p. 305)	· Team-level; · Multiple individuals.
Ensley et al. (2006)	A team process where leadership is carried out by the team as a whole, rather than solely by a single designated individual (p. 220).	· Team process; · Multiple individual.
Mehra et al. (2006)	Shared, distributed phenomenon in which there can be several (formally appointed and/or emergent) leaders (p. 233).	· Distributed; · Several leaders.
Carson et al. (2007)	An emergent team property that results from the distribution of leadership influence across multiple team members (p. 1218).	· Emergent; · Distribution; · Multiple individual.
Avolio et al. (2009)	An emergent state where team members collectively lead each other (p. 431).	· Emergent; · Collectively.
Acar (2010)	The sharing of leadership roles, responsibilities, and functions among all group members (p. 1740).	· Sharing; · All group members.
Kocolowski (2010)	A relational, collaborative leadership process or phenomenon involving teams or groups that mutually influence one another and collectively share duties and responsibilities otherwise relegated to a single, central leader (p. 24).	· Relational; · Collaborative; · Mutual; · Collectively.
Bergman et al. (2012)	The number of members on the team who performed positive leadership behaviours; and the amount of leadership behaviour exhibited by the team (p. 26).	· Number of members; · Amount of leadership behaviour.
Carland and Carland (2012)	The use of a team instead of a single individual (p. 75); much more than the formal division of command and control within an organization (p. 76).	· Team phenomenon; · more than the formal division.
Erkutlu (2012)	Serial emergence of temporary leaders, depending on the tasks facing the team and the knowledge, skills and abilities of the team members (p. 104).	· Serial emergence; · Temporary leaders.
Drescher et al. (2014)	An emergent property of a group where leadership functions are distributed among group members (p. 772).	· Emergent; · Distributed.
Liu et al. (2014)	Involves non-hierarchical relationships and describes a relational phenomenon that is characterized with a dynamic, interactive influence process among individuals in the team (p. 284).	· Non-hierarchical; · Relational; · Dynamic; · Interactive
Wang et al. (2014)	An emergent team property of mutual influence and shared responsibility among team members, whereby they lead each other toward goal achievement (p. 181).	· Emergent; · Mutual; · Shared responsibility.
Lee et al. (2015)	A voluntarily, informally emergent structure beyond vertical leadership (p. 47).	· Voluntarily; · Informally emergent.
Chiu et al. (2016)	A group-level phenomenon generated from reciprocal reliance and shared influence among team members so as to achieve team goals (p. 1705).	· Group-level; · Reciprocal reliance; · Shared influence.

Zhu and Lee (2017)	Shared leadership can be viewed in terms of how different individuals enact leader and follower roles at different points over time (p. 444).	· Leader and follower roles shift.
Zhou and Vredenburgh (2017)	An emergent state where complementary leadership influence flows among team members in response to particular team strategic, task and relational requirements (p. 165).	· Emergent; · Complementary.
Kang and Svensson (2018)	Distribution of leadership across multiple individuals in an organization, whereby leadership becomes a collective phenomenon (in press).	· Distribution; · Collective.
Zhu et al. (2018)	An emergent team phenomenon whereby leadership roles and influence are distributed among team members (p. 4).	· Emergent; · Distributed.

2.3.1 Distributed among multiple individuals

Models of shared leadership define leadership as a set of practices that can and should be enacted by people at all levels rather than solely by those at the top or by those in formal positions (Bligh et al., 2006; Ensley et al., 2006). It results from the distribution of leadership roles, responsibilities, and functions among, and stems from multiple individuals within organizations (Drescher et al., 2014; Kang & Svensson, 2018; Mehra et al., 2006; Pearce & Sims, 2002). This definition emphasizes that shared leadership is a collective phenomenon, whereby the influence process of leadership involves peer, or lateral influence and at other times involves upward or downward hierarchical influence (Pearce & Conger, 2003). This is to say, shared leadership would entail more than an exercise of influence by a single official leader (hierarchical form), it may also involve mutual influence among team members (lateral form) in an organization (Carson et al., 2007).

2.3.2 Embedded in Social interaction

Another important relational feature of shared leadership is its emphasis on leadership as a social process. To this point, shared leadership has been portrayed as a social interactive or collaborative process (Kocolowski, 2010; Liu et al., 2014; Pearce & Conger, 2003), which is manifested in behaviors like communicating, influencing, making suggestions, and holding people accountable. Fletcher and Käufer (2003) have also noted in their research that shared leadership depends critically on social interaction, as leadership is deemed as something occurring in and through relations and networks of influence. In this way, these relational interactions that make up shared leadership are comprehended to be more fluid and multidirectional, as well as less individual, unidirectional than the traditionally individualistic forms (Fletcher & Käufer, 2003).

2.3.3 Dynamic and emergent

The dynamic nature of shared leadership has been emphasized by many researchers (see Day et al., 2004; Drescher et al., 2014; Fletcher & Käufer, 2003; Pearce & Conger, 2003). From a dynamic perspective, shared leadership is an emergent property (Avolio et al., 2009; Carson et al., 2007; Wang et al., 2014; Zhou & Vredenburgh, 2017) that is not owned by any particular individual but flows across multiple team members according to the characteristics of situations. This definition highlights time as the key facet of the phenomenon, which indicates that shared leadership is not a static process where diverse team members, simultaneously or sequentially, perform as leaders or followers (Müller et

al., 2018). Accordingly, leadership roles could be undertaken by different people either at the same time or at different points throughout the entire team life cycle (Mathieu et al., 2015) depending on the needs of organizations.

In summary, this study captures three core characteristics of shared leadership, which work together to uncover its intrinsic nature. Specifically, while the first characteristic of shared leadership highlights the distribution of leadership influence among multiple individuals, the second characteristic indicates how these leadership influences distribute within teams (occurs in and through social interactive processes), and the third one pointed out that both the distribution and social interaction processes of shared leadership are dynamic and flows across team members. Based on these characteristics, this research offers a new definition of shared leadership: shared leadership is an interactive, emergent, team-level phenomenon where leadership influence is distributed among, and stems from multiple team members within organizations.

2.4 Comparison with other leadership theories

2.4.1 Shared leadership versus vertical leadership

While leadership researchers grapple with how to conceptualize shared leadership, it is imperative to appreciate that shared leadership theory diverges from the conventional paradigm (D'Innocenzo et al., 2014), referred to as "vertical leadership" by Pearce and Sims (2002). Therefore, this research briefly presents an overview of the theoretical and

empirical differences between shared leadership and vertical leadership. First of all, conventional vertical leadership theories highlight the role of the single leader who is positioned hierarchically above and/or external to a group, has formal authority over the group, and is responsible for the group's processes and outcomes (Bass & Bass, 2009). In contrast, shared leadership is a team-level phenomenon where leadership is carried out by the team as a whole, rather than solely by those at the top or by those in formal leadership roles (Bligh et al., 2006). In this way, vertical leadership depends on the wisdom of a singular leader, while shared leadership extracts from the knowledge of a collective (Ensley et al., 2006). Another key distinction lies in the fact that the influence processes of shared leadership involves not only downward hierarchical influence that traditional leadership has, but it also requires and emphasizes peer or lateral, and even upward influence (Barnett & Weidenfeller, 2016; Pearce & Sims, 2002). On this basis, the shared leadership approach has been suggested as a viable complement to vertical leadership by many researches (see Cox et al., 2003; Gronn, 2002; Ramthun & Matkin, 2012). From an empirical perspective, both vertical leadership and shared leadership have been proven to be significantly associated with team effectiveness (Ensley et al., 2006; Hoch & Kozlowski, 2014; Pearce & Sims, 2002), though notably, shared leadership variables appears to be a more useful predictor above and beyond vertical leadership variables (Ensley et al., 2006; Pearce & Sims, 2002).

These events have forced leadership scholars to rethink traditional forms of leadership. However, this is not to necessarily downplay the relative role of vertical leadership, but rather to further consider leadership by encompassing both vertical and shared aspects (Day et al., 2004; Pearce & Sims, 2002). Authors such as Binci et al. (2016) have explored the interaction of vertical and shared leadership in their research and found their reciprocal need to deal with change. Cashman (2008) has studied their relationship and found that vertical leadership promotes the emergence of shared leadership. Researchers have also suggested that hierarchical leaders facilitate the ongoing development of shared leadership by fostering a suitable environment for team members to exercise leadership activities (Hsu et al., 2017), and by articulating an emphasis on follower self-leadership, lateral influence, and upward influence (Pearce, 2004). These should serve as motivation for future analysis on the combination of vertical and shared leadership so as to capture a fuller view of leadership processes and outcomes.

2.4.2 Shared leadership versus similar leadership concepts

Over the years, a number of researchers have introduced nomenclature and conceptualizations that are similar to shared leadership, such as collective leadership (Contractor et al., 2012; Friedrich et al., 2009), emergent leadership (Hoch & Dulebohn, 2017; Schneier & Goktepe, 1983), distributed leadership (Bolden, 2011; Goksoy, 2016), and empowering leadership (Chen et al., 2011; Cheong et al., 2018). Even though these terms have been used somewhat interchangeably in the literature, there are still nuanced

differences among them. Consequently, this research presents a brief overview of the theoretical and empirical arguments illustrated in the literature of how shared leadership differs from and connect with collective leadership, distributed leadership, emergent leadership and empowering leadership (see Table 5).

Table 5: Shared leadership versus other leadership theories

Concepts	**Description**	**Difference with SL**	**Characteristics of SL**			**Correlations with SL**
			Distributed among multiple individuals	Imbedded in social interactions	Dynamic and emergent	
Collective leadership	An integrated view of leadership in which leadership is described as something that may be shared within teams, distributed across organizations, pooled within a group of organizational members, or rotated among several individuals (Kang & Svensson, 2018).	It is an integrative concept, where SL plays only a part.	✓	✓	✓	NA
Emergent leadership	An individual leadership process wherein an individual appears as a team leader informally, without being allocated formal leadership responsibilities (Hoch & Dulebohn, 2017).	It focuses on individual-level analysis; whereas SL is a team-level construct.	NA	✓	✓	Emergent leadership has been proposed as a theoretical base for shared leadership (Charlier, 2012; Pearce & Sims, 2002)
Distributed leadership	It is predominantly found in the educational leadership literature and defined as the product of the interactions of school leaders, followers, and their situation" (Spillane, 2005).	This approach widely used in educational discipline; while SL is mostly in the business discipline.	✓	✓	✓	There is a relationship between shared leadership and distributed leadership, but this relationship is not very distinctive (Goksoy, 2016)
Empowering leadership	As a leader's encouragement for team members initiating tasks, setting goals, learning new thing, assuming responsibilities, and coordinating and collaborating with each other (Pearce & Sims, 2002).	It depends on encouragement or decision of formal leader; while SL stems from social interactions among team members.	✓	NA	✓	Empowering leadership has proven to be positively related to the emergence of shared leadership (Fausing et al., 2015; Travers, 2018; Wassenaar, 2017).

Note: NA = Not applicable

Collective leadership

According to Friedrich et al. (2009, p. 933), collective leadership is "a dynamic process in which a defined leader, or set of leaders, selectively utilize skills and expertise within a network, effectively distributing elements of the leadership roles as the situation or problem at hand requires". Similar to shared leadership, collective leadership involves a reorientation of leadership, from understanding a leader-centric or individual level phenomenon to understanding the emergent, informal, and dynamic leadership provided by members of the collective itself (Contractor et al., 2012). Although both shared leadership and collective leadership is defined as a team-level phenomenon wherein leadership functions are distributed among multiple team members, the term "collective leadership" is regarded as an integrated view of leadership that encompasses not only shared leadership, but also involves various theoretically overlapping conceptual models and definitions, i.e., distributed leadership and rotated leadership (Contractor et al., 2012). Collective leadership is thus thought of as "something that may be shared within teams, distributed across organizations, pooled within a group of organizational members, or rotated among several individuals" (Kang & Svensson, 2018).

Emergent leadership

Emergent leadership is regarded primarily as the phenomenon of leader selection, by members, from a leaderless group (Pearce & Sims, 2002). Schneier and Goktepe (1983) have proposed that under emergent leadership, team members exert significant influence

over others in their group even though no formal authority has been vested in them. As such, emergent leadership is highly similar to shared leadership in that it concentrates on whether leadership is informally brought about by members from groups (known as "emergent leaders"), instead of being provided by an appointed, formal leader (Carson et al., 2007). However, these two concepts are distinct. Firstly, as a group construct, emergent leadership is viewed on the individual level. It is portrayed as an individual leadership process wherein an individual appears as a team leader informally, without being allocated formal leadership responsibilities (Hoch & Dulebohn, 2017). Secondly, whereas the theory of emergent leadership typically concerns the ultimate selection of an assigned leader, shared leadership can be viewed as "serial emergence" of official and unofficial leaders over the life of the team (Pearce et al., 2004). As such, emergent leadership has been proposed as a theoretical base for shared leadership (see Charlier, 2012; Pearce & Sims, 2002).

Distributed leadership

Distributed leadership shares the most commonalities with shared leadership. They have always been used interchangeably in the leadership literature (see Avolio et al., 2009; Barnett & Weidenfeller, 2016; Nicolaides et al., 2014). These two concepts both emphasize leadership influence stemming from team members which adds strength to the arguments against leader-centric representations (Bolden, 2011). However, according to Kang and Svensson (2018), distributed leadership focuses more on leadership practices than the

functions, roles and structures of members within teams. This notion is predominantly found in the educational leadership literature. Bolden (2011) has reported that 68% of distributed leadership articles (data comes from Scopus, 1980-2009) were published in education/ educational management journals, compared with just 22% of shared leadership articles. Distributed leadership has thus been described "as the product of the interactions of school leaders, followers, and their situation" (Spillane, 2005). Empirically, Goksoy (2016) has examined the relationship between shared leadership and distributed leadership in the education context and found that this relation is positive, but not very distinctive. They therefore suggest that although these two concepts share common points, it is not suitable to use them interchangeably.

Empowering leadership

Another related construct is empowering leadership. This is described as a leader's encouragement for team members initiating tasks, setting goals, learning new thing, assuming responsibilities, and coordinating and collaborating with each other (Pearce & Sims, 2002). Accordingly, instead of directing and controlling group members, empowering group leaders to transfer power, responsibilities, and leadership to the group (Stewart, 2006) by enhancing autonomy and empowering the group and the individual members to be self-managed (Chen et al., 2011). This is similar to shared leadership that the leadership influence, functions and responsibilities tend to be distributed within teams and among team members. However, while an empowering leader gives members power

over their own tasks (Drescher et al., 2014), shared leadership involves leadership occurring in and through social interactions (Fletcher & Käufer, 2003) as opposed to being self-empowered by a singular leader. Moreover, Cheong et al. (2018) have pointed out the another distinction between empowering leadership and shared leadership from a level-of-analysis perspective. That is, shared leadership has been considered at the team or collective levels of analysis, but most empowering leadership studies are concentrated and studied at the individual levels of analysis. Empirically, empowering leadership has been demonstrated to facilitate the development of shared leadership (see Fausing et al., 2015; Travers, 2018; Wassenaar, 2017). Researchers suggested that when team leaders display empowering leadership behaviors, in terms of encouraging and enabling team members to engage in leadership functions, members tend to be more willing and motivated to offer and accept leadership influence from each other. It thereby fosters the emergence of shared leadership.

In summary, the concepts between shared leadership and collective leadership, emergent leadership, distributed leadership as well as empowering leadership are theoretically overlapping, empirically related, but still distinct for some aspects.

2.5 Measurement of shared leadership

With the explosion of the different interpretations of shared leadership, there are currently two major measurement techniques (aggregation and social network approach) adopted by scholars in their empirical work. These are summarized in the Table 6 together with representative studies, their Scales/Indexes, number of items used, sample items and its relevant citations. Details of these two measurement approaches are discussed below.

Table 6: Measurement approaches of shared leadership

Approaches	Representative studies	Scales/Indexes	No. of items	Sample items	Used by
Aggregation	Avolio et al. (2003): Team Multifactor Leadership Questionnaire (TMLQ)	Transformational, Transactional, Passive-Avoidant.	45	Members of my team instill pride in being associated with each other	Boies et al. (2011)
	Wood and Fields (2007)	Leadership behaviors	10	Each member of the leadership team shares in establishing the goals for this organization.	Daspit et al. (2014); Gu et al. (2016); Hu et al. (2017)
	(Hoch et al., 2010a): Shared Leadership Questionnaire (SLQ)	Five behavioral scale: Transformational, Transactional, Directive, Empowerment, Aversive.	26	My team members provide a clear vision of whom and what our team is.	Fausing et al. (2015); Hoch (2013); Rolfsen et al. (2013)
	Grille and Kauffeld (2015): Shared Professional Leadership Inventory for Teams (SPLIT)	Task leadership orientation; Relation leadership orientation; Change leadership orientation; Micropolitical leadership orientation.	20	We help each other to correctly understand ongoing processes in our team.	Grille et al. (2015); Han et al. (2018)
Social network approach	Carson et al. (2007)	Network density	NA	To what degree does your team rely on this individual for leadership?	Ishikawa (2012); Liu et al. (2014); Robert (2013); Serban and Roberts (2016)

	Mehra et al. (2006)	Network centralization	NA	Respondents were asked to nominate the people they perceived to be a leader.	(McIntyre & Foti, 2013); Müller et al. (2018)

2.5.1 Aggregation

Aggregate theories of shared leadership have been widely employed by researchers in recent decades. This approach conceptualizes shared leadership as a team-level construct by using items measuring the team as an entity as the source of influence and the team as a whole as the target of the influence (Conger & Pearce, 2002). D'Innocenzo et al. (2014) contend that, aggregation approaches have shifted the source of leadership from an external leader to an undifferentiated whole of team members. It has therefore been regarded as a "referent-shift consensus measure" (Chan, 1998), where the normal referent of measures (e.g., my leader) is changed by another focus (e.g., my team members). For example, Avolio et al. (2003) have adopted the original scale from the Multifactor Leadership Questionnaire and modified the source of leadership from the team as a whole, rather than from individuals. Other representative studies also aggregated the traditional leadership behavioral scales. For example, Wood and Fields (2007) focused on ten items of leadership behaviors; Hoch et al. (2010a) focused on five behavioral scales: transformational, transactional, directive, empowerment and aversive leadership; and Grille and Kauffeld (2015) studied four leadership orientated behaviors: task leadership orientation, relation leadership orientation, change leadership orientation and micropolitical leadership

orientation, which have all been broadly used in the following empirical studies (see Daspit et al., 2014; Fausing et al., 2015; Han et al., 2018).

With the aggregation approach gaining popularity in measuring shared leadership, it brings two strengths. First, it concentrates on specific leadership behaviors and provides accurate and appropriate method to address the collective nature of shared leadership (Carson et al., 2007). Second, when evaluating the shared influence in a group as a whole, the aggregation approach smooths the differences in contributions of each individual member (Conger & Pearce, 2002). However, D'Innocenzo et al. (2014) augured that this approach provides only little insight into the influence and complexities of shared leadership; and during this process the significant details and unique nuances are easily obscured. Therefore, more recently, scholars have turned to social network techniques, which has been suggested as a richer and more informative way to study the dynamics of shared leadership.

2.5.2 Social network approach

Social network approach has recently gained popularity among shared leadership researchers. This method uses items measuring each team member as the sources of influence and each of team members as the targets of influence (Conger & Pearce, 2002). According to Wang et al. (2014), social network techniques allow for a measurement of the extent to which team members are perceived to be involved in the sharing of leadership (by using network density), and the dispersion of leadership roles (by using network

centralization). Specifically, network density is a measure of proportion of possible ties, or relations that are actually displayed by team members as perceived by others. Carson et al. (2007) pioneered this approached by asking every team member to rate each peer on the following question: "To what degree does your team rely on this individual for leadership?" and then summed all the rating values to divide the sum of total number of links within teams. As for the network centralization, it is a measure of compactness that specifies how dyadic ties are distributed in the overall network (D'Innocenzo et al., 2014). For example, Mehra et al. (2006) have adopted this method by asking respondents to nominate as many or as few leaders as they deemed appropriate employing the roster method. They then generated visual representations of network diagrams to see the structure of each network. Meanwhile, a combination of network density and network centralization has been employed by some researchers when they used social network approaches to measure shared leadership (see DeRue et al., 2015; Wu & Cormican, 2016).

Compared to the aggregation approach, the social network approach is not concerned with the leadership behaviors, but focuses on the interrelationships between individuals. It allows for the understanding of leadership as a relational concept that entails an interpersonal influence processes (Mehra et al., 2006). The strengths of this method lies in the fact that it assists researchers in examining the following: 1) the extent to which all individuals are involved in the leadership of the group; 2) the degree of distribution of leadership in the group; and 3) the "web" of interconnections between team members about

who influences whom and how influence "travels" across the group (Conger & Pearce, 2002). However, it fails to evaluate the potential influence that targeted at the team as a whole (Wang et al., 2014) and it is somewhat burdensome for participants (Conger & Pearce, 2002).

2.6 Nomological network of shared leadership research

Having discussed how shared leadership is defined and measured in the leadership literature, this section now provides a synthesis of the empirical studies that examine the factors needed for fostering shared leadership (antecedents), the potential outcomes of shared leadership (consequences), the mediating mechanisms (mediators) and boundary conditions (moderators) that influence the relationship between shared leadership and team outcomes. Such synthesis has both the theoretical and empirical significance by providing a roadmap of where we are and we need to go to advance our understanding of shared leadership studies.

In doing so, the nomological network of shared leadership is presented in the Figure 3. It comprises details about the antecedents, consequences, mediators and moderators of shared leadership are discussed below.

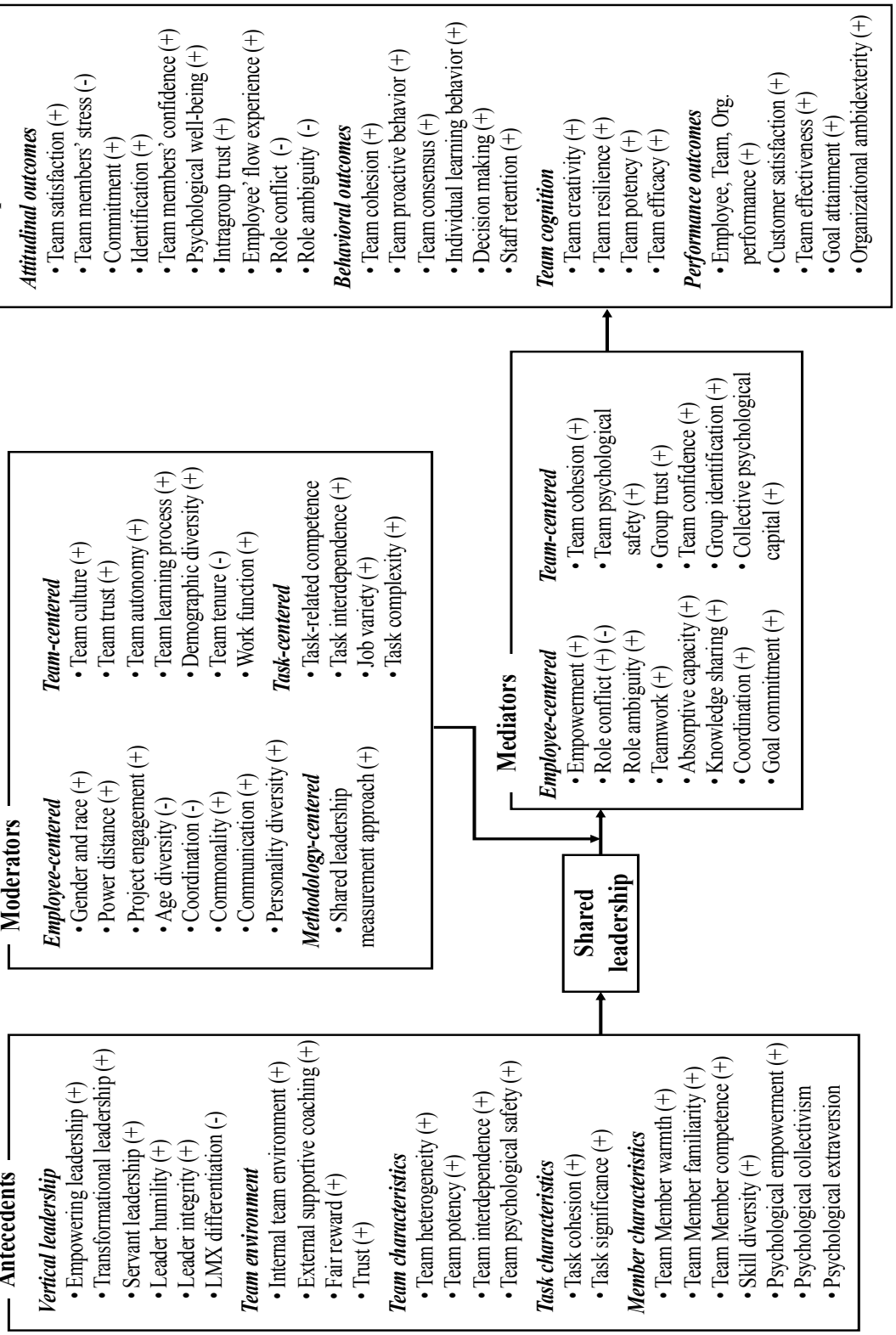


Figure 3: The nomological network of shared leadership

2.6.1 Antecedents of shared leadership

As shown in the Figure 3, the antecedents of shared leadership extracted from empirical studies are grouped into five categories which have been demonstrated to benefit the emergence of shared leadership. These are vertical leadership, team environment, team characteristics, task characteristics and members' characteristics. Specifically, the first category is vertical leadership. As mentioned above, shared leadership is not a competing theory to traditional vertical leadership pattern (Hoch & Dulebohn, 2013), instead, extant studies suggest that vertical empowering leadership (Fausing et al., 2015; Hoch, 2013; Travers, 2018), transformational leadership (Cashman, 2008; Hoch, 2013; Masal, 2015; Travers, 2018; Wassenaar, 2017) and servant leadership (Wang et al., 2017b) are positively associated with the occurrence of shared leadership. Moreover, leader humility (Chiu et al., 2016) and leader integrity (Wassenaar, 2017) have also been found to foster the development of shared leadership in teams. Furthermore, Wang et al. (2017b) suggests that leader-member exchange (LMX) differentiation has an impact on the emergence of shared leadership, but this effect is negative and servant leadership can weaken this negative influence of LMX differentiation on shared leadership.

The second category is the team environment. Findings from Carson et al. (2007) indicate that shared leadership is facilitated when the internal team environment promotes: a shared purpose (similar understanding among team members of their collective objectives), social support (interpersonal encouragement and recognition of contributions and

accomplishments from other members), as well as voice (constructive change-oriented communication and participation in the decision making process). A positive internal team environment that enables shared leadership has also been proven by empirical studies (see Serban & Roberts, 2016; Travers, 2018; Wu et al., 2018). Moreover, researchers have advocated that fair internal reward systems (Cashman, 2008; Grille et al., 2015) and team trust (Boies et al., 2011; Small, 2007) enable members to be significantly more engaged and committed to shared leadership within an organization. As for the external factors that nurture shared leadership, supportive coaching from external team managers contribute to the development of shared leadership by providing encouragement, support and suggestions to group members, and building shared commitment in the group (Carson et al., 2007).

Team characteristics, is the third critical predictor of shared leadership. According to a meta-analysis conducted by Wu et al. (2018), team heterogeneity, with higher levels of non-overlapping and non-redundant information is positively related to the emergence of shared leadership in teams. Similarly, team potency, with higher degree of team members' shared beliefs in their capability to successfully achieve objectives, facilitates shared leadership (Boies et al., 2011). Further, findings from Fausing et al. (2015) state that shared leadership increases with high levels of team interdependence where mutual dependency exists among team members in their work. Moreover, from a psychological perspective, team psychological safety, as a shared belief that the team is safe for interpersonal risk

taking, has been also suggested as a significant predictor of the successful practice of shared leadership (Kukenberger & D'Innocenzo, 2017).

The fourth category centers on task characteristics. Kang and Svensson (2018) have proposed that the nature of a given task is an essential antecedent to shared leadership. To be specific, Serban and Roberts (2016) have suggested the task cohesion as an antecedent that supports the presence of shared leadership. Unlike team cohesion that has been mostly examined as an outcome of shared leadership (Bergman et al., 2012; Mathieu et al., 2015), task cohesion defined as the shared attraction of a team and commitment to the team goals, has been proved to be positively related to shared leadership. Another factor is task significance. This refers to the extent to which team members feel that the work they are engaged in has considerable influence on the lives of others in their immediate organization or the world at large. It has been demonstrated to positively impact the development of shared leadership in a work team (Hans & Gupta, 2018).

Finally, the characteristics of team members can also facilitate or hinder the occurrence of shared leadership in teams. Prior studies suggest that individuals with high-levels of familiarity (close social distance) (Cashman, 2008) and warmth (trustworthiness, helpfulness, and friendliness) (Fransen et al., 2018), are more likely to engage in shared leadership behaviors. In addition, shared leadership also increases with conditions that the more competent that employees achieve (DeRue et al., 2015) and the more diversity of

skills (Hans & Gupta, 2018) and roles (Kukenberger & D'Innocenzo, 2017) that employees have. Also, from an intrinsic perspective, organizational members have high-levels of psychological empowerment (Grille et al., 2015), psychological collectivism and psychological extraversion (Chen, 2014) more likely to advance the development of shared leadership within an organization.

2.6.2 Consequences and mediators of shared leadership

While progress has been made in identifying the antecedents of shared leadership, the majority of shared leadership empirical research has concentrated on how it impacts teams, as well as the mediating mechanisms that explains such influence. However, our understanding on the consequences and mediators of shared leadership remains fragmented. An overarching review from empirical studies regarding the relationships between shared leadership and team outcomes, containing attitudinal outcomes, behavioral outcomes, team cognition and performance outcomes (see Figure 3), together with its mediators (see Table 7), is thus necessary so as to depict the main steam of studies on shared leadership. The details are discussed below.

Table 7: Shared leadership and team outcomes with its mediators

Category	Mediators	Team outcomes	Reference
Employee-centered	Empowerment	Organizational commitment	Steniheider et al. (2006)
Employee-centered	Role conflict	Job stress	Wood and Fields (2007)
Employee-centered	Role conflict	Individual well-being	Nielsen and Daniels (2012)
Employee-centered	Role ambiguity	Job satisfaction	Wood and Fields (2007)
Employee-centered	Teamwork	Team member's flow experience	Aubé et al. (2017)
Employee-centered	Absorptive capacity	Team performance	Daspit et al. (2014)

Employee-centered	Knowledge sharing	Team performance	Hoch (2014); Lee et al. (2015)
Employee-centered	Coordination	Team performance	Chen and Liu (2018)
Employee-centered	Goal commitment	Team performance	Chen and Liu (2018)
Team-centered	Team cohesion	Work related well-being,	Wood and Fields (2007)
Team-centered	Team cohesion	Collective efficacy	Chen (2014)
Team-centered	Team psychological safety	Individual learning behavior	Liu et al. (2014)
Team-centered	Group trust	Team performance	Drescher et al. (2014)
Team-centered	Group trust	Collective efficacy	Chen (2014)
Team-centered	Team confidence	Team performance	Nicolaides et al. (2014)
Team-centered	Group identification	Team performance	Armon (2015)
Team-centered	Collective psychological capital	Organizational commitment and creativity	Wu and Chen (2018)

Attitudinal outcomes

Shared leadership has been found to be positively related to a board range of attitudinal outcomes. Among them, the most commonly examination is on team members' satisfaction (see Casady & Dowd, 2005; Drescher & Garbers, 2016; Serban & Roberts, 2016). Suggested by Wood and Fields (2007), such a relationship is mediated by the role of ambiguity (a lack of certainty and predictability in work requirements). Specifically, increases in shared leadership, led to decrease in role ambiguity, which in turn enhances individual satisfaction. They also pointed to the evidence that shared leadership is negatively associated with team members' stress, role conflict, and role ambiguity, where role conflict has been demonstrated to mediate the relationship between shared leadership and job stress. Moreover, Aubé et al. (2017) suggested that shared leadership of project teams facilitates the team members' flow experience (a state of deep absorption in an activity that is intrinsically enjoyable) through a mediating role of teamwork. A nascent and emergent body of research has proved that shared leadership is positively linked with

intragroup trust (Bergman et al., 2012), employee's confidence (Rosengren et al., 2010) and individual well-being (Nielsen & Daniels, 2012). The relations with individual well-being have been proposed to be mediated by role conflict (Nielsen & Daniels, 2012) and team cohesion (Wood & Fields, 2007). Moreover, research findings also reveal that team members are more prone to view this organization positively in the presence of shared leadership. This involves increased levels of organizational identification (Robert, 2013) and organizational commitment (Wu & Chen, 2018). Among them, there is a partial mediating role of collective psychological capital (Wu & Chen, 2018) and role of empowerment (Robert, 2013) between shared leadership and organizational commitment.

Behavioral outcomes

The relationships between shared leadership and behavioral outcomes have been explored in many empirical studies. For example, Bergman et al. (2012) studying decision-making teams, found that shared leadership is significantly related to team cohesion and team consensus. Similarly, Mathieu et al. (2015), in a study of student team simulating business environment, also proved that shared leadership plays a positive role in promoting team cohension. Moreover, Erkutlu (2012), studied commercial banks, and found shared leadership to be a better predictor of team proactive behavior. In the study of work teams, Liu et al. (2014) demonstrated that shared leadership is significantly linked to individual learning behaviors through the mediating role of team psychological safety. Further, evidence from extant empirical studies also indicates a strong positive relationship existing

between shared leadership and team decision-making principles and approaches (Galli et al., 2016), as well as shared leadership and staff retention (Casady & Dowd, 2005).

Team cognition

Research has found support for the relationship between shared leadership and a series of relational outcomes, such as team creativity (Gu et al., 2016; Hoch, 2013; Lee et al., 2015; Wu & Cormican, 2016), team resilience (Van der Kleij et al., 2011), team potency (Boies et al., 2011; Cashman, 2008) and collective efficacy (Chen, 2014). Among them, the significantly positive impact of shared leadership on team creativity is mediated by collective psychological capital (Wu & Chen, 2018), and collective efficacy is mediated by team cohesion as well as trust simultaneously (Chen, 2014).

Performance outcomes

Beyond the attitudinal outcomes, behavioral outcomes and team cognition, researchers in the field of shared leadership have focused on its impact on a series of performance outcomes. Firstly, Pearce and Sims (2002) and Ensley et al. (2006), compared the impacts between shared leadership and vertical leadership, and found that the shared leadership style appears to be a more useful predictor of team performance than vertical leadership. Secondly, evidences also shows that shared leadership has a positive influence on team performance as rated by team leaders (e.g., Fausing et al., 2015), team members (e.g., Hoch & Kozlowski, 2014) and clients (e.g., Carson et al., 2007) in many different contexts.

Examples include knowledge and manufacturing teams (Fausing et al., 2015), professional work teams (Chiu et al., 2016), consulting teams (Carson et al., 2007), entrepreneurial teams (Zhou & Vredenburgh, 2017), laboratory teams (Müller et al., 2018) and even military teams (Ramthun & Matkin, 2014). Thirdly, researchers have investigated how shared leadership affects team performance. For example, Daspit et al. (2014) proposed that absorptive capacity (how firms recognize the value of, integrate, and exploit knowledge to remain competitive) mediated the positive relationship between shared leadership and team performance. Meanwhile, this relationship has also been demonstrated to be mediated by knowledge sharing (Hoch, 2014; Lee et al., 2015), team confidence (Nicolaides et al., 2014), group identification (Armon, 2015), team coordination and goal commitment (Chen & Liu, 2018). Fourthly, except for the performance at team level, shared leadership has been proven to be positively related to employee intended performance (Drescher & Garbers, 2016), firm performance (Hmieleski et al., 2012) and organizational performance (Foster, 2014). Moreover, shared leadership has also been regarded an important enabler of team's organizing and planning effectiveness in financial and insurance teams (Choi et al., 2017), team goal attainment in aircrew teams (Bienefeld & Grote, 2014), and organizational ambidexterity in top management teams (Mihalache et al., 2014; Umans et al., 2017).

2.6.3 Moderators in shared leadership research

A promising start has been made in unpacking the boundary conditions in which shared leadership operates. An overview of research utilizing moderators in the shared leadership research have been illustrated in Table 8. In detail, the category detailing employee-centered moderators presents, team members' gender and race (Robert, 2013), power distance (Liang et al., 2017), project engagement (Evans & Sanner, 2018), age diversity and coordination (Hoch et al., 2010b), commonality and communication (Drescher & Garbers, 2016), as well as personality diversity (Zhou, 2016), influence the effectiveness of shared leadership on the satisfaction, workflow, performance of team, and the creativity of individuals. Furthermore, on terms of the team-centered moderators, findings show that team culture (Angles, 2007; Erkutlu, 2012), team trust (Angles, 2007), team autonomy (Rolfsen et al., 2013), team learning process (Somboonpakorn & Kantabutra, 2014), team demographic diversity (Hoch, 2014), and team tenure (Nicolaides et al., 2014), play a moderating role in the relationship between shared leadership and team proactive behavior, team effectiveness and team performance. Moreover, the task-centered boundary conditions have also been suggested as one kind of moderates of shared leadership. For example, task-related competence (Chiu et al., 2016), task interdependence (Gu et al., 2016; Nicolaides et al., 2014), job variety (Liu et al., 2014) and task complexity (Müller et al., 2018; Wang et al., 2014) have been demonstrated as moderators of shared leadership and team performance, team creativity and team and individual learning. Additionally shared

leadership measurement approach has been proved to influence the relationship between shared leadership and team outcomes in three meta-analytic studies (see D'Innocenzo et al., 2014; Nicolaides et al., 2014; Wu et al., 2018), where stronger relationship has been found when shared leadership is assessed by social network approach than aggregation techniques.

Furthermore, in the shared leadership literature, there have been some research that have used shared leadership as a moderator. For example Acar (2010), found that shared leadership moderates the negative relationship between group diversity and emotional conflict; Zhou et al. (2015) proved that managerial skill diversity can improve entrepreneurial team performance when leadership is shared among team members; Hu et al. (2017) suggested that shared leadership weakened the negative relationship between team creativity and relationship conflict.

Table 8: Shared leadership and team outcomes with its moderators

Category	Moderators	Team outcomes	Reference
Employee-centred	Gender and race	Team satisfaction	Robert (2013)
Employee-centred	Power distance	Individual creativity	Liang et al. (2017)
Employee-centred	Project engagement	Team workflow	Evans and Sanner (2018)
Employee-centred	Age diversity	Team performance	Hoch et al. (2010b)
Employee-centred	Coordination	Team performance	Hoch et al. (2010b)
Employee-centred	Commonality	Team performance	Drescher and Garbers (2016)
Employee-centred	Communication	Team performance	Drescher and Garbers (2016)
Employee-centred	Personality diversity	Team performance	Zhou (2016)
Team-centred	Team culture	Team proactive behaviour	Erkutlu (2012)
Team-centred	Team culture	Team effectiveness	Angles (2007)
Team-centred	Team trust	Team effectiveness	Angles (2007)
Team-centred	Team autonomy	Team performance	Rolfsen et al. (2013)

Team-centred	Team learning process	Team performance	Somboonpakorn and Kantabutra (2014)
Team-centred	Demographic diversity	Team performance	Hoch (2014)
Team-centred	Team tenure	Team performance	(2014)
Team-centred	Work function	Team performance	Rolfsen et al. (2013)
Task-centred	Task-related competence	Team performance	Chiu et al. (2016)
Task-centred	Task interdependence	Team creativity	Gu et al. (2016)
Task-centred	Task interdependence	Team performance	Nicolaides et al. (2014)
Task-centred	Job variety	Team and individual learning	Liu et al. (2014)
Task-centred	Task complexity	Team performance	Müller et al. (2018); Wang et al. (2014)
Methodology-centred	Shared leadership measurement approach	Team outcomes	D'Innocenzo et al. (2014); Nicolaides et al. (2014); Wu et al. (2018)

In summary, this section synthesizes the literature regarding the fragmented antecedents, consequences, mediators and moderators of shared leadership and presents a nomological network to depict the general steam of shared leadership research. Such a thorough review is valuable for capturing this increasing complex research area more effectively and for pinpointing important research directions.

2.7 Summary

In summary, this chapter presents a systematic review on the topic of shared leadership. Specifically, this research highlighted the importance of shared leadership for organization, synthesized 26 definitions, identified its key characteristics and provided a new concept; this study also distinguished shared leadership from traditional vertical leadership and other similar leadership concepts, e.g., collective leadership, emergent leadership, distributed leadership and empowering leadership; further the main shared leadership measurement approaches were reviewed and evaluated in order to provide feasible measurement suggestions for future empirical research; finally this study presented a nomological

network of shared leadership from empirical studies that summarizes its antecedents, consequences, mediator as well as moderators. All of these will serve as a basis for the model construction and hypotheses proposition.

Chapter 3: Model construction and hypotheses proposition

Followed by the comprehensive literature review of shared leadership studies, in chapter 3, this research theoretically created a conceptual model regarding the changing pattern of shared leadership across the project life cycle, so as to answer research question 3 (How does shared leadership changes during four phases of the project life cycle, initiation, early phase, later phase and closeout). Moreover, with the aims to explore research question 4 (What is the relationship between shared leadership and team effectiveness) and question 5 (Do the stages of project life cycle moderate the relationship between shared leadership and team effectiveness, if yes, how to moderate), the current study also adopted a common research design by theoretically proposing and empirically test research hypotheses. The details about the research design, problems, purposes and relevant research questions are illustrated in Table 9.

Table 9: Research design, problems, purposes and relevant research questions

Research design	**Research problems**	**Research purposes**	**Research questions**
Model construction	◆ Lack of insights into the dynamics of shared leadership.	◆ To theoretically delineate and empirically test a dynamic model of how shared leadership changes throughout the project life cycle.	**Q3**. How does shared leadership changes during four phases of the project life cycle, initiation, early phase, later phase and closeout?
Hypotheses proposition	◆ The existing research fails to more fully consider the potential moderating impact of the project life cycle on the relationship between shared leadership and team effectiveness	◆ To explore the relationship between shared leadership and team effectiveness; ◆ To investigate the moderating role of the project life cycle in such relationship.	**Q4**. What is the relationship between shared leadership and team effectiveness? **Q5**. Do the stages of project life cycle moderate the relationship between shared leadership and team effectiveness? If yes, how to moderate?

The structure of Chapter 3 is that: 1) the concept of project life cycle is presented; 2) a conceptual model regarding the changes of shared leadership during four phases of the project life cycle, is introduced; 3) the hypotheses about the relationship between shared leadership and team effectiveness (divided into team task performance and team viability) and hypotheses about the moderating role of the project life cycle in such relationship, are displayed. The details are discussed as below.

3.1 Project life cycle

As Williams (2002) described, project life cycle is a sequence of identifiable stages, where the project is born, matures, carries through to old age and expires. In general, these project phases are sequential, and each of them has different inputs and deliverables. The reason why this research focused on the project life cycle, is because of its dynamic team environment (with different processes, inputs and outputs) could stimulate the changes of shared leadership. Therefore, studying the changing process of shared leadership during the project life cycle and studying on the moderating role of project life cycle in the relationship between shared leadership and team effectiveness, could help us to better understand the dynamic nature of shared leadership and its influence on team process and team outcomes in project teams.

Following by the work of Rose (2013, p.38), this research divides the project life cycle into four phases (see in Figure 4).

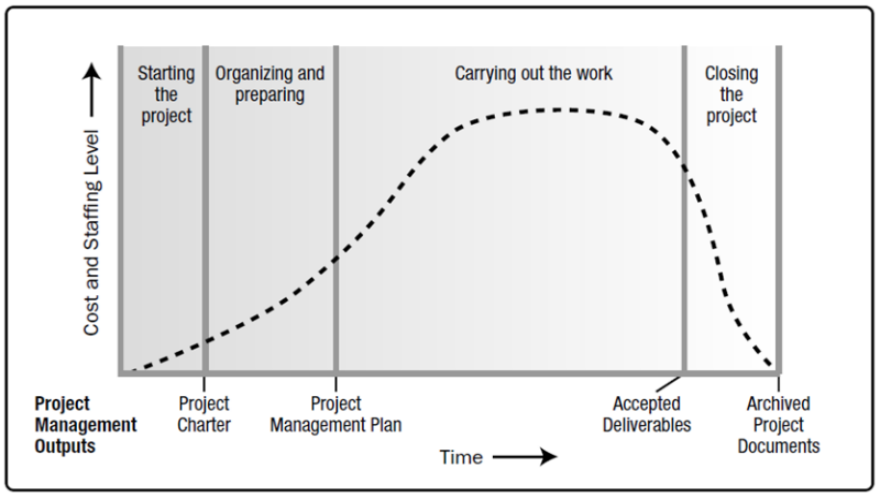


Figure 4: Phases of the project life cycle proposed by Rose (2013, p.38)

As shown in figure 4, there are four stages in a project life cycle:

- **Initiation:** it is the first phase of a project with very low inputs of cost and staffing. The major task is defining and authorizing the process.
- **Early phase:** during the second stage of a project, the inputs of cost and staffing rise gradually. In order to make a project managing plan, team members focus on defining and refining goals, planning and scheduling, as well as preparing and organizing (Farh et al., 2010).
- **Later Phase:** the inputs of cost and staffing continue to increase and reach to the top level. The project process concentrates on integrating resources to carry out the plan, monitoring process for corrective actions and formalizing project acceptance (Chang et al., 2003).

- **Close:** when the project develops into the last stage, the inputs would decrease dramatically. The main task is project handover with final output being archived project documents.

Followed by these four phases, this research uncovers the changing process of shared leadership during different phases of the project life cycle and also explores the moderating role of the project life cycle (early phase vs later phase) in the relationship between shared leadership and team effectiveness (see details in Chapter 3.2 and 3.3). It will contribute to our understanding on the dynamic nature of shared leadership as well as bringing insights into the boundary conditions of the relationship between shared leadership and team effectiveness.

3.2 Model construction

With the aims of understanding the changing patterns of shared leadership across the project life cycle, this study considers shared leadership from a social network perfective based on a theoretical model developed by Pastor and Mayo (2002) (see Figure 5). It describes the characteristics of shared leadership from two critical dimensions: network density and network centralization. The former is used to assess the emergence and quantity of interactions among team members. The latter is to measure the compactness and distribution of shared leadership.

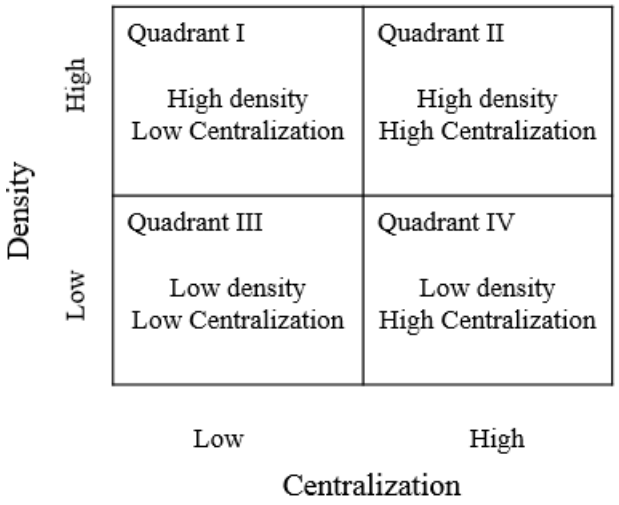


Figure 5: Characteristics of shared leadership with social network analysis (Pastor & Mayo, 2002)

According to the Figure 5, this research proposes a new conceptual model that reveals how shared leadership changes during the whole project life cycle (shown in Figure 6). In this model, due to differences of project inputs, project processes, and project outputs throughout the different project life phases, the shared leadership shows different characteristics as time goes by.

- **Initiation**: at the very beginning of a project, the cost and staffing levels are low. The main tasks for managers are defining and authorizing a specific project. However, they face the greatest challenge of bringing together members who might be not familiar with each other in a short time. Much work centres on building shared understanding and smooth working relationship. Moreover, because a project are likely to be equipped with members bringing varying knowledge bases and niche specialties often highly technical, the process of communication and integration may be further complicated.

In this internal team environment, there is a hindering effect for members to displaying leadership activities (Carson et al., 2007; Fiore & Salas, 2002). Thus, the amount of interactions among team members would be small. Besides, as few individuals are very central to make decisions in the beginning of a project, centralization of shared leadership would be high.

- **Early Phase**: In the early stage, this study proposes that shared leadership has a high degree of network density and low centralization. First, due to the fact that the focal concern of the project teams centres on planning (Burke, 2013; Chang et al., 2003), members will tend to have integrated cross-functional communication and coordination with each other. This interaction motivates individual experts to share and exchange information (Farh et al., 2010), which in turn helps to increase the level of familiarity among team members. Shared leadership is more likely to emerge in this situation, where greater number of actors participate in the decision-making process and exert leadership influence collectively (Cox et al., 2003). As a result, network density of shared leadership may be high because of large amounts of quantities of leadership influence within teams. Moreover, network centralization is low, due to the equal distributions of these influences among individuals. Therefore, at the early stage of a project, the shared leadership could represent the optimal level: high density and low centralization.

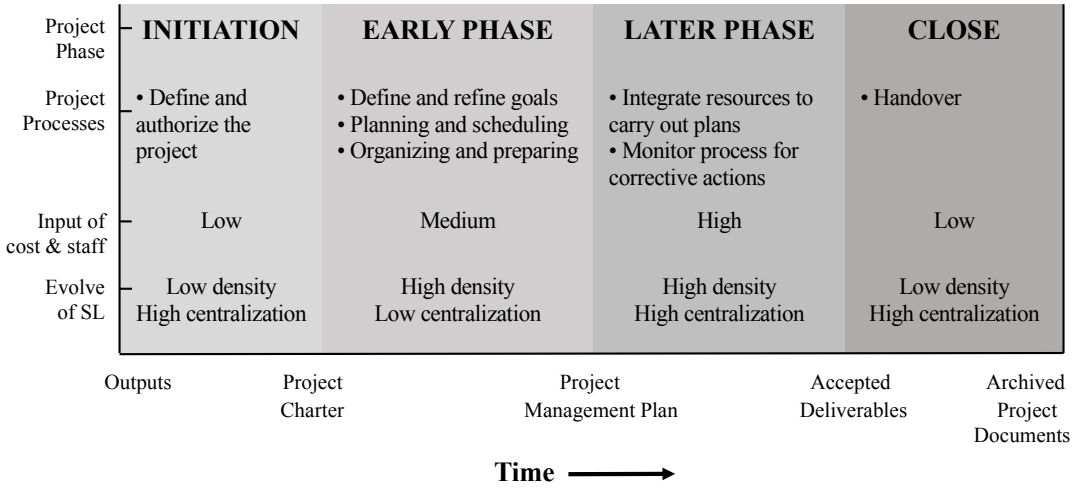


Figure 6: A conceptual model of evolvement process of shared leadership during the project life cycle

- **Later Phase**: As the teams advance into the later phase of the project, shared leadership would stay at a high level of density, but change become highly centralized. The main reason is that the emphasis of this phase is on executing project plans to meet deadlines and keep cost within budgets (Farh et al., 2010). In particular, when the actual operations start, leadership responsibilities tend to gradually focus on few members who engage in integrating resources (cost and staffing inputs are in maximum level) to carry out plans. In addition, they are also required to monitor implementation processes for corrective actions. The need of controlling for the whole project in later stage is also a sign of shared leadership becoming centralized. The theoretical underpinning is based on the research in Yukl (2002), who found that there are few leaders in a team that can provide all the specific directions required to carry out task successfully. Outcomes related to this leadership role are maintaining the task-oriented project teams,

particularly keeping it in time, and within budget. Thus, shared leadership presents high-level density and high-level centralization.

- **Close**: During the last stage of a project, the inputs of cost and staffing decrease dramatically. As the simplicity of tasks, the density of shared leadership is in a low degree and centralization in high. It will go back to the initiative status.

3.3 Hypotheses proposition

To response to the call from Carson et al. (2007); Conger and Pearce (2002); Nicolaides et al. (2014); Wang et al. (2014), this study extends a line of research that examines the relationship between shared leadership and team effectiveness and advances it by measuring team effectiveness from two perspectives. Specifically, team effectiveness refers to the extent to which teams meet the expectations of organizations (Essens et al., 2009). This conception guides us to think about team effectiveness from a multidimensional perspective without being limited to regard it as a series of achievements of performance aims. As such, this study following by the research of Aubé and Rousseau (2011), Balkundi and Harrison (2006), Kozlowski and Ilgen (2006), and Mathieu et al. (2008), considers team effectiveness from two distinct aspects: team task performance and team viability. Team task performance is defined as how well the group meets (or even exceeds) expectations regarding its assigned charge at work; team viability refers to the potential of teams to retain its members and to keep proper team functioning over time

(Balkundi & Harrison, 2006). It also conforms to a classic work conducted by Barrick et al. (1998), who suggested that a comprehensive assessment of team effectiveness should capture both current team effectiveness (i.e., present task performance) and future team effectiveness (i.e. capability to continue working together). Therefore, this research provides a comprehensive investigate on team effectiveness and explores the relationship between shared leadership and team effectiveness. The details are shown below.

3.3.1 Shared leadership and team effectiveness

This study expects that shared leadership is positively related to team performance and team viability, and thus would exert positive influence on team effectiveness. First of all, the potential performance benefits of shared leadership are supported by numerous initial studies. For instance, Carson et al. (2007), in a study of 59 consulting teams, found that shared leadership is positively associated with team performance as rated by clients. Ensley et al. (2006), in a study of 66 top management teams, demonstrated that shared leadership to be a more significant predictor, than vertical leadership, of new venture performance that is considered in teams of revenue growth and employee growth. Further, Gupta et al. (2010), in a longitudinal examination of 28 student teams who engaged in the business strategy game simulation, also suggested that shared leadership is positively related to overall performance measured by sales growth. Finally, qualitative studies by Zhou (2016) in 144 entrepreneurial teams and Daspit et al. (2013) in 24 cross-functional teams, also demonstrated support for the positive influence of shared leadership on the performance of

teams. Followed by these, this research suggests that shared leadership will be positively related to team task performance. Specifically, when group members offer leadership to others and to the mission or purpose of their group, they will bring more personal and organizational resources to the task, share more information, as well as experiencing greater commitment with the group (Katz & Kahn, 1978). Further, when group members receive influence from their fellows, the team functioning is improved with high level of respect and trust among group members. Teams, exhibiting these characteristics, can also exhibit greater levels of performance (D'Innocenzo et al., 2014). Moreover, as mentioned by Day et al. (2004), shared leadership improves the social capital of the team via better facilitating the internal resources, knowledge, and expertise of diverse group members, which subsequently fosters team task performance. Therefore, this study proposes:

Hypothesis 1a*:* Shared leadership is positively related to team task performance.

As mentioned above, not all team effectiveness criteria are task-driven. Team viability (the potential of teams to retain its members and to keep proper team functioning over time) has also been regarded as a measurement for team outcomes. According to Balkundi and Harrison (2006), team viability is a broad concept that involves not only group members' satisfaction with their membership, but also their behavioral intent to stay in the group. This research expects that shared leadership, an important intangible resource available to teams (Carson et al., 2007), would enhance team viability. Wood and Fields (2007) suggested, as the greater empowerment and autonomy inherent to shared leadership, shared

leadership exerts a series of positive impacts on the job perceptions of team members: it brings low level of role overload, role conflict, role ambiguity and job stress, as well as high level of job satisfaction of team members. Similarly, Bergman et al. (2012) also demonstrated that teams with shared leadership experience less conflict, greater consensus, and higher intragroup trust and cohesion than teams without shared leadership. This may thus foster team viability as members of shared leadership teams feel increased interdependence, more collaboration with others, and sense greater satisfaction. To be specific, when there are frequent communication, coordination and collaboration among team members fulfilling leadership responsibilities, it is easier for them to identify the potential causes of conflicts and related solutions. It thus reduce the times of conflict and promote team consensus and trust, which can resist damaging relational or socioemotional conflicts to drive fragmentation or loss of members for teams (Balkundi & Harrison, 2006). This research therefore posits:

Hypothesis 1b*:* Shared leadership is positively related to team viability.

Taken these two hypotheses (hypothesis 1a and 1b) together, this study expects that shared leadership will foster team effectiveness through enhancing team performance and team viability. Moreover, followed by the research of Wang et al. (2014), this study borrows from the social identity theory of leadership (Hogg, 2001) to have a better understanding of the positive relationship between shared leadership and team effectiveness. This theory suggests that "*as group membership becomes more salient, and members identify more*

strongly with the group, prototypicality becomes an increasingly influential basis for leadership perceptions" (Hogg, 2001, p. 189). Here prototypicality, not restricted to official leaders, but might apply to group or team members (Hogg, 2001). Given that members of the group themselves are able to take on the leadership role in the shared leadership context, shared leadership broadens and expands the extent of leader prototypicality. That is to say, group members with high degrees of shared leadership intrinsically accept their own leadership role as being prototypical, as it then becomes portion of their own social identity. As such, shared leadership nurtures a collective identity among members of the team and strengthens the level of engagement with and commitment to the group, which in turn enhances team performance (Wang et al., 2014). Moreover, as noted by Mathieu et al. (2015), shared leadership also fosters social inclusion and enhances team cohesion, which can, subsequently, facilitate team effectiveness. Collectively, this research suggests:

Hypothesis 1c*:* Shared leadership is positively related to team effectiveness.

3.3.2 Moderating effect of the project life cycle

Notwithstanding study on the connection between shared leadership and team effectiveness brings insights into the effect of shared leadership on teams, its boundary conditions cannot be ignored. This will help us understand under what conditions shared leadership plays a stronger or weaker role in team effectiveness. This research examines the moderating effect of project life cycle and expects that the positive association between shared leadership and

team effectiveness will be stronger at the early phase than the later phase of project life cycle. This expectation is based on the conceptual model regarding the changing patterns of shared leadership throughout the whole process of the project life cycle (illustrated in Chapter 3.2). In this model, the early stage of the project cycle life has high-level network density and low centralization where individuals exert leadership influence collectively toward planning and strategy generation, which allows team members bring more resources to the task, share more information, as well as experiencing higher commitment within groups. Collectively, these consequences would result in greater team effectiveness (D'Innocenzo et al., 2014). Additionally, as there are relatively plentiful time and resources processed by teams at the early stage, members are able to invest more energy to take initiatives for their own development of leadership abilities as well as facilitating the leadership of others in order to maximize team effectiveness. Thus, high team effectiveness is easily created at this phase with high-degree shared leadership. However, during the later stage, since leadership distribution changes from team members to few individuals who take responsibility to integrate resource and control the development of the project to meet deadline (Farh et al., 2010), teams may no long afford to input much time to cultivate leadership processes, functions and roles to promote team viability. As such, any potential for enhancing team effectiveness because of team viability would become unrealized. As consequence, this research expects that:

Hypothesis 2: Stages of the project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than at the later phase of project life cycle.

3.4 Summary

In summary, in this chapter, this study presents the concept of the project life cycle, and provides a conceptual model regarding the changing patterns of shared leadership from a social network perspective during four phases of the project life cycle. It also proposes hypotheses about the relationship between shared leadership and team effectiveness (divided into team task performance and team viability) and hypotheses about the moderating role of the project life cycle in such relationship (see Table 10 for summary of research hypotheses). The next chapter will introduce the research methodology for this study details to show how this study validates the conceptual model and tests hypotheses proposed.

Table 10: Research hypotheses

No.	Hypotheses
H1a	Shared leadership is positively related to team task performance.
H1b	Shared leadership is positively related to team viability.
H1c	Shared leadership is positively related to team effectiveness
H2	Stages of the project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than at the later phase of project life cycle.

Chapter 4: Methodology

In this research, the methodology section is structured as follows 1) restating the research problems; 2) outlining the flow for research design; 3) introducing the measures for all constructs in this study; 4) generating the process of survey development; 5) describing the methodologies for data analysis. The details are shown as below.

4.1 Restatement of research problems

Scholars have highlighted that shared leadership is a dynamic, interactive process of influence among individuals within teams (Pearce & Conger, 2003). It, as a time-varying construct, changes as a function of team inputs, processes, and outcomes (Day et al., 2004). However, past research lacks insights into the dynamic nature of shared leadership and its consequences. Therefore, this research aims to obtain a fine-grained understanding of the dynamic nature of shared leadership, by focusing on the changing process of shared leadership across the project life cycle and exploring the influence of such changes in the relationship between shared leadership and team effectiveness. The specific research questions are proposed below:

- How does shared leadership changes during four phases of the project life cycle, initiation, early phase, later phase and closeout?
- What is the relationship between shared leadership and team effectiveness?

- Do the stages of the project life cycle moderate the relationship between shared leadership and team effectiveness? If yes, how do they moderate this relationship?

4.2 Research design

Drawing on these research questions, the research procedures for this study (see Figure 7) are presented. It has been categorized into three phases. Phase I includes literature review on the topic of shared leadership, team effectiveness and project life cycle. Model construction and hypotheses proposition are also comprised in this phase. In phase II, survey was conducted. It comprises questionnaire design, sample strategy generation and survey administration. Pre-test, pilot study and data collection process are also contained in this phase. When this study entered into phase III, the empirical data collected were analyzed. The findings were discussed and the conclusion were draw. The detailed research processes are listed as follows.

Phase I:

Literature review: An extensive literature review was performed from a substantial volume of recent literature on the following topics: shared leadership, team effectiveness and project life cycle. This helps to understand the concepts and key variables, as well as identifying the research problems that serves as the foundation for developing conceptual model and proposing research hypotheses.

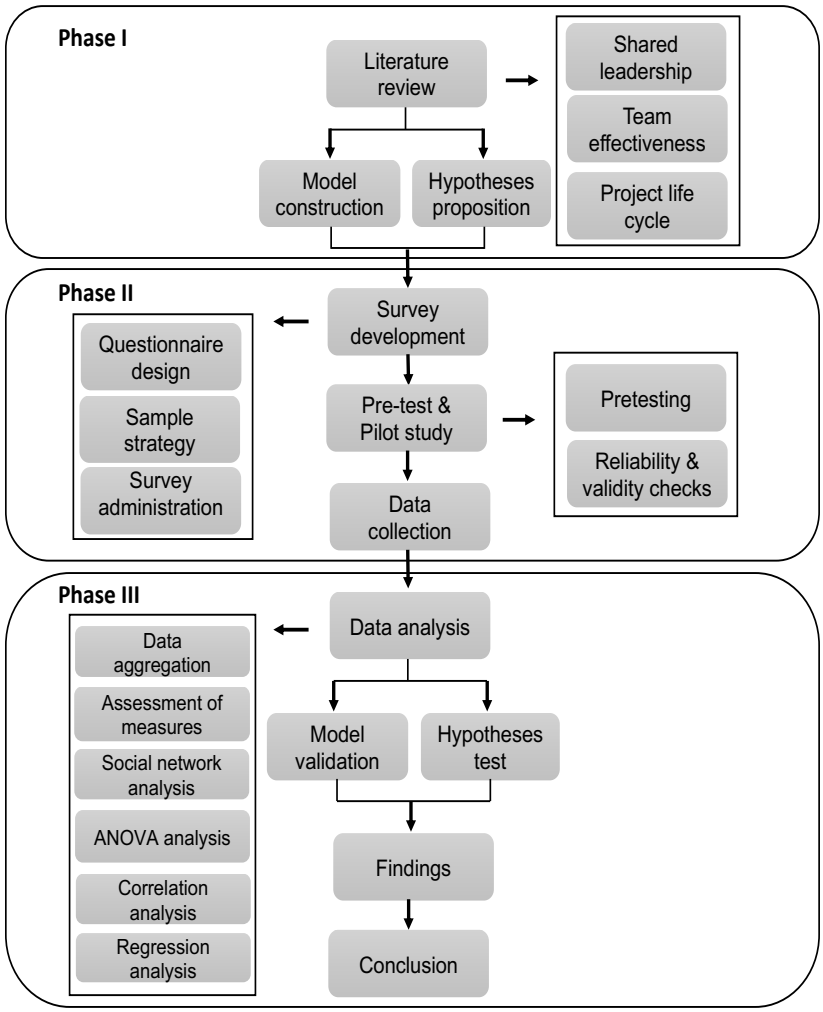


Figure 7: The flow of research design

Model construction and hypotheses proposition: Based on the research problems identified, this study created a conceptual model about changes of shared leadership during the project life cycle from a social network perspective, and proposed hypotheses about the relationship between shared leadership and team effectiveness, as well as how project life cycle moderators such relationship. Details on the model's construction and hypotheses proposition are described in Chapter 3.2 and 3.3 respectively.

Phase II:

Survey development: With the aim of validating the conceptual model and test hypotheses, a survey was employed in this research. This comprises questionnaire design (see questionnaire in Appendix 1), sample strategy selection and survey administration. Further details on these are discussed below in Chapter 4.4.

Pre-test & pilot test: After designing the questionnaire, a pre-test was conducted through reviewing by researchers and academics in order to reduce the ambiguities of the survey items. Then this study conducted a pilot test before the investigation to ensure the quality of questionnaire. Specifically, 16 employees from 3 engineering design teams participating in the primary study were solicited, and then contacted for feedback to check whether they have questions or problems about the content of items shown in the questionnaire. Among 16 participants, 5 respondents were interviewed over the phone: 4 people showed that they can fully understand these items and 1 proposed some questions about the questionnaire items. Consequently, minor modifications were made based on the suggestions from the employees. Also, the reliability and validity of the constructs were checked in this study. The results show that all indicators (Cronbach's alpha is between 0.73 and 0.81; Factor loading is between 0.82 and 0.94; Composite reliability is between 0.75 and 0.86) are acceptable.

Data collection: After the pre and pilot test, the survey data were gathered. This process lasted three months (from January 2018 to March 2018). Data were collected via emailing customized questionnaire (No. of questionnaire =146) to targeted respondents. They were required to answers all questions in the questionnaire and their responses were strictly confidential. Only the research group had access to the data. Questionnaires were translated into Chinese based on forward-and-back translation procedures as suggested by Brislin (1980). The detailed data collection process is also illustrated below in Chapter 4.4.2.

Phase III:

Data analysis: Once data were obtained, several analyses were conducted to answer the research questions established for this research. The methods of analysis include data aggression analysis, internal consistency analysis, confirmatory factor analysis, social network analysis, One-way ANOVA analysis, correlation analysis, and regression analysis (see Chapter 4.5.1, Method of Analysis, for detail).

Model validation and hypotheses test: The results of the data analysis were generated to validate the conceptual model and to test the hypotheses. This focused on the examination of the key questions of this research: 1) how does shared leadership changes during the project life cycle? 2) what is the relationship between shared leadership and team effectiveness? and 3) how does project life cycle moderate such relationship?

Findings and conclusions: Finally, the research findings were generated, results were discussed, conclusion were draw and future research agenda was provided (conclusion see Chapter 6).

In summary, as for the flow of this research, a comprehensive literature review on shared leadership, team effectiveness and project life cycle were firstly conducted. Based on it, this study created a conceptual model and proposed research hypotheses. These are all included in phase I. When this study entered into phase II, the survey was developed to validate the model and test hypotheses. This process involved questionnaire design, pre-test, pilot test, and data collection. In phase III, this research started to analyzed data collected and discussed the findings. It was followed by research conclusion, limitation and a future research agenda. Below the details of phase II (regarding measures of constructs, survey development and data collection process) and phase III (regarding data analysis process and results delivered) are presented.

4.3 Measures

With the aims to validate conceptual model and test hypotheses, this research employed survey, a questionnaire format (see questionnaire in Appendix 1) to collect empirical data. In order to have a good-quality questionnaire, it is an important step to develop measures for the constructs. Totally there are three main constructs in the conceptual model and hypothesis proposed namely, shared leadership, team effectiveness and project life cycle.

Control variables such as team size, team mean tenure and educational levels were also included (see Table 12) in this study. The following Table 11 shows how three major constructs are measured in this research. It is discussed in more detail below.

Table 11: Constructs and measurements

Constructs	Definition	Approach/category	Item No.	Measurement	Related literature
Shared leadership	Shared leadership is an interactive, emergent, team-level phenomenon where leadership influence is distributed among, and stems from multiple team members within organizations.	Social network analysis: network density and network centralization	SL	To what degree does your team rely on this individual for leadership?	Carson et al. (2007), Ishikawa (2012), Liu et al. (2014), Serban and Roberts (2016) and Robert (2013)
Team effectiveness	Team effectiveness measured with a comprehensive assessment by capturing both current team effectiveness (i.e., present performance) and future team effectiveness (i.e. capability to continue working together) (Barrick et al., 1998).	Team performance: It measured the degree to which the project meets its goals, quality, schedule, budget, and overall level of satisfaction with the team's performance.		***Project goals***	Azmy (2012); Bonner et al. (2002)
			PG_1	• Project goals are clearly defined and communicated to all team members.	
			PG_2	• Our team shares a common understanding of the goals.	
			PG_3	• Our team is capable of achieving its objectives.	
				Project quality	
			PQ_1	• Our project meets the quality standard specified.	
			PQ_2	• The team is capable of meeting the required quality.	
			PQ_3	• Measures to ensure high levels of quality are included in project plans.	
				Project schedule	
			PS_1	• Our team works hard to meet schedules and timelines.	
			PS_2	• Unforeseen risks are considered in the schedule.	
			PS_3	• Our team adjusts ensure that the project is delivered on time.	
				Project budget	
			PB_4	• We are capable of working within budget.	
			PB_5	• Our team actively seeks cheaper alternatives.	
			PB_6	• Overall project costs are continuously monitored.	

				Overall satisfaction	
			OS_1	• I am happy to work in this project team.	
			OS_2	• As project owner, I am satisfied with the final results of the project.	
			OS_3	• I believe that our customers are (will be) satisfied with the project we delivered.	
		Team viability: It assessed the degree of team's capacity to solve problems, to integrate new members, to adapt to changes, as well as to continue to work together in the future.	TV_1	• Our team is capable of solving problems.	Aube and Rousseau (2005)
			TV_2	• New members are easily integrated into this team.	
			TV_3	• Our team adjusts to changes if required.	
			TV_4	•The members of our team could work a long time together.	
Project life cycle	Project life cycle is a sequence of identifiable stages, where the project is born, matures, carries through to old age and expires (Williams, 2002).		NA	• Please describe the percentage of the project work completed at the time of the survey. • Please describe the major tasks of your current project.	Farh et al. (2010); Rose (2013)

Note: PG is the abbreviation of project goals, PQ is project quality, PS is project schedule, PB is project budget, OS is overall satisfaction, TV is team viability, and NA is not applicable.

4.3.1 Shared leadership

Shared leadership is the key construct in this research. It is regarded as a relational phenomenon that involves patterns of reciprocal influence within a team. One popular method to measure it is social network technique, which was employed in many empirical studies of shared leadership (see Carson et al., 2007; Ishikawa, 2012; Liu et al., 2014; McIntyre & Foti, 2013; Mehra et al., 2006; Robert, 2013; Serban & Roberts, 2016). Social network analysis is an intrinsically relational method used to examine relationship patterns; it provides methods to model the interpersonal influences and uses network graphs to identify patterns of leadership. According to Wang et al. (2014), social network techniques

enable researchers to measure the extent to which team members are perceived to be involved in sharing of leadership (by using network density), and the dispersion of leadership roles (by using network centralization). Specifically, network density is a measure of the proportion of possible ties, or relations that are actually displayed by team members as perceived by others. As for the network centralization, it is a measure of compactness that specifies how dyadic ties are distributed in the overall network (D'Innocenzo et al., 2014). This approach is appropriate for measuring shared leadership because of the following reasons. First, it allows for the understanding of leadership as a relational concept that entails interpersonal influence processes (Sutanto et al., 2011). Second it assists research in examining the extent to which all individuals are involved in the leadership of the group; the degree of distribution of leadership in the group; and the "web" of interconnections between team members about who influences whom and how influence "travels" across the group (Conger & Pearce, 2002). Third, social network analysis is lauded to better preserve information about actual distributed leadership patterns within groups (Balkundi & Kilduff, 2006).

This research thus employed social network techniques to measure shared leadership. Network density and network centralization were combined to assess shared leadership as so to present richer information about quantity and dispersion of leadership being shared. Similar to studies conducted by Carson et al. (2007), Ishikawa (2012), Liu et al. (2014), Serban and Roberts (2016) and Robert (2013), every team member was asked to rate each

of his/her peers on the following question: “To what degree does your team rely on a particular individual for leadership?” (A five-point Likert scale was used to measure shared leadership, where 1, represents “not at all,” and 5, “to a very great extent”). Network density and network centralization were then calculated by using the values collected from participants. Specifically, based on the measurement approach proposed by Carson et al. (2007), the network density was calculated by summing all of the actual responses of team members divided by the total number of possible ties, or relations, among team members. The values of density ranged from 0 to 1, where higher values indicate the higher degrees of shared leadership within team. Furthermore, the centralization index was computed, based on the advice of Aubé et al. (2017). This was done by summing the differences between the maximum member value and every other member value and then dividing that sum by the maximum possible sum of differences. The values for centralization also ranged from 0 to 1, with lower values corresponding to higher levels of shared leadership within team.

4.3.2 Team effectiveness

This study measured team effectiveness similar to the a classic work conducted by Barrick et al. (1998), who suggested that a comprehensive assessment of team effectiveness should capture both current team effectiveness (i.e., present task performance) and future team effectiveness (i.e. capability to continue working together). The first critical measure of team effectiveness in this study is team task performance. It was assessed with a five Likert

scale (where 1, represents strongly disagree and 5, represents strongly agree) as recommended by Azmy (2012) and Bonner et al. (2002). This scale included 15 items measuring the degree to which the project meets its goals, quality, schedule, budget, and overall level of satisfaction with the team's performance. The second important measure of team effectiveness is an assessment of a team's capacity to continue functioning as a unit (termed as team viability). Specifically, team viability has been defined as the potential of teams to retain its members and to keep proper team functioning over time (Balkundi & Harrison, 2006). This research employed a five point Likert scale (where 1, represents strongly disagree and 5, represents strongly agree) to measure team viability based on Aube and Rousseau (2005). This scale contains four items designed to assess the degree of a team's capacity to solve problems, to integrate new members, to adapt to changes, as well as to continue to work together in the future. The specific measurement items are illustrated in Table 10.

4.3.3 Project life cycle

Another variable tested in this study is the project life cycle. It has been defined as a sequence of identifiable stages, where the project is born, matures, carries through to old age and expires (Williams, 2002). Based on the work of Rose (2013, p. 38), the project life cycle was measured by dividing it into four phases:

- **Initiation**: this is the first stage of a project, which has very low inputs of cost and staffing. The main task is defining and authorizing the process.

- **Early phase**: during the second stage, the inputs of cost and staffing increase gradually. In order to make a project management plan, team members concentrate on defining and refining goals, planning and scheduling, as well as organizing (Farh et al., 2010).
- **Later Phase**: the inputs of cost and staffing continue to rise and reach to the top level. The project process focuses on integrating resources to carry out the plan, monitoring process for corrective actions and formalizing project acceptance (Chang et al., 2003).
- **Closeout**: when the project develops into the last stage, the inputs would decrease dramatically. The main task is project handover with final output being archived project documents.

Followed by the research of Farh et al. (2010), the phase of the project life cycle was measured from the percentage of the project work completed at the time of the survey. In the sample of this research, the mean project completion across 26 teams is 55.8% with a standard deviation of 0.28. In order to test the hypothesis proposed, this research used a mean split (Farh et al., 2010), where teams with a percentage of project completion below 55.8% were classified as being at an early phase and teams above 55.8% were classified as being at an later phase. This research also asked team managers to describe the major tasks of their current project to further subdivide the phase of the project life cycle (initiation, early phase, later phase, and closeout), in order to validate how shared leadership changes during these four phases. Based on the rule of Rose (2013), this research identified 2 project

teams in the phase of initiation; 12 in the early phase; 8 in the later phase; and 4 in the phase of closeout.

4.3.4 Control variables

Led by previous work, such as Liu et al. (2014), Ishikawa (2012), Hu et al. (2017), Gu et al. (2016), several control variables (see Table 12) were included to address possible alternative explanations of shared leadership and team effectiveness. First is team size. It was considered because team size has been proposed to be negatively associated with the emergence of shared leadership (Cox et al., 2003). In Pearce and Sims (2002), team size has been found to be negatively related to customer ratings and team self-ratings of team effectiveness. The reason behind this could lie in the fact that larger teams have a more ambiguous sense of objectives and lower levels of participation (Curral et al., 2001). In contrast, smaller leadership teams are more cohesive, which allows their members to act more effectively on strategic goals (Weiss & Hoegl, 2016). The second control variable is team mean tenure. It was included as it reflects the experience of group members working together which may influence team effectiveness (Marrone et al., 2007) and shared leadership because team longevity affects mutual familiarity, trust and interaction among team members (Cox et al., 2003). Moreover, team members' educational levels have been controlled in this study. Diversity of team members has been proven to be positively related to the emergence of shared leadership (Wassenaar, 2017). Furthermore, it has been demonstrated to play a moderating role in the relationship between shared leadership and

team outcomes (see Hoch, 2014; Robert, 2013). Therefore, team members' educational levels were controlled in this research, together with team size, team mean tenure for the analysis, which are summarized in Table 12.

Table 12: Control variables in this research

Control variables	Rationale	Reference
Team size	Team size has been proposed to be negatively associated with the emergence of shared leadership	Cox et al. (2003)
	It has been found to be negatively related to customer ratings and team self-ratings of team effectiveness	Pearce and Sims (2002)
	larger teams have a more ambiguous sense of objectives and lower levels of participation.	Curral et al. (2001)
	Smaller leadership teams are more cohesive, which allows their members to act more effectively on strategic goals	Weiss and Hoegl (2016)
Team mean tenure	It reflects the experience of group members working together which influences team effectiveness.	Marrone et al. (2007)
	It is proposed to affect shared leadership because team longevity affects mutual familiarity, trust and interaction among team members	Cox et al. (2003).
team members' educational levels	Diversity of team members has been proven to be positively related to the emergence of shared leadership.	Wassenaar (2017)
	It has been demonstrated to play a moderating role in the relationship between shared leadership and team outcomes.	(Hoch, 2014); Robert (2013)

4.4 Survey development

The survey method is selected as the quantitative component of this research. A survey is preferred, because it provides many benefits, such as rapid turnaround in data collection and helps to identify attributes of a large population from a small sample (Azmy, 2012). In the survey, this study used judgement sampling method to collect data, targeted at

engineering design project teams in China. Details relating to the sample strategy and survey administration process, as well as the sample characteristics are introduced below.

4.4.1 Sample strategy

The judgement sampling method was selected and used in this research. It is regarded as a non-probability sampling strategy where the researcher in the subject-matter makes selection of "representative or "typical" samples based on their knowledge and professional judgment (Deming, 1990, p.31). According to the research of Khan (2014), judgment sampling is an example of a purposeful sampling method, where the researchers select only those participants who are able to answer the research questions. Specifically, this study investigated the changes of shared leadership during project life cycle. Only project teams that could perform shared leadership were selected. Accordingly, the targeted sample of this research is engineering design project teams. Engineering design project teams are characterized by cross-functional collaborations with the aim to develop new engineering-related products, process or systems (Kratzer et al., 2008). The major reason why this research selected this team structure lies in its potential to leverage the expertise of a diverse of group members via pooling their talent and knowledge. This kind of team process is likely to nourish the emergence or development of shared leadership. Therefore, conducting the examination on how shared leadership changes in such teams is significant, which helps us to have a better understanding of the dynamic nature of shared leadership.

4.4.2 Survey target

The research survey was administered in China. The reason why this study selected a Chinese sample due to the fact that the conceptualization and operationalization of shared leadership is predominantly developed in the Western countries. For example, most empirical studies on shared leadership have been conducted in United States (see Acar, 2010; Bergman et al., 2012; Carson et al., 2007; Choi, 2009; Daspit et al., 2013; Ensley et al., 2006; Hmieleski et al., 2012; McIntyre & Foti, 2013). Some studies have been conducted in Europe like Denmark (Nielsen & Daniels, 2012), Germany (Masal, 2015), Dutch (Mihalache et al., 2014), Italy (Binkhorst et al., 2018), Belgium (Fransen et al., 2018) and Sweden (Rydenfält et al., 2015) England (Serban & Roberts, 2016), Canada (Aubé et al., 2017) and Turkey (Erkutlu, 2012). Others have been conducted in Japan (Ishikawa, 2012) and South Korea (Lee et al., 2015). However, it remains infant whether its theoretical models hold up in Chinese cultural settings. Scholars (e.g., Whetten, 2009) have called for more attention for an appropriate explanation of cultural context effects. Therefore, this study seeks to extend the validity of shared leadership construct to Chinese context, whereby its organizational culture distinguishes from Western countries.

In order to ensure content validity of questionnaire, this study followed by the approach suggested by Fausing et al. (2015) and Zhou (2016), and translated the English questionnaire to Chinese and then translated it back into English to ensure validity of the first translation. Additionally, due to the fact that the survey was not anonymous, the

purpose of the investigation was emphasized in the introduction section of the questionnaire. Participants were informed that the study was solely for academic research use. Participants were assured that their responses were strictly confidential and only the research group had access to the data.

Finally, the survey data were gathered in China from January 2018 to March 2018. There were two steps for the survey administration process. The first step involved short interviews with team managers to ask if his or her team would be willing to participate in the questionnaire answer, and to determine numbers and names of team members if they agreed to participate. The second step focused on distributing customized questionnaire (by email) to targeted respondents. To ensure a high response rate, a reminder email was sent to non-respondents after one week. Meanwhile a thank you email was also sent to all respondents who completed the questionnaire. In the end, of the 146 participants who received the questionnaire, 127 returned it, yielding an 87% response rate. Teams with less than three respondents were eliminated from the sample, which resulted in a sample of 119 employees working in 26 teams. The average team size of the sample was 5.26. The specific participant demographic is outlined in the Table 13.

Table 13: Sample characteristics

Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage
Age (years old)			***Highest education***		
<= 20	0	0	High school degree or equivalent	2	2%
21-30	57	48%	College degree	76	64%
31-40	47	39%	Master's degree	30	25%
41-50	9	8%	Doctoral degree	8	7%
More than 50	6	5%	Others	3	3%
Gender			***Role***		
Male	69	58%	Project manager	28	24%
Female	50	42%	Designer/Planner	37	31%
			Engineer	26	22%
Working experience (years)			Operators	15	13%
<= 2	15	13%	Admin/Supervision	7	6%
3 to 5	51	43%	Others	6	5%
6 to 10	38	32%			
>=11	15	13%			
Total	119	100%		119	100%

4.5 Data analysis

4.5.1 Method of analysis

This research employed several methods to analyze data collected so as to empirically validate the conceptual model and test the hypotheses proposed. The specific methodologies adopted in this study together with its detailed explanations, measurements, and purposes are depicted in Table 14.

Table 14: Methods of analysis

Methods	**Description**	**Measurement**	**Rationale**
Data aggregation analysis	Data aggregation is a process where information is gathered and expressed in a summary form, for purpose like statistical analysis (Bliese, 2000).	Within group agreement r_{wg}, Interclass correlation ICC (1) and Interrater correlation ICC (2)	To justify the aggregation of individual responses to the team level constructs for this research.

Internal consistency analysis	Internal consistency analysis is used to measure the consistency of results across different items within a test (Trochim & Donnelly, 2001).	Cronbach's alpha	To assess the reliability of measurements in this research.
Confirmatory factor analysis	Confirmatory factor analysis is used to assess the construct validity (Brown, 2014).	Factor loadings, Composite reliability, Average variance extracted (AVE)	To assess the convergent and discriminant validity of the measurements in this research.
Social network analysis	Social network analysis, as an intrinsically relational technique, provides methods to assess and model the relationship patterns for a leadership network (Mehra et al., 2006).	Network density, network centralization	To measure shared leadership from two perspectives: 1) the extent to which team members are perceived to be involved in shared leadership; 2) the dispersion of leadership roles.
One-Way ANOVA analysis	One-way ANOVA analysis is a statistical technique that is used to compare different sources of variance within a data set (Keselman et al., 1998).	p value	To determine if there are significant changes in shared leadership across different phases of the project life cycle.
Correlation analysis	Correlation analysis is used to study the strength of a relationship between two variables (Cohen et al., 2014).	Pearson product moment r	To examine the strength of correlations among all the constructs in this research.
Regression analysis	Regression analysis is used to estimate the relationship among two or multiple variables (Cohen et al., 2014)	β and p	To test the relationship between shared leadership and team effectiveness, and the moderating role of project life cycle in such relation.

Data aggregation. As shown in Table 14, this research aggregated the data collected. Data aggregation is a process where information is gathered and expressed in a summary form, in order to conduct statistical analyses (Bliese, 2000). The reason why this research performed data aggregation analysis lies in the fact that shared leadership is a team-level construct. Thus, this study needs to aggregate the individual responses to the team level

constructs. To do that, the within-group agreement and between-group variability (James et al., 1984) needed to be tested. Specifically, this research used r_{wg} to assess the within-group agreement and used intraclass correlation coefficient ICC (1) and reliability of the mean ICC (2) to examine between-group variability. The main purpose of data aggregation analysis is to justify the aggregation of individual responses to the team level constructs for this research.

Internal consistency analysis. To assess the quality of measurements in this study, an internal consistency analysis and confirmatory factor analysis was performed. Internal consistency analysis is used to measure the consistency of results across different items within a test (Trochim & Donnelly, 2001). In this research, internal consistency analysis was conducted to measure reliability of measurements, especially for the constructs, team viability, team performance and team effectiveness. The common method is to calculate Cronbach alphas. If its value exceeds 0.70, it indicates a good reliability of the measures (Trochim & Donnelly, 2001). In terms of confirmatory factor analysis, it is used to assess the construct validity of a proposed measurement theory (Brown, 2014). Specifically, this research performed confirmatory factor analysis to assess the convergent and discriminant validity of the measurements. As for the examination of convergent validity, factor loadings, composite reliability and average variance extracted (AVE) were calculated. If the values of composite reliability are above the 0.70 recommended level and AVE exceeds the 0.5 criterion, it indicates that the convergent validity of the measurement is good

(Brown, 2014). As for discriminant validity, this study followed the work conducted by Brown (2014) to compare the relationship between the square root of the AVE scores and the correlations among constructs to measure the discriminant validity. The specific results of these analysis are outlined in the section titled Assessment of measures.

Social network analysis. It is an intrinsically relational technique. It provides methods to assess and model the relationship patterns for a leadership network (Mehra et al., 2006). In this study, social network analysis was used to measure shared leadership from two perspectives: 1) the extent to which team members are perceived to be involved in shared leadership (by using network density); 2) the dispersion of leadership roles (by using network centralization). Following the procedures used in Pastor and Mayo (2002), this study assessed shared leadership using social network techniques and calculated network density and network centralization. The detailed procedures are illustrated in Chapter 5.4.

One-way ANOVA analysis. It was adopted in this study in order to validate the conceptual model. This is a statistical technique that is used to compare different sources of variance within a data set (Keselman et al., 1998). This research used it to determine if there is a significant difference in the dynamic nature of shared leadership across different phases of the project life cycle. According to Keselman et al. (1998), researchers need to examine and compare the p value to .05. If the p value less than .05, it means that there is a

significant difference between the compared groups. The detailed discussions are shown in Chapter 5.5.

Correlation analysis and regression analysis. This research also employed correlation analysis and regression analysis to test the hypotheses proposed. Correlation analysis provides methods to study the strength of a relationship between two variables (Cohen et al., 2014). This study used it to examine the strength of correlations among all the constructs and preliminary test the research hypotheses. Regression analysis is used to estimate the relationship among two or multiple variables (Cohen et al., 2014). More specifically, a two-way moderated hierarchical regression analysis was conducted followed by the research of Carson et al. (2007), Erkutle, 2012 and Rolfsen et al. (2013). It was used to test the relationship between shared leadership and team effectiveness as well as the moderating role of project life cycle in the relationship between shared leadership and team effectiveness.

In summary, this section presents methodologies of data analysis utilized. For each method used in this research, detailed explanations and relevant results are given in the next chapter. Before presenting the research results, the data analysis flow was introduced.

4.5.2 Data Analysis flow

A data analysis flow was created in order to present a clear understanding of the process for the data analysis. It is illustrated in Figure 8.

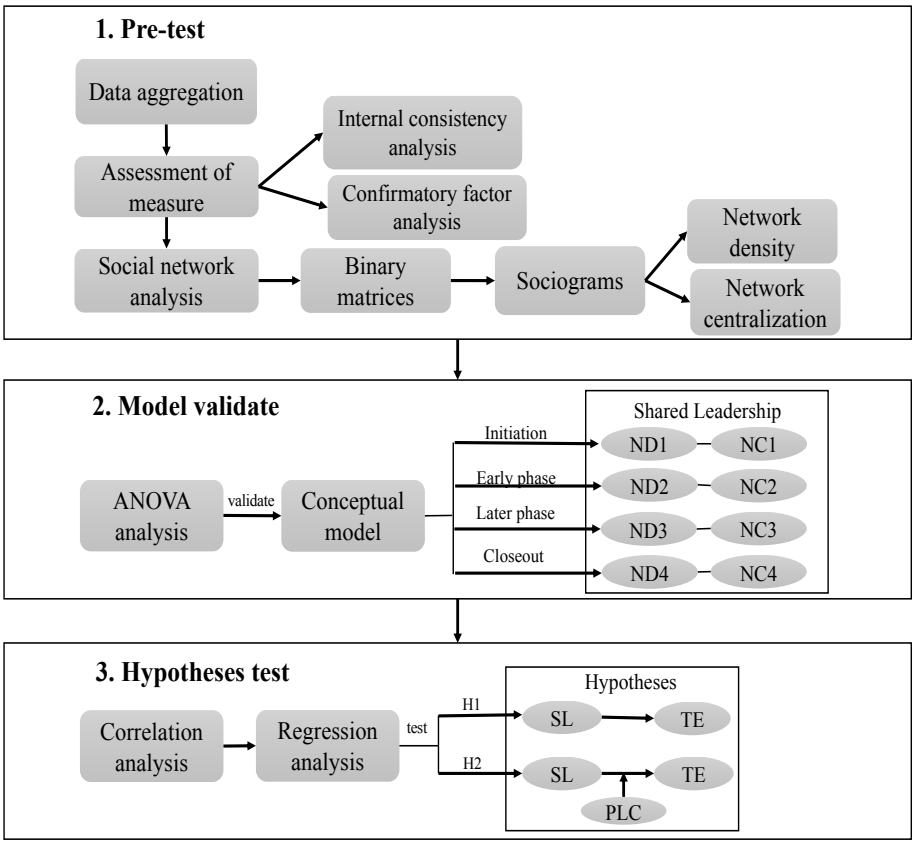


Figure 8: Data analysis flow

Note: ND: network density, NC: network centralization, SL: shared leadership, TE: team effectiveness, PLC: project life cycle.

As shown in Figure 8, the process of the data analysis includes three parts. The first part focuses on the pre-test. It contains data aggregation, assessment of measures (using internal consistency analysis and confirmatory factor analysis), and social network analysis (including creating binary matrices, drawing sociograms and calculating network density

and network centralization). The second part focuses on model validation. Specifically, a One-way ANOVA analysis was used to validate the conceptual model and to check how shared leadership changes during the project life cycle. In detail, his study analyzed the shared leadership networks regarding its network density and network centralization across different phases of the project life cycle. The third part includes correlation analysis and regression analysis, in order to test the hypothesis 1a (shared leadership is positively related to team task performance), hypothesis 1b (shared leadership is positively related to team viability), hypothesis 1c (shared leadership is positively related to team effectiveness) and hypothesis 2 (stages of project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than at the later phase of project life cycle).

4.6 Summary

In summary, in this chapter, the research problems are restated, the flow for research design is outlined, the measures for all constructs in this study is introduced, the process of survey development is presented, and the methodologies for data analysis is described. The next chapter will show the results of the data analysis.

Chapter 5: Results

5.1 Data aggregation

As shared leadership is a team-level construct, a team-level analysis was performed. To do that, the within-group agreement and between-group variability (James et al., 1984) were tested, so as to justify the aggregation of individual responses to the team level constructs. Specifically, r_{wg} was used to assess the within-group agreement. Intraclass correlation coefficient ICC (1) and reliability of the mean ICC (2) were employed to examine between-group variability. This was done for the following team-level constructs, a) shared leadership, b) team viability, c) team performance and d) team effectiveness (see Table 15). As shown in Table 15, the results of within-group agreement, r_{wg} for shared leadership, team viability, team performance and team effectiveness are .75, .84, .81 and .82 respectively. These results indicate that there is a high level of agreement among respondents when rating these constructs, as each of the results exceed the 0.6 criterion according to Lebreton and Senter (2007). Moreover, Table 15 also shows that the intraclass correlation coefficient, ICC (1) and reliability of the mean, ICC (2) for shared leadership is .44 and .77, team viability is .66 and .90, team performance is .73 and .92, and team effectiveness is .73 and .92, respectively. The results of ICC (1) imply that a considerable part of the variances of these constructs is explained by team members; ICC (2) scores (above the required cutoff value of .60) indicate that the constructs of shared leadership, team viability, team performance and team effectiveness differs between groups. Therefore,

it is totally reasonable to aggregate shared leadership, team viability, team performance and team effectiveness as team-level constructs in this research.

Table 15: Results of data aggregation analysis

Constructs	**r_{wg}**	**ICC (1)**	**ICC (2)**
Shared leadership	.75	.44	.77
Team viability	.84	.66	.90
Team performance	.81	.73	.92
Team effectiveness	.82	.73	.92

5.3 Assessment of measures

To assess the reliability, convergent and discriminant validity of the measurements, an internal consistency analysis and a confirmatory factor analysis was conducted. To be specific, Cronbach alphas were calculated to assess the reliability of measurements in the internal consistency analysis (Trochim & Donnelly, 2001). Factor loadings, composite reliability, average variance extracted (AVE) were used to assess the convergent and discriminant validity of the measurements for the confirmatory factor analysis (Brown, 2014). The relevant results are outlined in the Table 16. Firstly, we can see that the values of Cronbach alpha (except shared leadership and project life cycle, which have a single measure) range from 0.86 to 0.95, which indicate a good reliability of our measures (Trochim & Donnelly, 2001). Furthermore, the values of composite reliability range from 0.86 to 0.95, above the 0.70 recommended level. The scores of AVE ranges from 0.58 to 0.75, which exceeds the 0.5 criterion. These results point that the convergent validity of

the measurement in this research is good (Brown, 2014). As for the discriminant validity, this study followed Brown (2014) to compare the relationship between the square root of the AVE scores and the correlations among constructs to measure the discriminant validity. The results show that the square root of the AVE scores for each construct is larger than the correlations among the constructs, which confirms the discriminant validity for this research.

Table 16: Results of internal consistency analysis and confirmatory factor analysis

Constructs	Items No.	Factor loading	Cronbach's alpha	Composite reliability	AVE
Shared leadership	SL	NA	NA	NA	NA
Team viability	TV1	0.80	0.86	0.95	.61
	TV2	0.81			
	TV3	0.80			
	TV4	0.71			
Team performance	PG3	0.88	0.94	0.86	.75
	PQ1	0.86			
	PS1	0.85			
	PC1	0.88			
	OS3	0.87			
Team effectiveness	TV1	.76	0.95	0.92	.58
	TV2	.77			
	TV3	.76			
	TV4	.75			
	PG3	.86			
	PQ1	.87			
	PS1	.83			
	PC1	.89			
	OS3	.86			
Project life cycle	PLC	NA	NA	NA	NA

5.4 Social network analysis

Social network analysis was used in this research to measure shared leadership. Compared to the aggregation technique that concentrates on specific leadership behaviors, social network analysis, as an inherently relational method, provides approaches for modeling the leadership relations involving both vertical (i.e., between official leader and team members) and lateral (among team members) patterns within teams (Mehra et al., 2006). It is especially well suited to measure shared leadership that because it allows for assess the extent to which all individuals are involved in the leadership of the group, as well as the degree of distribution of leadership in the group. As such, this study adopted social network techniques to measure shared leadership and followed by the procedures documented in Pastor and Mayo (2002), who are among the first to present a step-by-step approach of social network analysis in the field of shared leadership, which approach is widely used for researchers (e.g., Carson et al., 2007, Mehra et al., 2006) to measure shared leadership from a social network perspective. It includes developing binary matrices, sociograms and calculating network density and centralization. The detailed steps are illustrated as follows.

5.4.1 Binary Matrices

Creating binary matrices is a first step. It is significant to quantify the degree of leadership influence for each team and to represent the presence or absence of leadership relations between pairs of team members. To be specific, the raw data collected from each participant are aggregated and included in g*g squared matrices (see Table 17). These data

were then dichotomized, where values of 4 (to a great extent) or 5 (to a very great extent) are considered as 1, and values less than 3 are assigned a value of 0. It means that an original network of data was changed into a binary network of data, where this study only counts the presence (rather than the strength) of the leadership relations.

Table 17: From original matrix of shared leadership network to binary matrix

	Original matrix of shared leadership network						
	A	B	C	D	E	F	Total
A	—	2	4	3	4	3	13
B	5	—	2	4	2	4	17
C	4	2	—	4	3	2	15
D	4	4	3	—	3	5	19
E	4	2	4	2	—	3	15
F	3	4	2	3	2	—	14

Note: Cell values are means of the shared leadership measurement items.
A to F means team member A to team member F.

↓

	Binary matrix of shared leadership network						
	A	B	C	D	E	F	Total
A	—	0	1	0	1	0	2
B	1	—	0	1	0	1	3
C	1	0	—	1	0	0	2
D	1	1	0	—	0	1	3
E	1	0	1	0	—	0	2
F	0	1	0	0	0	—	1

Note: this is an example in this research.

5.4.2 Sociograms

To illustrate the visibility of shared leadership networks, this research created leadership sociograms for each team based on binary matrices generated (Pastor & Mayo, 2002). Figure 9 presents three examples used in this research for the shared leadership networks. As shown in Figure 8, the nodes symbolize team members, and the arrows are leadership relations. One arrow points from team member (A) to member (B), indicating that B is perceived as a source of leadership by A. In this vein, two-headed arrows imply that two members perceive each other as a source of leadership.

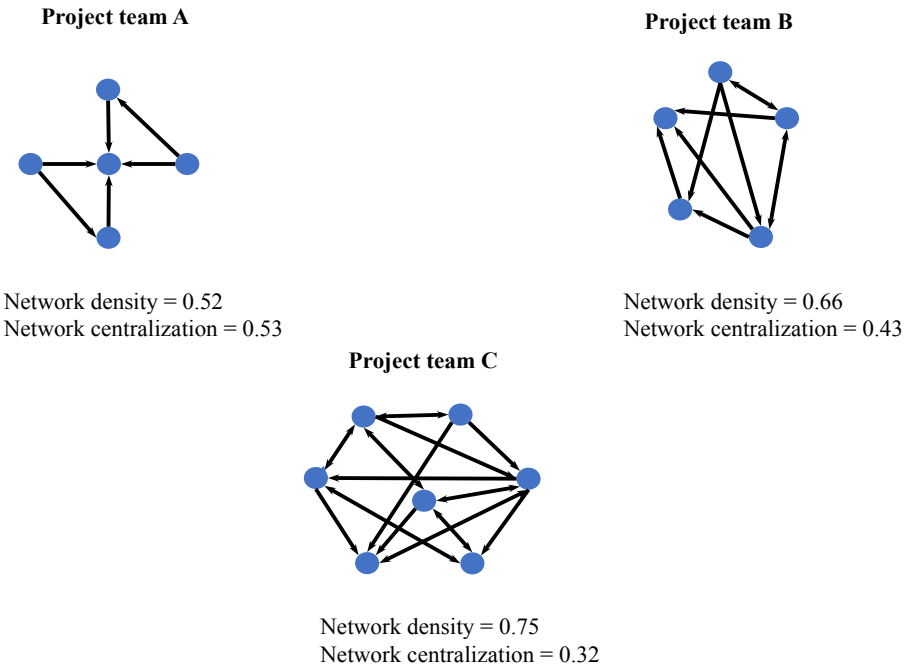


Figure 9: Sociograms and values of network density and network centralization

5.4.3 Network density and network centralization

The last step is to calculate the network density and network centralization. Network density is used to assess the compactness or closeness of the shared leadership network. It was calculated by summing all of the actual responses of team members divided by the total number of possible ties, or relations, among team members (Carson et al., 2007). The values of density range from 0 to 1, where higher values imply a greater level of leadership influence displayed by team members as perceived by others. In addition, network centralization is used to examine the distribution of leadership roles within teams and whether these links are organized around particular focal points (Mehra et al., 2006). It was calculated by summing the differences between the maximum member value and every other member value and then dividing that sum by the maximum possible sum of differences (Aubé et al., 2017). The values for centralization also range from 0 to 1, with lower values corresponding to higher levels of shared leadership within the team. In detail, a highly centralized network is hierarchical with one or few actors central, whereas in a decentralized network, distribution of leadership influence is equal. As shown in the Figure 8, the values of network density and centralization for each project team was calculated. We can see that project team C has the highest level of network density and the lowest level of network centralization, which means the leadership is mostly shared in this team.

5.5 Model validation

To validate the conceptual model, this research employed the One-Way ANOVA analysis. It is used to determine if there are significant differences in shared leadership (network density and network centralization) across different phases of the project life cycle. The result of One-Way ANOVA analysis is illustrated in Table 18. From the table, we can see that network density (p = .006, F = 5.402) has significant differences among different phases of the project life cycle (initiation, early stage, later stage and closeout), whereas there is no significant difference in network centralization (p = .061, F = 2.839) among these four phases. These results indicate that shared leadership changes across the project life cycle; such changes exist not in the centralization of shared leadership networks, but in the density of shared leadership networks.

Table 18: Results of One-Way ANOVA analysis

	Project life cycle (M+SD)					
	Initiation	Early stage	Later stage	Closeout	F	p
Network density	0.65+0.09	0.70+0.06	0.60+0.06	0.64+0.02	5.402	.006
Network centralization	0.43+0.11	0.37+0.07	0.46+0.09	0.45+0.02	2.839	.061

Note: M = Mean, SD = Standard deviation

This research further examined differences of network density between each of the two key phases of the project life cycle (the early phase VS the later phase). The results show that the density of shared leadership networks is significantly different in the early phase of the project life cycle when compared with the later phase (P = 0.001, F = 13.266). Network

density of shared leadership in the early stage (M = 0.69, SD = 0.06) is larger than it is in the later stage (M = 0.62, SD = 0.05). Figure 10 demonstrates graphically the scores of network density for both groups. It implies that more team members exert leadership influence on each other in the early phase than in the later phase of the project life cycle.

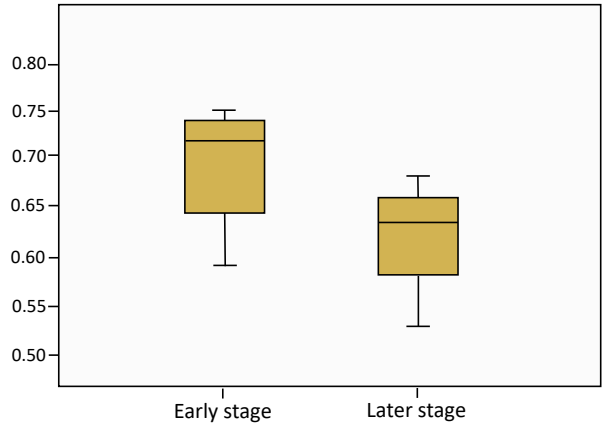


Figure 10: Scores of network density in the early stage and late stage

5.6 Hypotheses test

There are four hypotheses in this research: 1a (shared leadership is positively related to team task performance), hypothesis 1b (shared leadership is positively related to team viability), hypothesis 1c (shared leadership is positively related to team effectiveness) and hypothesis 2 (stages of project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than at the later phase of project life cycle). In order to test these hypotheses, this research used correlation analysis and regression analysis. First of all, correlation analysis was used to examine the strength of correlations among all the constructs in this research.

Table 19 presents the results of correlations together with some descriptive statistics. As illustrated in Table 19, shared leadership is positively and significantly correlated to team task performance ($r = .52$, $p < .01$), team viability ($r = .43$, $p < .05$) and team effectiveness ($r = .50$, $p < .05$), which provides preliminary support evidence to support Hypothesis 1a, 1b and 1c. Moreover, this research also found that project life cycle is negatively associated with shared leadership ($r = -.46$, $p < .05$). It further confirms that shared leadership is more likely to emerge in the early phase than later phase of the project life cycle.

Table 19: Descriptive statistics and correlations

Variables	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Shared leadership[a]	0.66	0.35	-							
2.Team task performance	3.69	0.74	.53**	-						
3.Team viability	3.71	0.67	.43*	.92***	-					
4. Team effectiveness	3.70	0.69	.50*	.96***	.97***	-				
5. Project life cycle	55.8	0.28	-.46*	-.38	-.35	-.37	-			
6. Team size	4.46	1.48	.12	-.09	.11	-.01	-.17	-		
7. Team mean tenure	2.48	0.53	.00	.12	.08	.10	-.02	.03	-	
8. Educational diversity	2.19	0.20	-.25	.02	-.05	-.02	.14	-.02	.07	-

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$

[a] The value of shared leadership is based on the density of shared leadership networks.

To further test the relationship between shared leadership and team effectiveness, a hierarchical regression analysis was performed (Carson et al., 2007; Gu et al., 2016; Rolfsen et al., 2013). Hierarchical regression analysis provides techniques to model and analyze several variables when focusing on the relationships between a dependent variable and one or more independent variables. Specifically, in the hierarchical regression model,

the control variables, team size, team mean tenure and educational diversity were entered first for our research. Shared leadership as an independent variable was entered in the second step. Table 20 depicts the results of regression analyses. As can be seen in model 1 in Table 20, the control variables were not significantly associated with team effectiveness. However, in model 2, we can find that there is a significantly positive influence of shared leadership on team effectiveness ($\beta = 0.53$, $p < .05$), which fully support hypothesis 1c.

Table 20: Results of regression analysis for team effectiveness

	Team effectiveness		
Variables	**Model 1**	**Model 2**	**Model 3**
Step 1			
Team size	-0.01	-0.07	-0.11
Team mean tenure	0.10	0.09	0.10
Educational diversity	-0.03	0.10	-0.14
Step 2			
Shared leadership [a]		0.53*	0.26
Step 3			
Shared leadership[a] * project life cycle[b]			-0.47*
R^2	0.10	0.27	0.41
Adjust R^2	-0.13	0.13	0.26
F	0.08	1.95	2.76*

Notes: * $p < .05$

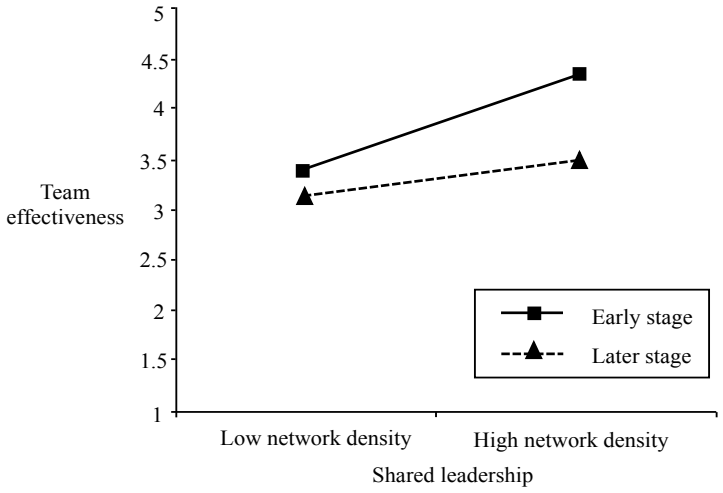
[a] The value of shared leadership is based on the density of shared leadership networks.

[b] Project life cycle: early phase = 5%-56% project completion;
later phase = 58%-100% project completion.

In order to test for hypothesis 2, a two-way moderated hierarchical regression analysis was run (Chiu et al., 2016; Erkutlu, 2012; Rolfsen et al., 2013). Two-way moderated hierarchical regression analysis is used to examine the effect of a moderating variable on

the relationship between dependent and independent variables. This study tested the moderating role of project life cycle in the relationship between shared leadership and team effectiveness. Specifically, in this research, the interaction terms (predictor variable, shared leadership and moderator variable, project life cycle) was added and entered in the third step. These results are illustrated in Table 20. As shown in model 3 in Table 20, the interaction between shared leadership and project life cycle (β = -0.47, $p < .05$) is significantly related to team effectiveness. Following the methods of Aiken et al. (1991), this study graphically plotted the relationship between shared leadership and team effectiveness as moderated by project life cycle (Figure 11). We see that a positive relationship is stronger in the early stage, when compared to the later phase of the project life cycle. Therefore, hypotheses 2 was supported.

Figure 11: The moderating effect of project life cycle on the relationship between shared leadership and team effectiveness



5.7 Summary

In summary, this chapter provides results of the data analysis for this research. It involves the results of data aggregation, the assessment of measures, and results of social network analysis. It also presents the results of model validation and hypotheses test. These results show that shared leadership changes across the project life cycle; such changes exist not in the centralization of shared leadership networks, but in the density of shared leadership networks. Further, the density of shared leadership networks is significantly larger in the early stage than it is in the later stage. Moreover, the findings of this research support hypothesis 1a (shared leadership is positively related to team task performance), hypothesis 1b (shared leadership is positively related to team viability), hypothesis 1c (shared leadership is positively related to team effectiveness) and hypothesis 2 (the stage of project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than at the later phase of project life cycle). The next chapter will discuss the findings, illustrate the limitations, present the recommendations and draw the conclusion.

Chapter 6: Conclusion

Integrating literature on shared leadership, team effectiveness and project life cycle, the current study sheds light on our understanding of the dynamic nature of shared leadership: it explores how shared leadership changes throughout the whole process of the project life cycle; examines the relationship between shared leadership and team effectiveness as well as investigating the moderating role of the project life cycle in such relationship. Table 21 summarized the key findings/deliverables together with the relevant research questions. The findings of this research bring important theoretical contributions and practical implications. The details are discussed below.

Table 21: Key findings/deliverables and the relevant research questions

Items	Research questions	Key findings/deliverables
Q1	How is shared leadership defined and measured in the literature?	**Deliverables:** • A new concept of shared leadership is formulated based on a synthesis of 26 existing definitions. • The difference between shared leadership and traditional vertical leadership as well as other similar leadership concepts are generated. • An evaluation on the measurement approach of shared leadership is provided.
Q2	Which kind of antecedents, consequences, mediating mechanisms and boundary conditions of shared leadership have been previously investigated?	**Deliverables:** A nomological network of shared leadership that integrates its antecedents, consequences, mediator as well as moderators is developed.
Q3	How does shared leadership changes during four phases of the project life cycle, initiation, early phase, later phase and closeout?	**Findings** • This research found that the density of shared leadership changes across the project life cycle. • There is no significant difference in the centralization of shared leadership among different phases of the project life cycle. • Leadership is more shared in the early phase rather than later phase of the project lifecycle.

Q4	What is the relationship between shared leadership and team effectiveness?	**Findings** • This research found that shared leadership is significantly positive related to team task performance. • Shared leadership is significantly positive related to team viability. • Shared leadership is significantly positive related to team effectiveness.
Q5	Do the stages of project life cycle moderate the relationship between shared leadership and team effectiveness? If yes, how to moderate?	**Findings** This research found that the project life cycle moderates the relationship between shared leadership and team effectiveness, such that this relationship is stronger at the early phases than at the later phases of the project life cycle.

6.1 Discussion of findings

First of all, the current study is among the first efforts to investigate the changing patterns of shared leadership from a social network perspective during different stages of the project life cycle. The results indicate that shared leadership changes across the project life cycle; such changes exist not in the centralization of shared leadership (dispersion of leadership roles), but in the density of shared leadership networks (extent to which team members are perceived to be involved in shared leadership). When going through the details of how the density of shared leadership networks changes, this study found that the higher level of shared leadership density is in the early stage than in the late stage. This is because, in the late phase, the focal concern of the project teams on executing project plans to meet deadlines and keep cost within budgets, whereas the emphasis of the early phase is on planning and strategy generation in the early phase (Burke, 2013; Chang et al., 2003). Team members in the early phase are thus encouraged to engage in interacting, cooperating and

exchanging information toward planning and strategy generation. It is consistent with the emergence of shared leadership reported in Carson et al. (2007), Daspit et al. (2013), Serban and Roberts (2016), and Travers (2018) who suggest the level of 'voice' is positively associated with the density of shared leadership. Carson et al. (2007) pointed out voice connotes participation and input, where group members participate in decision making and constructive change-oriented communication. The presence of high degrees of voice in teams would create an internal environment in which team members engage in mutual leadership by committing to and becoming proactively in pursuit of team objectives (Carson et al., 2007). Accordingly, such high levels of involvement within teams nourish shared leadership.

Second, joining a handful of research on shared leadership, this study replicated previous findings and further confirmed that shared leadership exerts a positive influence on team effectiveness. However, this study went beyond previous research by considering team effectiveness from two perspectives, team task performance and team viability. Specifically, this research linked shared leadership with team task performance (that is defined as how well the group meets (or even exceeds) expectations regarding its assigned charge at work). Shared leadership has been consistently shown to be critical for improving team performance by numerous shared leadership scholars and practitioners (Carson et al., 2007; Chiu et al., 2016; D'Innocenzo et al., 2014; Ensley et al., 2006; Fransen et al., 2018; Hoch, 2014; Kukenberger & D'Innocenzo, 2017; Wang et al., 2014). Although many

studies have advocated the benefits of shared leadership on team performance, there are still some disagreement and controversy surrounding it. For instance, Mehra et al. (2006) failed to find support for the ideas about the positive relationship between shared leadership and team performance, and even some researchers found shared leadership identified exerts negative influence on team performance (e.g., Boies et al., 2011). The results of this study support the main stream of research and demonstrate that shared leadership play a positive role in enhancing team task performance. Moreover, the findings also suggest that shared leadership is positively associated with team viability (that is considered as the potential of teams to retain its members and to keep proper team functioning over time). This finding is consistent with previous studies that suggest shared leadership fostering team functioning and team member satisfaction. For example, Bergman et al. (2012) demonstrated that teams with shared leadership experience less conflict, greater consensus, and higher intragroup trust and cohesion than teams without shared leadership. Wood and Fields (2007) suggested, as the greater empowerment and autonomy inherent to shared leadership, shared leadership exerts positive impacts on the job satisfaction of team members. Therefore, under the sharing of leadership where members of teams feel increased interdependence, more collaboration with others, and sense greater satisfaction, team potential to retain its members and to keep proper team functioning over time is enhanced.

Thirdly, the examination of the moderating role of the project life cycle contributes insights into the boundary conditions of the relationship between shared leadership and team effectiveness. The results of this study show that the stage of project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than the later phase of the project life cycle. This finding is consistent with another results of this research that the density of shared leadership network is greater in the early stage than the later stage. To be specific, the early stage of the project cycle life has higher-level network density that team members exert leadership influence collectively toward planning and strategy generation, which allows individuals bring more resources to the task, share more information and experience higher commitment within teams. Collectively, it results in greater team effectiveness.

6.2 Practical implications

This research brings significant practical implications to management practitioners. Most notably, the findings of this research confirm that the positive relationship between shared leadership and team effectiveness, consisting of team task performance and team viability. It indicates that shared leadership can be a useful way that is beneficial in improving team effectiveness. This research thus underscores the need for organizations to recognize and leverage such effective leadership strategy. Moreover, the results of this research show that the density of shared leadership is higher in the early phase than the late phase and the relationship between shared leadership and team effectiveness is also stronger in the early

phase than the late phase. It indicates the environment that early phase has nourishes the emergence and development of shared leadership. This kind of environment involves cross-functional communication and coordination toward planning and strategy generation. Managers are therefore suggested to

1) Establish clear, well-defined goals and objectives;
2) Provide team members adequate opportunity to participate in team activities in order to interact and learn of each other's competences;
3) Create a positive team climate whereby members feel comfortable when they take charge and/or defer to their fellows;
4) Establish a psychologically safety environment by encouraging members to take leadership roles and responsibilities and making them feel comfortable to take risks;
5) Provide proper training programs for employees to nurture a shared leadership perspective in teams;
6) Adopt a benchmark from a social network perspective to describe what shared leadership is happening within teams.

Furthermore, this research also brings some implications for organizations to maintain effective shared leadership processes. For example, shared leadership does not seem to be applicable to teams with routine, repeated and inflexible tasks. On the contrary, it could become effective in teams with complex, novel and flexible tasks, where team members would need each other to be involved in information sharing. Organizations could also

increase the interdependence of team tasks by enhancing coordination among team members; and increase team autonomy by allowing individuals to apply their knowledge and abilities autonomously, to maximize the effectiveness of shared leadership.

6.3 Limitations of this study

As with most research, this study is not without limitations. First of all, this study did measure the changing patterns of shared leadership throughout the project life cycle, by collecting empirical data in engineering design project teams that are during different phase of the project life cycle. However, longitudinal designs are not employed. Therefore, future research with employing longitudinal data to understand how shared leadership develops over time are encouraged. Second, the current study used the project life cycle as a generic example to investigate how shared leadership changes as it is a good example of a dynamic team environment (with different processes, inputs and outputs) that is lauded to stimulate the emergence and development of shared leadership. However, it is important to say that this life cycle perspective focuses on different specific scenarios which are not applicable to non-project teams (e.g. work groups). It thus serves as another suggestion for shared leadership scholars to further examine the changes of shared leadership in non-project teams. Third, this research used self-report studies that rely on a certain level of introspective ability from respondents to answer questions. However, respondents in self-report studies may be prone to response bias which could lead to deviation in the data. To combat this, future studies might consider including data from both external assessments

such as independent experts, and self-reported data from internal respondents. Forth, this study did find that the density of shared leadership is higher in the early phase than the late phase and also the relationship between shared leadership and team effectiveness is stronger in the early phase than the late phase. It then suggested the reason behind could lies in the fact that the positive environment (i.e., cross-functional communication and coordination, and actively participation in decision-making process) that early phase has nourishes shared leadership. But this study did not directly examine these factors that could simulate the emergence and development of shared leadership. It would be a promising research direction for future research.

6.4 Agenda for future research

Further to a detailed analysis on the literature of shared leadership and the research findings, this article significantly advances our understanding of the field, nevertheless there are still some considerable gaps. Below, a detailed agenda for future research on shared leadership comprising seven domains of opportunity is presented. It involves 1) the interplay between vertical and shared leadership; 2) dynamic nature of shared leadership; 3) measurement of shared leadership; 4) antecedents of shared leadership; 5) consequences of shared leadership; 6) mediators and moderators of shared leadership; and 7) limits of shared leadership.

6.4.1 The interplay between vertical and shared leadership

As discussed above, vertical leadership styles (e.g., empowering, transformational and servant leadership) and leader's characteristics (e.g., leader humility and leader integrity), significantly influence the emergence of shared leadership. This research thus suggests future research should focus on actions of the vertical leader that plays a critical catalytic role in the promotion of shared leadership. In the meantime, studies that investigate the relative contribution of various categories of vertical leadership strategies (i.e., empowering, transformational and servant leadership) for enhancing shared leadership, are also encouraged. Further, employing longitudinal studies to uncover the interplay between vertical and shared leadership over time is also a promising avenue. This research also encourages future studies focusing on suitable contexts for the interaction between vertical and shared leadership. For example, Von Krogh et al. (2012) developed a theoretical framework that shows how shared leadership coexist together with traditional leadership in the SECI (Socialization, Externalization, Combination, Internalization) process within an organization. Therefore, questions seeking to understand whether there are some kind of setting that is more beneficial for the coexistence of these two leadership forms, or whether there is one kind of setting that by their very nature impede one form over the other, are worthy of future investigation.

6.4.2 The dynamics of shared leadership

Notwithstanding theory that emphasizes that shared leadership is a dynamic process (Day et al., 2004; Fletcher & Käufer, 2003; Pearce & Conger, 2003), insight into this phenomenon is limited (see Pearce et al., 2004; Zhu & Lee, 2017). In order to have a more fine-grained understanding on the intrinsic of shared leadership, researchers should pay more attention to its dynamic characteristics. First, our understanding of the transition triggers for the sharing of leadership is a particularly significant future research area (Conger & Pearce, 2002). Shared leadership is regarded as a process of "serial emergence" (Pearce et al., 2004), and role rotation between leader and follower at different points over time (Zhu & Lee, 2017), thus the triggers for one to lead are based on the *task or demand transitions*. It raises several questions: what are typical triggers that *initiate* shared leadership? After the emergence of shared leadership, are there further kinds of triggers that enhance ongoing transitions? Accordingly, are we able to categorize transition triggers around time frames (short-time frame triggers vs longer-term, developmental triggers)? Second, further investigation into the influence of the dynamics of shared leadership on team outcome is needed. Prior research explored how the dynamics of shared leadership are related to group performance in strategy simulating game teams (Drescher et al., 2014). Wang et al. (2017a) also examined how shared leadership and team learning behaviors influence each other over time in self-managed teams. Scholars should further advance this line of research to study how the dynamics of shared leadership influence team process and

outcomes across various contexts. Third, since shared leadership is a dynamic process, longitudinal research designs is essential. However, the majority of extant empirical studies only include one-time point, thus another avenue for future researches is considered longitudinal three or more time points to investigate shared leadership.

6.4.3 Measurement of shared leadership

The extant measurement approaches used in shared leadership considerably contribute to the burgeoning stream of empirical shared leadership studies. However, due to the complexities of shared leadership, new measurement techniques still need further attention. First, social network approaches have been widely used in shared leadership studies, especially for the network density using measures developed by Carson et al. (2007). This study asks team members to rate the degree to which their teammates exerted "leadership" rather than specifying detailed leadership behaviors. Although it captures the overall patterns of shared leadership network, it neither specifies the meaning of leadership nor primed specific behaviors for team members. Therefore, future studies can make valuable contributions by developing measures that capture both overall patterns of leadership network and specific leadership behaviors shared among team members. The second research direction is combining different network measures, for instance, network density and network centralization. Such a combination for assessing shared leadership presents richer information about quantity and dispersion of leadership being shared and provides a more realistic picture of shared leadership within teams.

6.4.4 Antecedents of shared leadership

Another future research avenue concerns the antecedents of shared leadership in other words, those factors that facilitate the emergence or development of shared leadership within teams. While this research has synthesized different kinds of shared leadership antecedents from empirical studies, many other important factors have been undeveloped. Specifically, as mentioned above, while previous studies have explored the facilitators of shared leadership at individual level (e.g., leader humility and team members characteristics) or team level of analysis (e.g., team environment and team characteristic), little is known about the organizational level of analysis, such as organizational culture, design, or politics. The one exception is a study of Choi (2009) who explored the influence of organizational structure, culture and context on shared leadership from a public sector perspective. However, much additional work is needed to empirically examine what types of organizational factors that are crucial for the display of shared leadership. Moreover, many antecedent factors of shared leadership that have been proposed in the theoretical articles, have yet to be examined, like task complexity and life-cycle issues (Conger & Pearce, 2002), shared mental models (Fiore & Salas, 2002), team member turnover (Avolio et al., 2003), team proximity and team size (Cox et al., 2003), structural arrangements and leader vulnerability (Shamir & Lapidot, 2003), cultural diversity (Ramthun & Matkin, 2012), self-leadership (Hoch & Dulebohn, 2013), overarching lessons (Pearce et al., 2014), team personality composition (Hoch & Dulebohn, 2017) and so forth. Additionally, this

research also encourages future research to explore more facilitators of shared leadership in a broad range of contexts, such as cross-functional project teams (Cox et al., 2003), virtual teams (Hoch & Dulebohn, 2017) and sport teams (Kang & Svensson, 2018).

6.4.5 Consequences of shared leadership

To date, scholars have proved the benefits of shared leadership by exploring its powerful impact on team attitudinal outcomes, behavioral outcomes, team cognition and performance outcomes. This research encourages further studies to advance this line in the following way. First, more studies are needed to examine any potential links between specific types of shared leadership and team outcomes. For example, Wang et al. (2014), have categorized shared leadership into shared traditional leadership, shared new-genre leadership, and cumulative, overall shared leadership, and explored the influence of each of them on team effectiveness. Thus, more fine-grained analyses on the effects of each type of shared leadership (e.g., shared transformational leadership and shared empowering leadership) on team outcomes would prove useful. Second, due the fact that the majority of empirical studies have focused on the outcomes of shared leadership at the individual and team level, this research recommends that more consequences at the firm and organizational level should be examined, examples include firm competitive advantage and organizational effectiveness and creativity. Third, as suggested above, future studies can make a valuable contribution examining the relationship between shared leadership and its outcomes, in longitudinal studies and a wide variety of contexts.

6.4.6 Mediators and moderators of shared leadership

As theory develops, it is worthwhile to analyze the mediating mechanisms and boundary conditions of shared leadership in future studies. This will provide opportunities to advance our understanding of how shared leadership influences team outcomes. In detail, future research should clarify the underlying mediating mechanisms that transmit the effects of shared leadership on team outcomes. Although some of mediators have been explored, others like emergent states (e.g., team cognition) and team processes (e.g., interpersonal processes) are worthy of future investigation. While a mediator provides an explanation of how shared leadership links with team outcomes, a moderator has been regarded as a condition that impacts the direction and degree that shared leadership is associated with team outcomes (Barnett & Weidenfeller, 2016). Thus, it is also important to examine a wide range of boundary conditions of shared leadership, like task-related characteristics (e.g., task time demands), team-related characteristics (e.g., team virtuality), organization-related characteristics (e.g., organizational culture and values). This should serve as a fruitful avenue for future studies.

6.4.7 Limits of shared leadership

Shared leadership, as a new leadership pattern that has been demonstrated to facilitate team processes and team outcomes. But as Conger and Pearce (2002) suggested, this research does not advocate shared leadership as a panacea for all organizational woes. However, studies on the limits of shared leadership are quite few. The one exception is the study of

Conger and Pearce (2002) who presented the five limitations to shared leadership including (a) lack of knowledge, skills, and abilities necessary for shared leadership; (b) lack of goal alignment between team members; (c) lack of goal alignment between the team and the organization; (d) lack of time to develop shared leadership; and (e) lack of receptivity to shared leadership. Further studies should empirically examine these five liabilities and much additional work is needed to study other types of limits of shared leadership in more detail. Furthermore, Pearce (2004) have suggested that shared leadership is a more complex and time-consuming process than traditional vertical leadership. Research concerning when and for whom shared leadership is inappropriate should be another interesting avenue and thus worthy of further attention.

6.5 Conclusion

As a result of the proliferation of self-managed teams (Solansky, 2008) and decentralized organizational designs (Balogun & Gerry, 2004), the topic of shared leadership has recently emerged in the literature and received considerable attention. It offers an alternative perspective on leadership: from a traditional understanding of a leader-centric and individual-level phenomenon, to a dynamic, interactive group-level leadership phenomenon (Pearce, 2004). However, although the exponential surge of shared leadership studies, a systematic review that surveys the full shared leadership literature is undeveloped. Moreover, there is still lack of insights into the dynamics of shared leadership, which impedes its theoretical and empirical advancement. Followed by these, this study provided

a systematic literature review of *what* has been studied thus far in the field of shared leadership. It also investigated *how* shared leadership changes across the project life cycle; as well as *whether* and *when* shared leadership influences team effectiveness.

By doing these, the findings of this research make significant contributions to the area of shared leadership. First of all, it provides coherence and clarity in this field and presents scholars an integrated, comprehensive overview of shared leadership studies, involving outlining the importance of shared leadership in organizations, offering a new definition, synthesizing differences with other leadership theories, evaluating its measurements approaches, as well as mapping a nomological network of its antecedents, consequences, mediating mechanisms and boundary conditions. Secondly, it reveals the dynamic nature of shared leadership by investigating the changing patterns of shared leadership from a social network perspective during different stages of the project life cycle. This research found that the density of shared leadership is larger in the early phase than the later phase of the project life cycle. This is the first study to theoretically develop, empirically test a conceptual model of the changing process of shared leadership across the whole project life cycle. It encourages future study to advance this line by focusing on the dynamic nature of shared leadership and exploring its developing pattern. Thirdly, it reintegrates the relationship between shared leadership and team effectiveness (including two perspective, team task performance and team viability) and confirms their positive association. This finding provides supports for the previous studies that suggest the positive influence of

shared leadership on team outcomes. 4) it also extends a long line of research that explored the moderating role of the project life cycle in the relationship between shared leadership and team effectiveness. This study found that the stage of project life cycle moderates the positive association between shared leadership and team effectiveness, such that this relationship will be stronger at the early phase than the later phase of the project life cycle. This finding adds valuable debates in what conditions shared leadership plays a stronger or weaker role in team effectiveness. 5) Finally, this research brings insightful thoughts to shape future shared leadership studies and practical suggestions for project managers in industry who seek to implement best practice in organizations toward high team effectiveness.

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Appendix

Appendix 1: Questionnaire of this study

CONSENT TO PARTICIPATE IN RESEARCH

You are being invited to join a research study conducted by Qiong Wu, a Doctoral candidate from National University of Ireland, Galway. She is doing research on *"Shared leadership and team effectiveness: A social network analysis in the project life cycle"*.

PURPOES OF THE STUDY

The purpose of this study is to identify the shared leadership patterns in project teams, and then understand its evolvement during different phases of the project life cycle, as well as exploring its influence on team effectiveness. You help will benefit us to achieve these aims.

POTENTIAL RISKS

In this study, there are no foreseeable risks to you. Your participation is entirely voluntary. You can select to be in this research or not. Even if you are participating, you can withdraw without penalty or loss of benefit to yourself. The results of this study could be published; however, all responses are strictly confidential and anonymous. Your personal information will not be shared.

PROCEGURES

You should follow the procedures to participate in this study:

1. Answer the first question and agree to participate.
2. Next, you will start your survey. It is divided into 3 parts:
   Part A seeks to capture some information about you and your role;
   Part B deals with questions relating to your team effectiveness;
   Part C is about the leadership performed in your team.
3. All questions are with single choice.
4. There are totally 30 questions in this survey. It will take no longer than 15 minutes to complete.

IDENTIFICATION OF INVESTIGTORS

If you have any questions or concerns about this study, please feel free to contact the following email: Q.wu1@nuigalway.ie.

AGREEMENT TO PARTICIPATE

Before starting, please answer the first question:

***I read the information described above, and I agree to participate in this study.**

- ☐ Yes, I agree.
- ☐ No, I decline.

Part A:
The following questions are about you and your role in the team.

1. Please select your gender:
   - ☐ A. Male
   - ☐ B. Female

2. How old are you (years old)?
   - ☐ A. <=20
   - ☐ B. 21 to 30
   - ☐ C. 31 to 40
   - ☐ D. 41 to 50
   - ☐ E. >=51

3. Please select your working experience (years)?
   - ☐ A. <=2
   - ☐ B. 3 to 5
   - ☐ C. 6 to 10
   - ☐ D. >=11

4. Please mark the highest education level completed.
   - ☐ High school degree or equivalent
   - ☐ College degree
   - ☐ Master's degree
   - ☐ Doctoral degree
   - ☐ Others, please specify_____

5. Which of the following best describes your role in your team?
   - ☐ A. Project manager
   - ☐ B. Designer/Planner
   - ☐ C. Engineer
   - ☐ D. Operators
   - ☐ E. Admin/Supervision
   - ☐ F. Others, please specify_____

Part B:
In this section, all questions are related to your team effectiveness. Please identify the extent to which you agree with the following statements.

6. How do you rate the following items for your team viability?

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
6a. Our team is capable of solving problems.	☐	☐	☐	☐	☐
6b. New members are easily integrated into this team	☐	☐	☐	☐	☐
6c. Our team adjusts to changes if required.	☐	☐	☐	☐	☐
6d. Employees have enough knowledge and skill to do their task.	☐	☐	☐	☐	☐

7. How do you rate the following items for your team's performance on (a) project goals, (b) project quality, (c) project schedule, (d) project costs, and (e) overall satisfaction?

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
7a. Project goals					
$a_{1.}$ Project goals are clearly defined and communicated to all team members.	☐	☐	☐	☐	☐
$a_{2.}$ Our team shares a common understanding of the goals.	☐	☐	☐	☐	☐
$a_{3.}$ Our team is capable of achieving its objectives.	☐	☐	☐	☐	☐
7b. Project quality					
$b_{1.}$ Our project meets the quality standard specified.	☐	☐	☐	☐	☐
$b_{2.}$ The team is capable of meeting the required quality.	☐	☐	☐	☐	☐
$b_{3.}$ Measures to ensure high levels of quality are included in project plans.	☐	☐	☐	☐	☐
7c. Project schedule					
$c_{1.}$ Our team works hard to meet schedules and timelines.	☐	☐	☐	☐	☐
$c_{2.}$ Unforeseen risks are considered in the schedule.	☐	☐	☐	☐	☐
$c_{3.}$ Our team adjusts ensure that the project is delivered on time.	☐	☐	☐	☐	☐

7d. Project budget					
d_1. We are capable of working within budget.	☐	☐	☐	☐	☐
d_2. Our team actively seeks cheaper alternatives.	☐	☐	☐	☐	☐
d_3. Overall project costs are continuously monitored.	☐	☐	☐	☐	☐
78e. Overall satisfaction					
e_1. I am happy to work in this project team.	☐	☐	☐	☐	☐
e_2. As project owner, I am satisfied with the final results of the project.	☐	☐	☐	☐	☐
e_3. I believe that our customers are (will be) satisfied with the project we delivered.	☐	☐	☐	☐	☐

Part C:

This part is related to the leadership in your team. Please identify the best descriptions to your own.

8. To what degree does your team rely on this individual for leadership?

	Not at all 1	Slightly 2	A moderate degree 3	A great extent 4	A very great extent 5
1. Name 1*	☐	☐	☐	☐	☐
2. Name 2	☐	☐	☐	☐	☐
3. Name 3	☐	☐	☐	☐	☐
4. Name 4	☐	☐	☐	☐	☐
5. Name 5	☐	☐	☐	☐	☐
6. Name 6	☐	☐	☐	☐	☐

*Names are listed in the Alphabetical order.

9. Do you any other comments or observations?

Many thanks for your help.