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PROJECT MANAGEMENT

POJAV DELJENEGA VODENJA V PROJEKTNIH SKUPINAH PRI RAZVOJU IZDELKOV

THE EMERGENCE OF SHARED LEADERSHIP IN PRODUCT DEVELOPMENT PROJECT TEAMS

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POVZETEK

V zadnjih dveh desetletjih so se pod vplivom teorije kompleksnosti pojavili koncepti vodenja, kot je koncept deljenega vodenja. Empirične raziskave potrjujejo prednosti deljenega vodenja v kompleksnih organizacijskih okoljih. Vendar pa je malo znanega o tem, kako nastane deljeno vodenje. Cilj te diplomske naloge je zagotoviti globlji vpogled v pojav deljenega vodenja v kompleksnih okoljih, kot so projektne skupine za razvoj izdelkov. Raziskovalno vprašanje je, kako se v projektnih skupinah za razvoj izdelkov pojavi skupno vodenje. V raziskovalni študiji primera z več modeli s tremi projektnimi skupinami za razvoj izdelkov. Podjetje, v katerem je bila izvedena študija primera, deluje v avtomobilski industriji in je mednarodni inženirski ponudnik. Podatki so bili zbrani s polstrukturiranimi intervjuji, opazovanjem sestankov skupin ter internimi dokumenti projekta in skupine, analizirani pa s pomočjo metodologije Gioia, analize omrežja, analize strukture dogodkov in kvalitativne analize vsebine. Na podlagi analize so bili oblikovani dejavniki, odnosi med temi dejavniki in procesno usmerjen okvir za nastanek skupnega vodenja. Izvirnost raziskave je v razširitvi teorije deljenega vodenja na pojav nastanka. Ugotovitve so pomembne za raziskovalce, saj razširjajo teorijo deljenega vodenja v projektnem kontekstu z dodajanjem dejavnikov, njihovih odnosov in procesov za pojavljanje deljenega vodenja. Ugotovitve so lahko dragocene tudi za praktike, ki delajo v začasnih kompleksnih organizacijah. Mojo raziskavo je mogoče posplošiti na druge ekipe v projektih razvoja izdelkov in ekipe, ki delajo v kompleksnih podjetniških okoljih.

Ključne besede: Skupno pojavljanje vodenja, pojavljanje vodenja, vodstvene funkcije, projektne skupine za razvoj izdelkov, raziskovalna študija primera.

SUMMARY

Over the past two decades, leadership concepts have emerged through the influence of complexity theory, such as the concept of shared leadership. Empirical research confirms the benefits of shared leadership in complex organisational environments. However, little is known about how shared leadership emerges. The aim of this thesis is to provide deeper insights into the emergence of shared leadership in complex environments such as product development project teams. The research question is how shared leadership emerges in product development project teams. In an exploratory multi–design case study with three product development project teams. The company in which the case study was conducted operates in the automotive industry and is an international engineering provider. The data was collected through semi–structured interviews, observation of team meetings, and internal project and team documents and analysed via the Gioia Methodology, a network analysis, the event–structure analysis and the qualitative content analysis. Based on the analysis, factors, relations between these factors and a process–orientated framework for the emergence of shared leadership was created. The originality of the research lies in the extension of the shared leadership theory to include the emergence phenomenon. The findings are relevant for researchers as they extend the theory of shared leadership in the project context by adding factors, their relationship and processes for the emergence of shared leadership. The findings may also be valuable for practitioners working in temporary complex organisations. My research can be generalised to other teams in product development projects and teams working in complex corporate environments.

Keywords: Shared leadership emergence, leadership emergence, leadership functions, product development project teams, explorative case study.

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1 INTRODUCTION

The first section introduces the topic of the emergence of shared leadership, explains the research gap, and introduces the purpose and objective of the research, as well as the chosen research methods. The second section outlines the framework and organisation of the doctoral thesis.

1.1 Research Problem

1.1.1 Introduction of shared leadership

Today's business organisations are exposed to a variety of influences. Elkington et al. (2017, 2) claim that the dynamics of the business environment in the 21st century is propelled by six mega–trends: "globalization, technology, digitalization, individualization, demographic change and the environmental crisis". However, temporary factors such as pandemics or wars also influence companies. In addition to these megatrends, hotly debated topics such as the shortage of skilled labour, the different generations in society, and the energy crisis are also impacting companies. Organisations arrange themselves in such a way that they can react to environmental contingencies (e.g. Thompson 1967, 148). This is because organisations are more successful when they adapt to their environment (Stacey 1995, 479). In other words, a complex environment requires a complex organisation (Dooley 2002, 7). As a result, today's organisations are characterised by increased dynamism and complexity (Serban et al. 2015, 402).

In such complex organisations, it is unlikely that a single leader will have all the knowledge and skills that are necessary to successfully cope with emerging threats and opportunities (Day et al. 2004, 863). In the history of leadership research, the focus has been on the leader's traits, behaviour or competencies. It is recommended that the traditional, people–centred leadership concept is no longer state–of–the art and should be reconsidered. Research needs to focus on a broader spectrum of leadership, not just the formal leaders of teams (Morgeson et al. 2010, 6). Leadership is a more multidisciplinary construct through the co–production of leadership by multiple individuals (Lord et al. 2017, 445). The shift in focus from leader to leadership is necessary because teams have different leaders in different everyday situations (McGrath 1962, 3). One concept that goes in this direction is so–called shared leadership, in which leadership is seen as an activity or behaviour that is shared or distributed among the group members (Pearce and Conger 2003, xi). Empirical research has shown that shared leadership positively impacts performance and satisfaction at individual, team, project and organisational levels (Scott–Young et al. 2019, 571). Complex environments and the adaptation of the organisation have an influence on the complexity of the leadership concepts.

Shared leadership is a more complex construct than traditional leadership structures (D'Innocenzo et al. 2016, 12), because shared leadership is a dynamic, interactive influence

process within teams (Pearce and Conger 2003, 1),. In order to grasp the complexity of the concept of shared leadership, we need to take a look at the social processes and interactions. The social process is a very dynamic, sometimes chaotic process characterised by constant interactions (Uhl–Bien 2006, 664). Each team is characterised by different chains of interaction and therefore behaves differently in terms of dynamics. This is due to the fact that many upstream factors influence the interactions of the members (Reimer et al. 2017, 4). These include the characteristics of individual members (e.g. their expertise, attitudes, and personality), team–level factors (e.g. the size and diversity of the team) and organisational and contextual factors (e.g. characteristics of the task and environment) (Reimer et al. 2017, 4). Interactions among members form relationships of varying quality, which in turn affects collaboration and interpersonal relations. Social processes modify social systems by structuring and restructuring roles and relationships. In such a dynamic social process, team members' interactions can influence who emerges as a leader (Lord and Dinh 2014, 170) and lead to formal and informal leaders inside and outside the team (Morgeson et al. 2010, 9). As a result, there are multiple leaders and followers simultaneously, meaning leadership is shared. This phenomenon, which gives rise to leader, is called emergence. The phenomenon of emergence plays a crucial role in the concept of shared leadership, as almost all definitions agree that shared leadership emerges through the interactions of people (D'Innocenzo et al. 2016, 1968; Wang et al. 2014, 181; Nicolaides et al. 2014, 924).

Most research on shared leadership focuses on the factors that promote shared leadership, also called antecedents, and the benefits of shared leadership, but little is known about the emergence of shared leadership (Acton et al. 2019, 146; Lyndon and Pandey 2021, 367). This is the identified research gap, which provides the basis for my research.

1.1.2 Purpose and objectives of the doctoral thesis

The purpose of my research is to gain a deeper understanding of the emergence of shared leadership in product development project team. The aim of this thesis is to make an original and significant contribution to existing knowledge on the emergence of shared leadership by filling the gap on the emergence of shared leadership. I aim to fill this gap by answering the following research questions.

1.1.3 Research questions

The main research question is:
How does shared leadership emerge in product development project teams?

Three sub–research questions are posed to answer the main research question:
(1) What are the key factors of leadership emergence in PDP teams?
(2) What are the relations between these identified factors in PDP teams?
(3) What are the processes of shared leadership emergence in PDP teams?

1.1.4 Research methods

Due to the research question and the fact that I will be breaking new ground with my research, I have chosen a qualitative, explorative research approach. Since context has a significant impact on the emergence of shared leadership, I decided to conduct a case study. An exploratory multiple–case design with three cases (three product development project teams) was selected to provide a deeper and more meaningful understanding of real–life events in a business context (Yin 2018, 15).

Product development project teams were selected for three reasons. Firstly, only a few studies have been conducted on shared leadership emergence in project teams in product development. Secondly, the environment of project teams in product development offers suitable conditions for investigating the emergence of shared leadership. Thirdly, project teams for product development can represent a complex organisation, which will help with generalisability.

I have chosen the following product development project teams:

- Team 1: System Engineering for an electrical parking brake
- Team 2: Defining an electric/electronic concept for a new passenger car
- Team3: Software development for advanced charging function

The three selected teams are involved in three different product development projects. The products are the same, namely passenger cars. I did this to gain a more comprehensive understanding, compare the analysis, improve the validity and reliability, increase generalisability and robustness of the results. I randomly selected the teams to reduce the researcher's bias and increase representativeness. The only criteria were that the project must start between March 2022 and October 2022 and be in the initial, planning and part of the execution phase.

In our exploratory case study, three data collection methods are chosen: interviews, direct observation, and documents. The use of multiple data collection enables the triangulation of information, which enhances the quality and credibility of qualitative research (Yin 2018, 126). I also chose the data collection methods because I wanted to gain insights into real projects, as context influences the emergence of shared leadership. The data collection period was from March 2022 to December 2022.

Due to the consequences of the COVID–19 pandemic (the offer to do home office) and the fact that the team is distributed on different locations, interviews and meetings were conducted virtually, recorded, automatically transcribed by the software Microsoft Teams, and then checked and reworked for accuracy. The rework involved reading all automatically generated transcripts and listening to the recorded sessions in parallel. If there was a discrepancy, I adjusted them according to the session. The revision was necessary because the automatically generated transcriptions were error–prone, but it was still a relief.

Based on the sub–research questions in this thesis, the Gioia method was used to identify the factors for the emergence of shared leadership. Network analysis was used to identify the relationships between these factors. Event structure analysis and qualitative content analysis were used to describe the process of shared leadership emergence.

As part of my research, I have identified several factors and their relationship to the emergence of shared leadership in project development teams. In addition, I have developed a new process for the emergence of shared leadership. I could identify that shared leadership arises through the emergence of many leadership functions that are assumed by many different people. The leadership functions primarily serve to satisfy critical needs of the team, which leads to greater team effectiveness (Morgeson et al. 2010, 30). Those who take responsibility for meeting the needs of a team can be considered team leaders (Morgeson et al. 2010, 8). Morgeson et al. (2010, 10) defined 15 leadership functions in teams:-compose team, define mission, establish expectations and goals, structure and plan, train and develop team, sensemaking, provide feedback, monitor team, manage team boundaries, challenge team, perform team task, solve problems, provide resources, encourage team self–management, and support social climate.

My findings make theoretical contributions to shared leadership, leadership emergence and functional leadership theory. But also, for practitioners, especially for project managers, sub–project managers and team members of product development projects or complex temporary organisations.

1.2 Structure of the thesis

This dissertation consists of a theoretical and empirical part in which the phenomenon of the emergence of shared leadership is explored and embeds the results for science and practice. Addition to that, the limitations and boundaries of the research are explained and recommendations for future research.

In Chapter 2, the thesis provides a comprehensive theoretical background on the emergence of shared leadership. Everything explained in this chapter aims to elucidate the concept of shared leadership emergence and highlight the existing research gap. To gain a thorough insight, I begin the section with a brief history of leadership and the underlying assumptions in leadership research. I explore the influence of complexity on leadership research, as it is the primary catalyst for the study of shared leadership. Shared leadership is then examined in depth. Starting with the definition that shared leadership is an emergent phenomenon, I outline the current research on this topic. Various definitions and antecedents of the emergence of shared leadership are presented. Additionally, the emergent team states and processes for the emergence of shared leadership are discussed. Based on this analysis, I identify and describe the research gap, concluding the chapter.

Chapter 3 explains the research methodology used to close the identified research gap. It begins with the purpose and objectives of the research. The research questions are then

formulated, and the research design is derived using case study research. Finally, the methods used to collect and analyse data are described.

Chapter 4 presents the results of the research. The structure of this section is based on the sub–research questions. I present the factors, their relationships and the processes for the emergence of shared leadership.

In chapter 5, I will integrate the results of shared leadership emergence in the current state of research and discuss their theoretical and practical implications. The chapter ends with the limitations and boundaries of the research.

Finally, chapter 6, is the conclusion section. This section is summarising the findings and give recommendation for future research.

2 REVIEW OF RELATED LITERATURE

This is the theoretical part of the dissertation, which spans the arc from leadership and its assumptions to shared leadership and its conditions to the emergence of shared leadership. At the end of the chapter, I identify the research gap that exists in the emergence of shared leadership.

2.1 Introduction to leadership

"In industrial, educational, and military settings, and in social movements, leadership plays a critical, if not the most critical, role, and is therefore an important subject for study and research."

Bass and Bass (2008, 25)

The topic of leadership has a long history in research. If you enter the term leader or leadership into google scholar, you will get over 6.82 million and 5.38 million results (retrieved on 16/08/2024). In addition, many definitions have been developed over the years, all of which are certainly justified. Victoria et al. (2021, 273) identified over 1,500 definitions and 66 theories of leadership. However, I would like to highlight one definition from Yukl and Gardner (2020, 27), which gives a state of the art view: "Leadership is the process of influencing others to understand and agree about what needs to be done and how to do it, and the process facilitating individuals and collective efforts to accomplish shared objectives".

Leadership is a huge topic and can be found in many areas such as military, sport, politics, school or business, to name just a few. The widespread fascination with leadership may be because it is such a mysterious process, was well as one that touches everyone's life (Yukl and Gardner 2020, 21). Moreover, the term "leadership" associates' images of powerful and dynamic people in most people's minds, which may be the reason why leadership is a topic that has long captured people's interest. Yammarino's (2013, 149) definition gives a sense of why leadership is so important and where leadership can be found in organisations: "Leadership is one of the most widely researched and discussed topics in all areas of organizational science because literally nothing gets accomplished without it. Leadership may be formal, occurring at all levels of management and not just at the top; and it may be informal and emergent, not solely bestowed by title or position."

Avolio et al. (1996, 175) also highlight the importance by saying that "the most critical ingredient of team success is its leadership". Many empirical studies and meta–analysis confirm the statement from Avolio and his colleagues. For example, leadership is a significant success factor and influences the project performance (Müller and Turner 2007, 30; Larsson et al. 2015, 9; Aga et al. 2016, 814).

2.1.1 Briefly history of leadership

I would like to start with a brief overview of the history of leadership. In the past, many efforts have been made to answer the question of what makes leadership successful or effective. The list of researchers in leadership is long and maybe Confucius (500BC) was one of the first by describing four virtues of effective leaders, called love, proper conduct, piety, and the doctrine of the mean (Turner and Müller 2005, 49). When focusing on the last hundred years, Turner and Müller (2005, 50) highlighted and described six major schools of leadership: trait, behaviour or style, contingency, visionary, emotional intelligence, and competency schools.
The trait school looks at the personal traits like abilities, personality, and physical of the leader. In an early study from Stogdill (1948, 64) summarized six general traits of a leader. That are capacity (intelligence, alertness, verbal facility, originality, judgement), achievement (scholarship, knowledge, athletic accomplishments), responsibility (dependability, initiative, persistence, aggressiveness, self–confidence, desire to excel), participation (activity, sociability, cooperation, adaptability, humour), status (socio–economic position, popularity) and situation (mental level, status, skills, needs and interests of followers, objectives to be achieved, etc.). In a later study, Kirkpatick and Locke (1991, 49) highlight six traits for an effective leader: drive, leadership motivation, honesty and integrity, self–confidence, cognitive ability, and knowledge of the business .

The behavioural or style school focuses on the interaction between leader and followers and on finding a leader's behaviour or style such as relationship–oriented and task–oriented behaviour to have successful leadership. Task oriented behaviour concentrated on accomplishing the task in an efficient and reliable way. Relation–oriented behaviour on the other hand is primarily concerned with increasing mutual trust, cooperation, job satisfaction, and identification with the team or organization (Yukl and Gardner 2020, 43–44). Another popular research field in the behaviour or style school is the directive versus participative leadership and the autocratic versus democratic leadership approach. Both approaches can be seen as continuums of leadership behaviours and with many grey areas between. On the one side of the continuum autocratic or directive leaders decide and don’t perceive the opinions and needs of the followers and on the other side the participative or democratic leader decide together with the followers. Turner et al. (2008, 131) identified four styles of leadership called laissez–faire, democratic, autocratic, bureaucratic.

The contingency school highlight, that no single leadership behaviour is appropriate, the situation must consider. The aim of the contingency school is to find a match between the situation and the leader behaviour. In the project management research, several factors are known to be contingent the leadership style, such as the project type (Müller and Turner 2010, 444; Müller and Turner 2007, 30), project complexity (Müller and Turner 2006, 5–6; Dulewicz and Higgs 2003, 228; Cavaleri and Reed 2008, 76–77), project phases (Skulmoski and Hartman 2010, 65; Turner and Müller 2005, 51), and project culture (Turner and Müller 2005, 58).

Dulewicz and Higgs (2003, 228) identified three leadership styles which are different based on the level of complexity of a project. The goal–oriented style is most effective on low–

complexity, involving–style is most effective on medium–complexity, and engaging–style is most effective on high–complexity projects.

Visionary and charismatic school seeing leadership as series of interaction processes wherein leaders motivate followers in different ways. Transactional and transformative leadership (Bass 1990, 19 ff.) is a part of the visionary and charismatic school.

The transactional leadership is primarily task–focused and has the following characteristics (Bass 1990, 22):

- Contingent Reward: Contracts exchange of rewards for effort, promises rewards for good performance, recognizes accomplishments.
- Management by Exception (active): Watches and searches for deviations from rules and standards, takes corrective action.
- Management by Exception (passive): Intervenes only if standards are not met.
- Laissez–Faire: Abdicates responsibilities, avoids making decisions.

The transformational leadership is primarily people–focused and has the following characteristics (Bass and Bass 2008, 22) :

- Charisma: Provides vision and sense of mission, in stills pride, gains respect and trust.
- Inspiration: Communicates high expectations, uses symbols to focus efforts, expresses important purposes in simple ways.
- Intellectual Stimulation: Promotes intelligence, rationality, and careful problem solving.
- Individualized Consideration: Gives personal attention, treats each employee individually, coaches, advises

Emotional intelligence school says, when leaders drive emotions positively, they bring out everyone's best (Goleman et al. 2002, 3). Dulewicz and Higgs (2000, 372) emphasize seven primary elements of emotional intelligence: Self–awareness, emotional resilience, motivation, interpersonal sensitivity, influence, intuitiveness, conscientiousness, and integrity.

Competence school encompasses all the earlier schools. In different situations and circumstances, the leader can use different competencies and applies the most appropriate leadership style. Dulewicz and Higgs (2003, 232) suggest that these three meta–competences and 17 competences explain most managerial performance. The meta–competences are intellectual (e.g. Critical analysis and judgment), managerial (e.g. Engaging Communication) and emotional competences (e.g. Self–awareness).

I would like to conclude this brief history of leadership with the end of the 1990s and the beginning of the 2000s. Research is still being conducted in the various schools today, but the influence of complexity theory on the concept of leadership has given rise to a new branch of research, which I would like to discuss in the following chapters.

2.2 From industrial age to the knowledge era

In the first part of this sub–section, I will describe the assumption on which many concepts of traditional leadership research insist. In the second part, I will switch to a more complex view and its assumptions on leadership research.

2.2.1 Assumptions in traditional leadership research

Traditional theories of leadership are rooted in and limited by assumptions about the conception of leadership. The overall assumption is that the world is linear, mechanical, and predictable, with simple cause and effect solutions (Marion and Uhl–Bien 2001, 389; Wheatley 2006, 28; Keene 2000, 15). Environmental changes are largely identifiable and the organization has to adapt to it (Stacey 1995, 478). In this world, it needs an implementation of top–down organizational forms by drilling deeper and deeper into human relations model (Uhl–Bien et al. 2007, 301). Managerial practices should be structured to achieve goals (Uhl–Bien et al. 2007, 301).

Traditional assumptions must control be rationalised (Uhl–Bien et al. 2007, 301) and it is essential to implement monitoring forms of control (Stacey 1995, 478). The aim is to seek order and stability (Marion and Uhl–Bien 2001, 390) through organisational structure and processes (DeRue 2011, 127) to avoid uncertainty and complexity. Any disorder is seen as the consequence of ignorance, inertia, or incompetence (Stacey 1995, 478). This way of thinking leads to a simplified and reductionist view. Organisations trying to simplify and rationalise their structure (Uhl–Bien et al. 2007, 301) and reduce holistic systems to isolate observations (Marion and Uhl–Bien 2001, 391). Simplifying and rationalising lead to fixed boundaries, compartmentalised organisational responses, and simplified coordination and communication (Uhl–Bien et al. 2007, 301).

For example, solving problems using reductionist rather than holistic thinking by applying simple decision processes (Ashmos et al. 2002, 195). In general, the traditional top–down leadership theories are overly simplistic (Osborn et al. 2002, 813).

Leaders try to reduce the complexity and uncertainty with controlling the future by directing followers towards highly prescribed future states. (Plowman et al. 2007, 344). This reflects our need for safety and our fear of the unknown and being at the mercy of someone or something (Keene 2000, 15–16). Leadership is grounded in a context of supervisor–subordinate relationship whereby the supervisor is conceived of as the leader and the subordinate as the follower (DeRue 2011, 127). Traditional views are individualistic and person–centric perspective, which emphasizes the person as the source of leadership (or followership) (DeRue 2011, 130). Focus was on a set of leader traits, behaviours, or styles implicitly assume that the leadership acts delineated in those theories are within other actors' zone of acceptance, and as a result, produce followership (DeRue 2011, 129). There is also the implicit assumption of one–directional influence (DeRue 2011, 128). Formal hierarchical structures influence who attempts to lead, who attempts to follow, and others' reactions to those attempts, the prevalence of this hierarchical assumption is limiting (DeRue 2011, 127). Leaders who are generally defined as

those who exercise intentional influence over people to channel and facilitate collective tasks in order to achieve organizational goals (Yukl and Gardner 2020, 26), create desired knowable future states through direction and control. (Plowman et al. 2007, 344). The predominant concern has been leadership effectiveness and control (Uhl–Bien et al. 2007, 301; Yukl and Gardner 2020, 22).

To summarize, from this reductionism and simplified view, organizations consist of highly prescribed rule sets, formalized control, and hierarchical authority structures, which are intended to simplify the organization's ongoing operations and lead to simple, and well–defined and predictable responses to a changing, yet knowable world. (Plowman et al. 2007, 343). But it is still to highlight, that there is no leadership theories with an universally accepted theoretical framework for understanding leadership. (Plowman et al. 2007, 343). A more complex view, or in other words, the impact from the complexity theory in leadership brought new concepts of leadership, for example, the idea of shared leadership. Shared leadership can be understood as sharing leadership functions between many team members. The next section explains the concept of shared leadership. I would like to start with a complex view on the exploration of leadership.

2.2.2 A complex view on leadership

"I think the next century will be the century of complexity".

Stephen Hawking (Complexity digest 2001/10,5 March 2001)

We live in an era characterised by a highly competitive landscape driven by globalisation and technology (Bettis and Hitt 1995, 8). Organisations and entire industries are being affected, with increased connectivity through everyday people network (Uhl–Bien and Arena 2017, 9). This connectivity and interactions by the people lead to a rising complexity. Complexity is occurring on multiple levels and across many sectors and contexts (Uhl–Bien and Arena 2017, 10). The complex view is a perspective of a nonlinear and organic world, characterised by uncertainty, volatility, and unpredictability (Marion and Uhl–Bien 2001, 390; Uhl–Bien and Arena 2017, 9). In general, nature is too dynamic, unstable, and unpredictable because internal dynamics will determine future conditions (Marion and Uhl–Bien 2001, 390–391). Complexity is about interconnectivity, interacting and mutually influencing things, leading to unexpected and irreversible ways (Uhl–Bien and Arena 2017, 9). On the one hand, a complex world creates unexpected outcomes and emergence (Uhl–Bien and Arena 2017, 10) and on the other hand, complexity is one of the biggest challenges for organisations (Uhl–Bien and Arena 2017, 9). Increasing customer needs and the continuous development of technologies, many other challenges such as pandemics, wars, skills shortages and energy giants, to name but a few, influence today's business organisations. In complex environments, traditional approaches to leadership often make things worse (Uhl–Bien and Arena 2017, 11). Uhl–Bien and Arena (2017, 10) said, it takes complexity to beat complexity. This complex perspective moves us to a whole system and more holistically view (Lichtenstein et al. 2006, 2; Marion and Uhl–Bien 2001, 391). It led to the fact that many scholars suggest seeing organisations as complex systems (Ashmos et al. 2002, 191; Marion and Uhl–Bien 2003, 55; Meyer et al. 2005, 458)

because organisations are composed of a diversity of agents who interact with and mutually affect one another (Marion and Uhl–Bien 2003, 55). The focus is on interactions among agents (Lichtenstein et al. 2006, 3) and their dynamics (Lichtenstein and Plowman 2009, 618). In organisations, leaders should recognise the importance of interactions, correlation, and unpredictability among ensembles or aggregates of individuals (Marion and Uhl–Bien 2001, 391). The complex view suggests the leadership theory towards a more social, dynamic and processual perspective on leadership (Uhl–Bien et al. 2007, 299–300). A process whereby the rules governing local interactions are changed in response to and anticipating changing circumstances (Hazy and Uhl–Bien 2013, 2). Leadership is a system phenomenon (Lichtenstein et al. 2006, 3). This perspective created a paradigm shift in the leadership theory because leaders can emerge through dynamic interactions of all organisational members (Lichtenstein and Plowman 2009, 618; Bradbury and Lichtenstein 2000, 552; Hazy and Uhl–Bien 2013, 3). Lichtenstein et al. (2006, 2) highlighted that leadership is an emergent event, an outcome of relational interactions among agents and Marion and Uhl–Bien (2003, 55) emphasised that leaders are products of interactive dynamics. Leaders do not create the system but rather are created by it through a process of aggregation and emergence (Marion and Uhl–Bien 2003, 55). Emergence is the creation of new order that happens when agents (e.g. people, technology, information, resources) in a network system combine together in an environment poised for change to generate the emergence of something that did not exist previously (Uhl–Bien and Arena 2017, 10). Leadership can occur anywhere within a social system because as the situation changes and under certain conditions, different people may act as leaders (Lichtenstein et al. 2006, 4; Lichtenstein and Plowman 2009, 617). The social processes are too complex to be attributed to a single individual (Finkelstein 2002, 75; Marion and Uhl–Bien 2001, 401). Based on the discussion that leaders can emerge through interactions, leadership is not necessarily embedded in a formal position (Marion and Uhl–Bien 2003, 55). The difference between "leader" and "follower" are blurred (Marion and Uhl–Bien 2003, 56) because the same person can lead in this situation and follow in the next situation. The complex view suggests seeing leadership as a shared, collective, or distributed phenomenon (Avolio et al. 2009, 421; Lichtenstein et al. 2006, 3).

Table 1 compares the key assumptions from the industrial age and the knowledge era to illustrate the differences.

Table 1: Comparison of the key assumptions industrial and knowledge era

	Industrial era	**Knowledge era**
View of the world	linear, mechanical and predictable	nonlinear, dynamic and unpredictable
Models of the world	simplified models	complex models
Controllability of the world	can be controlled	can not be controlled
Decision making	top-down approaches	top-down and bottom-up approaches
Structure	hierachical	network
Focus on leadership	person-centred	process-centred

Source: Authors contribution.

2.3 Project complexity

As the subject of my research is teams from product development projects, I would like to present this complex view of projects. The literature speaks of project complexity. The study of project complexity is an important topic and one of the first publications on the subject dates back to 1996 by Baccarini (Geraldi et al. 2011, 972; de Rezende and Blackwell 2019, 129; Bakhshi et al. 2016, 1200). Thirty years later a lot of research was made, and different streams occur. According to Bakhshi et al. (2016, 1199), the research of project complexity is researched from different views: Project management Institute (PMI) view, the System of Systems (SoS) view, and the complexity theory view. This is probably one of the reasons why there is still no accepted definition among researchers (Bakhshi et al. 2016, 1200).

However, in order to create a common understanding, I will begin with an explanation of the categories of project complexity. Later, I will provide an overview of the associated factors and examples. I will conclude the subchapter with the interdependencies between the categories.
For getting an appropriate overview about complexity in projects, the complexity categories play a crucial role. The paper from Luo et al. (2017, 4), gives an good overview on the different categories of project complexity. Technological, organisational, goal, environmental, cultural and information complexity (He et al. 2015, 549) or structural, technical, directional and temporal complexity (Remington and Pollack 2007, 6). Bakhshi et al. (2016, 1206) define project context, autonomy, belonging, connectivity, diversity, emergence, and project size. In the remainder of this section, I will describe the categories of project complexity based on the research of Geraldi et al. (2011, 976–983) and de Rezende and Blackwell (2019, 131) called structural complexity, uncertainty, pace, dynamic complexity, novelty, socio–political complexity, and institutional complexity.

2.3.1 Structural complexity

The idea of the structural complexity was introduced by Baccarini (1996, 201–202). Complexity can be explained in terms of differentiation and interdependencies (or connectivity). For projects it is the number of elements and the interrelatedness between them. Baccarini (1996, 202) distinguishes organisational and technological complexity and applied it to project. The differentiation part in the organisational complexity is related to the depth of the organizational hierarchical structure, the variety and size of the organisation. The organisational interdependencies explains the relationship between the organisational units, teams, specialist, and workers in general. The technological differentiation expresses the variety and number of elements, such as inputs, outputs, actions, tasks, and many other aspects of the project. Technology interdependency involves the connection between technical elements, for example between the tasks, between inputs, between different technologies). Based on the research of Baccarini (1996, 201–202), Williams (1999, 296) introduces the notion of structural complexity, which is still recognised in the literature today. In the meantime, the concept of structural complexity has evolved to include the size, variety and interdependence of elements within the project. For example, structural complexity can be applied to a product by looking at the arrangement of the product based on the components, sub–systems and systems (Shenhar et al. 2016, 64). In addition to the elements and the variety, the intensity of the dependencies is

decisive for the complexity of the project. Dependencies can be pooled, sequential or reciprocal. When the dependencies are reciprocal the behaviour, processes and outcome difficult to predict (Xia and Lee 2005, 55). This is because reciprocal dependencies allowing feedback effects to develop, the project will behave in a way difficult to predict intuitively and certainly at variance to how conventional techniques would indicate (Williams 2005, 502).

2.3.2 Uncertainty

The concept of uncertainty was introduced in management literature as early as the 1920s. Two currents have emerged that have significantly influenced the definition of uncertainty. One current views uncertainty in terms of variety, the other in terms of epistemic uncertainty. Variety refers to the probability and change of an event. Epistemic uncertainty describes the lack of information, lack of agreement about the current and future situation or ambiguity (Geraldi et al. 2011, 977–978). The concept of technological uncertainty was introduced into project management by Shenhar and Dvir (1996, 610) and can be defined as the inability to predict future outcomes or the lack of information (difference between the information required and the amount of information available). In the current project management literature, uncertainty is usually expressed by the uncertainty of the goals and methods, the degree of unpredictability, the ambiguity of the objectives and the novelty (technology or unusual contractual framework) (de Rezende and Blackwell 2019, 131). It is also important to differentiate uncertainty and risks. Ahern et al. (2014, 1374) classified it as "known knowns (knowledge), known unknowns (risks), unknown knowns (untapped knowledge), and unknown unknowns (uncertainty). Risks management focuses on the known known and known unknown, while uncertainty management deals with unknown known and unknown unknown (de Rezende and Blackwell 2019, 132). Ambiguity and uncertainty are often used interchangeably, but it is also important to differentiate these. This may be because the effect of ambiguity and uncertainty is the same, namely that a situation or problem is misinterpreted, and one wonders about the cause–effect relationship. Ambiguity can arise when the intention of the message sent, and the interpretation of the message received are different. An example of this could be that people believe they are confronted with known knowledge and derive solution strategies from it, whereas they are confronted with unknown knowledge and other solution strategies would be necessary. This misunderstanding can lead to unintended consequences (Walker et al. 2017, 180).

2.3.3 Pace

Temporal aspects of complexity were already mentioned in the literature on new product development projects (Brown and Eisenhardt 1997, 1). A little later, Shenhar et al. (2002, 101) introduced pace as part of project complexity. Pace is understood here as the speed and criticality of a project. Williams (1999, 272) argues that as the duration of a project becomes shorter, leading to parallelism and concurrency, project complexity increases. Projects can be categorised according to the degree of urgency, as the same objectives may require different approaches depending on the given time frame (de Rezende and Blackwell 2019, 132). According to the project pace, Shenhar et al. (2002, 104) categorised three types of projects: regular projects , fast or competitive projects, and critical or blitz projects. In regular projects

such as road construction projects, missed deadlines are indeed tolerated as time is not critical to the success of the organisation (Shenhar et al. 2002, 104–105). In competitive projects such as the development of a passenger car, a missed deadline is not fatal, but it does have an impact on profit and market position. In this type of project, the pace begins to increase the complexity of the project (Shenhar et al. 2002, 105). Critical or blitz projects may be military or security projects where there is a fixed delivery date and delay means failure of the project (Shenhar et al. 2002, 105). However, pace is an important type of complexity and requires a different structure and management attention (Shenhar and Dvir 2007b, 123). Finally, complex projects can become unstable if they are disrupted, and difficult to manage over high pace circumstances, given many decisions to be made rapidly.

2.3.4 Dynamics

Maylor et al. (2008, 20) stated that dynamic complexity refers to the way in which each attribute and indicator changes over time. Dynamic complexity describes change, adaptation and evolution by expressing the unpredictable and non–linear nature of projects (Zhu and Mostafavi 2017, 4–5). Dynamics research is concerned with temporal emergence, especially processes that cause sudden, radical and unpredictable changes in systems (Floricel et al. 2016, 1363). Dynamics as a dimension of project complexity therefore attempts to explain how a project and its parts evolve over time. Dynamics refers to changes in projects, such as changes in specifications and in the objectives, team members or in any other stakeholder of the project.
Maylor et al. (2008, 20) argued that "for every structural element there is a corresponding dynamic element" to explain how the project elements evolve during their life cycle. In addition, they found that change is an inevitable part of project work, and that the extent and frequency of change are important factors for the project complexity (Maylor et al. 2008, 24). Changes can lead to disorganisation, rework or inefficiency in the project if the changes are not well communicated or absorbed by the team and other stakeholders (Geraldi et al. 2011, 978).
Ahern et al. (2014, 1375) considered the environment as the main cause of change in a project and examined dynamic complexity through the lens of knowledge change by introducing the concept of dynamic knowledge (expertise) and static knowledge (plans). Dynamics in a project can result from various aspects, such as changes in characteristics, positions and relationships between stakeholders, emerging stakeholders or relationships, and changes in methods or strategies for involving stakeholders (Aaltonen and Kujala 2016, 1541). Other causes of dynamism arise from the "uncertainty" mentioned above (lack of knowledge and ambiguity). The dynamic arises because knowledge is built up and ambiguity is reduced in the course of the project. This has an impact, for example, on requirements management and the objectives of the project. Projects change not only from the outside in, but also from the inside out, the motivation of the team can change, and internal politics can emerge (Geraldi et al. 2011, 978). Understanding change patterns, for example by systematising change processes, can help to better manage the dynamics in projects (Geraldi et al. 2011, 979). In project management, this can take the form of processes such as risk management, configuration management and change management. It is also important to ensure that project objectives are aligned with those of key stakeholders and new competitive developments.

2.3.5 Socio–political complexity

A number of research papers on projects emphasise that projects are carried out by human actors with potentially conflicting interests and difficult personalities (e.g. Clegg and Courpasson 2004, 530). The human actors form an important dimension of project complexity, called socio–political complexity. In fact, socio–political complexity is one of the most important measures of complexity to be found in all management problems (Geraldi et al. 2011, 980).

Remington and Pollack (2007, 52) characterize social–political complexity as 'directionally complex,' highlighting the ambiguity in defining objectives and identifying key stakeholders. This ambiguity adds to the underlying uncertainty of goals discussed within the "Uncertainty" dimension mentioned earlier.

Maylor et al. (2008, 22) addressed the issue indirectly, pointing out problems associated with stakeholder management, such as lack of stakeholder engagement and problematic relationships between stakeholders as well as those related to the team. Geraldi and Adlbrecht (2007, 35–36) summarised some of these aspects under the term "complexity of interaction". This arises in the interaction between people and organisations and includes aspects such as transparency, empathy, diversity of languages, cultures, disciplines, etc..

Abstracting from these descriptions, this type of complexity emerges as a combination of political aspects and emotional aspects involved in projects. Geraldi et al. (2011, 981) highlight that complexity in projects stems from a combination of political and emotional factors. They argue that projects involve human actors with potentially conflicting interests and difficult personalities, leading to a complexity that includes political and emotional aspects. This complexity is particularly pronounced in situations such as mergers and acquisitions, organizational change, or projects needing to reconcile different interests, agendas, or opinions. Social and political complexity is further compounded by factors such as diversity in aspirations, mental models, values of decision–makers, transparency, empathy, language, culture, discipline, and interests, as emphasized by Geraldi et al. (2011, 981–982), He et al. (2015, 561), and Lu et al. (2015, 612).

So far, I have mentioned social and political complexity as a single entity. However, despite the similarities between social and political complexity, it is important to emphasise the key differences between the two dimensions.

The social complexity of projects arises from the interactions between individuals and organisations working together. Megaprojects are an example of this complexity due to the high level of coordination required (Kardes et al. 2013, 905). Challenges such as cultural differences, different communications and integration issues arise and lead to interpersonal and intra–organisational complexities. Factors such as the "Not Invented Here" syndrome, interdependency issues, conflicts and communication difficulties contribute to these complexities (Kim and Wilemon 2003, 22). Overall, the social complexity of projects results from the collaboration between the individuals and organisations involved Political complexity in projects arises from the emergent behaviours of individuals and organizations supporting the

project. Bosch–Rekveldt et al. (2011, 730) elaborate that organizational complexity is tied to various factors, including the involved actors, their interests, and the project's risks and consequences in relation to its environment. They highlight trust, political influence, competition levels, strategic pressure, and required local content as contributing factors. Aaltonen and Kujala (2016, 1545) emphasize the importance of stakeholders in political complexity, noting that their influence varies based on factors such as local embeddedness and acceptable behaviours. Lack of commitment and problematic relationships among stakeholders further exacerbate socio–political complexity (Maylor et al. 2008, 22). Megaprojects face heightened political interest due to their significant costs and impacts on communities, the environment, and budgets (Kardes et al. 2013, 906). Political influence over megaprojects often leads to optimistic misinterpretation of project facts and figures, resulting in cost overruns and benefits shortfalls (Kardes et al. 2013, 910). To mitigate political factors, entities engage in lobbying efforts and seek political and market power to shape regulations and establish their own rules. Despite various dimensions of complexity, it is the people and organizations involved in projects that drive emergent behaviours, characteristic of complex adaptive systems.

2.3.6 Novelty

Novelty has been discussed for a long time by new product development researchers (Tatikonda and Rosenthal 2000, 74; Griffin 1993, 112) and project complexity researchers (Ahern et al. 2014, 1371 ff.; Bosch–Rekveldt et al. 2011, 728 ff.; Dvir et al. 2006, 36 ff.; Hobday 1998, 689 ff.; Shenhar 2001, 395 ff.). In new product development, novelty, initially explored by Griffin (1993, 112 ff.), encompasses both incremental and radical changes, distinguishing between "new to the firm" and product improvements (Griffin 1997, 8). Clift and Vandenbosch (1999, 190) categorized projects based on modification degrees, while Tatikonda and Rosenthal (2000, 74) viewed novelty technologically, defining product and process technology novelty. Their approach complements Griffin's (1997, 13) definition, while Ahern et al. (2014, 1371 ff.) and Hobday (1998, 689 ff.) explored process novelty and product technology novelty, respectively. This multifaceted perspective highlights novelty's significance in project complexity assessment. In project complexity research, novelty initially equated to market uncertainty, focusing on product novelty's impact (Shenhar et al. 2002, 101–102). Shenhar and Dvir (2007a, 183) shifted the discussion to users' perspective, categorizing projects progressively from derivative to new–to–the–world products. Novelty extends beyond product and technology, influencing management, market, objectives, organization, stakeholders, and team dynamics (Bakhshi et al. 2016, 1199; Shenhar et al. 2005, 8; Bosch–Rekveldt et al. 2011, 738). Novelty intertwines with uncertainty but represents a distinct dimension in project complexity assessment (Tatikonda and Rosenthal 2000, 74).

2.3.7 Institutional complexity

The dimensions of project complexity mentioned earlier often foster heightened interaction among the elements of projects. Conversely, institutional complexity tends to restrict or compel interactions within the system, leading to conflicts and unexpected behaviours. The impact of policies, regulations, laws, or standards on a project has been extensively studied, typically in

relation to the project's organizational, environmental, or market context (Gransberg et al. 2013, 317; Kian Manesh Rad et al. 2017, 4). Institutional complexities can emerge in a project because of changes in policies, regulations (He et al. 2015, 557), laws (Qureshi and Kang 2015, 168), or industry standards (Bosch–Rekveldt et al. 2011, 731). The consequences of institutional complexity for projects vary from case to case, but heavy regulation and control are usually involved in a complex project (Hobday 1998, 699). For example, Gransberg et al. (2013, 317) stated that a "transportation project is typically a public work, constrained by the regulations applied to public funding and as a result, susceptible to influence by public opinion, political motivations, and a variety of other external factors that are outside the direct control of the PM [project manager]." The effects of these factors also shape the organizational structure of projects (Kardes et al. 2013, 909), because "the multiplicity of procedures force all processes to strictly obey related regulations," making the highest level of the hierarchy "responsible for issuances of outline documents for the entire construction project, framing all project–related rules and regulations, guiding management manuals and executive standards of each subsystem" (Fang et al. 2010, 325). Most projects focus on compliance with these norms (Kardes et al. 2013, 913), although in some industries, such as aerospace, nuclear or civil engineering, for example, the implications of regulations go beyond the current rules, norms, standards or laws, as "these organizations all need to be able to track configuration items to be able to revisit designs and comply with future regulation on safety–critical facilities" (Whyte et al. 2016, 344). Despite the negative emergent behaviours that regulations create in projects, the existence of common norms can also help managers to coordinate, reduce uncertainty, and avoid chaos, given the shared understanding of procedures and routines (Oedewald and Gotcheva 2015, 109). Liu et al. (2014, 523–524) argued that this is possible because people know how to behave based on common norms. This dual effect caused by regulative issues was also discussed by Engwall (2003, 802) for whom it is necessary to create an alignment between the project and its surrounding environment. Aaltonen and Kujala (2016, 1546) also highlighted that a lack of structure and governance models or multiple processes can make a project more complex in the context of stakeholder management. To summarise, regulations can increase the complexity of a project unless there is an appropriate balance between what the project needs and what the institutional environment allows. Overall, institutional complexity involves formal aspects of relationships, contrasting social–political complexity that deals with informal relationships, and refers to factors related to policies, regulations, laws, or standards that constrain projects.

I have described seven categories of project complexity. Table 2 provides an overview of the categories of project complexity described. I have listed an example definition and factors including examples of each category.

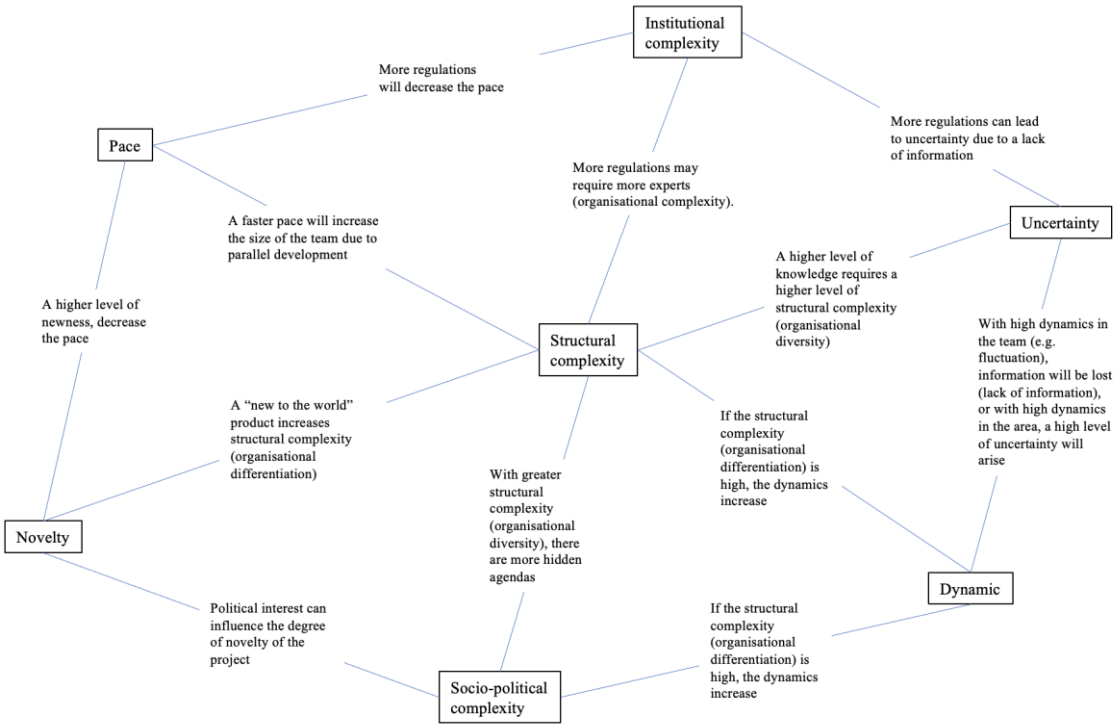
Table 2: Definitions and factors of project complexity dimension

	Exemplary definition	Factors
Structural complexity	Project complexity can be interpreted and measured regarding differentiation and interdependencies Baccarini (1996, 203).	Size (e.g. scope size, budget size, team size), variety (e.g. number-variety of technical elements, scope variety, number-variety of stakeholders, number-variety of suppliers), and interdependencies (e.g. parts and system)
Uncertainty	Uncertainty is "the relative difference in the amount of information required and the amount possessed by the organization by the organization". Galbraith 1973, 20)	Uncertainty (e.g. uncertainty about the stakeholder, uncertainty in goals/methods) and Ambiguity (e.g. ambiguity of the project goals, information ambiguity)
Dynamic	Complexity arises from changes in the organisational and technological environment that make the cause-and-effect relationship ambiguous and non-linear. (Xia and Lee 2003, 55)	Changes (e.g. scope changes, stakeholder changes, goals and objective changes)
Pace	Paces is the project 's speed and criticality of time goals. (Shenhar et al. 2002, 101)	Speed (e.g. goals and objective speed, team speed), criticality (e.g. goals and objective criticality, team criticality)
Novelty	Novelty is the degree of newness of project aspects in terms of mission, product, processes, organisation, stakeholders, team, and market , among other (Shenhar and Dvir 2004,183-184).	Novelty (e.g. technical novelty, goals and objectives novelty)
Socio-political complexity	Socio-political complexity "occurs as a combination of political and emotional aspects in projects" (Geraldi et al. 2011, 981).	Alignment (e.g. goals, interests, requirements), Hidden agendas (e.g. personal or political interests)
Institutional complexity	Institutional complexity deals with the formal aspects of relationships between people and organisations (Rezende and Blackwell 2019, 137).	Laws and regulations (e.g. emission regulations), norms and standards (e.g. organisational processes, ISOs)

Source: Authors contribution.

I have outlined seven categories of project complexity as independent categories. However, it is important to note that projects not only exhibit a mixture of these categories, but that the categories themselves are often interdependent. High level of uncertainty can increase the level of dynamic complexity, where significant unmitigated risks are realised, and a high pace requires a high interdependence of tasks, leading to high structural complexity (Geraldi et al. 2011, 983). In the empirical research paper, de Rezende et al. (2022, 4) show the interdependencies of complexity dimensions (and their factors) in defence projects. In Figure 1 shows a simplified representation of the relationships between the categories.

Figure 1: Simplified representation of the relationships between the categories



Source: Authors contribution.

2.3.8 Differentiating between complicated and complexity

The terms "complicated" and "complex" are often used interchangeably, although there is a different understanding of them. In complicated systems, the outcomes are easily predictable if the initial conditions (the project's inputs) are known, whereas in complex systems the outcomes are unpredictable due to the constantly changing interactions, even if the initial conditions are known (Maylor et al. 2008, 16). To clarify, I would now like to illustrate the concept of complexity in the continuum from simple to chaotic for projects. Based on the Cynefin framework developed by Snowden and Boone (2007, 7) simple, complicated, complex and chaotic projects can be classified as:

Simple:

- Repeating patterns and consisting events
- Clear cause–and–effect relationships evident to everyone, right answers exist
- Known knowns
- Fact–based management

Complicated:

- Expert diagnosis required
- Cause–and–effect relationships discovered but not immediately apparent to everyone; more than one right answer possible
- Known unknowns

- Fact–based management

Complex

- Flux and unpredictability
- No right answers, emergent instructive patterns
- Unknown unknowns
- Many competing ideas
- A need for creative and innovative approaches
- Pattern–based leadership

Chaotic

- High turbulence
- No clear–cause–and effect relationships, so no point in looking for right answers
- Unknowable
- Many decisions to make and no time to think
- High tension
- Pattern–based leadership

This framework is certainly a very simplified representation, and it is very difficult to assign a project to one single category. This is because, as already explained, complexity is influenced by many dimensions and factors and, in addition, dimensions influence each other. The areas (e.g. bundle of tasks or in specific teams) and phases of a project can range from simple to chaotic and should be considered in a differentiated manner. Nevertheless, I would like to emphasise that there is a difference between complicated and complex and should be considered in a differentiated way.

I would like to conclude the topic of project complexity. There are very different approaches to project complexity in the literature. I have taken a closer look at the dimensions of project complexity, its factors and the interrelationships. I also go into the difference between complicated and complex. In this context, I would like to emphasise that complexity is researched on different levels. For example: Task complexity, social complexity, cultural complexity, operational complexity, cognitive complexity (San Cristóbal et al. 2018, 4). A comprehensive review of task complexity can be found by Campbell (1988, 40 ff.) or, by Liu and Li (2012, 553 ff.).

Based on the increasing complexity and influence on leadership research, more and more pluralistic approaches to leadership are making their way into research. Like the concept of shared leadership, which I will describe in the next chapter.

2.4 Shared leadership

In the last two decades, there has been an emerging stream in the field of complexity leadership studies on the notions of shared and distributed leadership (Pearce and Conger 2003, 21 ff.). There are similar concepts going in the same direction like collective leadership (e.g. Denis et

al. 2001, 809 ff.), collaborative leadership (e.g. Rosenthal 1998, 847 ff.), distributed leadership (e.g. Bolden 2011, 251), team leadership (e.g. Zaccaro et al. 2001, 451 ff.), balanced leadership (e.g. Müller et al. 2018, 83 ff.), co–leadership (e.g. O'Toole et al. 2002, 65) or leadership as an emergent organizational meta–capability (Hazy 2006, 58). Although they are different terms, the concepts basically have strong similarities as they all focus on the division of leadership tasks between two or more people in appropriate situations.

I will now take a closer look at the concept of shared leadership by showing the roots, the results, the relationship to product development projects and definitions of shared leadership.

2.4.1 The roots of shared leadership

If you understand history, you also understand the development and influences that have led to the present. The historical roots are in the fields of leadership, psychology, and organizational behaviour. This sub–section describes the most significant theories which has built at the end the shared leadership theory.

2.4.1.1 Law of situation

Follett (1924, 1 ff.) proposed a radically different leadership process in contrast to her contemporaries. She introduced the concept of the law of situation and underline that, following the person in the group who had the most knowledge about the situation in which the group was operating (Follett 1924, 3–30). Follett (1924, 62–63) emphasized that any relationship between two people provides the possibility of these influencing each other, which makes it unlikely that leadership within teams stems from the dedicated leader only.

2.4.1.2 Human relation and social perspective

A major step in the management of organization was the social view of the organization. A relationship between the leaders and the persons who get led take on new meaning, new findings highlight interpersonal dynamics in the workplace. (e.g. Mayo 1933, 1 ff.; Turner 1933, 577 ff.). Focusing on the psychological needs of employees – is an important step towards the ultimate expression of shared leadership. It reveals that leadership behaviour is not just a one–way process from leader to led, but a more complex process, with subordinates and their needs also influencing the leader (Pearce and Conger 2003, 7) .

2.4.1.3 Role differentiation

Benne and Sheats (1948, 43–44) describe several different roles that working group members can assume. Some of these roles can be considered leadership roles. Leadership is no longer a one–sided process, but a two–way process. The importance of this work is that it identifies groups other than formally appointed leaders. There is a growing realization that members of a group can play roles as influential as the leader himself. They opened the door to studying shared leadership dynamics within groups through the concept of multiple roles.

2.4.1.4 Co–Leadership

The work focused primarily on situations in which two individuals simultaneously shared one leadership role on an equal footing (Solomon et al. 1953, 171 ff.). There is also research on co–leadership in the boardroom—especially in the C–Level (like CEO) of the management (e.g. Gibeau et al. 2016, 255). Co–leadership, while a distinct concept, is clearly related to the concept of shared leadership.

2.4.1.5 Social Exchange Theory

The social exchange theory (Homans 1958, 597 ff.; Festinger 1954, 117 ff.) extends economic exchange theory by claiming that people expect certain social gains and certain social costs when entering social relations. The essence of this theory of shared leadership is that it suggests that influence processes are embedded in most, if not all, social interactions, and that influence is not limited to a designated leader but is widely distributed among others.

2.4.1.6 Management by objectives and participative goal setting

Peter Drucker (1954, 121–136) invited management by objectives (MbO) and saw it as a useful technique for engaging individuals by aligning their goals with larger organizational goals. An extension of MbO followed under the heading of participatory goal–setting research (Erez and Arad 1986, 591), in which subordinates participate in the definition of their subordinates; instead, it becomes a shared activity. Thus, MbO and participatory goal setting identify the role of subordinates in expressing performance expectations, bringing us closer to a shared leadership model in an organization.

2.4.1.7 Emergent leadership

The emergent leadership theory (e.g. Hollander 1961, 247–250) refers to the phenomenon of leader selection by members of a leaderless group (e.g. Bartol and Martin 1986, 262–266; Stein and Heller 1979, 1993 ff.). While the concept of emergent leadership is concerned with the selection of an appointed leader, shared leadership on the other hands is linked to the serial emergence of multiple leaders over the lifecycle of the team (Pearce and Sims Jr 2002, 176). Thus, emergent leadership provides yet another theoretical base for shared leadership.

2.4.1.8 Expectation states theory and team member exchange

Expectation state theory was developed on the basis of social exchange theory (Berger et al. 1972, 241–255). Expectation state theory suggests that team members intuitively develop ideas about each other's status in the team.

Later, Seers (1989, 118 ff.) introduced the construction of team–member exchange in the elaboration and integration of expected state theory and leader–member exchange. Team member exchange theory focuses on the quality of exchange relationships between team members. This view suggests that different people can achieve high status based on the

particular function or task they are involved in, allowing the process of influence to be shifted from one team member to the next.

2.4.1.9 Participative decision making

Vroom and Yetton (1973, 5) specified when and how leaders should involve their subordinates in the decision–making process. The model by Vroom and Yetton (1973, 34–35) suggest that more involvement is required under the different conditions. Vroom and Yetton identified that in some cases shared leadership is likely to be more efficacious than directive forms of vertical leadership.

2.4.1.10 Vertical Dyad Linkage / Leader–Member Exchange

Graen and his colleagues (e.g. Dansereau Jr et al. 1975, 46 ff.; Scandura et al. 1986 ff.; Graen and Scandura 1987, 175 ff.) introduced vertical dyad linkage/leader–member exchange (LMX) theory. In their theory, they have discussed the importance of the leader–follower dyad on the leadership process. Leaders must change their style based on affiliation, and subordinates influence the leader's behaviour.

2.4.1.11 Substitutes for leadership

Another model which has influenced the shared leadership theory is the substitute for leadership concept. Substitutes for leadership (e.g. Kerr and Jermier 1978, 378) suggests that certain conditions may serve as substitutes for social sources of leadership or in other words under certain circumstances there are possible substitutes for a hierarchical leader. In this direction, shared leadership may serve as a substitute for more formal appointed leadership. When team members are actively involved in developing a vision for their team, a strong visionary leader may not be needed to keep the team focused on their distant goals.

2.4.1.12 Self–leadership

Manz and Sims Jr (1980, 361 ff.) considered self–management, or self–leadership as a potential substitute for more formal vertical leadership. The focus is on shifting the hierarchical power to the followers. Self–leadership reduces the need for close supervision, direction, and control. If we put self–leadership on team level of analysis, we can see how shared leadership could work in a similar way.

2.4.1.13 Self–managing work teams

While acknowledging that team members can and do assume roles previously reserved for management, the literature focuses more on the role of the designated leader than on the role of team members in the leadership process (Stewart and Manz 1995, 750).

The literature on self–managing work teams, while acknowledging the role of team members in the leadership process, does not propose a systematic approach to investigating how and how

teams share the leadership process as a whole (Pearce and Conger 2003, 11). Recent work on self–managing work teams has taken the biggest steps toward articulating the concept of shared leadership (e.g. Manz et al. 1990, 15 ff.).

2.4.1.14 Followship

Several scholars and practitioners from various fields have emphasized the role of followers in the leadership process (e.g. Kelley 1988, 1 ff.). The main focus of this line of research is to define what constitutes a good follower. Therefore, all team members need good follower skills: team members must be able to clearly see when they should lead and when they should lead and when they should follow. Under conditions of shared leadership, followship is dynamically determined (Pearce and Conger 2003, 12).

2.4.1.15 Theory of empowerment

Another important step in the history of shared leadership is the question of empowerment. A central theme in the empowerment literature is that of power (e.g. Conger and Kanungo 1988, 471 ff.). The concept of empowerment emphasizes decentralization for power and not at the top of an organization. Empowered workers who deal with daily situations are the best qualified to make decisions related to those situations. Most literature of empowerment focuses on the individual (e.g. Conger and Kanungo 1988, 471 ff.) and some researchers have expand the concept to the group level of analysis (e.g. Lord and Hutchison 1993, 5 ff.). Empowerment is a necessary, but not sufficient, condition for shared leadership to be developed and displayed by teams (Pearce and Conger 2003, 12).

2.4.1.16 Shared cognition

Organizational research is deeply interested in the role that shared cognition can play in teams to improve understanding of team dynamics and team effectiveness (e.g. Cannon–Bowers et al. 1993, 221–246). Shared cognition can be viewed as a "mental map" related to various aspects of its internal and external environment. Shared cognitive theory advances the understanding of shared leadership by providing a framework within which leadership can be shared. Shared cognition provides another conceptual basis for shared leadership (Pearce and Conger 2003, 13).

2.4.1.17 Connectivity leadership

Connectivity leadership (e.g. Lipman–Blumen 2000, 3 ff.) focuses on a leader's ability to build interpersonal relationships within a team's internal and external networks. Most discussions of shared leadership focus on leadership dynamics within teams, and connected leadership helps to further develop the external focus of team leadership activities.

2.4.1.18 The arrival of shared leadership

By the mid–1990s, several scholars had independently and simultaneously developed a model that directly addressed shared leadership (Avolio et al. 1996, 173 ff.; Pearce 1997, 1 ff.; Seers 1996, 145 ff.). Accepting this seemingly radical departure from the traditional view of leadership is finally appropriate because it is something that is passed on from the top to the leader's followers. During this decade, there has been an increase in work on how Pearce and colleagues refined the formulation of shared leadership theory by developing general theoretical models (Pearce and Sims 2000, 117 ff.).

To summarise, the development of leadership theories that have influenced the concept of shared leadership has increasingly emphasised the distribution of influence within groups. From Follett's situational leadership and the human relations movement to the multifaceted roles identified by Benne and Sheats, leadership began to be viewed as a collective endeavour. The concepts of co–leadership, social exchange theory, and participative decision–making further highlighted the involvement of multiple actors in the leadership process. Theories such as emergent leadership and expectation states demonstrated how leadership can naturally arise within a team. Empowerment and shared cognition theories emphasized decentralization and the collective mental models necessary for shared leadership. By the mid–1990s, scholars formalized the concept of shared leadership, integrating these diverse insights into a comprehensive framework suitable for modern organizational needs.

2.4.2 Outcomes of shared leadership

In this sub–chapter, I would like to highlight the added value in different teams and at different levels. Over the last two decades, numerous empirical studies have been conducted on shared leadership. In general, shared leadership adds the most value when tasks have the following characteristics: high interdependence, high levels of creativity are required, and complexity is high (Pearce 2004, 48). Clarke (2012b, 196) suggested that shared leadership is better suited to respond to the dynamic and changing circumstances characteristic of most projects. For example, researchers have shown that teams with shared leadership perform better than teams with vertical leadership (e.g. Ensley et al. 2006, 226; Pearce and Sims Jr 2002, 183).

There are conducted studies of shared leadership in different project teams, including globally distributed new product development teams (Muethel and Hoegl 2016, 327 ff.), agile teams (Hofman et al. 2023), a defence acquisitions project team (Novikov 2016, 15 ff.), engineering design teams (Wu and Cormican 2016, 2 ff.), information systems development teams (Hsu et al. 2017, 1557 ff.), industrial construction projects (Ali et al. 2020, 1 ff.), student project teams (Aubé et al. 2018, 198 ff.) and military teams (Cakiroglu et al. 2020, 301 ff.). These project studies have demonstrated that shared leadership produces positive performance benefits.

Shared leadership positively impacts project, team, and individual levels. The paper from Scott–Young et al. (2019, 571) provides a comprehensive overview. Studies on the individual level found a positive relationship between shared leadership and team member satisfaction and trust (Robert Jr and You 2018, 508), performance, skill development and learning (Liu et al. 2014, 289–291). On team level, research studies have shown that shared leadership influences the team effectiveness (Pearce and Conger 2003, 181–183), creativity and satisfaction

(D'Innocenzo et al. 2016, 1978–1980), learning (Liu et al. 2014, 289–291), sense of belonging (Barrick et al. 2007, 549–550), proactivity (Erkutlu 2012, 102) and team functioning (Bergman et al. 2012, 34). Shared leadership contribute to task performance (Ensley et al. 2006, 225–226; Sousa and Van Dierendonck 2016, 7–9; Hoch et al. 2010, 110–111), innovation (Hoch 2013, 167–177) and project success (Imam and Zaheer 2021, 7) on project level.

In meta–analyses, studies on shared leadership have found that shared leadership has a positive relationship with outcomes such as team effectiveness (Wang et al. 2014, 192) and team performance (Nicolaides et al. 2014, 934; D'Innocenzo et al. 2016, 1980), although some researchers have also found (e.g. Fausing et al. 2013, 244) that shared leadership does not always have positive effects.

The context plays a decisive role and influences the outcome of shared leadership. A complex environment is an advantage for shared leadership. The characteristics of a product development project team seem to fit particularly well here for shared leadership.

2.4.3 Shared leadership in product development project teams

Shared leadership in new product development teams has a common history. Since its inception, there has been a belief in the added value of shared leadership in new product development (Cox et al. 2003, 49–51). I would like to briefly examine the environment and conditions of a product development project and the characteristics of the tasks in such a project.

Product development is central to companies in global markets as it achieves sustainable competitive advantages (Kleinschmidt et al. 2007, 40). However, today's world of product development is characterised by a fast–moving and highly competitive market (Takeuchi and Nonaka 1986, 137). On the one hand, customers' demands for the product are increasing, and there are more and more technical possibilities to fulfil these wishes. On the other hand, competition is getting tougher as globalisation and digitalisation allow suppliers to compete for customers worldwide. The result is technically more and more complicated products, and managing the development of such products is a complex task (Bhattacharya et al. 1998, 50).
For the reasons already mentioned, the products' technology is becoming increasingly complicated (I deliberately do not use the term "complex" because most definitions state that the outcome is unpredictable with complexity, which is not the case with products.). A modern passenger car, for example, now has 1,200 functions (a function can be tiring pressure monitoring) executed by about 10,000 individual parts and 100 million lines of software code. The forecast is showing approx. 300–500 million lines of software code in self–driving cars.
In addition to the complicated product, product development is exposed to uncertainties. Uncertainty arises because customers' preferences change and competitors' products influence the product's specifications, thus already influencing the development (Bhattacharya et al. 1998, 50). Added to this is the lack of a precise understanding of the specific tasks, their sequence, interdependencies and the time required before execution (Tatikonda and Rosenthal 2000, 77–78). Developing products that are complicated and characterised by uncertainty is primarily organised in project or programme teams.

New product development projects are growing increasingly complex (Yang et al. 2014, 928). Besides the complicated technology of the product and the uncertainty in product development projects, there are reasons why a project is complex (not specific to product development), e.g. the interdependence and interrelationships between tasks, the many different stakeholders and their different goals and intentions, and the number of project participants and the flow of information between them, to name a few (San Cristóbal et al. 2018, 3).

Using a practical example, I want to show which requirements arise from the project's tasks. For this purpose, I would like to refer to the development of the tire pressure control system. The development of the function involves the Chassis team (responsible for the tires and the relevant electrical control unit and software), the Instrument Cluster team (an icon is needed when the pressure is too low), the Design team (responsible for creating the icons in the display), the Electrical Architecture team (signals must be defined for communication between the electrical control units), cyber security (to protect the system from external influences), controlling (will the planned cost are met), release team (will the timing met) and the legal team (tire pressure control is a law). The example given clearly shows the interdependencies of the task to be implemented. Many teams are involved in fulfilling the tasks. There is also an increased level of complexity for the task. The complexity of the task is due to the lack of knowledge before the development of the product and the fact that any changes in the requirements have / can impact other areas.

A higher degree of creativity is necessary to complete the tasks. Creativity is needed when developing innovative solutions, defining goals or when problems and decisions must be made during a project. This is the case when it comes to finding compromises because cross–functional teams have different aims and requirements for product development.

Pearce (2004, 48–50) underlines that shared leadership is most appropriate when the tasks are highly interdependent, require a great deal of creativity, and are complex. The meta–analysis confirms task complexity and interdependence's positive association with shared leadership. (Fausing et al. 2015, 271; Wang et al. 2014, 181). In summary, the characteristics of product development projects and shared leadership harmonise well with each other. This is consistent with the study by Mueller (2021, 25) which showed shared leadership in all eight product development project teams analysed.

2.4.4 Definitions of shared leadership

The most widely cited definition is from Pearce and Conger (2003, 1): Shared leadership is a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to achieve group or organisational goals or both.

In recent decades there have been many different definitions of shared leadership. I have identified key components in the definitions that I would like to address. In the following, I will explain shared leadership as a dynamic, shared, team–orientated and emergent phenomenon.

2.4.4.1 Shared leadership as a dynamic phenomenon

In many definitions, shared leadership is described as a dynamic phenomenon (e.g. Sweeney et al. 2019, 5; Pearce and Conger 2003, 1). The dynamics result from the simultaneous, continuous process of mutual influence of individuals in groups (Pearce 2004, 48).

The word "dynamic" means a change over time. The opposite would be static, which describes a stable, unchanging state. Depending on the context, dynamics can be a development, an evolution, a movement, an adaptation or an unfolding. Dynamics are not only linear, but also include cyclical and episodic aspects (Marks et al. 2001, 358).

Team constructs and phenomena are not static (Kozlowski and Bell 2003, 73). Groups are living systems (Forsyth 2010, 19) and can adapt. It is no coincidence that teams are also seen as complex adaptive systems. The advantage of the group dynamic is the change and reaction on influencing factors, what make the group more successful.

The dynamic results from the interactions between the individuals within and outside the group. Groups are influenced by the individual team members (bottom up) but also from organizations (top down) (Forsyth 2010, 20). Individual–level factors (e.g. personality, knowledge, skills, abilities), team–level factors (e.g. structure level of cohesiveness, group size), environmental–level factors (e.g. reward structure, level of stress) influence the group interaction process (Forsyth 2010, 358) and thus the dynamics in the team.

Due to the dynamic, teams consistently develop over time as members evolve and adapt to the varying situational demands they continuously face (Kozlowski and Ilgen 2006, 78). I want to emphasise two team development models to understand the dynamics.

The team development models provide an illustration of the dynamic. Researchers have shown that teams evolve over time and different models have emerged. Tuchman's model, for example. Tuckman and Jensen (1977, 419) identified five stages of a group development: forming, storming, forming, performing, adjourning. The initial phase, Forming, is characterized by a lack of clarity regarding roles and a desire to evaluate the abilities and preferences of fellow team members. During this phase, teams typically designate a leader and form initial impressions about each other and the tasks ahead. The subsequent phase, Storming, involves an inherent struggle for leadership positions, compromises, uncertainties, and a potential risk of disruption due to emotional and relational factors. In the third phase, Norming, there is a significant movement towards advancing the task by establishing rules, roles, and processes. This stage often sees a decrease in discontent and an increase in acceptance of the team's approach. The fourth stage, Performing, is characterized by peak efficiency and coordination within the team. Processes tend to run smoothly, and relationships between members flourish during this phase. The addition of the fifth stage, Adjourning, which was introduced over a decade later, is crucial for understanding how the model anticipates the disbandment of a group and the associated processes that occur during this phase.

Another model of team development is from Kozlowski and Bell (2003, 107) which includes 4 phases: Team formation, task compilation, role compilation, team compilation, team maintenance. The model revolves around four phase transitions, each characterized by specific focal points and criteria for content, process, and outcomes. Unlike distinct stages, which involve abrupt shifts, phase transitions represent gradual reorientations in predominant activities. In the first phase, team formation, individuals concentrate on establishing their place within the social context through a process of socialization. This leads to outcomes such as interpersonal familiarity and team alignment, laying the groundwork for shared norms, objectives, and perceptions of the team environment. Moving into phase 2, task compilation, individuals focus on acquiring task–related knowledge through processes of skill development, resulting in outcomes such as task proficiency and self–regulation abilities. Phase 3, role compilation, shifts the focus to dyads, which must negotiate role dynamics, identifying key roles and routines to guide task–related interactions. In phase 4, team maintenance, the focus extends to the team level, where a flexible network of role interdependencies is established to facilitate ongoing improvement and adaptability to new challenges. Unlike many time–constrained developmental models, this model regards team integration as an ongoing phase rather than a final state.

Based on the dynamic in teams which leads to different team stages, leadership is also a dynamic phenomenon (Denis et al. 2012, 264). Leadership dynamics are based on the fact that leadership adapts in order to remain effective. For example, the adaption of a leadership style based on the leader–member relation, task structure, and leader position power (Fiedler contingency theory) or on the maturity level of the follower (Hersey and Blanchard situational leadership theory).

Shared leadership evolves and changes over time. Research has shown that shared leadership changes in a curvilinear fashion over time, with the pattern during a project team approaching an inverted U–shape (Lorinkova and Bartol 2021, 77). Changing relationships with team members, changing team dynamics, the complexity and dynamics of team tasks and the development of competences influence these dynamics.

2.4.4.2 Shared leadership as a shared phenomenon

Definitions have in common that they describe shared leadership as a shared phenomenon. Some definitions describe shared leadership as sharing leadership responsibilities (e.g. Acar 2010, 1740; Hiller et al. 2006, 388), as sharing leadership roles (e.g. Barry 1991, 34; Carte et al. 2006, 323), as sharing leadership functions (e.g. Small and Rentsch 2010, 203; Nicolaides et al. 2014, 924; Drescher et al. 2014, 772) and some as sharing leadership behaviours (e.g. Barry 1991, 34; Carte et al. 2006, 323).

There are different views on what is meant by leadership. Leadership responsibility, leadership functions, leadership roles or leadership behaviour. I would like to look at the definitions that describe shared leadership as a distribution of functions and delve deeper into the topic of leadership functions.

Functional leadership is one of the oldest approaches to team effectiveness and can be traced to work conducted on leadership training in the US Civil Service Commission (McGrath 1962, 1 ff.). Functional leadership focuses on the key leadership behaviour required for satisfying core team needs and getting processes and activities initiated and accomplished that lead to team success (Kozlowski et al. 2016, 36–37).

McGrath (1962, 365 ff.) developed a typology of critical leadership functions arrayed in a two–by–two matrix. One axis specifies the type of activity (monitoring or taking executive action), whereas the other axis describes the orientation of the activity (internal or external to the group).

Bowers and Seashore (1966, 238) summarised four basic dimensions of leader functions, which included support, interaction facilitation, goal emphasis, and work facilitation. The dimension of support includes behaviour that reinforces another person's sense of personal worth and importance (ipid, 247). The dimension of interaction facilitation contains the behaviour that encourages group members to develop close, mutually satisfying relationships (ipid, 247). The dimension of goal emphasis includes behaviours that promote enthusiasm for achieving the group goal or outstanding performance (ipid, 247). The dimension of work facilitation is the behaviour that helps achieve goal attainment by such activities as scheduling, coordinating, planning, and by providing resources such as tools, materials, and technical knowledge (ipid, 247).

Hackman and Walton (1986, 114) describe that leadership with a clear, engaging direction, a facilitating group structure, a supportive context, available expert coaching, and adequate material resources contribute to team effectiveness.

Fleishman et al. (1991, 264–267) offered a taxonomy of functional leadership that grouped activities into four overarching dimensions: information search and structuring, information use in problem–solving, managing personnel resources, and material resources.

Marks et al. (2001, 354) describe in their taxonomy ten team processes. Mission analysis, goal specification, strategy formulation and planning, monitoring progress towards goals, systems monitoring, team monitoring and backup, coordination, conflict management, motivation and coincidence building, and affect management.

Furthermore, Hackman and Wageman (2005, 273) applied the concept of functional leadership to executive coaching and suggested that team coaching has motivational, consultative and educational functions.

An examination of the literature by Kozlowski et al. (2009, 115) revealed matches four interrelated leadership functions – planning and organising, monitoring and acting – that are internally or externally focused on team tasks or social domains.

In a leadership functional approach, all those who take responsibility for satisfying the critical team needs of a team can be considered team leaders (Morgeson et al. 2010, 8).

Morgeson et al. (2010, 5 ff.) developed a comprehensive taxonomy of team leadership functions by examining 85 articles and book chapters spanning 60 years (roughly 1950–2010) to compile a pool of possible team leader behaviours. They identified 517 behaviour items relevant to team leadership and coded them to 15 leadership functions (see Table 3). Morgeson et al. (2010, 10) show in their research that the leader can be formal or informal and inside or outside the team. These leadership functions are composing the team, defining the mission, establishing expectations and goals, structuring and planning, training and developing the team, sensemaking, providing feedback, monitoring the team, managing team boundaries, challenging the team, performing team tasks, solving problems, provide resources, encourage team self–management, and support social climate (Morgeson et al. 2010, 10). Selecting motivated and competent team members who have the right mix of skills and have already worked well together is covered in the leadership function compose the team. The Define Mission function ensures that the team has a clearly articulated shared understanding of vision, mission and purpose. Establishing expectations and goals involves defining and communicating expectations for high team performance but also setting standard rules and regulations. This function focuses on setting challenging and realistic goals and reviewing them for realism, challenge and business necessity. The leadership function of structure and planning involves defining and structuring one's own work and the work of the team. The function includes clarifying strategies for completing tasks and ensuring that the roles of team members are clear. The function trains and develops the team to ensure that the team has the necessary problem–solving and interpersonal skills. It helps the team learn how to do their work and learn from past events or experiences. The function of Sensemaking help the team to interpret things that happen inside or outside the team. Helps the team integrate internal or external events and make sense of ambiguous situations. Providing feedback involves reviewing and rewarding performance results but also giving positive or corrective feedback to team members. The team monitoring function aims to monitor the team's performance, request task–relevant information from team members and identify weaknesses in the task process or team performance. Team boundary management is to prevent the team from being influenced by external forces or events. Helps different teams communicate with each other and resolve difficulties between different teams. The challenging team function serves to rethink the key assumptions in order to determine the right course of action. It also challenges the status quo, suggests new ways of doing the work and contributes ideas to improve the team's performance.

In the context of the leadership function, completing team tasks is about working with the team to get the job done. This can take the form of "pitching in" or "rolling up their sleeves" and helping the team to do their work. Solving problems implements problem–solving or helps the team to implement problem–solving or helps the team to develop solutions to tasks and relational problems. The Provide Resources function aims to procure and allocate resources (material, equipment, personnel and services) for the team to achieve the best performance of the team. By encouraging self–management in the team, the team should be encouraged to make most of their own work–related decisions, solve their own problems, be responsible for their own affairs and evaluate their own performance. The social climate support function includes a commitment to actions that show respect and concern for team members. Furthermore, it is about looking after the personal well–being of team members.

Table 3: Leadership functions

1) Composing the team
2) Defining the mission
3) Establish expectations and goals
4) Structuring and planning
5) Training and developing the team
6) Sensemaking
7) Providing feedback
8) Monitoring the team
9) Managing the team boundaries
10) Challenging the team
11) Performing team tasks
12) Solving problems
13) Provide resources
14) Encourage team self–management
15) Supporting social climate

Source: Morgeson et al. 2010, 10.

Several meta–analyses underlined the evidence of the leadership functions and team effectiveness (Mathieu et al. 2019, 22–23; Bell 2007, 602–610; LePine et al. 2008, 284–293; Hülsheger et al. 2009, 1134–1135; Klein et al. 2009, 209).

2.4.4.3 Shared leadership as a team phenomenon

Since the team is involved in the leadership process, shared leadership is defined as a team phenomenon (e.g. Perry et al. 1999, 38; Ensley et al. 2003, 334; Pearce and Sims Jr 2002, 172). Some definitions explicitly state that leadership cannot be attributed to a single leader (e.g. Meuser et al. 2016, 1390).

In general, today's work is organised in teams in many areas. For example, projects always consist of teams. Teams are ubiquitous and touch our lives every day (Forsyth 2010, 352). This is also due to the fact that over time, people's tasks have become more complex, and thus the need to work in teams to achieve their goals has increased (Forsyth 2010, 352). To summarise, teams are faster and achieve better results than a single person when the tasks are difficult, complex and important (Forsyth 2010, 356).

A very simplified definition of a team is described as a wide assortment of human aggregations (Forsyth 2010, 353). A team can be defined in a more detail as (a) two or more individuals who (b) socially interact (face–to–face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with

boundaries and linkages to the broader system context and task environment (Kozlowski and Ilgen 2006, 79).

Teams can be categorised into management, project, consulting, service, production and action teams (Forsyth 2010, 354). Project teams, for example, include people with different backgrounds and expertise who come together to develop innovative products and find new solutions to existing problems. These teams are familiar with companies as they are often composed of employees from different departments and are deliberately organised to reduce the lack of communication that isolates individual units within the company (Forsyth 2010, 354).

If teams are viewed as a social system in a complex and dynamic environment, many different social interactions arise over time. This results in a series of processes, including leadership processes within the team. This means that leadership processes cannot be attributed to a single person but to the team or at least to more than one individual. The vision is that the most suitable people will lead, and the most appropriate people will follow. This certainly has advantages, as it increases the team's leadership capacity.

Current leadership research shows a clear trend that leadership can be seen as a team phenomenon (shared and distributed leadership, collective leadership, balanced leadership, team leadership).

2.4.4.4 Shared leadership as an emergence phenomenon

I have described that permanent social interactions lead to a dynamic in the concept of shared leadership. This dynamic leads to official and unofficial leadership within a team, which is why shared leadership is defined as an emergent phenomenon in various meta–analyses (e.g. D'Innocenzo et al. 2016, 1968; Wang et al. 2014, 181; Nicolaides et al. 2014, 924).

For example, Small and Rentsch's (2010, 203) definition of shared leadership as an emergent process in which team members influence each other and share leadership functions between two or more people.

The concept of emergence is an important component in the concept of shared leadership. In the following sections, I will describe the concept of emergence in the context of shared leadership.

Before I conclude the chapter on shared leadership and move on to the chapter on the emergence of shared leadership, I would like to summarise the chapter. Shared leadership has been defined in numerous ways over the decades, but common components include its dynamic, shared, team–oriented, and emergent nature. Pearce and Conger's (2003, 1) widely cited definition encapsulate shared leadership as a dynamic and interactive influence process aimed at achieving group or organizational goals. These definitions emphasize the continuous and mutual influence among team members, highlighting how shared leadership adapts and evolves over time in response to changing group dynamics and situational demands. Additionally,

shared leadership involves the distribution of leadership responsibilities, roles, functions, and behaviours among team members, fostering a collaborative environment. Recognizing teams as complex systems, researchers have identified how shared leadership can emerge naturally within a team, influenced by individual, team, and environmental factors. Overall, shared leadership is a multifaceted and flexible approach that enhances team effectiveness and adaptability in complex organizational settings.

2.5 The emergence of shared leadership

As emergence is an important part of the concept of shared leadership, I would now like to go into it in more detail. In this subsection, I briefly describe the state of research on the emergence of shared leadership. I start with the history of emergence in leadership, describe the states and conditions of emergence in leadership, differentiate in the definitions of leadership emergence, continue with the antecedents of shared leadership, give an overview of emergent team states, emergent process mechanisms and finally with the emergent process of shared leadership.

2.5.1 The history of the emergence in leadership

The notion of emergence has a long history, originating in philosophy, biology, physics, sociology, and, more recently, and has been integrated with complexity theory (Acton et al. 2019, 146).

According to Hodgson (2000, 65), the philosopher George Lewes first suggested the word "emergent" in this context of social emergence in 1875. Subsequently, Conwy Lloyd Morgan was one of the pioneers of this topic. Morgan (1927, 3–6) defined emergent properties as "unpredictable" and "non–additive" results of complex processes, and it needs a shift from mechanistic to organic metaphors (Morgan 1933, 58). Polanyi (1967, 36) highlighted it is impossible to represent principles of a higher level by the laws governing its isolated particulars. For a long time, there was the assumption that it cannot be reduced entirely to components and phenomena at lower levels (Mayr 1988, 11). This paradigm is called the strong (Bedau 1997, 377) or collective emergence (Sawyer 2005, 94), which holds that group behaviour is constituted by individual action yet cannot be reduced to the individual level. The second paradigm is the weak (Bedau 1997, 377) or individualist emergence (Sawyer 2005, 94) and starts with the development of computer technology, which greatly facilitated the simulation of nonlinear dynamic systems in the 1980s. The chaos theory was raised. This theory assumes that tiny changes in crucial parameters can lead to dramatic consequences, also known as the butterfly effect. Like a butterfly stirring the air today in Peking can transform storm systems next month in New York (Gleick 1988, 8).

The doctrine that all social phenomena (their structure and their change) are in principle explicable only in terms of individuals properties, goals, and beliefs (Elster 2003, 22). The reductionism was born. Reductionism sometimes involves the notion that wholes must be explained entirely in terms of their elemental constituent parts (Hodgson 2000, 72). Between 1980 and 2000, emerging concepts were pushed from the fringes into the spotlight of discussions about the evolution of complex systems (Hodgson 2000, 72).

Already over 30 years ago, Lord et al. (1986, 408) stated that emergent leadership is “a major component of the social fabric of many organisations.” Meanwhile, the emergence theory has been integrated with the complexity theory (Acton et al. 2019, 146). Currently, the goal of the emergent phenomena is to simultaneously understand the process of emergence through systems dynamics across multiple levels (Kozlowski et al. 2013, 585).

2.5.2 States and conditions of emergence in leadership.

In general, some states influence the emergence of leadership. These include the presence of a state of disequilibrium (Lichtenstein and Plowman 2009, 620). Systems tend to remain in equilibrium. Disruptions can lead to changes and adjustments that force a situation that is far from equilibrium and where the system cannot return to its previous equilibrium. During this disruption, leaders emerge to help the organisational system transform and adapt until it reaches a new emergent order (Lichtenstein and Plowman 2009, 620).

Another but very similar state is the "edge of chaos". The edge of chaos is a region of complexity. It is a transition zone between stability and chaos in systems (Osborn and Hunt 2007, 321). In this state, systems exhibit a delicate balance between stability and unpredictability. In this state, new patterns and emergent behaviours can emerge.

In both states, disequilibrium or edge of chaos, the emergence of leadership is encouraged. Next to the states, there is research about the conditions about leadership emergence. E.g. during changes in organisational structure (e.g. Birkinshaw et al. 2017, 422 ff.), when performing non–routine tasks (Chung and Jackson 2013, 442 ff.) while working in complex and dynamic environments (Curnin et al. 2014, 561; DeChurch et al. 2011, 162), in product development project teams (Mueller 2021, 20; Hoegl et al. 2004, 38), when new resources are needed (Waldman and Atwater 1994, 243) or given certain levels of inter–team interdependence (Kennedy et al. 2017, 273).

2.5.3 Differentiate in the definitions of leadership emergence

The research on leadership emergence is at least 40 years old and has different terms and definitions. Basically, the relationship between the individual and the collective level is a fundamental one. Acton et al. (2019, 154) describe leadership emergence as an individual, relational, and collective level phenomenon. The collective level represents shared leadership. In their literature review, Cox et al. (2022, 6) provide different terms and explanations of the emergence of leadership.

2.5.3.1 Emergent leadership

Cox et al. (2022, 5) defined emergent leadership as a configuration of immanent, relational social influence that signifies priorities of importance to a group and may supplement or substitute formal leadership roles or structures.

2.5.3.2 Leadership emergence

Leadership is viewed in terms of information flows. Often situates leadership within a systems perspective. Highlights leadership as a dynamic rather than as a locus or outcome (e.g. Bass 1949, 532–533).

2.5.3.3 Definition Emergent leader:

Through their influence over others (e.g. with task competencies) , becomes a leader of a group (Hollander 1959, 17).

2.5.3.4 Emergence of leadership

The emergence of leadership as an interactional, social practice within a team, rather than a focus on an individual emerging as a leader (Bass and Stogdill 1990, 18).

2.5.3.5 Emergence of leaders

Understanding the conditions that allow leaders to emerge (Cox et al. 2022, 6).

2.5.3.6 Leadership emergence

Acton et al. (2019, 146) defined leadership emergence as a multilevel interactional process driven by deep–level cognitive and perceptual processes of group members that form a collective patterning of leader and follower interactions over time.

2.5.3.7 Definition Emergence of shared leadership

An emergent property of the group where multilevel individuals invest and divest themselves of leadership even though their status is never formally recognised Cox et al. (2022, 6).

2.5.4 Antecedents of shared leadership

In the history of shared leadership emergence, a lot of effort was made in identifying the conditions and factors which foster or predict shared leadership emergence. Acton et al. (2019, 150) have shown antecedents of leadership emergence in their literature review: behaviour, emotional competency, intelligence and recognition, cognitive ability, knowledge, masculinity/femineity/ androgyny (gender role), motivation to lead, personality, physical features, race, self–efficacy, self–esteem/confidence, and self–monitoring.

Pearce and Conger (2003, 55) have shown in their conceptual model that vertical leadership and team characteristics are antecedents of shared leadership. Vertical leadership contains team formation, boundary management, leadership support, and empowerment. Team characteristics include proximity, team size, ability, diversity, and maturity. A few years later, Hoch and Dulebohn (2013, 118) highlighted support factors (perceived team support, information,

rewards), vertical leadership (transformational leadership style, empowerment, leader–member exchange), and team member characteristics and composition (self–leadership, locus of control, proactive personality) as antecedents in their framework model of shared leadership.

Burke et al. (2003, 108) posited that four types of shared cognition (shared mental model, shared attitudes, shared metacognition, and shared situation assessment) together generate shared leadership in teams.

In some empirical studies, antecedents are identified. Carson et al. (2007, 1227) illustrated that shared purpose, social support, and the opportunity for voice (also called the internal team environment) are antecedents and positive influence shared leadership. The meta–analysis from Wu et al. (2020, 58) supports the relationship between the internal team environment and shared leadership. Serban and Roberts (2016, 188) found a positive effect of task cohesion and internal team environment on the emergence of shared leadership in innovation labs. Fausing et al. (2015, 271) showed a positive effect of task interdependency and empowering leadership on shared leadership. Findings that a team's experimental culture and team's ability to reflect are positively related to shared leadership in an innovation lab environment (Rose et al. 2021, 7). Trust and collectivism also play a crucial role in increasing the degree of shared leadership (Small and Rentsch 2010, 209). Additional antecedents to foster the emergence of shared leadership are leader humility (Chiu et al. 2016, 10), fair reward, psychological, empowering and team leader behaviour (Grille et al. 2015, 330), demographic diversity (Hoch 2014, 541), team diversity, team composition (Zhou 2016, 153), collaboration decision making, respects competencies (Muethel and Hoegl 2016, 339–341), member autonomy (Buchanan et al. 2007, 1085), openness to new experience, and the degree of team's conscientiousness (Zhou 2013, 4). Lyndon and Pandey (2021, 366) identified in their study shared interpersonal cognition (personal strengths/weaknesses, others strengths/weaknesses) and trust (in competencies and in the intent) as antecedents for shared leadership.

In his dissertation, Park (2018, 27–29) distinguished between situational antecedents and individual antecedents of shared leadership.

Situational antecedents (Park 2018, 61–62):

- Formal leader traits/behaviour (coordination, empowerment, coaching behaviour, trust building, vision proposition)
- Team composition (level of expertise, age/work experience, number of people, interdependent role, task, and responsibility, managerial level, harmony/fit)
- Work characteristics (challenging work, need for innovative/creative outcomes, unexpected situation/uncertainty)

Individual antecedents of shared leadership (Park 2018, 72–73):

- Holding core team evaluation (team awareness, team esteem, collective efficacy)
- Showing team trust
- Creating an open communication climate

2.5.5 Emergent team states

The emergent team states also play a crucial role in the emergence of shared leadership. Emergent team states are defined as cognitive, motivational, and affective states of teams, which are typically dynamic in nature (Marks et al. 2001, 357). In the context of shared leadership emergence, Wang et al. (2014, 187) identified a positive correlation between shared leadership and team empowerment, team identification and team satisfaction. Emergent team states such as a shared mental model, team cohesion and metacognition also affect shared leadership (Zaccaro et al. 2001, 461). In addition to that, team psychological safety, a shared belief among individual members within a team whether they feel safe taking risks, was identified as an emergent team states (Lee et al. 2015, 54). Positive team states such as flow (Aubé et al. 2018, 198) positively influence team motivation and creativity (Lee et al. 2015, 54) of shared leadership. Shared leadership can also give positive emergent states such as team cohesion (Wang et al. 2014, 187), trust (Drescher et al. 2014, 1), confidence (Nicolaides et al. 2014, 923) and potency (group believes in their productivity) (Sivasubramaniam et al. 2002, 66), thereby building the team's social capital (Day et al. 2004, 876).

2.5.6 Emergence process that leads to shared leadership

This section describes the process of shared leadership emergence divided into primary individual, relational, and collective level. These mechanisms can be understood as steps which are necessary to go through.

On the individual level, the leadership emergence processes are:

- Follower self–identity/self–schema; information processing, leadership prototype activation, self–identity activation, self–schema, and self–view (e.g. Foti et al. 2008, 178 ff.; Lord et al. 2001, 326–328);
- Adjustment to social cues/follower expectancies & feedback, behaviour, communication, and/or task contribution; information exchange (e.g. Murphy 1941, 674 ff.; Strickland et al. 1978, 583 ff.);

The processes on the relational level:

- Adjustment to social cues/follower expectancies & feedback; follower self–identity/ self–schema (e.g. Robins and Boldero 2003, 56 ff.);
- Claiming & granting/double interacts, identity negotiation/construction (DeRue 2011, 125; DeRue and Ashford 2010, 631; Marchiondo et al. 2015, 892);

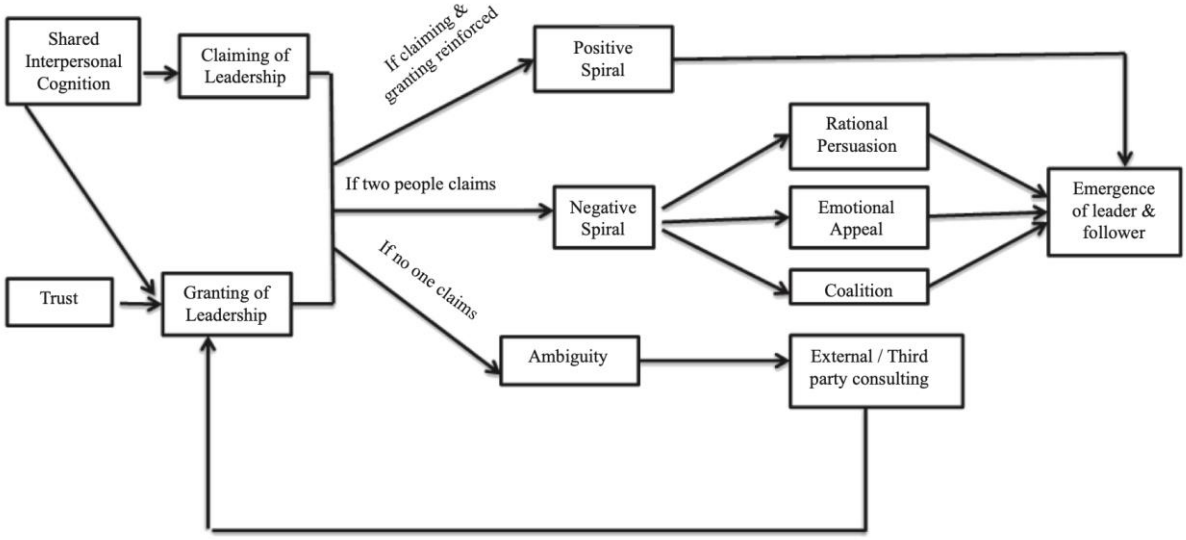
And finally, the processes on collective level:

- Coevolution of leadership and social networks; evaluation of other dyadic relationships within the collective (Carter et al. 2015, 615);
- Collective patterning of interaction; coupling/signalling, shift to attractor states/phase transitions; resolving tensions (Guastello 2007, 357 ff.; Hazy 2008, 281 ff.; Uhl–Bien et al. 2007, 298 ff.);

- Adjustment to social cues/follower expectancies & feedback; conformity to group norms; earning idiosyncrasy credits (Hollander 1958, 117 ff.; Stone and Cooper 2009, 787);
- Self–schema activation; shift to attractor states/phase transition (Lord et al. 2015, 271);
- Resolving tension; social identity (Hogg 2001, 184 ff.; Haslam and Reicher 2007, 125 ff.; Van Knippenberg and Hogg 2003, 243–295).

Many individual processes at different levels that lead to shared leadership. I would like to emphasise one paper in particular. Lyndon and Pandey (2021, 367) described a schematic representation of the shared leadership emergence process (Figure 2) in an Indian intrapreneur team. The process starts with a shared interpersonal cognition, which is the knowledge about the strengths and weaknesses of self and other team members. The second element in the process is the claiming and granting of leadership. One team member is claiming leadership, and another team member is granting leadership. This leads to a positive spiral, resulting in the emergence of a leader and follower. If both people are claiming leadership or granting leadership, strategies like rational persuasion, emotional persuasion, emotional appeal, or coalition will also lead to emergence of a leader and follower. If no one claims leadership, ambiguity is raised, and external support brings it back to the second element.

Figure 2: Shared leadership emergence process



Source: Lyndon and Pandey 2021, 367.

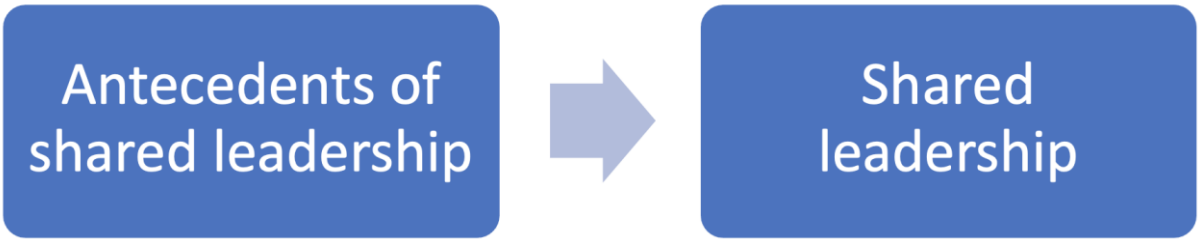
2.6 Research gap

A research gap is a gap of a topic or area for which missing or inadequate information for a given question (Wang et al. 2016, 251). I would now like to turn to the identified research gap in the concept of shared leadership theory.

A lot is known about the concept of shared leadership. Shared leadership seems an appropriate concept for complex environments like product development project teams. Empirical research

confirms the benefits of shared leadership in complex environments. Emergence is also mentioned in the definition of shared leadership. Shared leadership is an emergent phenomenon that arises from the interactions and relationships of the team members. Emergence describes the creation of new, complex properties or structures from the interactions of the parts of a system. Current research on the emergence of shared leadership focuses on the antecedents of shared leadership and some processes that can lead to shared leadership. Figure 3 illustrates the current simplified state of research by showing the antecedents of shared leadership that lead to shared leadership. The antecedents are to be understood as various factors that positively promote the emergence of shared leadership over time. However, there is no concrete description of how these factors interact to create shared leadership. Fransen et al. (2018, 142) and Acton et al. (2019, 146) emphasise that although the emergence of shared leadership is a widespread phenomenon, little is known about it. More research is needed on shared leadership emergence like the underlying processes (Acton et al. 2019, 145–146).

Figure 3: Antecedents of shared leadership leads to shared leadership



Source: Authors contribution.

And here I would like to emphasise that this is precisely where the research gap lies, namely in the knowledge of how shared leadership emerge. Miles (2017, 3–4) distinguishes seven types of research gaps and describes the knowledge gap as a general gap in prior research and describes when knowledge in the actual field may not be available on theories and literature from related research areas. There is a knowledge gap regarding the factors and their relationship to the emergence of shared leadership and there is a knowledge gap regarding the process of the emergence of shared leadership.

2.7 Conclusion

These sections discuss the relevant literature on the emergence of shared leadership. I first explain the concept of shared leadership and its connection to the phenomenon of emergence. I then delve deeper into the specifics of how shared leadership emerges and highlight the research gap, as there is still little understanding of the underlying processes, necessitating further study. In the next chapter, I will describe the research methodology I plan to use to address this gap.

3 RESEARCH METHODOLOGY

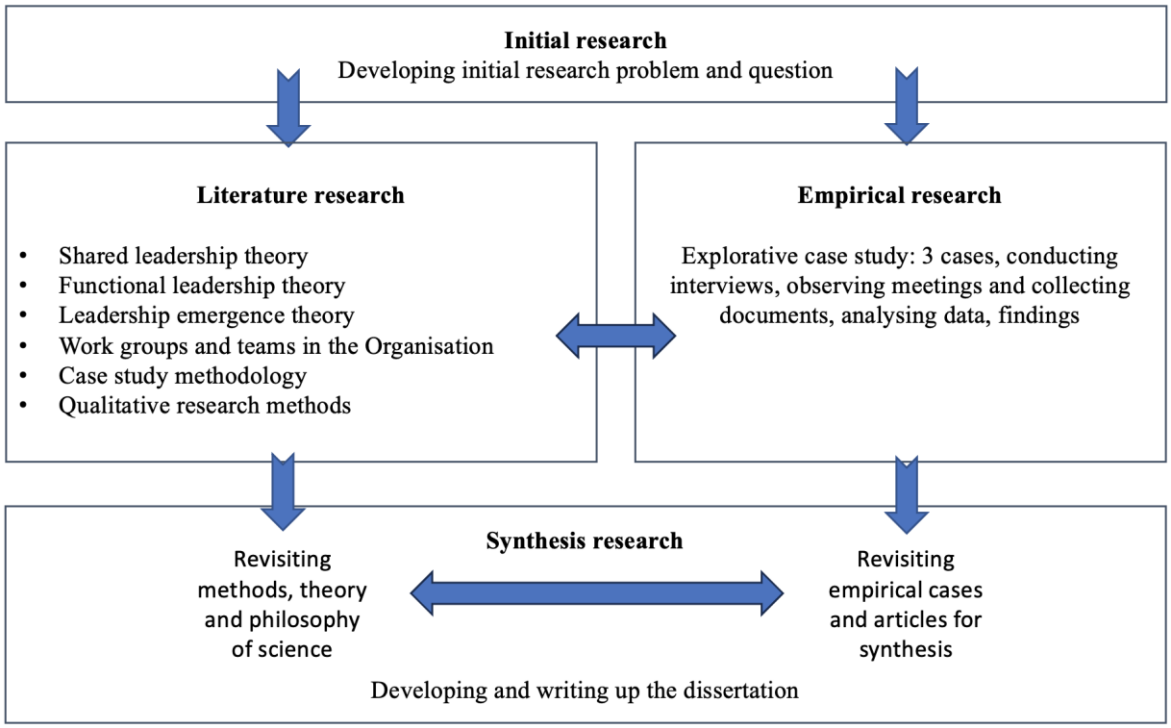
In this section I will begin with a briefly introduction about the term research methodology and how I proceed in an abstract manner. I then outline the purposes and objectives of my research and presenting the research question in detail. Derived from the research questions, I describe the research methods, including the research design, data collection and data analysis procedures, and conclude with a brief summary.

3.1 Introduction

Research methodology is a systematic way to solve a problem. It is the science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining, and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research (Rajasekar and Verma 2013, 5).

The research process shown in Figure 4 was not a linear inductive research process (from empirical analysis to theory) but an integrative and non–linear process. I went back and forth between the theory and the empirical data, constantly contrasting the two to refine the empirical findings and theoretical arguments. This recursive process can mainly be described as abductive, as it reconciles theory and empirical data to derive an explanation for the research phenomenon (Ketokivi and Choi 2014, 236).

Figure 4: Overall research process



Source: Authors contribution.

3.2 Purpose and objectives of the research

Based on the research gap and the fact that the emergence of shared leadership has not been sufficiently researched, the purpose and aim of the research were defined. The purpose of this thesis is to gain a deeper empirical understanding of the emergence of shared leadership in a complex organisational environment such as product development project teams. This knowledge is used to identify the factors and their relationships and to create a process–orientated framework for the emergence of shared leadership. The following research questions serve as a guide to achieve the research objective

3.3 Research questions

The main research question is:
How does shared leadership emerge in product development project teams?

Three sub–research questions are posed to answer the main research question:
(1) What are the key factors of leadership emergence in PDP teams?
(2) What are the relations between these identified factors in PDP teams?
(3) What are the processes of shared leadership emergence in PDP teams?

3.4 Research Design

The research design is a strategy for answering your research question.

3.4.1 Qualitative research

Qualitative research aims to gain a deeper understanding of a phenomenon. For example, the understanding of behaviour or social processes. This is in line with the purpose of my research. There are different ways of doing a qualitative research question. Because the context for shared leadership emergence is crucial, I selected a case study.

3.4.2 Case study

A case study lends itself to answering a "how" or "why" research question, and the question requires an extensive and “in–depth” description of some social phenomenon (Yin 2018, 11), which is the case in the present study.

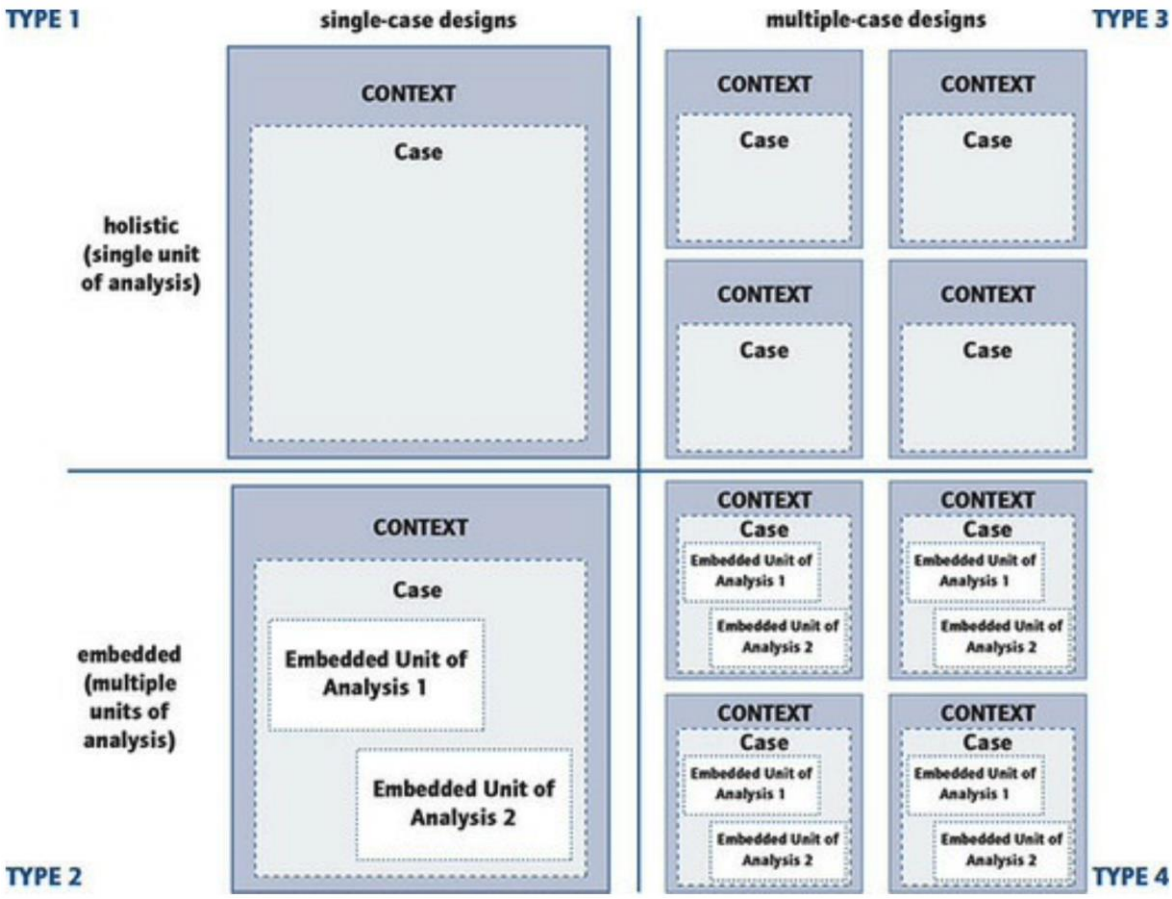
A case study can be used for explorative, interpretive, interventionist or constructive phenomenon (Martinsuo and Huemann 2021, 419). Generally, a case study can have its own analysis by “playing” with the data and searching for promising patterns, insights, or concepts (Yin 2018, 164). As this thesis aims to investigate the phenomenon of shared leadership emergence, a case study is the most appropriate method.

A case study investigates a phenomenon in its natural context, in a real–life setting (Martinsuo and Huemann 2021, 417). In the investigated phenomena of shared leadership emergence, the context is crucial because leadership emerge differently in different contexts through the shape of contextual factors (Kozlowski et al. 2013, 600).

The explorative case study can be chosen when the researcher has an external position and wants to understand and illustrate a phenomenon (Martinsuo and Huemann 2021, 419). Explorative case studies often contribute by way of offering a new understanding, a new framework, or even a summary of propositions that may guide the forthcoming research (Martinsuo and Huemann 2021, 420). An exploratory case study is best suited to the research objective of understanding the phenomenon of shared leadership emergence, identifying the factors and their relationship, and creating a process framework.

There are several types of designing a case study (Figure 5).

Figure 5: Basis types of design for Case Studies



Source: Yin 2018, 48.

3.4.3 Define the case study

In order to explain the case study comprehensively, the level of analysis, the case (unit of analysis), the phenomenon, and the context should explicitly be described by (Martinsuo and Huemann 2021, 418).

I have chosen the holistic multiple–case design (in the top right square). A multiple–case design is more convincing and robust compared to a single–case design (Yin 2018, 54). A multiple–case study with three cases was selected because this design can represent a significant contribution to knowledge and theory by confirming, challenging, or extending the theory (Yin 2018, 49), which corresponds to the aim of the research.

3.4.3.1 The level of analysis

The level of analysis in my case study is on the factors, their relationship and the process. According to Brunet et al. (2021, 2), taking a process perspective is essential because it:

- is precisely because of the need to take temporality into account.
- allows us to rethink the notion of outcomes and to see that the consequences of activity and events are not singular but ripple out in waves that change with time.
- recognises and captures the dynamic processes.
- focuses on how things are done (e.g. the activities required to achieve change) rather than simply what must be done.

However, a process perspective focuses on how and why phenomena flow over time (Langley 1999, 691; Tsoukas and Chia 2002, 578; Langley et al. 2013, 1). This is in line with the study of the emergence of the phenomenon of shared leadership. For studying projects processual, Brunet et al. (2021, 834) distinguish four perspectives: process as evaluation, process as narrative, process as activity, and process as "whiteness". I chose the process as an activity perspective for several reasons. First, in this perspective, actors and entities are not the focus of how phenomena emerge (Sergi et al. 2020, 4), which is consistent with the functional leadership perspective I adopt in this research. Instead, this process as an activity view invites actors, objects, places, and identities to actions, interactions, and practises, which then become the focus of studies (Sergi et al. 2020, 4).

3.4.3.2 Phenomenon

The phenomenon to be explored in the case study is the emergence of shared leadership. This is done on the underlying definition of shared leadership as an emergent process in which two or more people share leadership functions (Small and Rentsch 2010, 203).

3.4.3.3 Context and Cases

Shared leadership might, however, emerge and develop differently when team members work on projects (Carson et al. 2007, 1229). The context of shared leadership emergence is crucial.

Figure 5 (in the top right–hand quarter) shows that the cases in a multiple–case design have different contexts. The context of the selected cases has common and different characteristics. The common characteristics of the PDP teams are that they are teams analysed in a single company and that the company is involved in the development of passenger cars. The differences characteristics are because teams are responsible for different topics, different timings, different budget, different project management approaches, different clients, have different roles and have different people. Due to the fact that there are many different characteristics of the project teams, the multiple case design is the appropriate case design.

The company where the product development projects are running is EDAG, which is an international automotive service provider. I chose a German company called EDAG because EDAG has many PDPs and operates in a turbulent and dynamic environment. EDAG is a stock company that was founded in 1969 and is an international engineering service provider for the automotive industry with approximately 8,000 employees (Status End of 2022). Most projects at EDAG are product development projects, and the range can be the development of a software unit for an electrical control unit or the development of a total vehicle. EDAG is in the role of the contractor for the projects. EDAG works for various customers such as Porsche, Daimler, BMW, Continental, Bosch, etc. and works mainly under fixed–price contracts. The chosen PDP teams are in the electric electronics department. The electric/electronic department has a matrix organisation with team leaders and project managers. The research benefits from the fact that one of the authors has been an employee at EDAG for eight years, and access to the project teams and documents is guaranteed. In the past, it could be shown in a study at EDAG that shared leadership was used in product development teams (Mueller 2021, 25).

In general, the selection of the cases for a study is driven by the research question (Wahyuni 2012, 73) and practical considerations like access to the data (Yin 2018, 26). There are two other reasons why project teams in product development should be analysed as cases. Firstly, the environment of a product development project team offers suitable conditions for the emergence of shared leadership (high complexity of the environment). And secondly, the emergence of shared leadership in product development project teams is less well researched (as described in the research gap).

Finally, I selected three randomly chosen product development project teams starting between March and December 2022 that were in the initiation, planning and early execution phases of the project. The phases were necessary because the start of the project and the beginning of the interaction are particularly important for investigating the phenomenon of

joint leadership emergence. The selected teams have different areas of work and responsibility and represent a broad spectrum of product development project teams, which is helpful for the generation of my results. Figure 6 shows an overview of the cases.

There are many different factors that influence the number of cases in a case study. In my study, 3 cases should be appropriate as there is enough data to obtain meaningful results for the phenomena under investigation.

Figure 6: Overview of teams

	Team 1	Team 2	Team 3
Team content	Model-based system engineering parking brake	Developing software unit loading function	Defining electric/electronic features for electrical commercial vehicle
Team located	Three locations in Germany	One location in Germany	Three locations in Germany
Client	German Tier1	German Tier1	Start Up from United Kingdom
Start of the project Team	March 2022	June 2022	October 2022
Duration for the Project team	14-month	21-month	6-month
Team size	7	6	8
Roles	Different roles (see table 4)	Different roles (see table 5)	Different roles (see table 6)
PM Method	Hybrid (Mixture of waterfall and scrum)	Agile (Scrum)	Hybrid (Mixture of waterfall and Scrum)

Source: Authors contribution.

3.4.3.3.1 Team 1

The chosen product development project team is responsible for the model–based system engineering of an electrical brake for passenger cars. The duration of the project team is 14–month, starting in March 2022. The team size is seven, it is located at three German locations (it is worth noting that about 90% of the working time was done in the form of the home office), and the team in this composition is working together for the first time. The language in the team is German. The team members are coordinated at various levels such as architecture and system and in various areas such as functional safety. Table 4 shows the demographical and professional data about the project team members for team 1. They use a hybrid project management approach. They mixed scrum artefacts like sprint planning, and daily's with a waterfall approach by planning of the sprints.

Table 4: Demographical and professional data about the project team members for team 1

Project role	Subproject leader	System Engineer	Sprint Planner	Junior System Engineer	Functional Safety Expert	Functional Safety Expert	Senior Electrical Architect
Age	31	30	32	28	29	28	63
Experience at EDAG in years	9	5	7	5	4	3	21
Gender	male	male	female	male	female	male	male
Nationality	German	German	German	German	Korean	Korean	German

Source: Authors contribution.

3.4.3.3.2 Team 2

The chosen product development project team is responsible for developing a software unit for the loading function of a passenger car. The duration of the project team is 21–months, starting in June 2022. The team size is six, it is located at one German location (it is worth noting that about 90% of the working time was done in the form of the home office), and the team in this composition is working together for the first time. The team language is German. Table 5 shows the demographical and professional data about the project team members for team 2. They are using an agile project management method. In the sprint planning sub–project leader and the software manager defining tickets for the sprints. A ticket contains a schedule for the tasks to be completed and a person responsible. The tickets are organised in a dashboard and can be monitored.

Table 5: Demographical and professional data about the project team members for team 2

Project role	Subproject manager	Software Manager	Software Developer	Software Developer	Software Tester	Software Tester
Age	36	31	29	27	31	30
Experience at EDAG in year	8	6	2	1	1	2
Gender	male	male	male	male	male	male
Nationality	German	German	German	German	German	German

Source: Authors contribution.

3.4.3.3.3 Team 3

The chosen product development project team is responsible for defining the electric/electronic features for an electrical commercial vehicle. The duration of the project team is 6 months, starting in October 2022. The team size is eight, it is located at three German locations (it is worth mentioning that about 90% of the working time was done in the form of the home office), and the team in this composition is working together for the first time. The language is English and German because the team is located in Germany and the client is in the United Kingdom. Table 6 shows the demographical and professional data about the project team members for team 3. The project management method is hybrid. A mix of dailies and the discussion about daily activities of the team (scrum) and by planned work packages (waterfall). The team members are coordinated in six work packages. Each work package has a single owner who is responsible for the work packages.

Table 6: Demographical and professional data about the project team members for team 3

	1	2	3	4	5	6	7	8
Project role	Subproject leader	Architect	Homologation expert	Communication Expert	System Architect	ADAS Expert	Support Subproject leader	Architecture Process Expert
Age	32	30	28	64	34	37	33	36
Experience at EDAG in years	10	5	5	23	6	7	1	1
Gender	male	male	male	male	male	male	male	male
Nationality	German	German	German	German	German	German	German	German

Source: Authors contribution.

I have described the three selected project development project teams that serve as the source of my data collection. In the next chapter, I describe my data collection.

3.5 Data collection

In my exploratory multi–design case study, I used three data collection methods: semi–structured interviews, observation by outsiders and internal documents and reports. The reason for choosing the data collection methods was that I wanted to investigate the emergence of shared leadership in its natural setting, and in particular the observation and project documents supported this approach. Due to researching the phenomenon of shared leadership emergence, I collected data from the project teams during the initiation, planning and early execution phases of the project. For Team 1 it was between March and December 2022, for Team 2 between June and December 2022 and for Team 3 between October and December 2022.

3.5.1 Semi–structured interview

Semi–structured interviews provide insights into individuals' personal histories, perspectives, and experiences. The aim of the interview was to understand individuals' perceptions of their responsibilities, roles and current activities of each person, what they have done to become responsible for a particular topic/area, and their experiences of the emergence of leadership positions at EDAG. But also, to capture information that is not included in the observation or the documents.

For team 1, I conducted seven one–to–one semi–structured interviews between May 2022 and October 2022 with all members of the project team. Each interview lasted between 50 minutes and 1 hour. For team 2, I conducted six one–to–one semi–structured interviews between June 2022 and September 2022 with all members of the project team. Each interview lasted between 50 minutes and 1 hour. For team 3, I conducted eight one–to–one semi–structured interviews between October 2022 and December 2022 with all members of the project team. Each interview lasted between 50 minutes and 1 hour.

The interview questions (see Figure 7) focused on general information about the team member and the project, perceptions of the team member's and the team's strengths and weaknesses, the team member's daily actions and interactions, and their experience or

opinion of becoming a leader for different topics/areas. The semi–structured interviews were conducted and recorded virtually via MS Teams.

For team 1 I collected 385 minutes of interview material from seven people, resulting in 84 transcription pages. The cameras were on, and the spoken words were transcribed. For team 2, I collected 312 minutes of interview material from seven people, resulting in 71 transcription pages. The cameras were on, and the spoken words were transcribed. For team 3, I collected 442 minutes of interview material from seven people, resulting in 101 transcription pages. The cameras were on, and the spoken words were transcribed.

Figure 7: Semi–structured interview protocol

Introduction part
When do you join the project?
What is currently your role in the project team?
What is your scope of work?
What are your challenges?
Perception
What do you believe are the strengths/weaknesses of your team?
What do you believe is your strength/weakness?
Detailed understanding of activities and interactivities
Could you please describe in detail what are your daily actions?
Could you please describe in detail what are your daily interactions?
Leadership Emergence
Can you describe step-by-step how you became a leader/follower for topics A, B, and/or C (based on the answer before)?
Is your team leader or someone outside of your team involved in these activities?
Do you believe there is a pattern / are many patterns behind when a leader/follower emerges in this project team?
What do you have in your mind when speaking about a good leader/follower?
Conclusion
Before we finish, is there anything you would like to discuss on the topic of the emergence of shared leadership?

Source: Authors contribution.

3.5.2 Observation by outsiders

If the observer is not a team member, then it is an observation by an outsider. The strength of the observation lies in the real–life data provided. Our aim was to collect accurate and detailed data about individual and team behaviour in the PDP team.

For team 1, I observed 150 meetings (Meeting name: Daily Team Meeting) between April 2022 and December 2022. For team 2, I observed 68 meetings (Meeting name: Team meeting) between June 2022 and December 2022. For team 3, I observed 47 meetings (Meeting name: Daily Team Meeting) between October 2022 and December 2022. Each

meeting lasted around 30 min. As a rule, all team members participated (exceptions were (public) holidays and illness) in the meeting, and the aim was to share the status, especially when there were any issues, get an overview of the activities of the team, plan the next days and coordinate each other. The observations of all team meetings were conducted virtually via MS Teams and recorded. For team 1, I collected 4,350 minutes of video material, resulting in 1,208 transcription pages. For team, 2, I collected 1,836 minutes of video material, resulting in 511 transcription pages. For team 3, I collected 1457 minutes of video material, resulting in 413 transcription pages. In team 1 and 2, the cameras were deactivated during the meeting. For team 3, the camera of the subproject leader, the support subproject leader and the architect were partially activated. The spoken words were transcribed. During the meeting in MS teams, team members shared their documents on the screen, which helped the paper's authors identify the relevant internal documents for the collection. An observation protocol was created for each appointment, showing the participants, the date and a brief summary to find specific situations retrospectively.

3.5.3 Internal project and team documents

I collected the content from the following documents.

3.5.3.1 Team 1

The team chat in Microsoft Teams. MS Teams has the function that people can chat with each other. The team has agreed to use only one chat. The chat was used for exchanging information in the team, but also between two members. This information is collected. Volume approx. 340 pages.

Role description. The client provides several role descriptions for the team. This information was collected. Volume approx. five pages

Specification list of the project. The team has a work area to work through. Volume approx. ten pages.

List open points. The team has an area in MS SharePoint where they store and maintain a list of their daily tasks. Later, this list changed from a list to a two–week plan. But at least both variants contain the who is doing what. Volume approx. 84 pages.

Q&A List. The team has an area in MS SharePoint where they store and maintain a question–and–answer list. When a team member has a question, that question is added to this list. Volume approx. 15 pages.

3.5.3.2 Team 2

The team chat in Microsoft Teams. MS Teams has the function that people can chat with each other. The team has agreed to use only one chat. The chat was used for exchanging

information in the team, but also between two members. This information is collected. Volume approx. 157 pages.

Role description. The role description, which EDAG's organisation provided, was collected. Volume approx. Eight pages.

Specification list of the project. The team has a work area to work through. Volume approx. 24 pages.

Task manager: The team used an IT Tool to create the tasks as tickets. Each ticket has a description of to–dos of the tasks, who has to do it and when. The effort in hours varies between 2 and 40 hours. Volume approx. 1,338 tickets.

3.5.3.3 Team 3

The team chat in Microsoft Teams. MS Teams has the function that people can chat with each other. The team has agreed to use only one chat. The chat was used for exchanging information in the team, but also between two members. This information is collected. Volume approx. 340 pages.

Specification list of the project. The team has a work area to work through. Volume approx. 13 pages.

Status report: The team produced and updated a weekly status report document based on its work packages. The team has six work packages. Each work package contains the owner of the work package, the activities to fulfil the work package, the effort for each activity and the total planned effort for the work package. In the further course, the activities and efforts carried out were updated. Approx. 84 pages.

In total, I collected data from 21 semi–structured interviews, 270 observed team meetings and 73 different documents. Figure 8 shows the breakdown of the data collected for the three teams.

Figure 8: Breakdown of the data collected for the three teams

Team 1	Team 2	Team 3
7 semi-structured interviews	6 semi-structured interviews	8 semi-structured interviews
155 team meetings observation	68 team meetings observation	47 team meetings observation
33 documents	21 documents	19 documents

Source: Authors contribution.

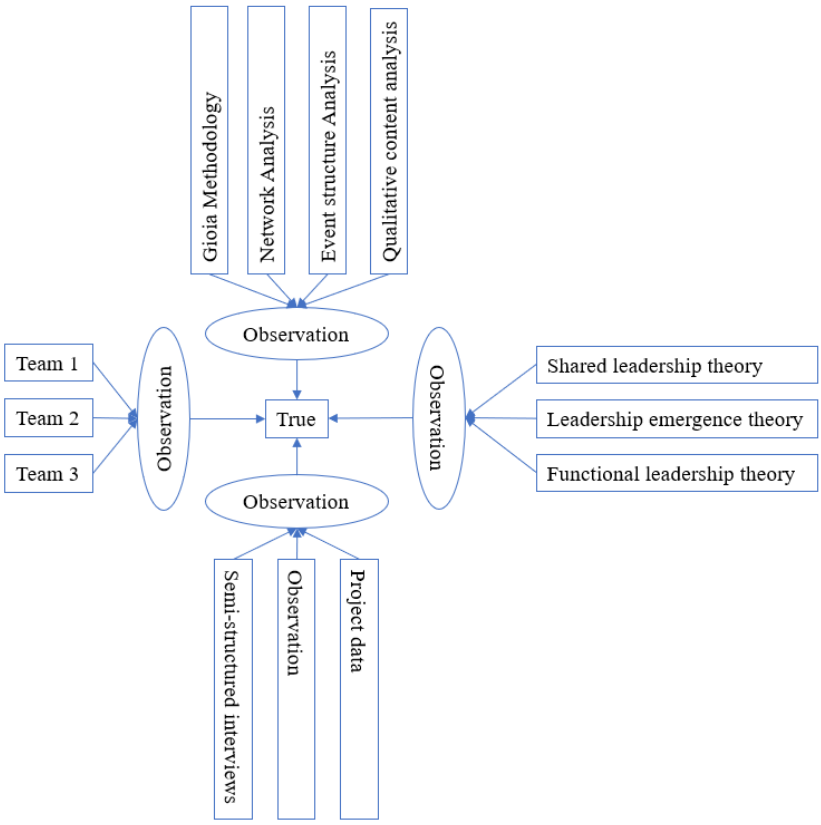
3.5.4 Transcription

After collecting the content from semi–structured interviews and the observations, I start with the transcription process. Due to the consequences of the COVID–19 pandemic (the offer to do home office) and the fact that the team is distributed in different locations, interviews and meetings were conducted virtually, recorded, and automatically transcribed. I used the MS Teams function to transcribe spoken words in the meeting. The transcriptions produced were checked for accuracy and revised, as the automated transcription via MS teams had misunderstood some words. Rework includes that all transcriptions were read and, in parallel, listened again to the recorded meetings. The transcribed words were adapted to the spoken word or added if not done (this happened when people spoke in parallel). The interviews and observations were transcribed in the project language, which was German.

3.5.5 Triangulation

Triangulation is important to increase the confidence of the research. The use of multiple sources enables the triangulation of information, which increases the quality and credibility of qualitative research (Yin 2018, 196). The goal of triangulation is to invest what you are researching from many different angles (Maylor et al. 2017, 221). Figure 10 is showing the triangulation of my thesis. In the thesis I used three different types of triangulations: Data triangulation, method triangulation and theory–triangulation.

Figure 9: Triangulation



Source: Authors contribution, adapted from Maylor et al. 2017, 221.

3.5.5.1 Data–triangulation

In data triangulation, the phenomenon is observed using different data sources and different data collection methods. The data are collected from semi–structured interviews, team meeting observation and project documents. The source was three different product development project teams.

3.5.5.2 Method–triangulation

This is a method–internal triangulation. This means that the triangulation within the qualitative research is done by using different methods. For the study I used four different analysis methods: Gioia Methodology, network analysis method, event structure analysis and the qualitative content analysis.

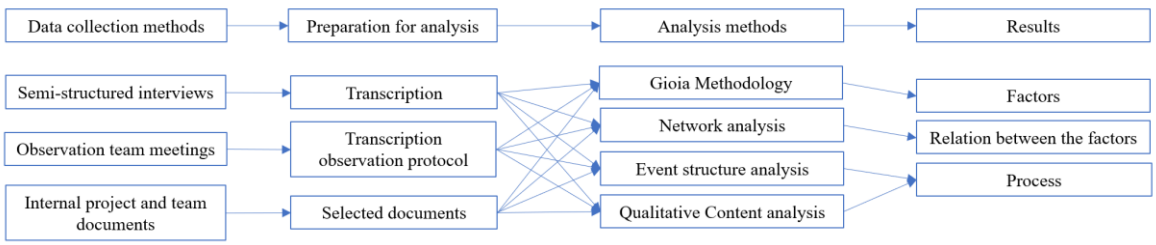
3.5.5.3 Theory–triangulation

Theory triangulation is an examination of research from different theoretical perspectives. The research is considered from different theoretical angels. Form the shared leadership theory, from the leadership emergence theory and from the leadership functional theory.

3.6 Data analysis

The choice of analysis methods is based on the sub–research questions. The Gioia methodology is used to identify the factors for the emergence of shared leadership that are asked with the first sub–research question. Network analysis is used to identify the relationship between these factors, which is asked with the second sub–research question. The third sub–research question and the identification of the processes is answered by the event structure analysis and the qualitative content analysis and the event structure analysis. Figure 10 provides an overview of which data was analysed using which analysis methods. All data collected was used for all methods of analysis. This includes the transcription of the semi–structured interviews, the transcription of the team meetings, the observation protocol and the project documents. The analysis was conducted in English.

Figure 10: Overview data analysis



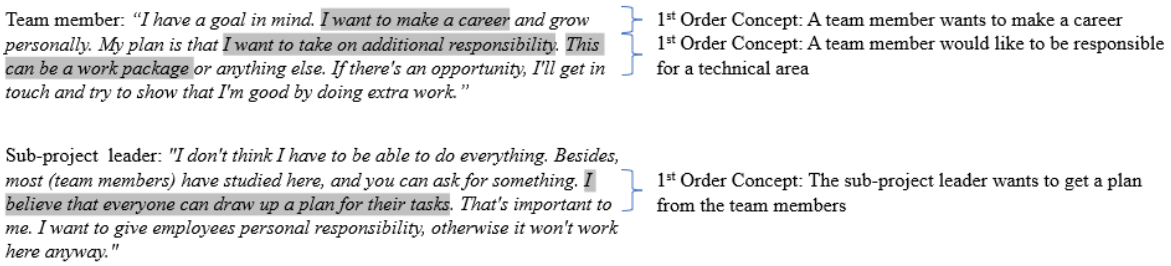
Source: Authors contribution.

3.6.1 Gioia Methodology

I applied the Gioia methodology by performing an analysis to develop first–order codes, process them into second–order codes and finally transform them into aggregated dimensions (Gioia et al. 2012, 20). Based on the transcripts from the semi–structured interviews, the transcripts from the observations and the team chat from the chat function of MS Teams were analysed using NVivo in a multi–step process (Neuman 2014, 359).

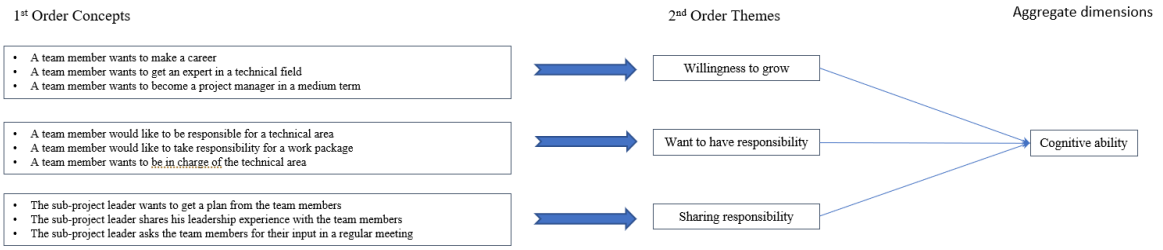
In the first step, open coding was carried out by analysing to find out the key ideas (Corbin and Strauss 2015, 238). In the second step, second–order concepts were developed from the first–order concepts by grouping similar first–order concepts. And finally, in a third step, all similar second–order concepts were summarised into a third–order concept (Gioia et al. 2012, 20). Figure 11 and Figure 12 serve as examples of the development of the codes using the Gioia method. Figure 11 shows the formation of code 1 in an extract from an interview. Figure 12 shows the formation of code 2 and the aggregated dimension.

Figure 11: Extraction from the interview transcription



Source: Authors interview transcription team 1.

Figure 12: Example of the first, second and third order concept



Source: Authors contribution.

The analysis and presented results were carried out separately for the semi–structured interviews, the observation of the team meetings and the project documents (such as the chat protocols).

3.6.2 Network analysis

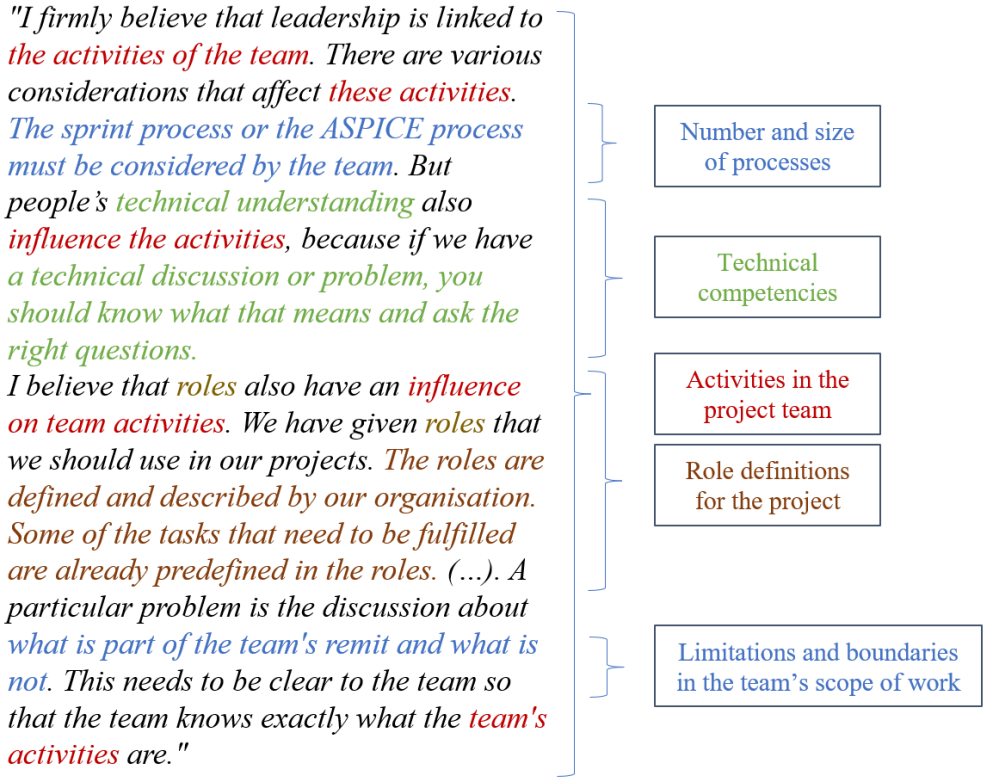
Network analysis is used in the social sciences to visualise complexity. Visualisation offers researchers a way to concisely describe, document and share complex data (Pokorny et al.

2018, 3). The visualised network consists of two elements of information: individual entities or objects, referred to as nodes, and the relationship(s) or interaction(s) between the targets, referred to as edges (Newman 2018, 1). Pokorny et al. (2018, 1 ff.) present a novel method for visualising the coding of qualitative data, which makes it possible to display the connections between the codes and analyse them using network analysis. The coded data forms the basis for the analysis (Pokorny et al. 2018, 1). A relationship is established through the proximity of the codes. In my study, the codes form the factors and thus the second–order codes form the nodes.

A prerequisite for this method is that the text–based data (e.g. recordings or transcripts of interviews) have already been coded (Pokorny et al. 2018, 5), which I did using the Gioia methodology. If codes in the text overlap in whole or in part, each pair of codes is given a bidirectional relationship in the network, e.g. A<–> B. If a code follows another code in the transcript but does not overlap, there is a directional relationship from the preceding code to the following code, e.g. A–> B (Pokorny et al. 2018, 5).

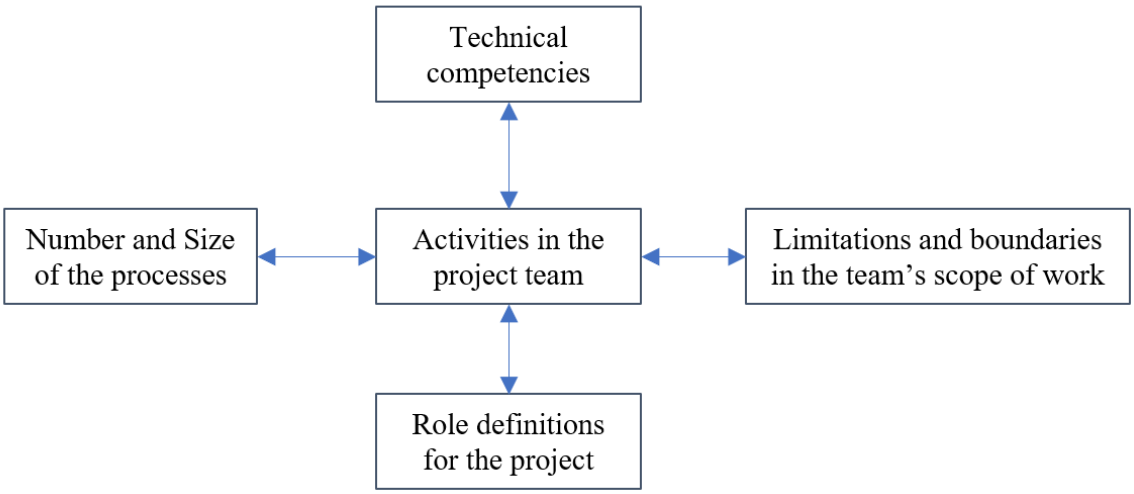
Figure 13 and Figure 14 serve as example for the network analysis. Figure 13 shows the formation of the second order codes in an extract from on interview. Figure 14 shows the connection of the second order codes.

Figure 13: Extract from a transcript interview segment



Source: Authors interview transcription team 1.

Figure 14: Presenting the factors in the relations based on the extract



Source: Authors contribution.

The analysis and presented results were carried out separately for the semi–structured interviews, the observation of the team meetings and the project documents (such as the chat protocols).

3.6.3 Event structure analysis

Event structure analysis (ESA) is a qualitative analysis technique that views a social process as a sequential series of events (Stevenson et al. 2003, 43). Events are significant occurrences that contribute to the understanding of the process (Stevenson et al. 2003, 43). The analyst using ESA assumes that events can be causally linked, and that parallel series of events can occur simultaneously (Stevenson et al. 2003, 44).

ESA is used to analyse and understand the logical sequence of events through which social activities unfold (Heise 1989, 140). The process helps to clarify how events are connected (Stevenson et al. 2003, 45). ESA is formal in the sense that it uses a set of logical rules to analyse the complex, interwoven series of events embedded in narratives about social processes (Stevenson et al. 2003, 45).

ESA employs temporal order, connectedness, and the unfolding of events in a narrative. It helps infer causal links among actions constituting events and identifies their contingencies and consequences (Griffin 2007, 17). ESA is both rigorous and interpretive; it preserves the complexity of social processes and allows for a dynamic, causal interpretation that can be replicated and generalized (Stevenson et al. 2003, 45).

Considering the context and contingencies that produce events leads to an interpretive understanding of the process. The logical principles of ESA force analysts to be explicit in their reasoning, enabling replication and generalization (Stevenson et al. 2003, 45). Through

ESA, a researcher can perform more rigorous, focused data collection and interpretation, concentrating on the interrelationships among events. Insights into key actors, turning points, and challenges may be generalized to future initiatives (Stevenson et al. 2003, 50).

The basic purpose of ESA is to aid the analyst in "unpacking" an event—breaking it into its constituent parts, which are sequences of actions—and analytically reconstituting it as a causal interpretation of what happened and why it happened (Ponti 2012, 5). The method involves asking researchers questions about the actions making up the event and then diagramming their responses (Ponti 2012, 5). Creating a diagram of how these events are linked should give the analyst insights into the social process involved (Stevenson et al. 2003, 44). To analyse an event, one first prepares a chronology of actions that, in the analyst's mind, define the event (Ponti 2012, 5).

To summarise, it can be said that the ESA is a suitable method of analysis for determining a process for the emergence of shared leadership in the form of events. The orientation for the events to be analysed is based on the definition of shared leadership as an emergent team process defined by distributed leadership functions among several team members (Small and Rentsch 2010, 203). Figure 15 is showing an extract as an example of the ESA.

Figure 15: Extract of the ESA

Source: Authors contribution.

3.6.4 Qualitative content analysis

I conducted a qualitative content analysis to identify shared leadership in the team. The data for the data analysis is based on semi–structured interviews, team meeting observations and collected internal project and team documents. I focussed on the leadership functions that are assumed by the team. I used a text search to (Krippendorff 2018, 273) to find the leadership functions based on Morgeson et al. (2010, 10) and formed categories.

Categories included the name of the leadership function, the person performing that leadership function, the area in which the leadership function takes place, the point in time when the leadership function came into existence, and the motive for taking over the leadership function (see Figure 16) The categories can be used to determine who took on which leadership functions and when during the study period. This led to an overview of the occurrence of leadership functions and to find out which people took on which tasks and when.

Figure 16: Example of the content analysis

No	Leadership function (area)	Who	When	Motive
1	Structure and plan (costs)	Sub-project leader	cw24	Role driven
2	Provide feedback (team status)	Software manager	cw28	Subjective leadership gab driven
3	Monitor (costs)	System Engineer	cw 26	Substitution rules driven

Source: Authors contribution.

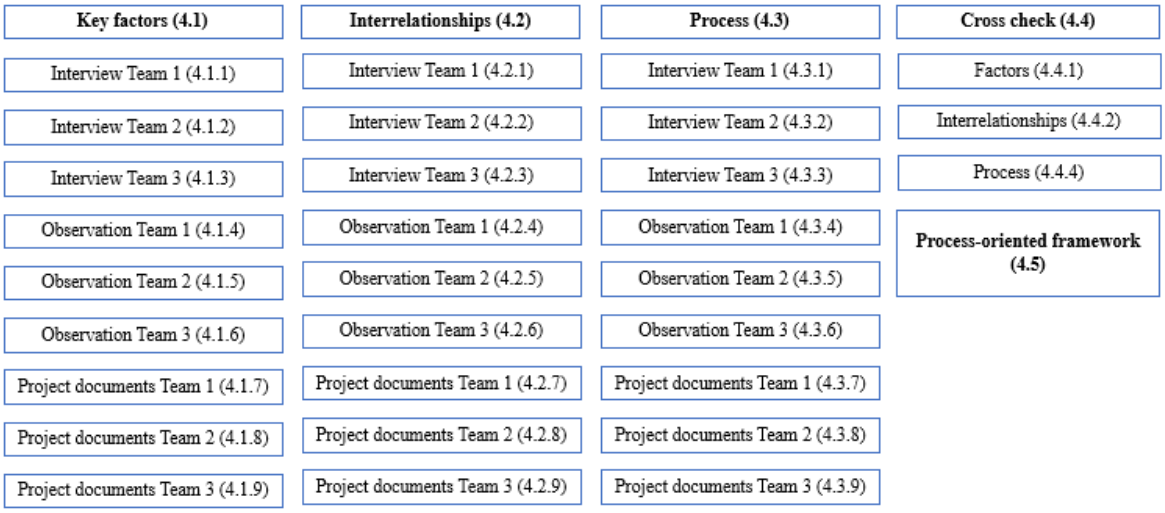
3.7 Conclusion

To close the research gap, I defined one main research question and three sub–research questions. Since my research is about discovering new areas of knowledge, I used a qualitative research approach: It is an exploratory case study with a multiple case design and three cases. The cases represent three product development project teams. I randomly selected three product development project teams between March and December 2022 and collected data through semi–structured interviews, observation of meetings and internal project and team documents. I transcribed the data and analysed it using four analytical methods according to the sub–research questions. The results are presented in the next section.

4 RESULTS

This section shows the results of the analysis and is organised in the order of the sub–research questions and the data collection method and teams. Figure 17 shows the structure with the respective section numbers. I conclude the section on the results with a cross–check of the factors, their interrelationships and the process. Based on the results of the processes, a process–orientated framework is created for the emergence of shared leadership.

Figure 17: Structure of the presentation of results



Source: Authors contribution.

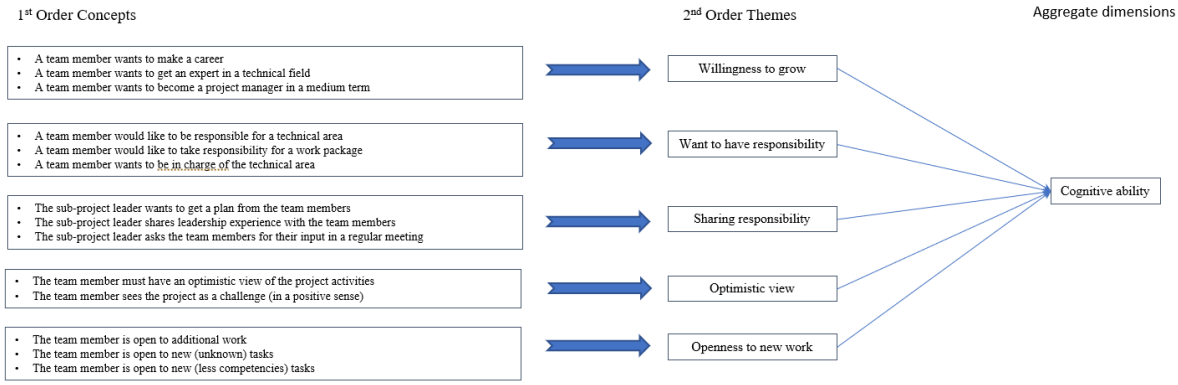
4.1 Key factors for the emergence of shared leadership

This subsection summarises the results based on the sub–research question: (1) What are the key factors of leadership emergence in PDP teams? The subsection presents the results from the Gioia methodology and is divided into the survey methods and teams.

4.1.1 Results based on the semi–structured interviews of team 1

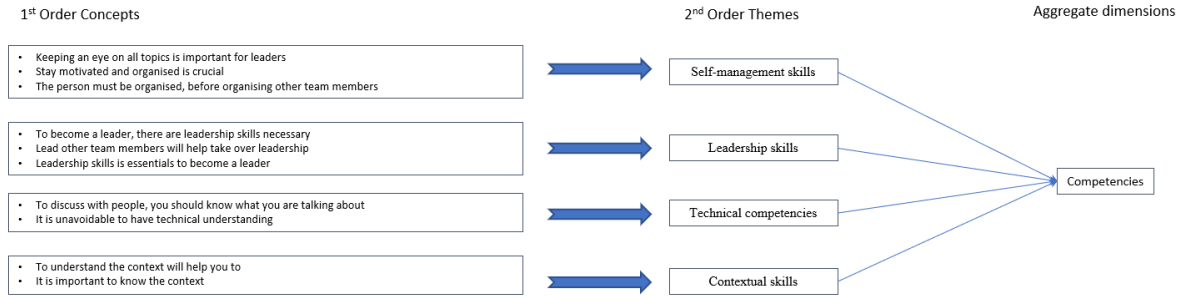
The following results are based on the semi–structured interviews of team 1. I present the results of the Gioia method in Figure 18– Figure 26 and the summary of the second order themes and the aggregate dimension as a summary in Figure 27.

Figure 18: First, second code and aggregate dimension: "Cognitive ability"



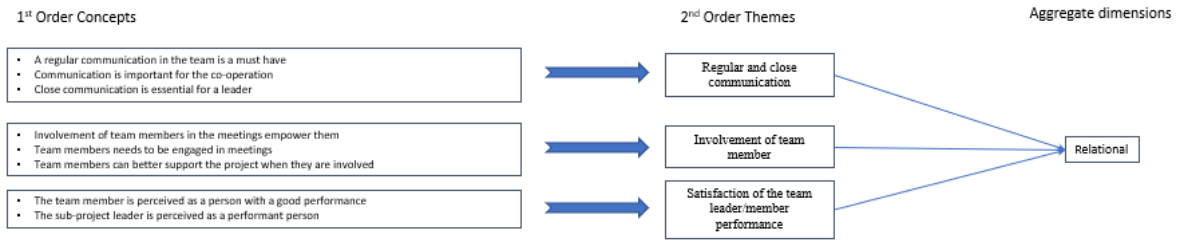
Source: Authors contribution based on Gioia method.

Figure 19: First, second code and aggregate dimension: "Competencies"



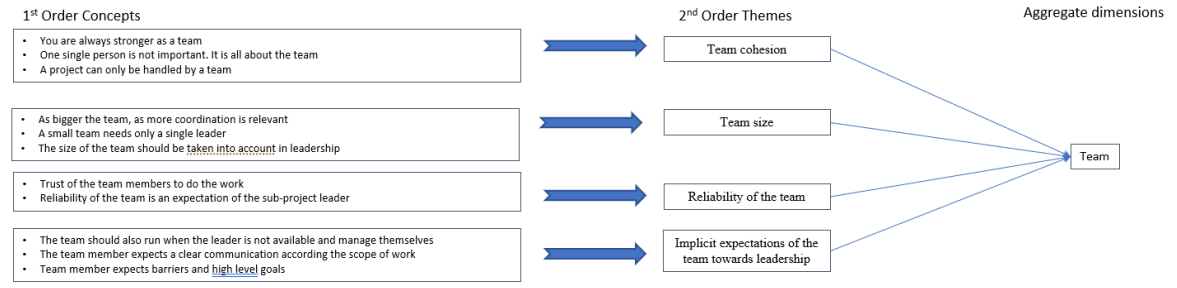
Source: Authors contribution based on Gioia method.

Figure 20: First, second code and aggregate dimension: "Relational"



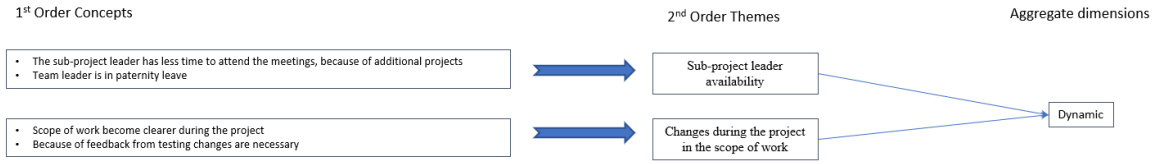
Source: Authors contribution based on Gioia method.

Figure 21: First, second code and aggregate dimension: "Team"



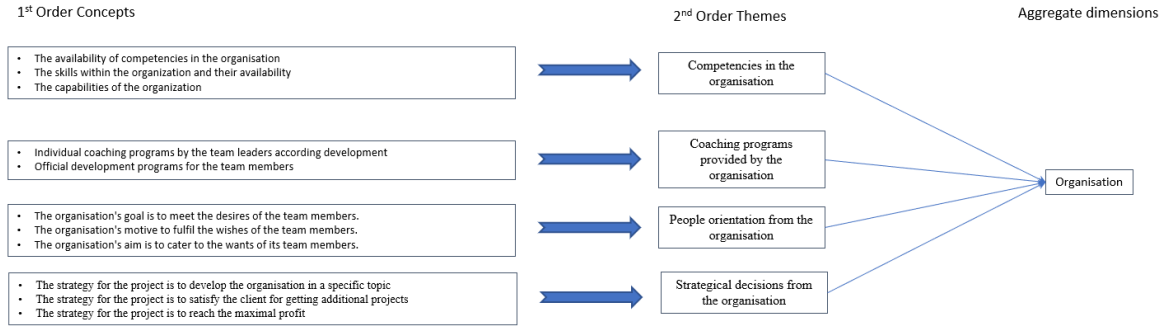
Source: Authors contribution based on Gioia method.

Figure 22: First, second code and aggregate dimension: "Dynamic"



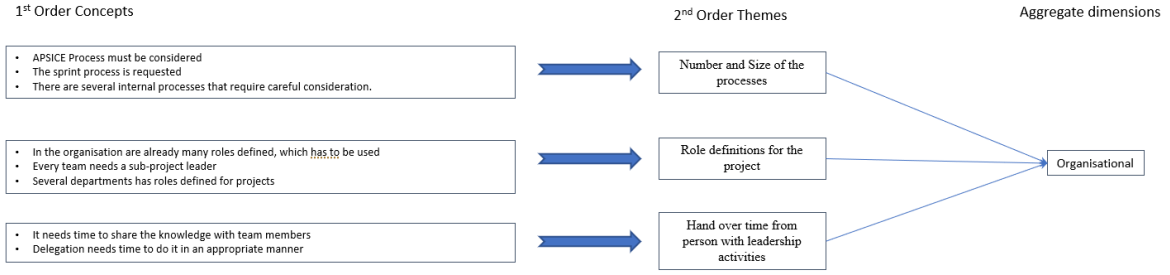
Source: Authors contribution based on Gioia method.

Figure 23: First, second code and aggregate dimension: "Organisation"



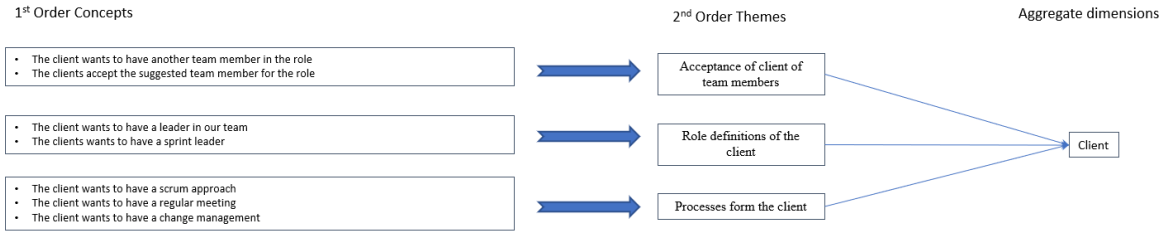
Source: Authors contribution based on Gioia method.

Figure 24: First, second code and aggregate dimension: "Organisational"



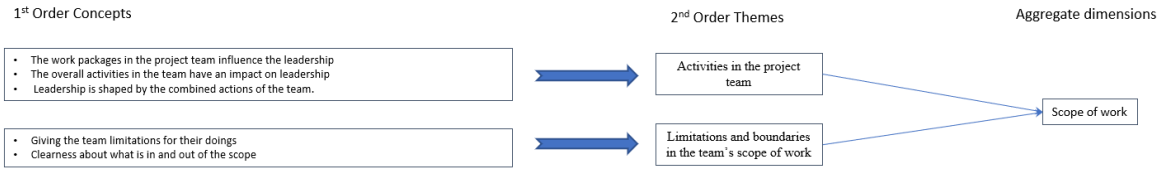
Source: Authors contribution based on Gioia method.

Figure 25: First, second code and aggregate dimension: "Client"



Source: Authors contribution based on Gioia method.

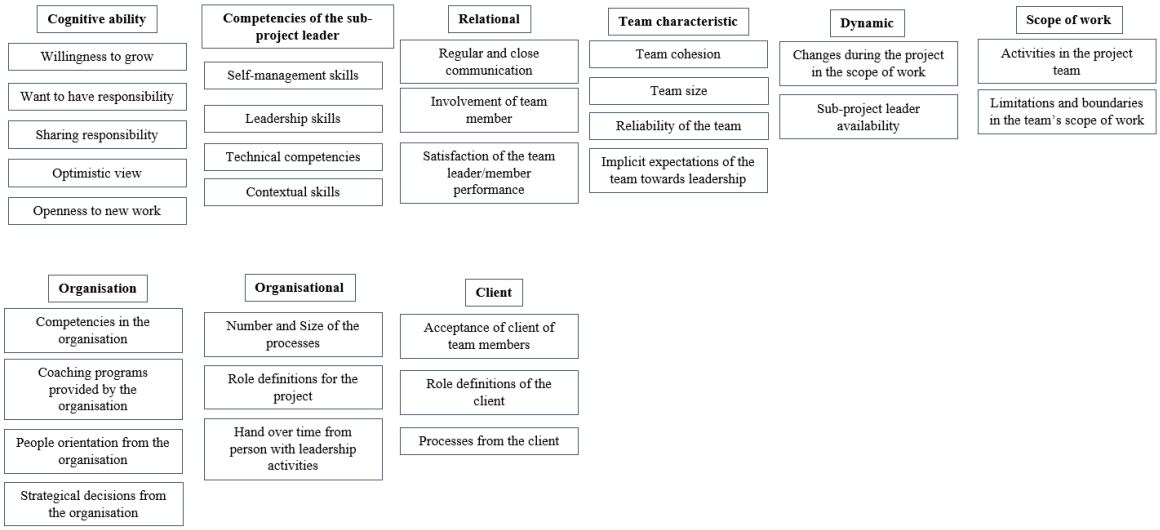
Figure 26: First, second code and aggregate dimension: "scope of work"



Source: Authors contribution based on Gioia method.

Based on the first, second code and the aggregated dimension from the Gioia method of the semi–structured interview of team 1, I summarise the results. The second–order codes formed the key factors for the emergence of shared leadership, and the aggregate dimension formed the categories for these factors. I have identified nine categories and 30 key factors. Figure 27 provides an overview of the key factors of team 1 based on the semi–structured interviews and the Gioia method.

Figure 27: Overview of the results of the key factors from the team 1 interviews

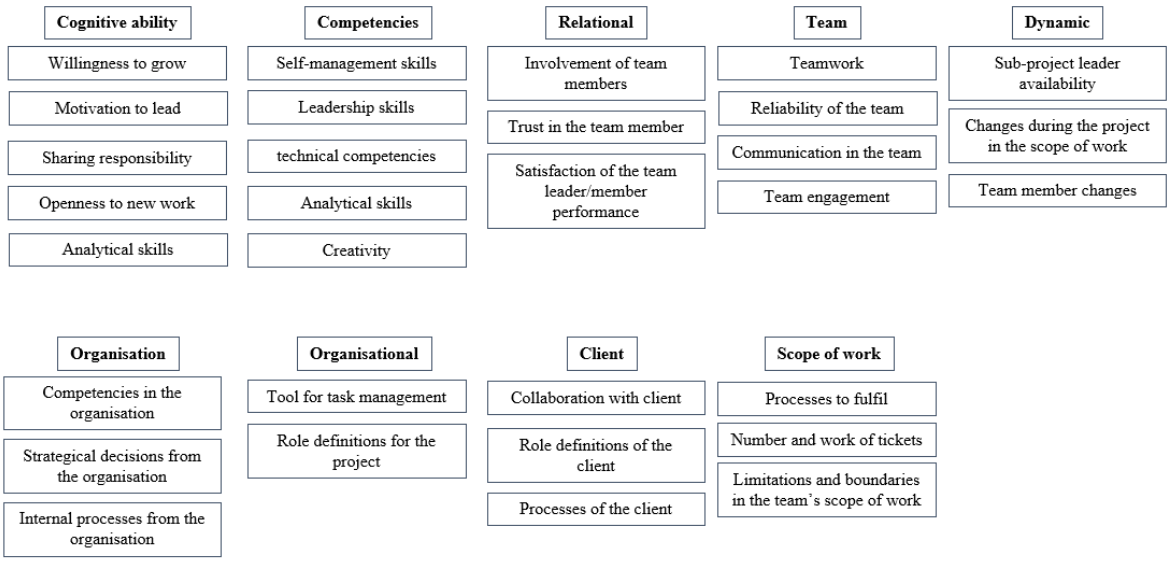


Source: Authors contribution.

4.1.2 Results based on the semi–structured interviews of team 2

The following results are based on the semi–structured interviews of team 2. Figure 28 provides an overview of the key factors of team 2 based on the Gioia method. I have identified nine categories and 32 key factors.

Figure 28: Overview of the results of the key factors from team 2 interviews

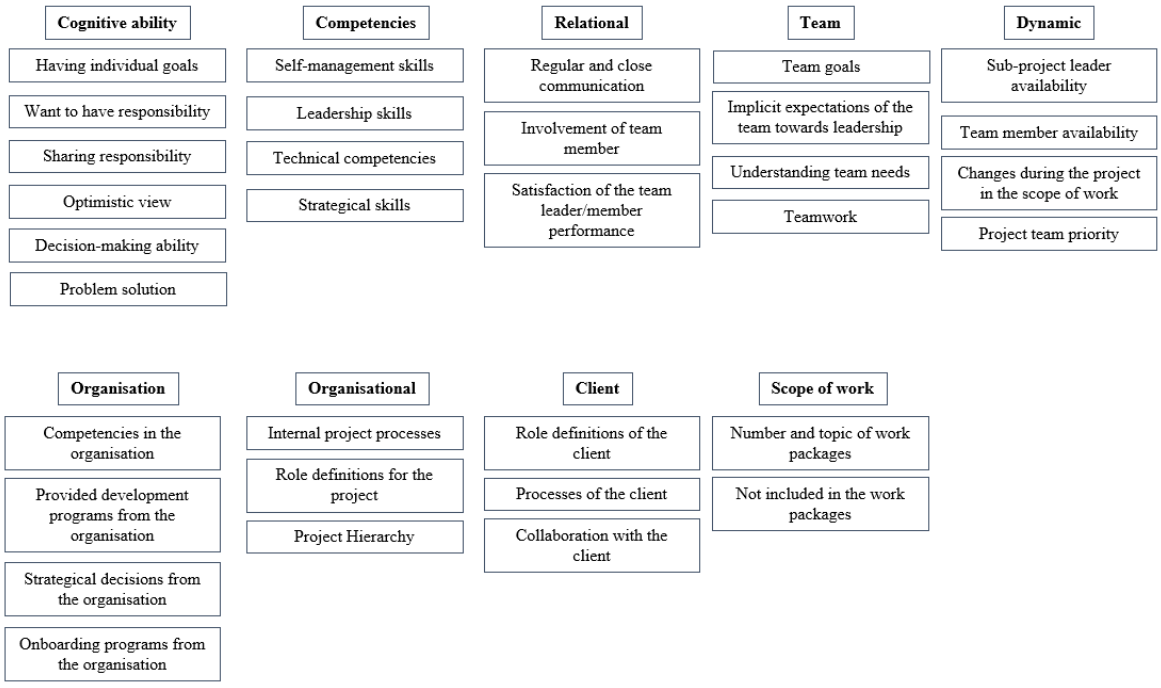


Source: Authors contribution.

4.1.3 Results based on the semi–structured interviews of team 3

The following results are based on the semi–structured interviews of team 3. Figure 29 provides an overview of the key factors of team 2 based on the Gioia method. I have identified nine categories and 32 key factors.

Figure 29: Overview of the results of the key factors from team 3 interviews

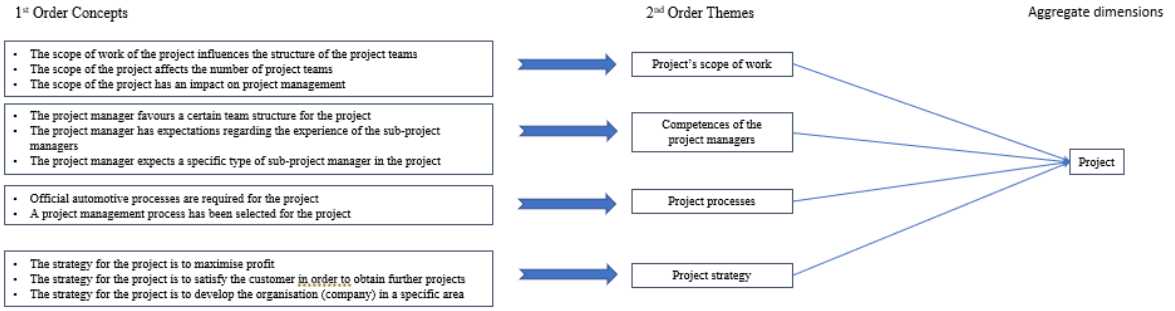


Source: Authors contribution.

4.1.4 Results based on the team meeting observations of team 1

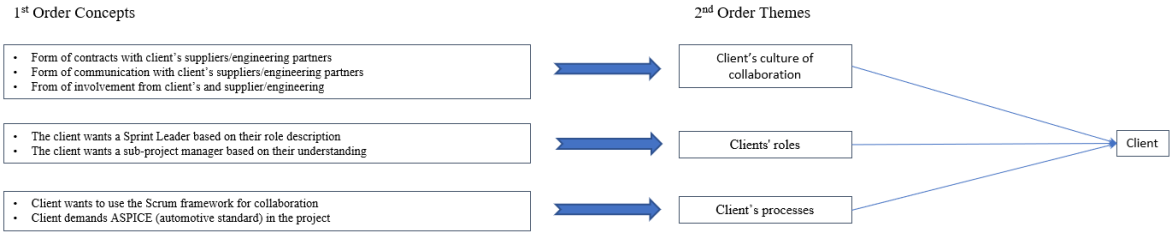
The following results are based on the observation of the team meetings. I will present the results of the Gioia method in Figure 30– Figure 38 and the summary of the second order themes and the aggregate dimension as a summary in Figure 39.

Figure 30: First, second code and aggregate dimension: "Project"



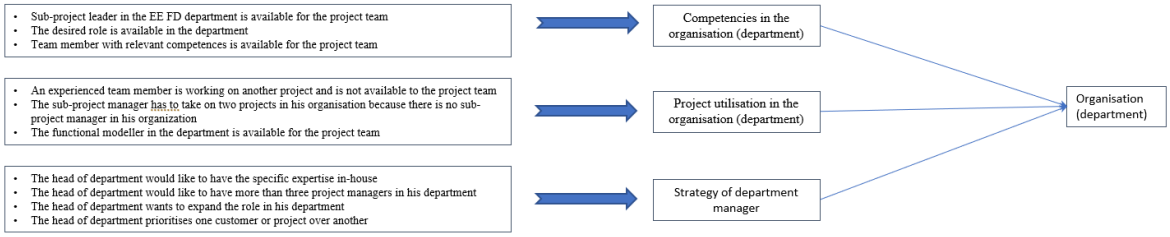
Source: Authors contribution based on Gioia method.

Figure 31: First, second code and aggregate dimension: "Client"



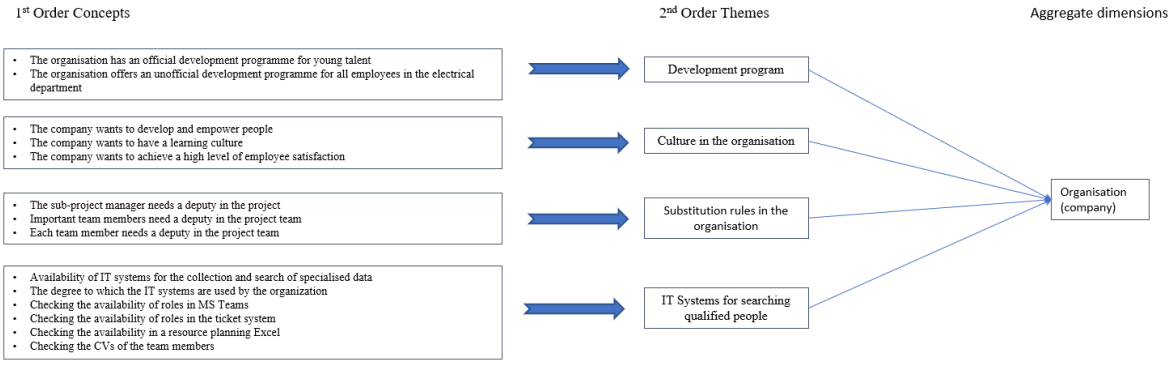
Source: Authors contribution based on Gioia method.

Figure 32: First, second code and aggregate dimension: "Organisation (department)"



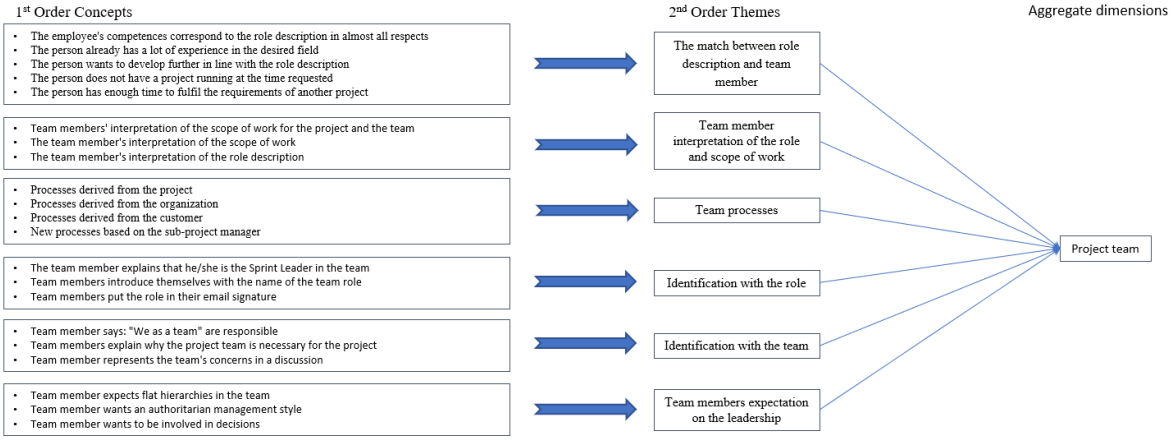
Source: Authors contribution based on Gioia method.

Figure 33: First, second code and aggregate dimension: "Organisation (company)"



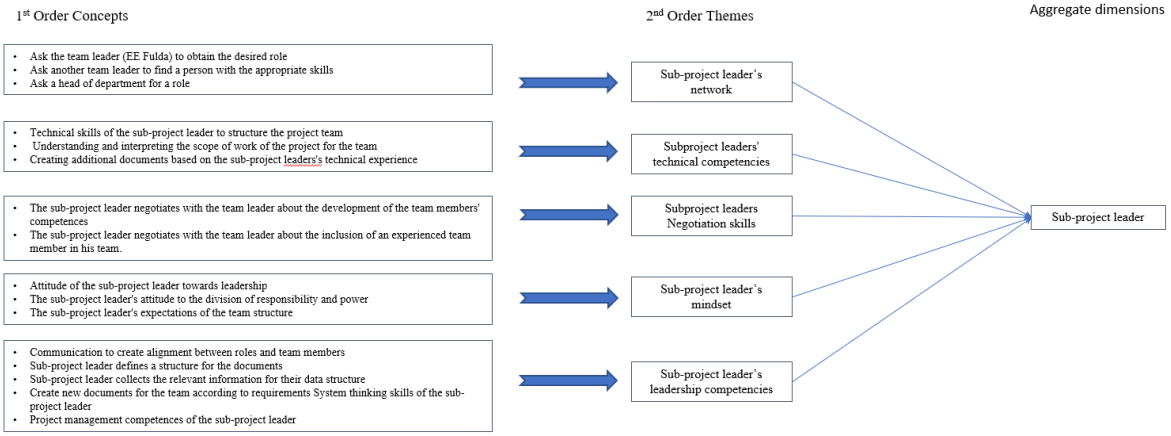
Source: Authors contribution based on Gioia method.

Figure 34: First, second code and aggregate dimension: "Project team"



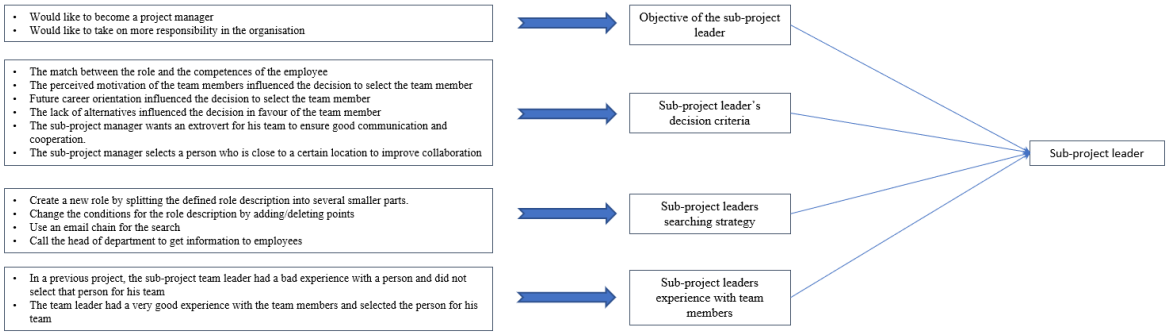
Source: Authors contribution based on Gioia method.

Figure 35: First, second code and aggregate dimension: "Sub–project leader 1/2"



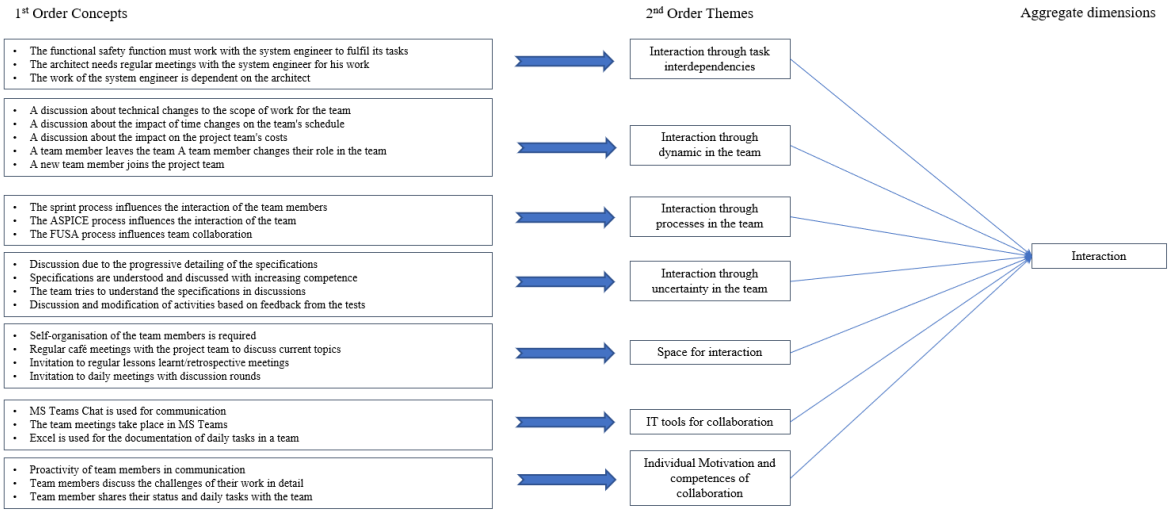
Source: Authors contribution based on Gioia method.

Figure 36: First, second code and aggregate dimension: "Sub–project Project 2/2"



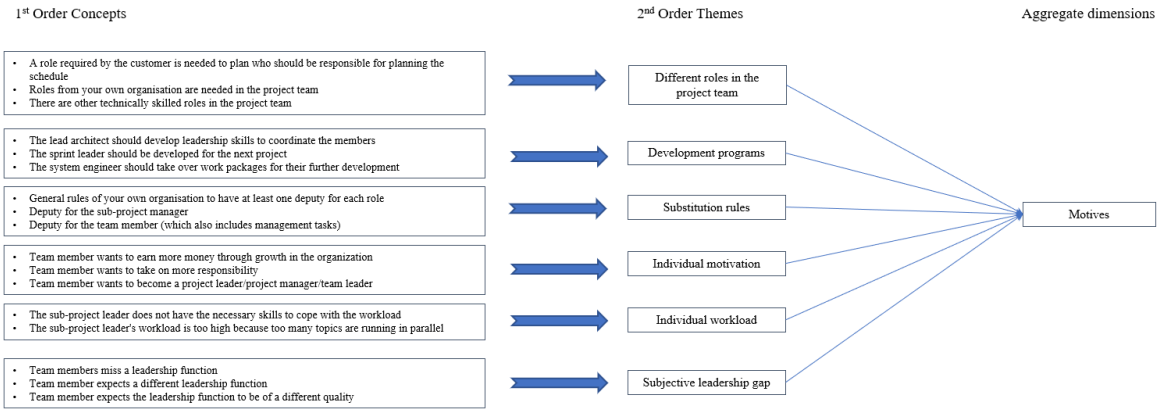
Source: Authors contribution based on Gioia method.

Figure 37: First, second code and aggregate dimension: "Interaction"



Source: Authors contribution based on Gioia method.

Figure 38: First, second code and aggregate dimension: "Motives"

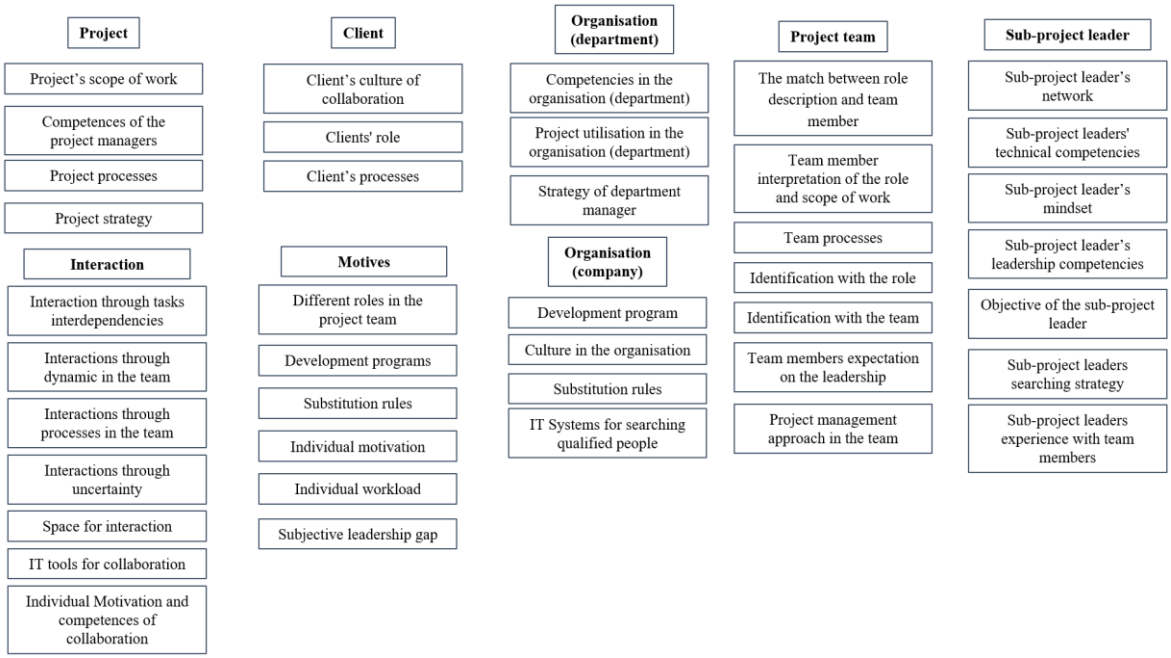


Source: Authors contribution based on Gioia method.

Based on the first, second code and the aggregated dimension from the Gioia method of the observation of the team meetings of team 1, I will summarise the results. The second–order codes formed the key factors for the emergence of shared leadership, and the aggregate

dimension formed the categories for these factors. Figure 39 provides an overview of the key factors of team 1 based on the observation and the Gioia method. I have identified nine categories and 47 key factors.

Figure 39: Overview of the results of the key factors by observing team 1

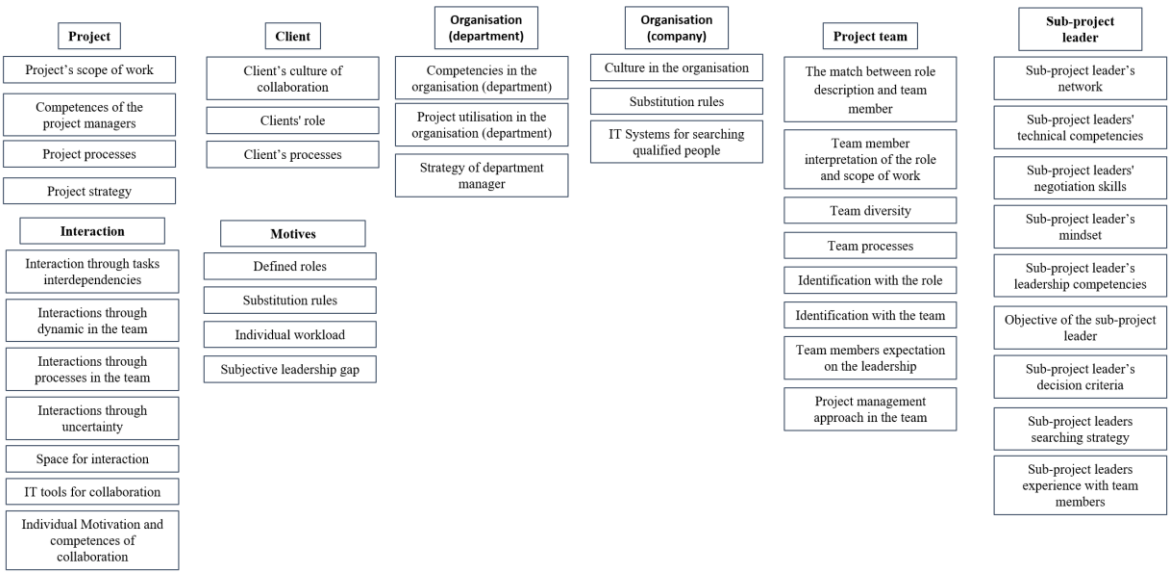


Source: Authors contribution.

4.1.5 Results based on the team meeting observations of team 2

Figure 40 provides an overview of the key factors of team 2 based on the observation of the team meeting and the Gioia method. I have identified eight categories and 44 key factors.

Figure 40: Overview of the results of the key factors by observing team 2

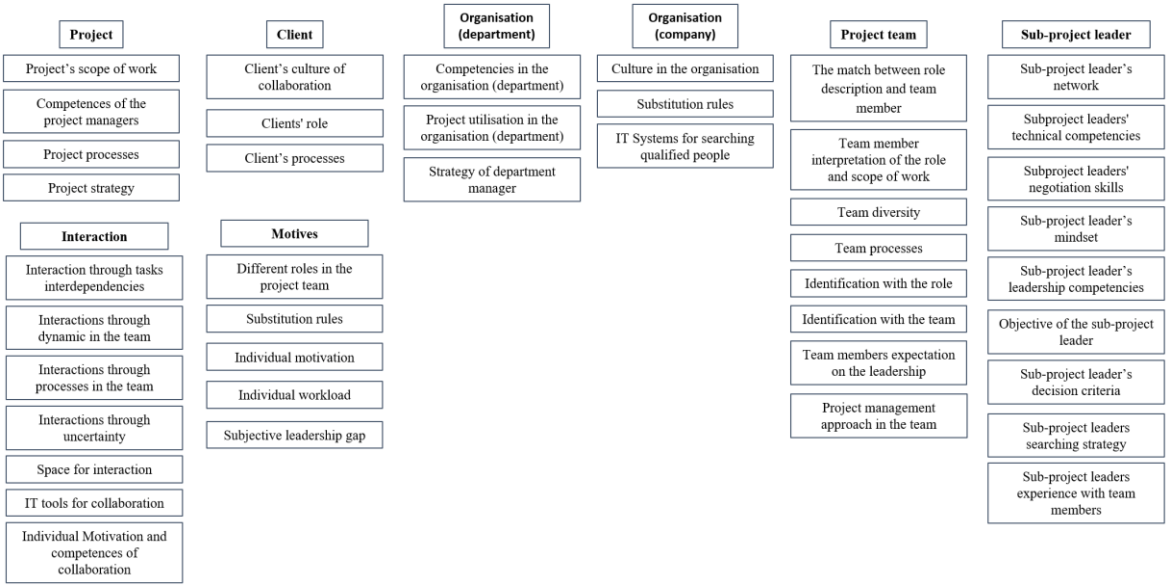


Source: Authors contribution.

4.1.6 Results based on the team meeting observations of team 3

Figure 41 provides an overview of the key factors of team 3 based on the observation of the team meeting and the Gioia method. I have identified eight categories and 41 key factors.

Figure 41: Overview of the results of the key factors by observing team 3

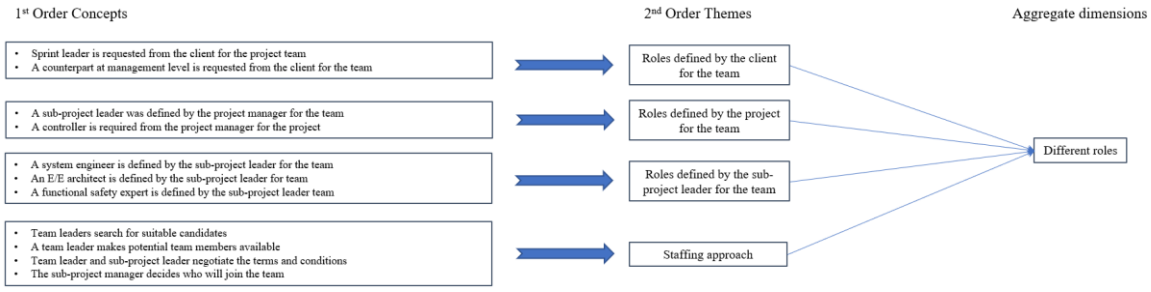


Source: Authors contribution.

4.1.7 Results based on the internal project and team documents of team 1

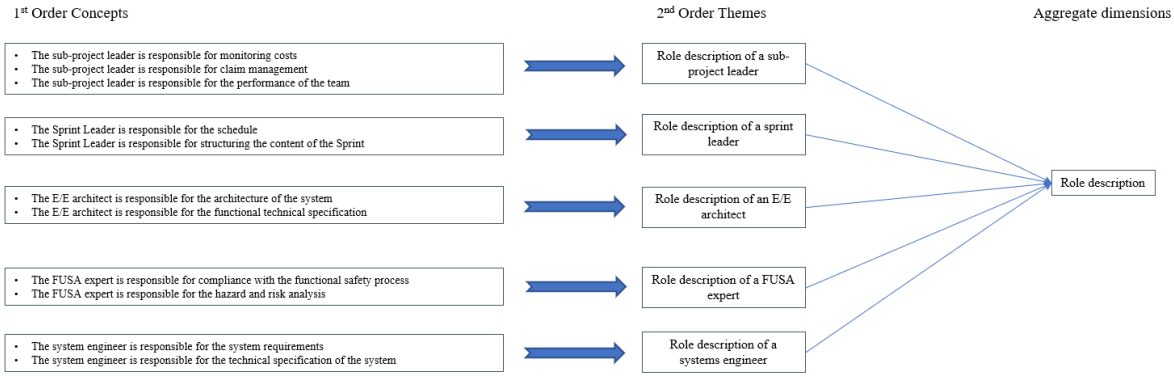
The following results are based on the internal project and team documents of team 1. I present the results of the Gioia method in Figure 42 – Figure 47 and the summary of the second order themes and the aggregate dimension as a summary in Figure 48.

Figure 42: First, second code and aggregate dimension: "Different roles"



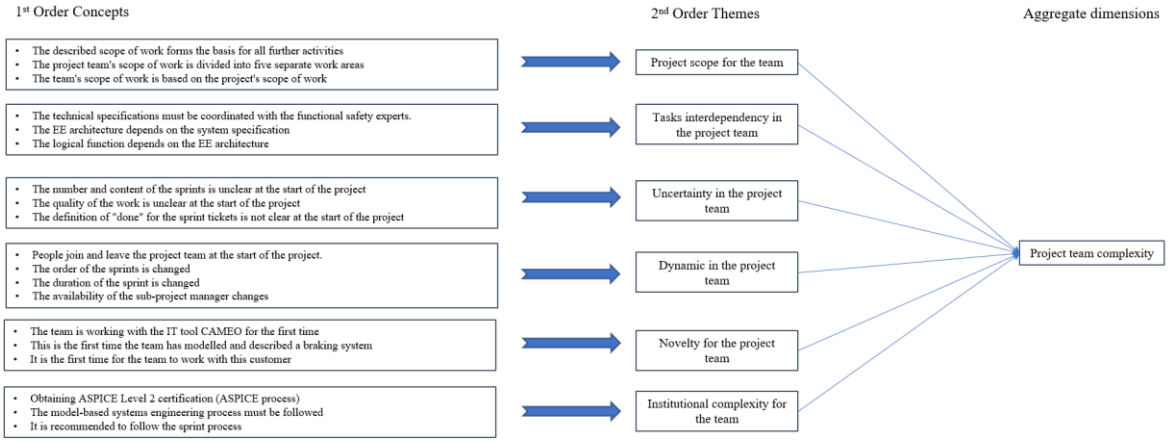
Source: Authors contribution based on Gioia method.

Figure 43: First, second code and aggregate dimension: “Role description”



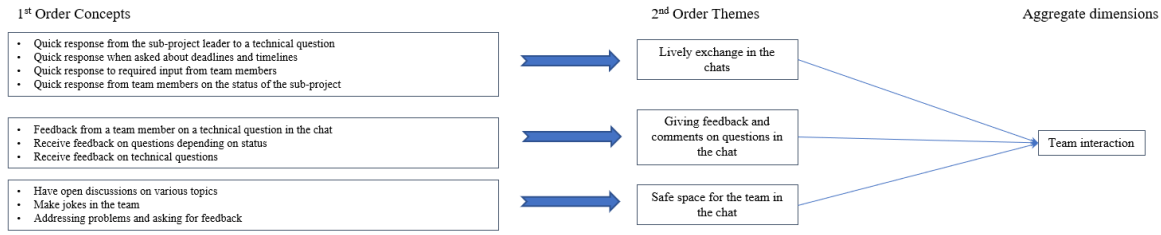
Source: Authors contribution based on Gioia method.

Figure 44: First, second code and aggregate dimension: “Project team complexity”



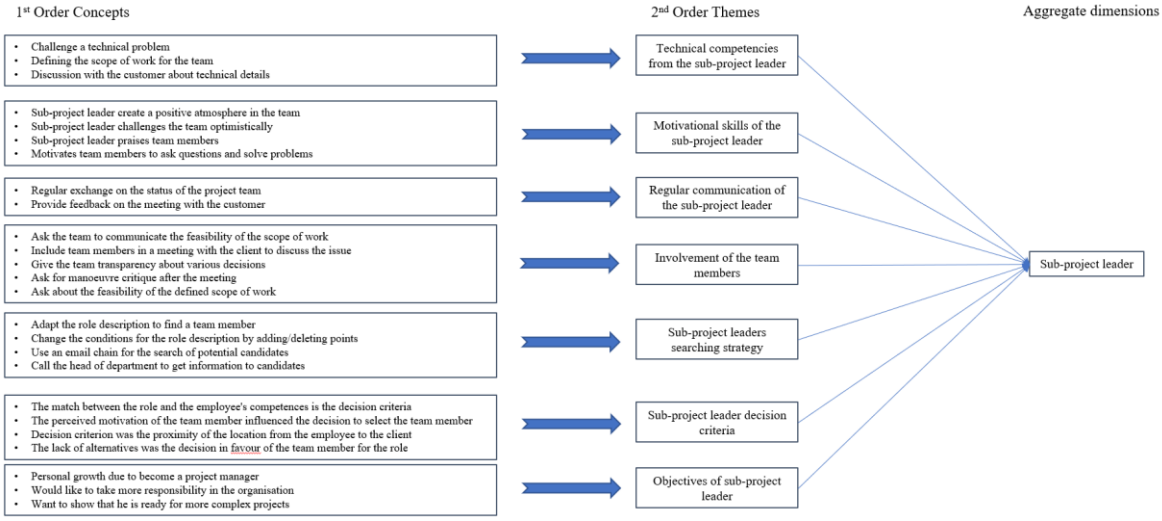
Source: Authors contribution based on Gioia method.

Figure 45: First, second code and aggregate dimension: “Team interaction”



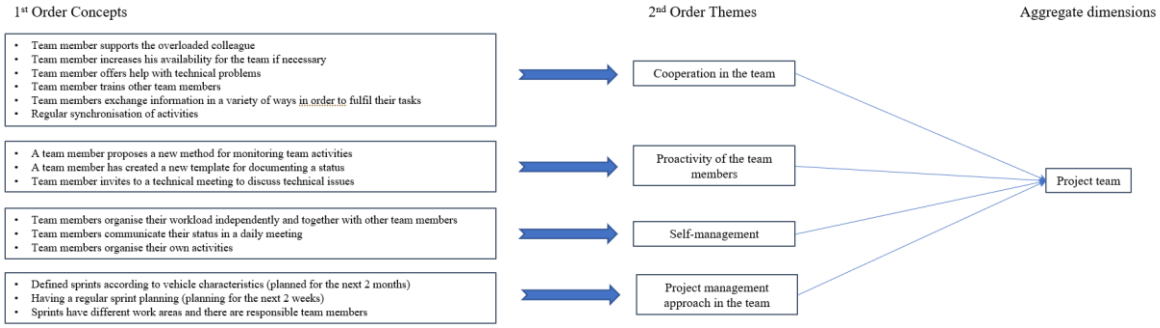
Source: Authors contribution based on Gioia method.

Figure 46: First, second code and aggregate dimension: "Sub–project leader"



Source: Authors contribution based on Gioia method.

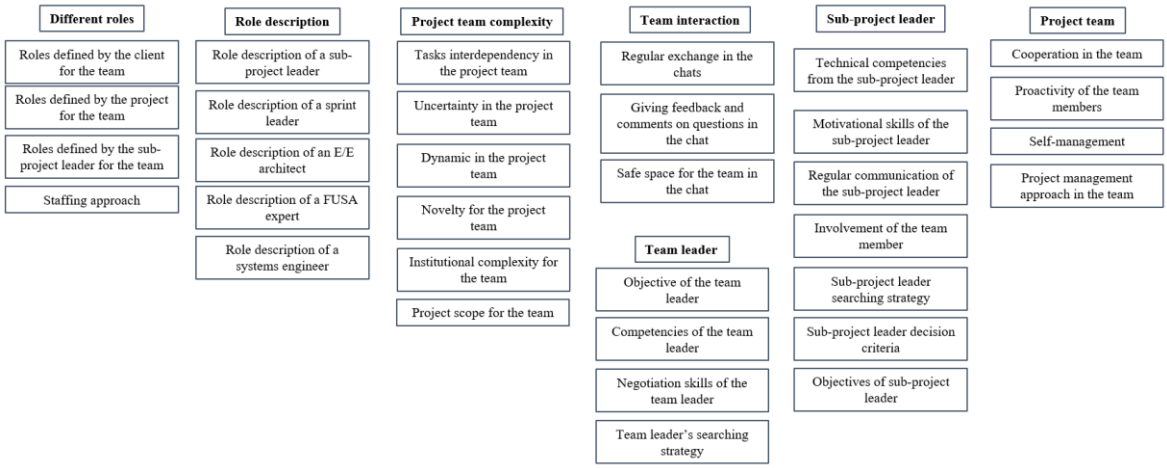
Figure 47: First, second code and aggregate dimension: "Project team"



Source: Authors contribution based on Gioia method.

Based on the first, second code and aggregate dimension from the Gioia method of the internal project and team documents of team 1, I will summarize the results. The second–order codes formed the factors of shared leadership emergence, and the aggregated dimension formed the categories of these factors. Figure 48 provides an overview of the key factors of team 1 based on the internal project and team documents and the Gioia method. I have identified seven categories and 33 key factors.

Figure 48: Overview of the results of the key factors from the internal project and team documents of team 1

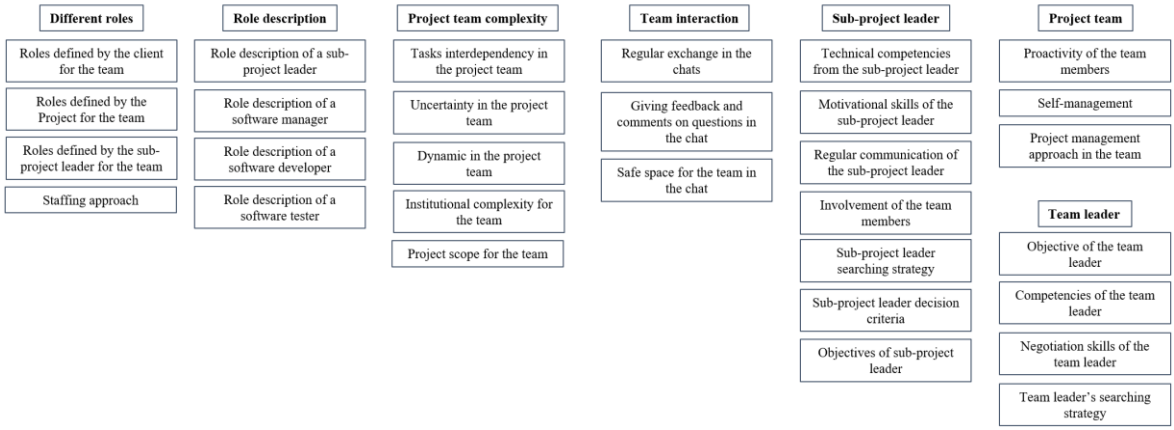


Source: Authors contribution.

4.1.8 Results based on the internal project and team documents of team 2

Figure 49 provides an overview of the key factors of team 2 based on the internal project and team documents and the Gioia method. I have identified seven categories and 30 key factors.

Figure 49: Overview of the results of the key factors from the internal project and team documents of team 2

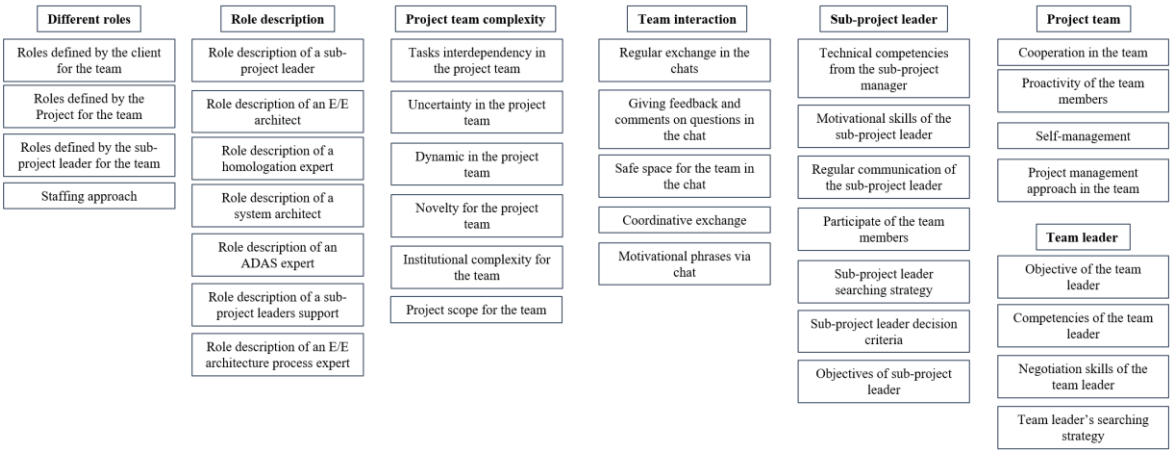


Source: Authors contribution.

4.1.9 Results based on the internal project and team documents of team 3

Figure 50 provides an overview of the key factors of team 3 based on the internal project and team documents and the Gioia method. I have identified seven categories and 37 key factors.

Figure 50: Overview of the results of the key factors from the internal project and team documents of team 3



Source: Authors contribution.

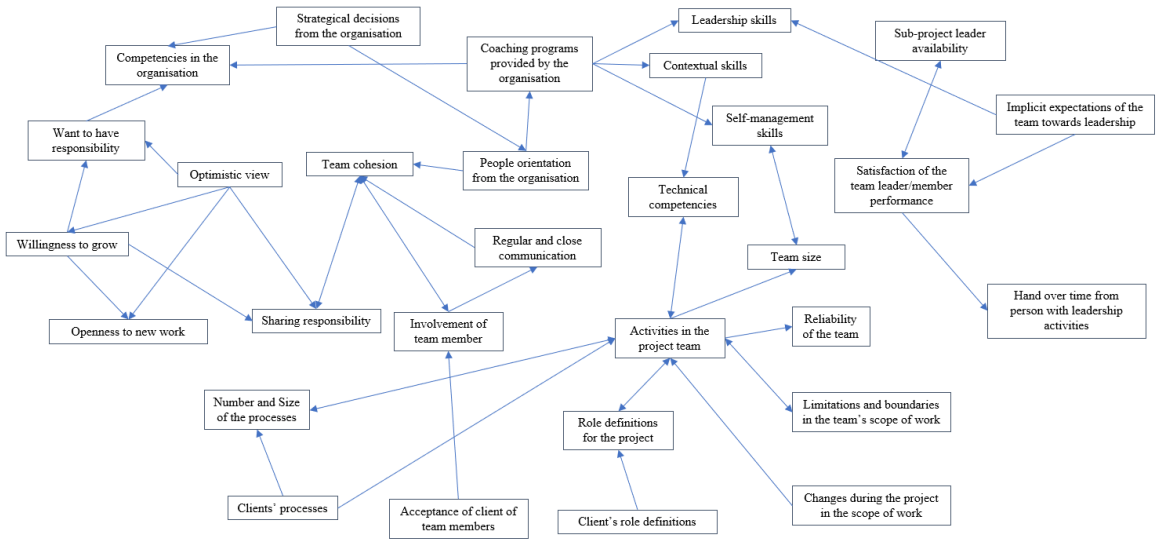
4.2 Relations of the key factors for the emergence of shared leadership

This subsection summarises the results based on the sub–research question: (2) What are the relations between these identified factors in PDP teams? The subsection presents the results from the network analysis and is divided into the survey methods and teams.

4.2.1 Results based on the semi–structured interviews of team 1

The following results are based on the semi–structured interviews of team 1. I present the results of the network analysis in Figure 51.

Figure 51: Network of the key factors based on interviews for team 1

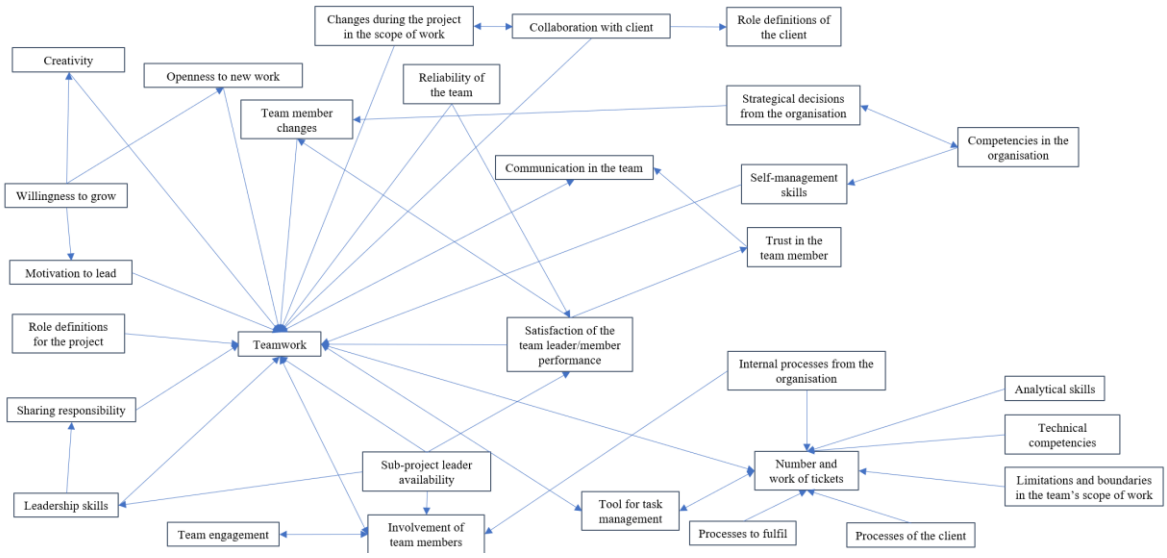


Source: Authors contribution.

4.2.2 Results based on the semi–structured interviews of team 2

The following results are based on the semi–structured interviews of team 2. I present the results of the network analysis in Figure 52.

Figure 52: Network of the key factors based on interviews for team 2

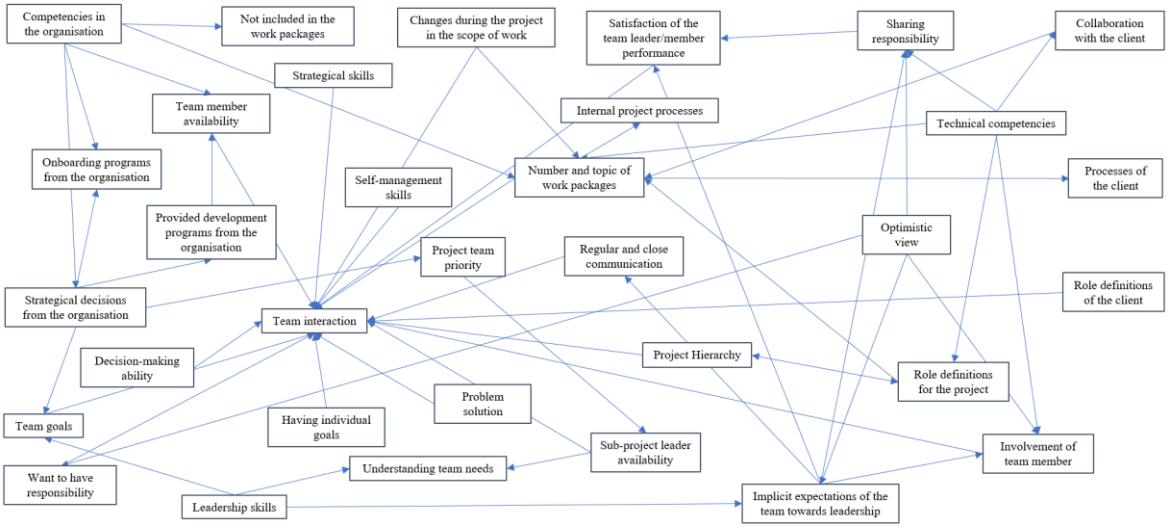


Source: Authors contribution.

4.2.3 Results based on the semi–structured interviews of team 3

The following results are based on the semi–structured interviews of team 3. I present the results of the network analysis in Figure 53.

Figure 53: Network of the key factors based on interviews for team 3

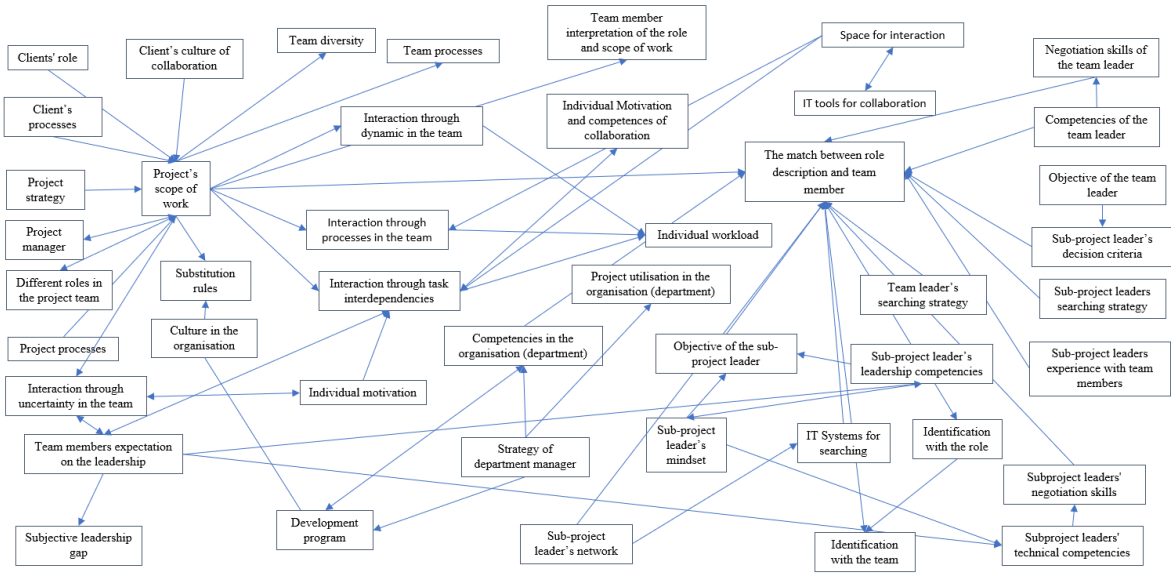


Source: Authors contribution.

4.2.4 Results based on the observation of team 1

The following results are based on the observation of the team meeting of team 1. I present the results of the network analysis in Figure 54.

Figure 54: Network of key factors based on observation for team 1

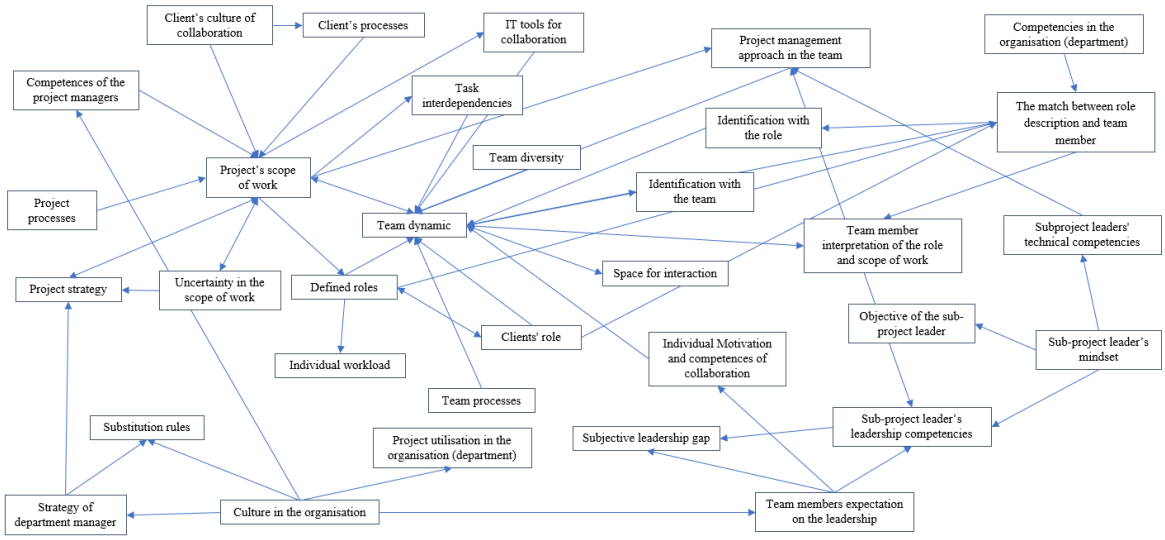


Source: Authors contribution.

4.2.5 Results based on the observation of team 2

The following results are based on the observation of the team meeting of team 2. I present the results of the network analysis in Figure 55.

Figure 55: Network of key factors based on observation for team 2

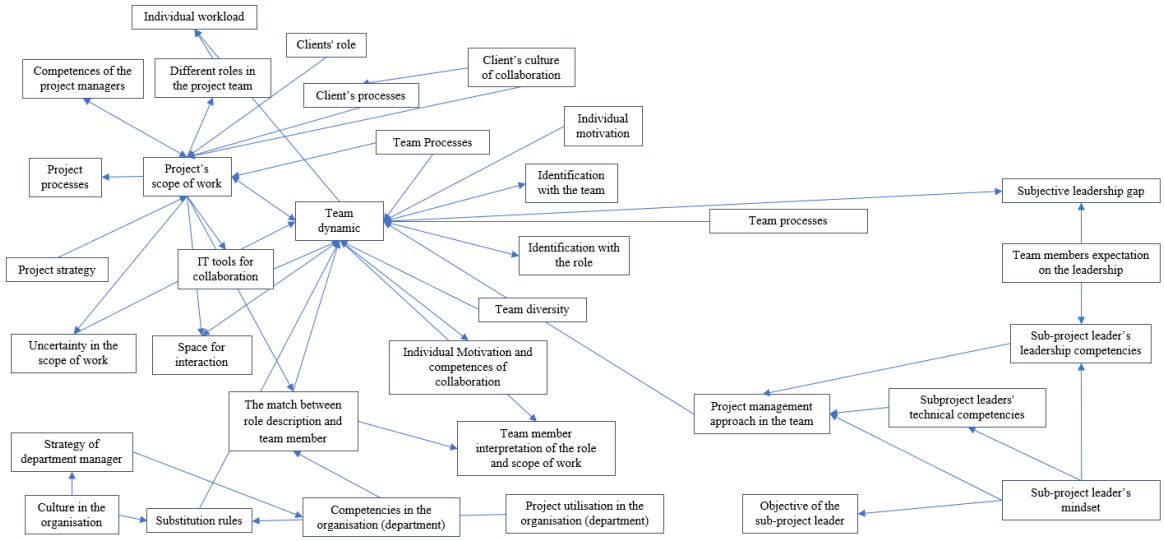


Source: Authors contribution.

4.2.6 Results based on the observation of team 3

The following results are based on the observation of the team meeting of team 3. I present the results of the network analysis in Figure 56.

Figure 56: Network of key factors based on observation for team 3

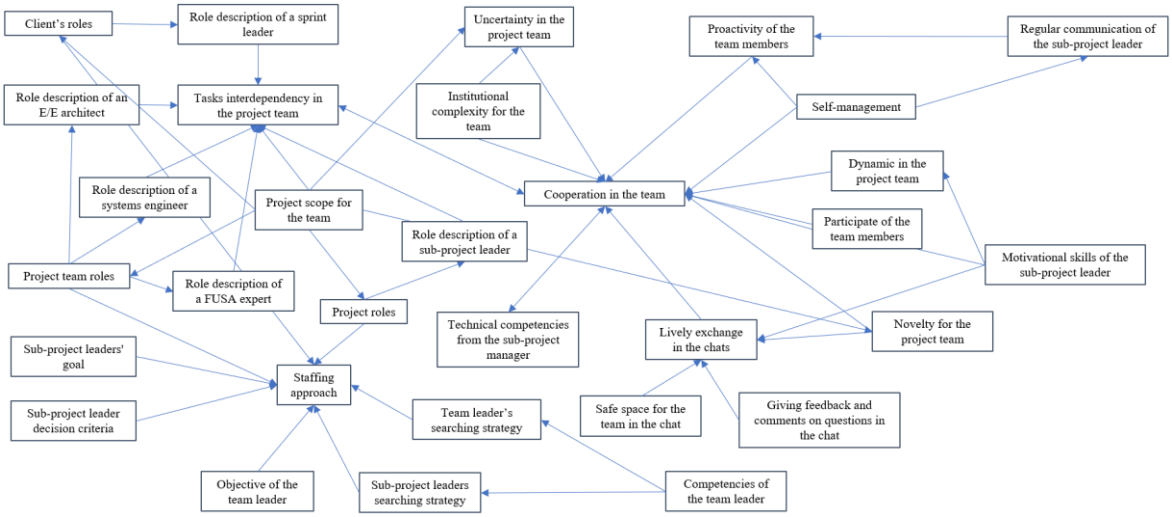


Source: Authors contribution.

4.2.7 Results based on the project documents of team 1

The following results are based on the internal project and team documents of team 1. I present the results of the network analysis in Figure 57.

Figure 57: Network of key factors based on project documents for team 1

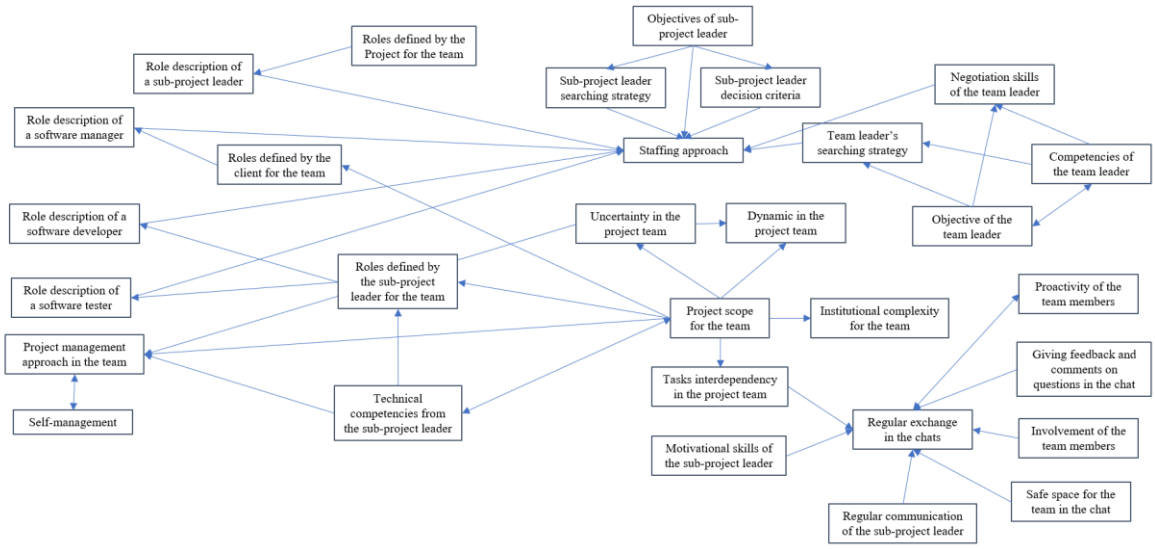


Source: Authors contribution.

4.2.8 Results based on the project documents of team 2

The following results are based on the internal project and team documents of team 2. I present the results of the network analysis in Figure 58.

Figure 58: Network of key factors based on project documents for team 2

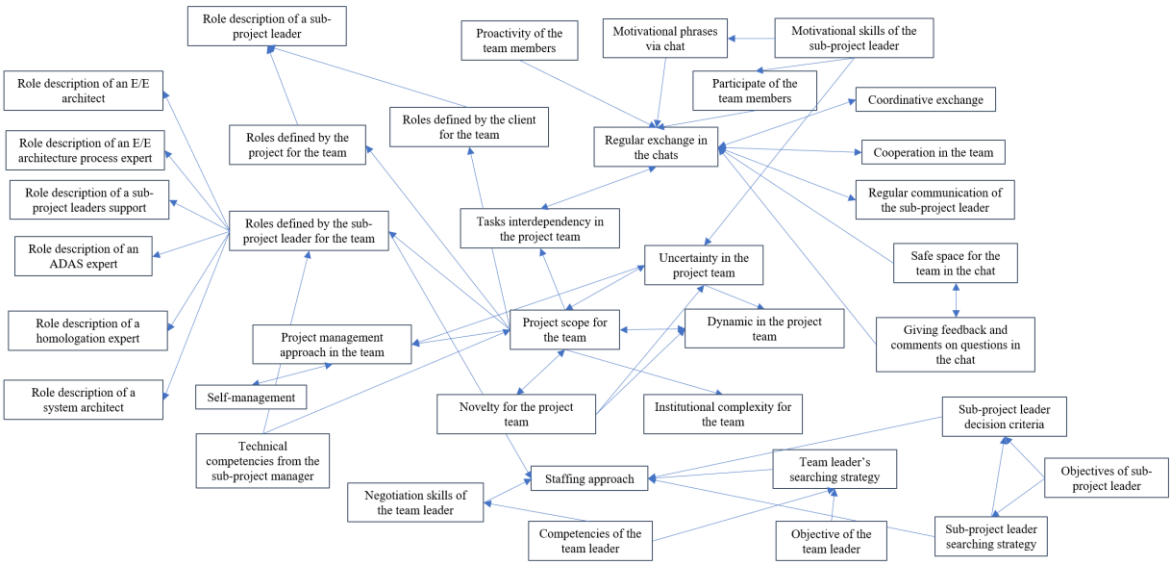


Source: Authors contribution.

4.2.9 Results based on the project documents of team 3

The following results are based on the internal project and team documents of team 3. I present the results of the network analysis in Figure 59.

Figure 59: Network of key factors based on project documents for team 3



Source: Authors contribution.

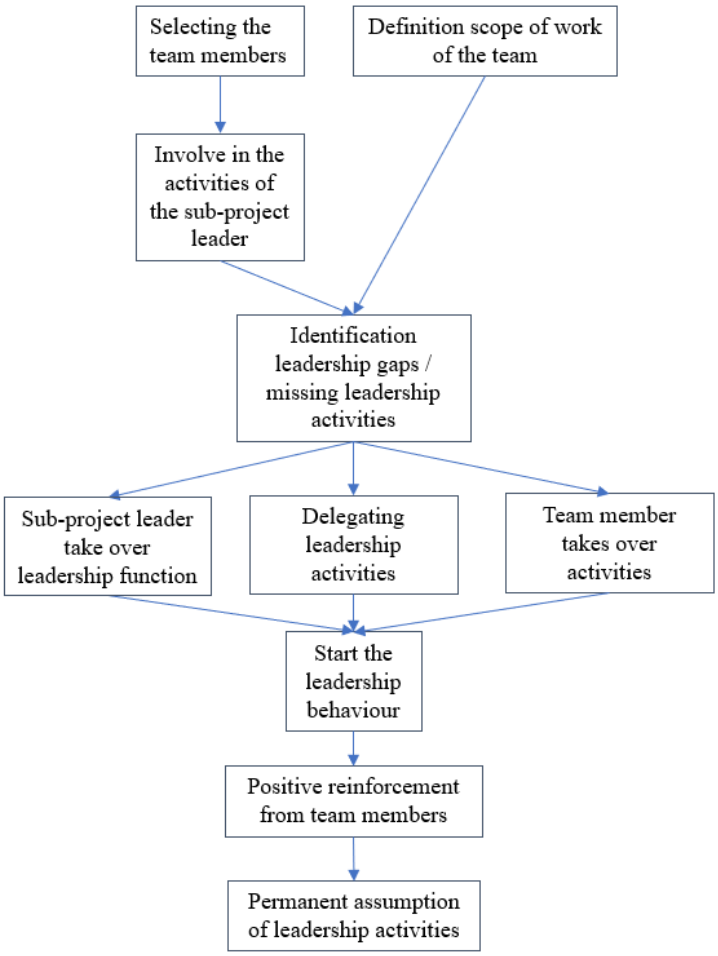
4.3 Processes for the emergence of shared leadership

This subsection summarises the results based on the sub–research question: (3) What are the processes of shared leadership emergence in PDP teams? The results of the event structure analysis and the qualitative content analysis are presented in the subsection.

4.3.1 Results of the key events due to the semi–structured interviews team 1

The following results are based on the semi–structured interviews of team 1. I present the results of the event structure analysis in Figure 60.

Figure 60: Process for the emergence of shared leadership from semi–structured interview and ESA of team 1

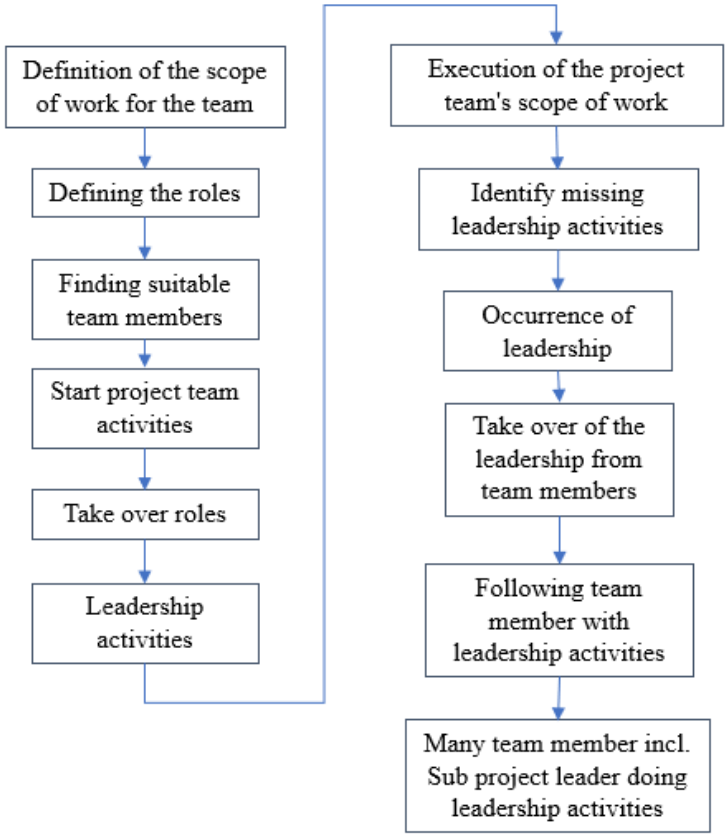


Source: Authors contribution.

4.3.2 Results of the process due to the semi–structured interviews team 2

The following results are based on the semi–structured interviews of team 2. I present the results of the event structure analysis in Figure 61.

Figure 61: Process for the emergence of shared leadership from semi–structured interview and ESA of team 2

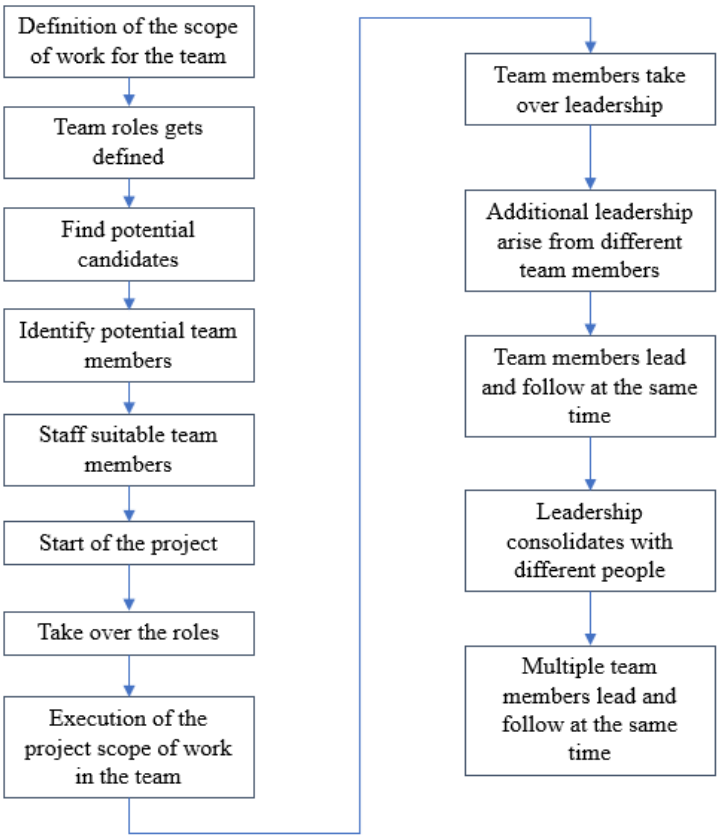


Source: Authors contribution.

4.3.3 Results of the process due to the semi–structured interviews team 3

The following results are based on the semi–structured interviews of team 3. I present the results of the event structure analysis in Figure 62.

Figure 62: Process for the emergence of shared leadership from semi–structured interview and ESA of team 3

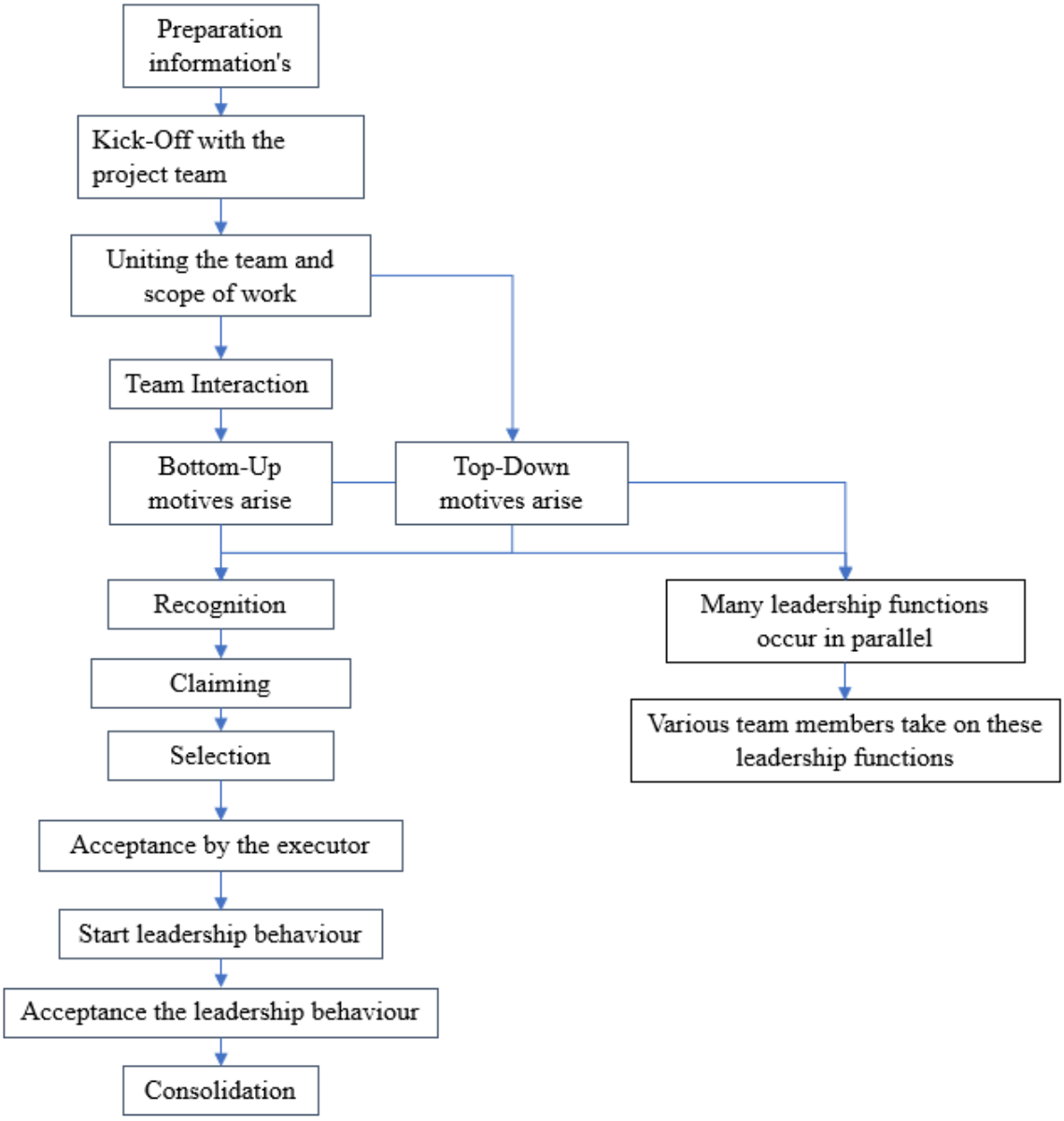


Source: Authors contribution.

4.3.4 Results of the process due to observation team 1

The following results are based on the team meeting observations of team 1. I present the results of the event structure analysis in Figure 63.

Figure 63: Process for the emergence of shared leadership from the observation of team meetings and the ESA of team 1

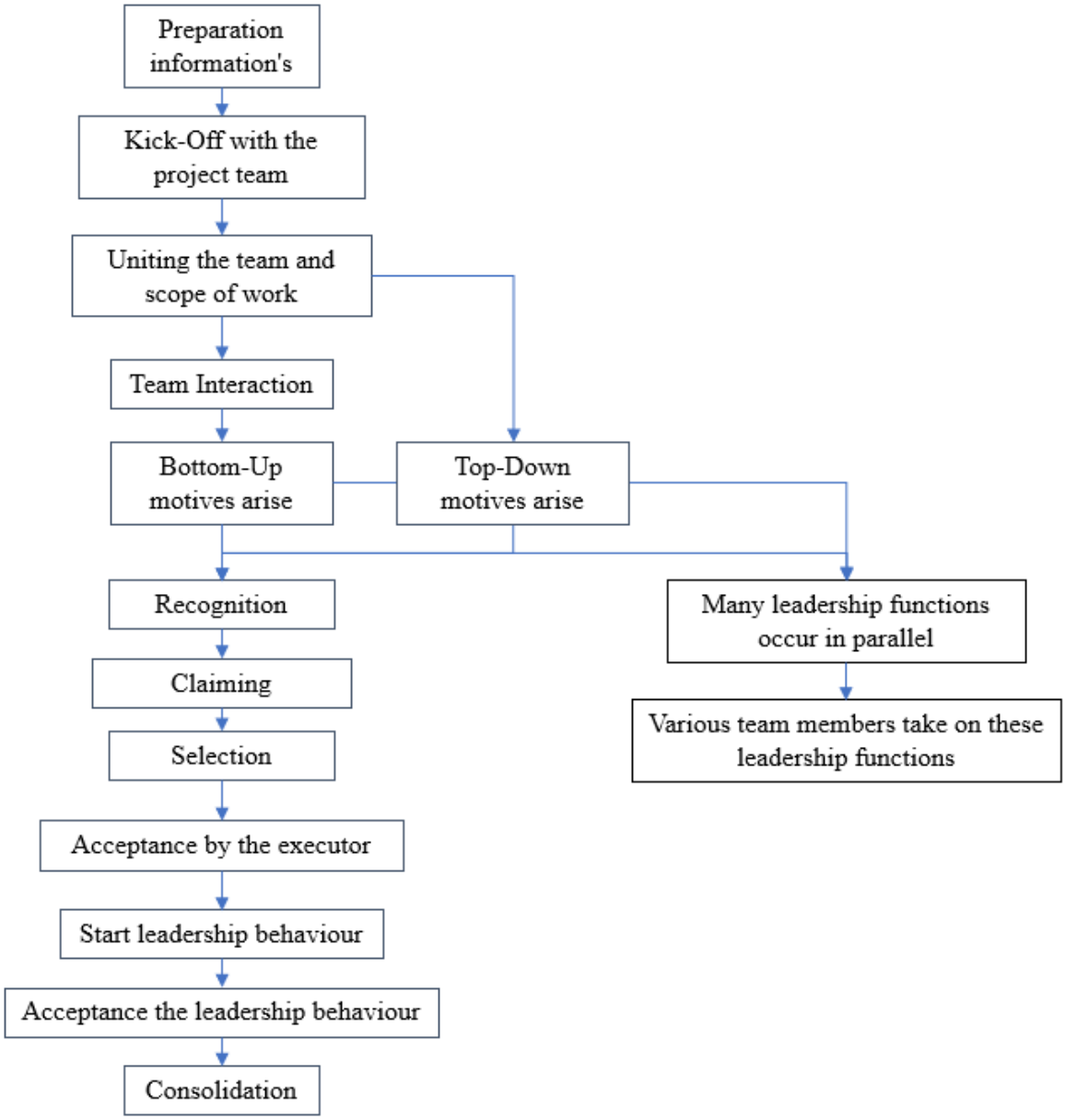


Source: Authors contribution.

4.3.5 Results of the process due to observation team 2

The following results are based on the team meeting observations of team 1. I present the results of the event structure analysis in Figure 64.

Figure 64: Process for the emergence of shared leadership from the observation of team meetings and the ESA of team 2

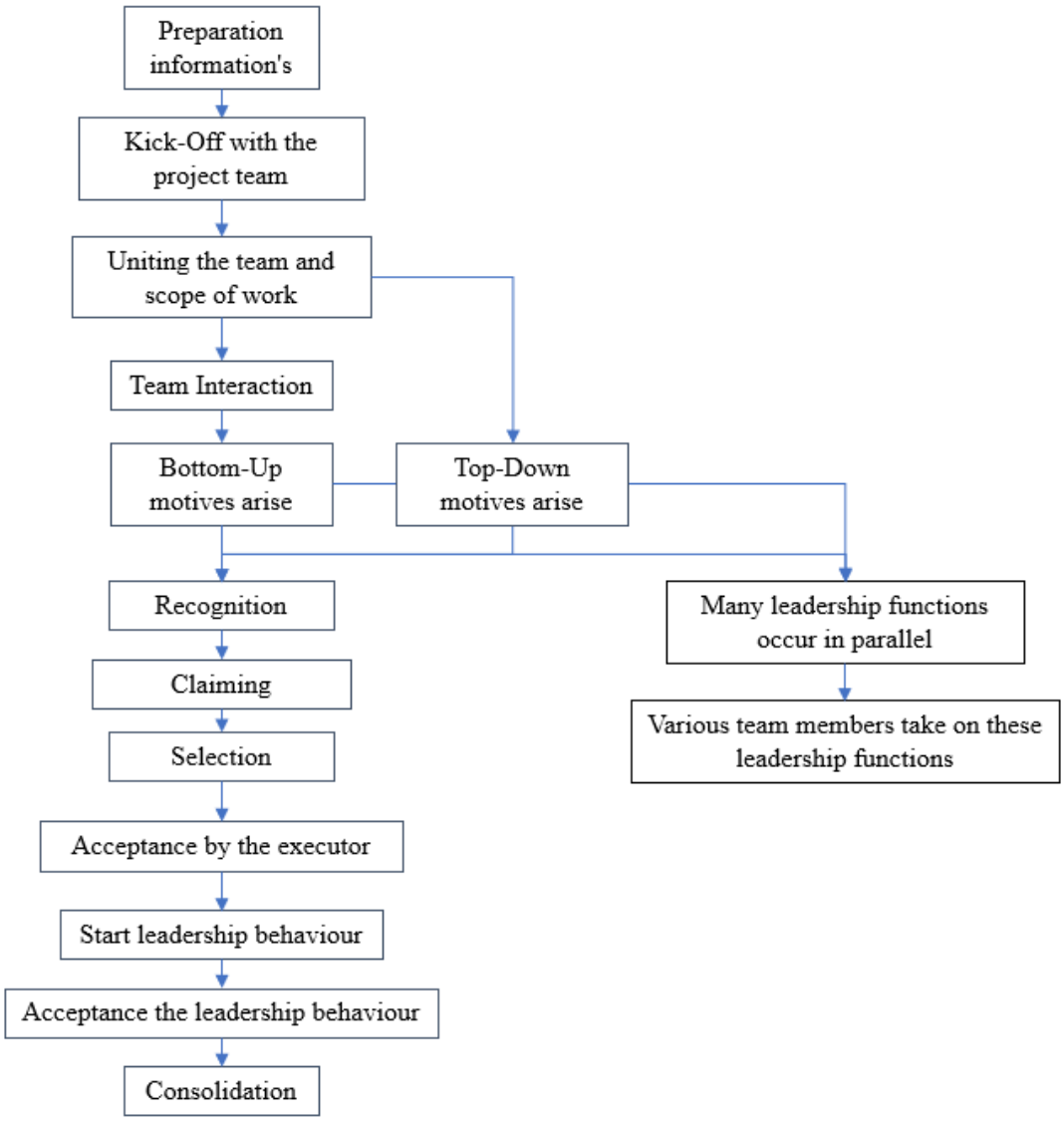


Source: Authors contribution.

4.3.6 Results of the process due to observation team 3

The following results are based on the team meeting observations of team 3. I present the results of the event structure analysis in Figure 65.

Figure 65: Process for the emergence of shared leadership from the observation of team meetings and the ESA of Team 3

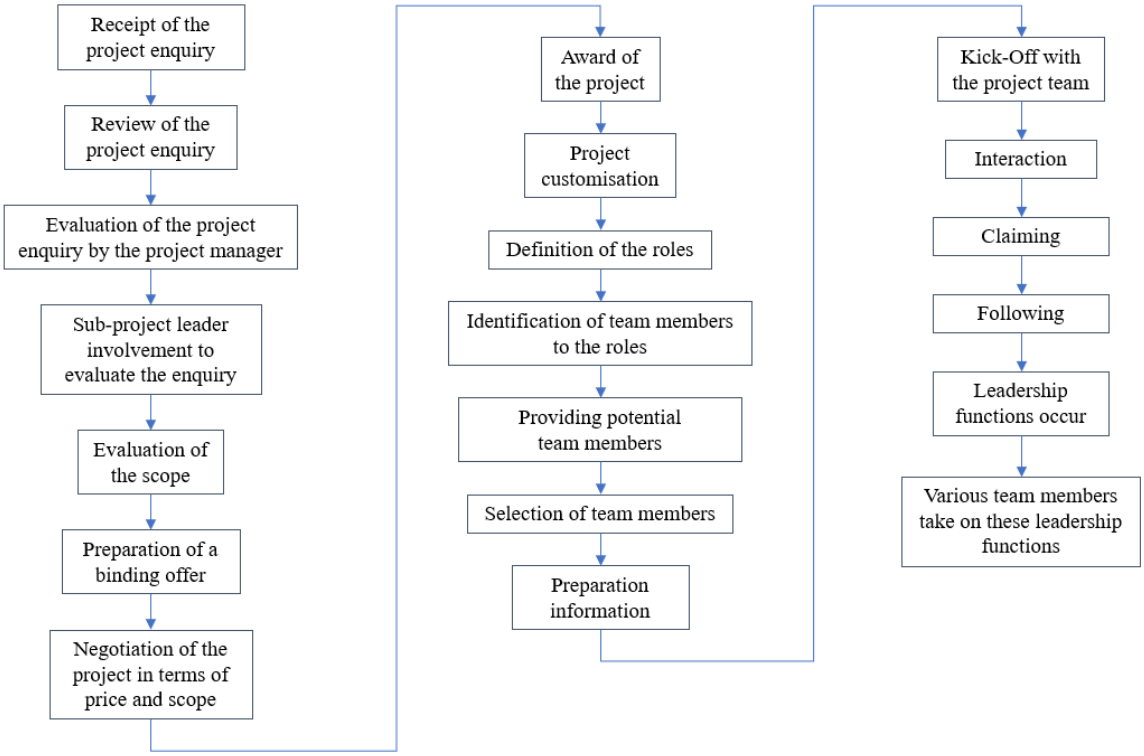


Source: Authors contribution.

4.3.7 Results of the process based on the internal project and team documents of team 1

The following results are based on the internal project and team documents of team 1. I present the results of the event structure analysis in Figure 66.

Figure 66: Process for the emergence of shared leadership from the internal project and team documents and the ESA of Team 1

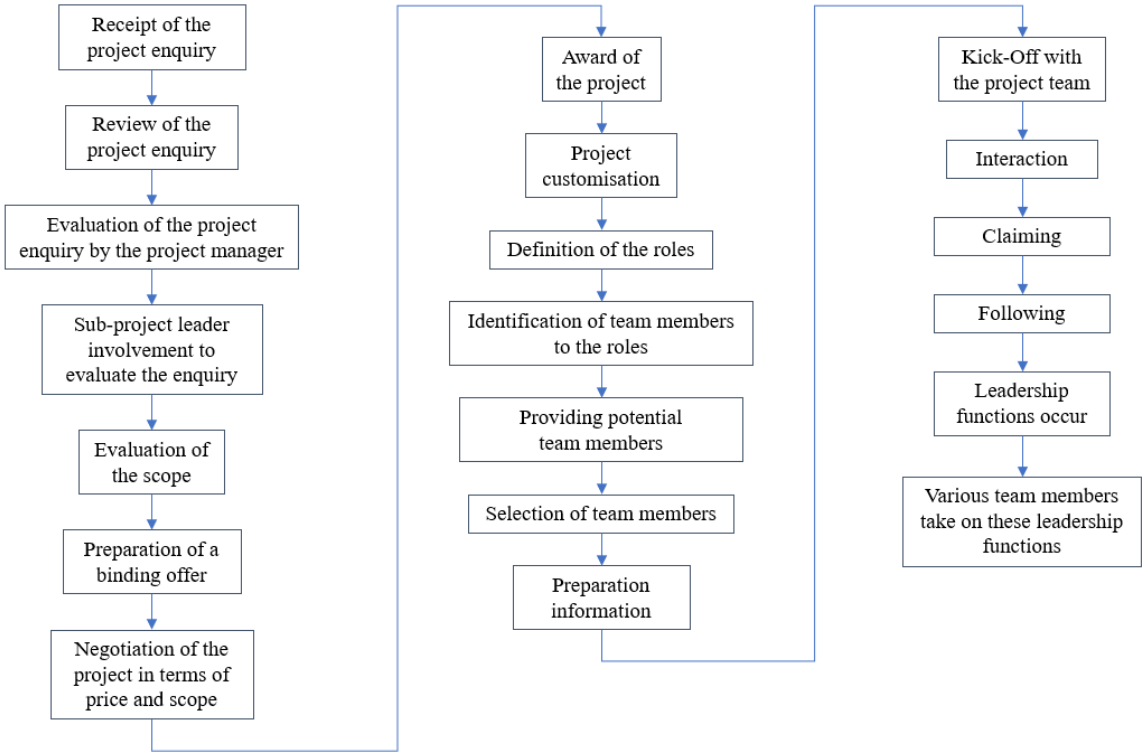


Source: Authors contribution.

4.3.8 Results of the process based on the internal project and team documents of team 2

The following results are based on the internal project and team documents of team 2. I present the results of the event structure analysis in Figure 67.

Figure 67: Process for the emergence of shared leadership from the internal project and team documents and the ESA of Team 2

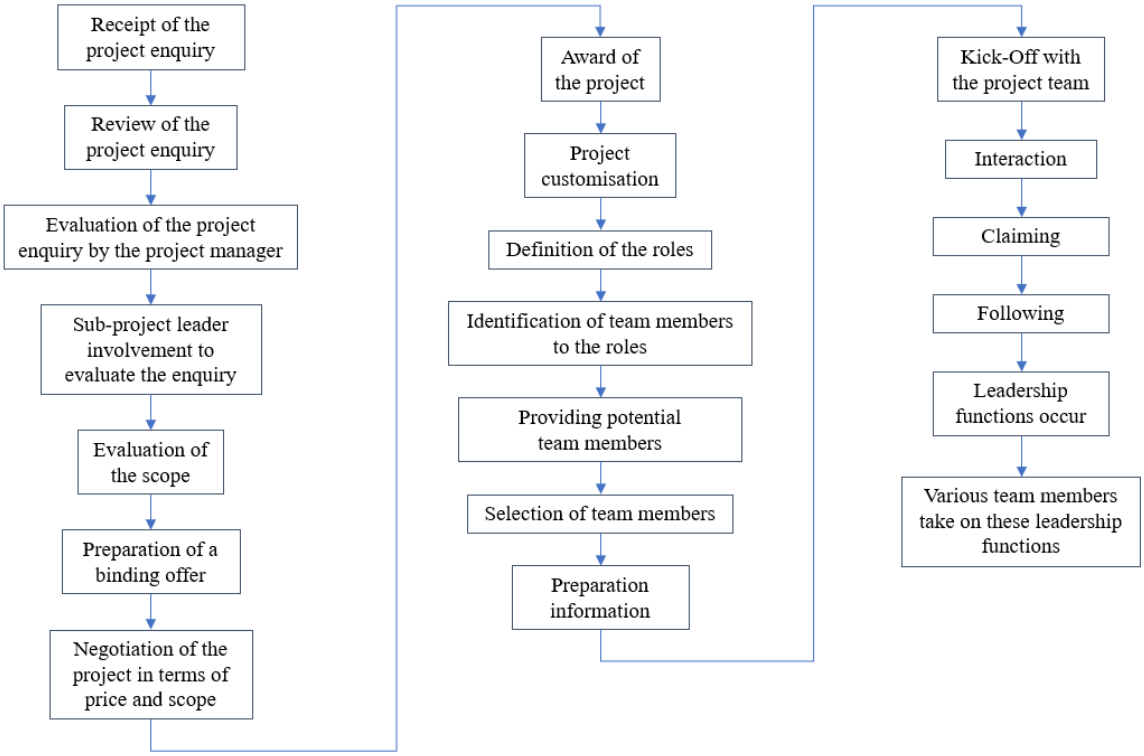


Source: Authors contribution.

4.3.9 Results of the process based on the internal project and team documents of team 3

The following results are based on the internal project and team documents of team 3. I present the results of the event structure analysis in Figure 68.

Figure 68: Process for the emergence of shared leadership from the internal project and team documents and the ESA of Team 1



Source: Authors contribution.

I presented the different processes of the emergence of shared leadership. The last key events are something like different team members taking on leadership functions. I would like to show what exactly this looks like in cases 1–3 by presenting the results of the qualitative content analysis in the following subchapter chapter.

4.3.10 Occurrence of many leadership functions undertaken by several team members

I would like to take a closer look at the key event occurrence of many leadership functions undertaken by several team members. I have divided the presentation of the results into two steps. Firstly, focussing on the leadership functions that occur and secondly, who performs these leadership functions.

4.3.10.1 Many leadership functions occurred

In the first stage, I want to present occurred leadership functions. Table 7 – Table 9 is showing the identified leadership functions for each team. During the analysis, I realised that a leadership function occurs several times, but in different areas and levels of detail. For better visualisation, I have indicated in brackets the area where the management function is exercised. For example: structure and planning (costs) or structure and planning (time).

4.3.10.2 Occurred leadership functions in team 1

Table 7 is showing the identified leadership functions in team 1. In total, 38 leadership functions occurred, and most functions were structure and plan (7) and monitor (8).

Table 7: Overview leadership functions in team 1

1	Compose Team	20	Structure and plan (costs)
2	Structure and plan (costs)	21	Monitor (costs)
3	Support social climate	22	Challenge team (costs)
4	Solve Problems (IT access)	23	Structure and plan (time, scope of work)
5	Encourage team self–management	24	Monitor (time, scope of work)
6	Monitor (costs)	25	Encourage team self–management
7	Establish expectations and goals (costs)	26	Perform team task (document management)
8	Manage team boundaries (costs)	27	Challenge team (time, scope of work)
9	Challenge team (costs)	28	Establish expectations and goals (time, scope of work)
10	Solve problems (general technical issues)	29	Train and develop (scrum method)
11	Provide feedback (general technical issues)	30	Provide feedback (time, scope of work)
12	Structure and plan (electrical system)	31	structure and plan (logical architecture)
13	Monitor (electrical system)	32	Monitor (logical architecture)
14	Solve Problems (technical issues)	33	Provide feedback (logical architecture)
15	Perform team task (team documents, Q&A)	34	Train and develop (logical architecture)
16	Monitor (costs)	35	Structure and plan (functional safety)
17	Monitor (time, scope of work)	36	Monitor (functional safety)
18	Structure and plan (time, scope of work)	37	Provide feedback (functional safety)
19	Support social climate	38	Train and develop (functional safety)

Source: Authors contribution.

4.3.10.3 Occurred leadership functions in team 2

Table 8 is showing the identified leadership functions for team 2. In total, 55 leadership functions occurred, and most functions were providing feedback (21) and establish expectations and goals (9).

Table 8: Overview leadership functions in team 2

1	Compose team	29	Train and develop (delivery report, timing, project culture)
2	Structure and plan (tickets)	30	Provide feedback (status own tickets)
3	Establish expectations and goals (ticket handling)	31	Structure and plan (own tickets)
4	Establish expectations and goals (ticket prioritising)	32	Provide feedback (techn. knowledge)
5	Establish expectations and goals (effort estimation of the tickets)	33	Solve problems (misunderstanding requirements)
6	Monitor team (dashboard)	34	Monitor team (dashboard)
7	Establish expectation and goals (dealing with assessors)	35	Establish expectations and goals (prioritising tickets)
8	Trian and Develop (IT tool)	36	Train and develop (techn. topic)
9	Provide feedback (Positive feedback for the done work)	37	Structrue and plan (tickets)
10	Support social climate (follow up projects)	38	Provide feedback (debugging session)
11	Establish expectations and goals (prioritising next release)	39	Provide feedback (information from client)
12	Support social climate (cafe meeting)	40	Support social climate (ask team about current issues)
13	Provide feedback (techn. feedback)	41	Provide feedback (information to the last two weeks and release)
14	Solve problems (technical issues)	42	Provide feedback (content SW)
15	Structure and plan (tickets)	43	Provide feedback (status own tickets)
16	Support social climate (ask team about current issues)	44	Structure and plan (own tickets)
17	Train and develop (ticket live cycle)	45	Provide feedback (techn. knowledge)
18	Monitor team (dashboard)	46	Provide feedback (extra workload)
19	Establish expectations and goals (prioritising tickets)	47	Provide feedback (content SW)
20	Establish expectations and goals (test coverage)	48	Provide feedback (status own tickets)
21	Provide feedback (positive feedback for the done work)	49	Structure and plan (own tickets)
22	Provide feedback (project status)	50	Provide feedback (techn. knowledge)

23	Provide feedback (feedback from client)	51	Provide feedback (status own tickets)
24	Structure and plan (timing release)	52	Structure and plan (own tickets)
25	Establish expectations and goals (quality tickets)	53	Train and develop (test rules)
26	Manage team boundaries (HMI and test topics)	54	Provide feedback (techn. knowledge)
27	Provide feedback (results assessment)	55	Provide feedback (workload)
28	Provide feedback (release documents)		

Source: Authors contribution.

4.3.10.4 Occurred leadership functions in team 3

Table 9 is showing the identified leadership functions in team 3. In total, 60 leadership functions occurred, and most functions were providing feedback (13), structure and plan (11) and establish expectations and goals (9).

Table 9: Overview leadership functions for team 3

1	Compose team	32	Structure and plan (system Diagrams)
2	Structure and plan (costs)	33	Provide feedback (system diagrams)
3	Establish expectations and goals (total project)	34	Structure and plan (WP power mode, system diagram)
4	Encourage team self–management	35	Provide feedback (WP power mode, system diagram)
5	Support social climate	36	Structure and plan (WP system diagram)
6	Provide feedback (created deliverables)	37	Provide feedback (WP topology)
7	Monitor (costs)	38	Solve problems (features in PREEvision)
8	Challenge team (cost to deliverables discussion)	39	Perform team task (WP system diagram)
9	Structure and plan (scope of work)	40	Solve problems (system diagram)
10	Provide feedback (all WPs)	41	Provide feedback (WP system diagram & topology)
11	Support social climate (team building)	42	Structure and plan (WP ADAS)
12	Structure and plan (team meeting)	43	Provide feedback (WP ADAS)
13	Monitor team (all work packages)	44	Monitor (WP ADAS)
14	Provide feedback (for TM effort)	45	Solve problems (EE architecture)
15	Provide feedback (for TMs effort)	46	Train and develop (outlook (Email) functions)
16	Manage team boundaries (project content)	47	Perform team task (NCAP requirements in feature list)
17	Solve problem (Team member leave the project)	48	Provide feedback (WP system digram, change management)
18	Establish expectations and goals (document mangement)	49	Structure and plan (WP system digram)

19	Train and develop (Sharepoint)	50	Monitor (WP system digram, change management)
20	Support social climate (Follow up project, jokes)	51	Perform team tasks (WP Overview, document management, meeting minutes)
21	Establish expectations and goals (meeting with client)	52	Monitor (WPs overview)
22	Structure and plan (WP feature list)	53	Perform team tasks (master timing)
23	Establish expectations and goals (feature list)	54	Perform team tasks (Holiday calender)
24	Monitor (WP work package)	55	Provide feedback (Data management, config. Management)
25	Provide feedback (WP 1,2 &6)	56	Structure and plan (WP system digram)
26	Train and develop (clients sharepoint)	57	Provide feedback (WP system digram)
27	Performing team task (team meeting invitation)	58	Perform team tasks (Template for docum. of the daily activities)
28	Structure and plan (WP homologation)	59	Solve problems (EE topology)
29	Train and develop (vehicle characteristics)	60	Train and develop (EE architecture process)
30	Monitor (WP homologation)	61	Solve problems (creating of system digramm in PREEvision)
31	Provide feedback (WPs Homologation & RFI)		

Source: Authors contribution.

4.3.11 Assumption of leadership functions by different team members in the team

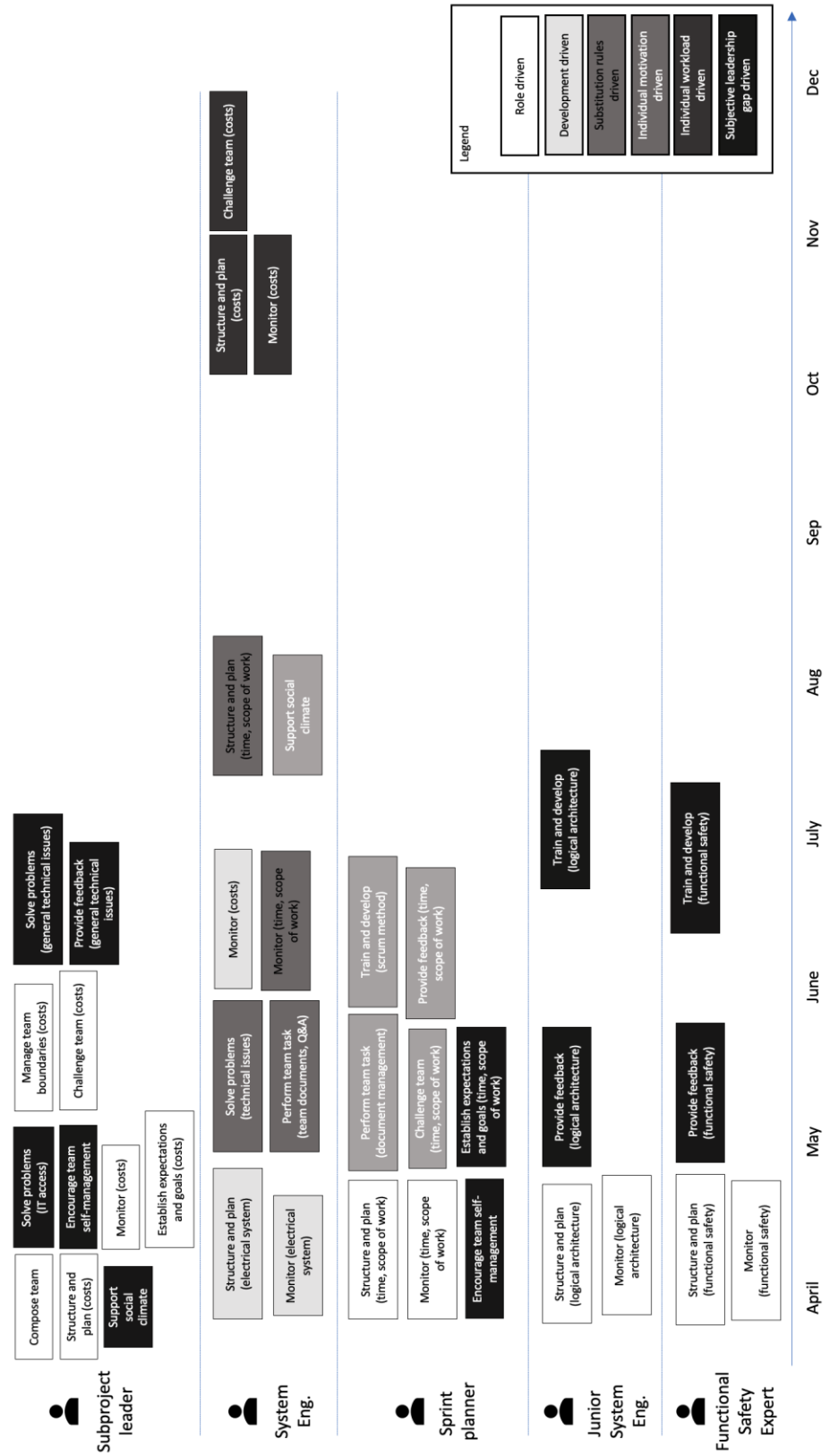
In the second stage, I have assigned the management functions to the person with whom it arises. Having established that there are many leadership functions in a project team during a project, I would now like to show how these are distributed among the team members. The results, which are shown in Figure 69 – Figure 71, are based on the qualitative content analysis. The figures show a schematic representation of the assigned leadership function by time, person and motive of the leadership function. Each box represents the occurrence of a leadership function and contains the name of the function and the area. The different colours of the boxes show the motives for the occurrence of the leadership function. I have also added the roles to the representation of the persons.

4.3.11.1 Overview of the leadership functions that occurred and assumed in team 1

The results of team 1 are shown in Figure 69**.** The leadership functions were identified in 5 out of 7 persons. At the subproject leader (11), the system engineer (11) and the sprint planner (8), most leadership functions occurred. Many leadership functions occur at the beginning of the study (which is also the beginning of the project team) and decrease over time. After a certain time, a saturation state occurs, and no further (or only very few) leadership functions arise. The subproject leader has the most leadership functions in the area of costs, while the sprint leader is in time and the team's scope of work. During the

further course of the project, the system engineer assumes management functions in the cost, time and scope of work areas for reasons of development, flexibility and subproject leader workload–driven. It should be noted that three of the seven team members share leadership functions in the area of (time, cost, and scope of work). The system engineer, junior system engineer and functional safety expert take on the leadership functions in technical areas. The system engineer takes on a special role here, taking over leadership functions from the sub–project leader and sprint planner over time. The most important drivers for the emergence of leadership functions are the role description and its adoption (12) and the subjective leadership gap (11). Especially at the beginning of the project, the leadership functions emerge through the description of the roles and are mainly in the time, costs and scope of work, but also and in technical areas. The leadership functions that occur through the subjective leadership gap are distributed in the first half of the project and are more at home in the technical areas.

Figure 69: Overview of leadership functions according to time and role for team 1

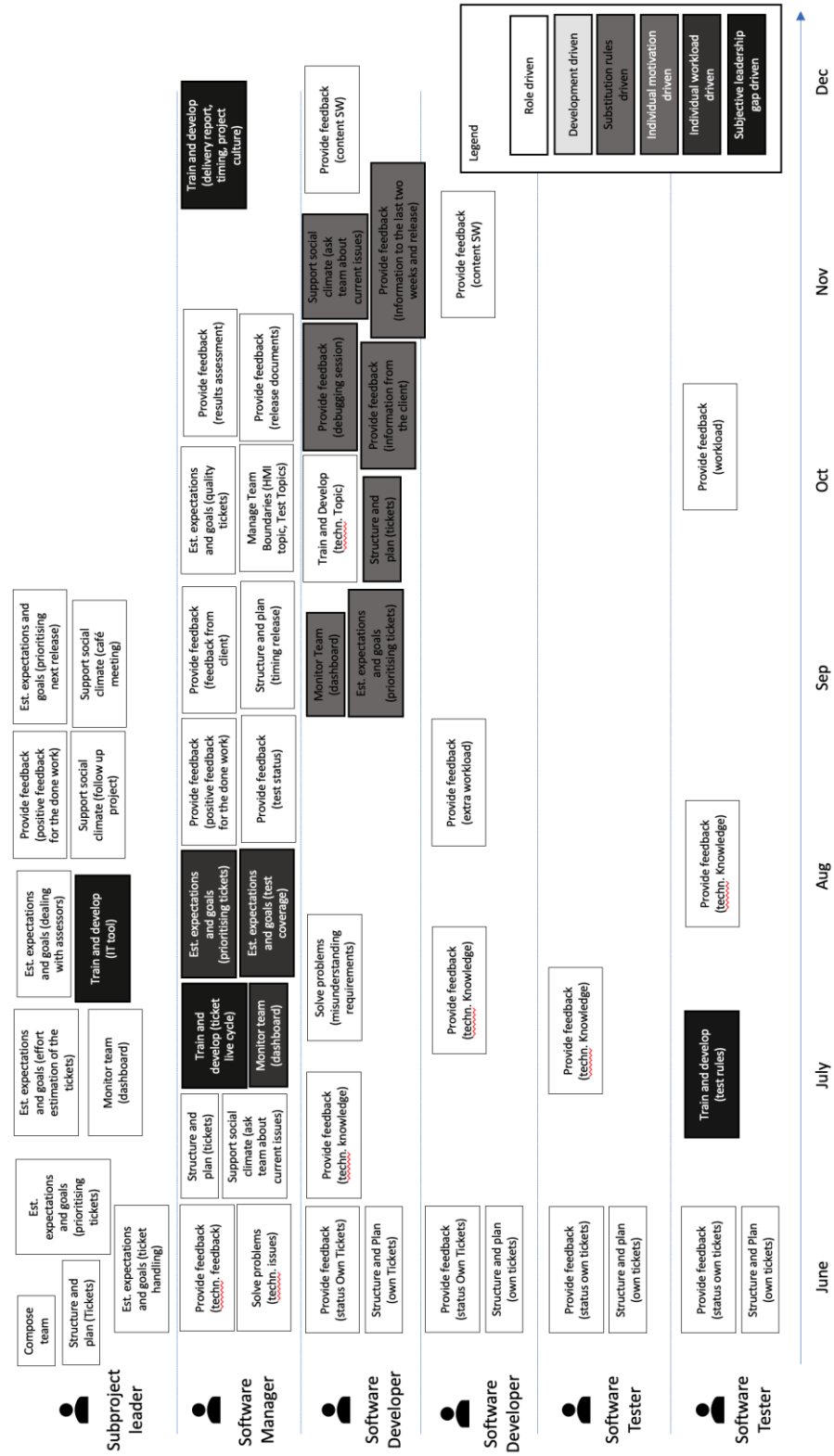


Source: Authors contribution.

4.3.11.2 Overview of the leadership functions that occurred and assumed in team 2

The results of team 2 are shown in Figure 70. The leadership functions were identified in 6 out of 6 persons. At the subproject leader (12), the software manager (17) and the software developer (13), most leadership functions occurred. The leadership functions are distributed relatively evenly over the course of the study. The subproject leader has the most leadership functions in the area of tickets handling. The software manager's leadership functions are more in the technical support. During the further course of the project, the software developer assumes leadership functions next to their technical topics also tickets for the whole project team. It should be noted that three of the six team members share leadership functions in the area of (time, cost, and scope of work). One software developer and the two software tester take on the leadership functions in technical areas. The most important drivers for the emergence of leadership functions are the role description (29) and the subjective leadership gap (13). Especially at the beginning of the project, the leadership functions emerge through the description of the roles and are mainly in the time, costs and scope of work, but also and in technical areas. In a later phase, a software developer will have leadership functions, as the flexibility of the project team is required.

Figure 70: Overview of leadership functions according to time and role for team 2

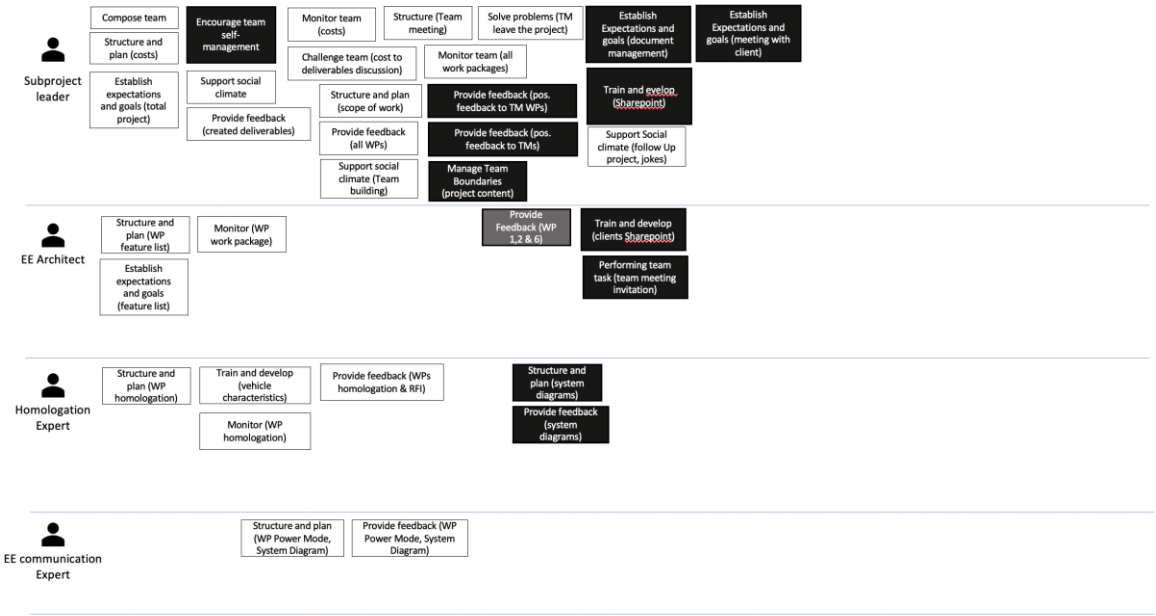


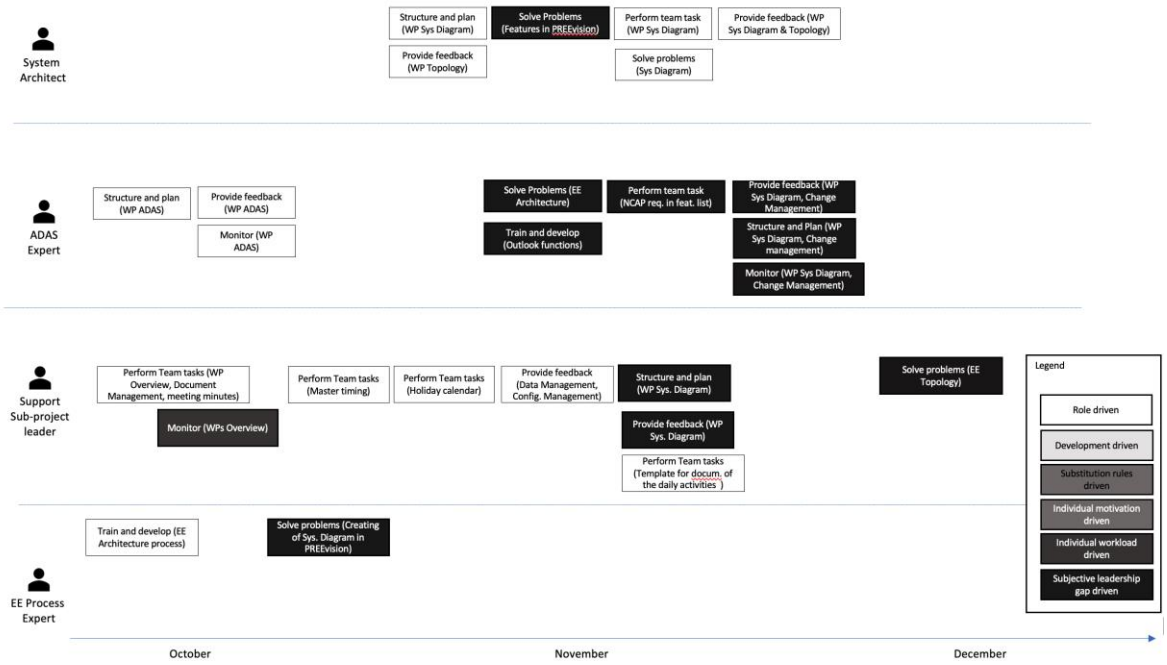
Source: Authors contribution.

4.3.11.3 Overview of the leadership functions that occurred and assumed in team 3

The results of team 3 are shown in Figure 71. The 61 leadership functions were identified in 8 out of 8 persons. At the subproject leader (21), and the support subproject leader (9) most leadership functions occurred. The subproject leader has the most leadership functions in the area of costs and monitoring all the work packages, while the support of the subproject leader is performing many team tasks. The project team works in work packages that are planned and structured and monitored independently by the team members. The team members therefore have a leadership function there. Many leadership functions occur at the beginning of the study (which is also the beginning of the project team) and decrease over time. At the beginning of the project, the leadership tasks that arise are role–orientated and later mainly subjective leadership gap driven.

Figure 71: Overview of leadership functions according to time and role for team 3





Source: Authors contribution.

4.3.11.4 Summary for the assumption of leadership functions by different team members

In all three teams, it was shown that different team members take on the leadership functions that arise. This is now the final key factor.

4.4 Cross check of the results for the three cases

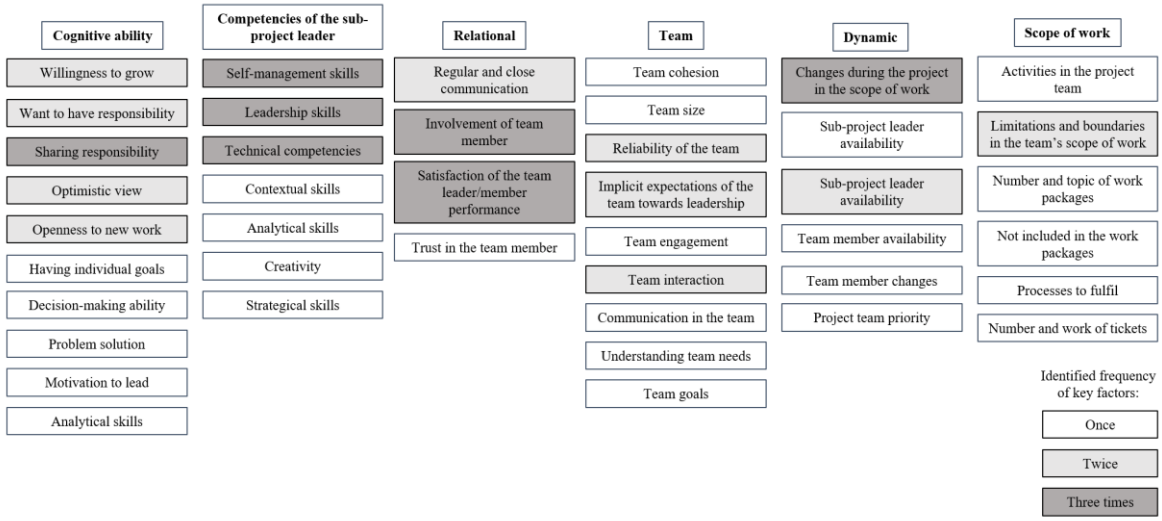
In this subsection, I will compare the results of the teams divided into the collection methods.

4.4.1 Results of the comparison for the key factors of shared leadership emergence

4.4.1.1 Based on the semi–structured interviews

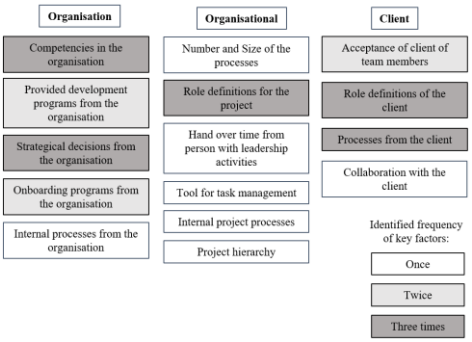
In the results of the key factors based on the semi–structured interviews, there are nine identical categories: Cognitive ability, competencies of the sub–project leader, relational, team, dynamic, scope of work, organisation, organisational, and client. I will present the key factors and the determined frequency of these key factors arranged in the categories in Figure 72–Figure 73:

Figure 72: Comparison of the key factors based on the semi–structured interviews (1/2)



Source: Authors contribution.

Figure 73: Comparison of the key factors based on the semi–structured interviews (2/2)

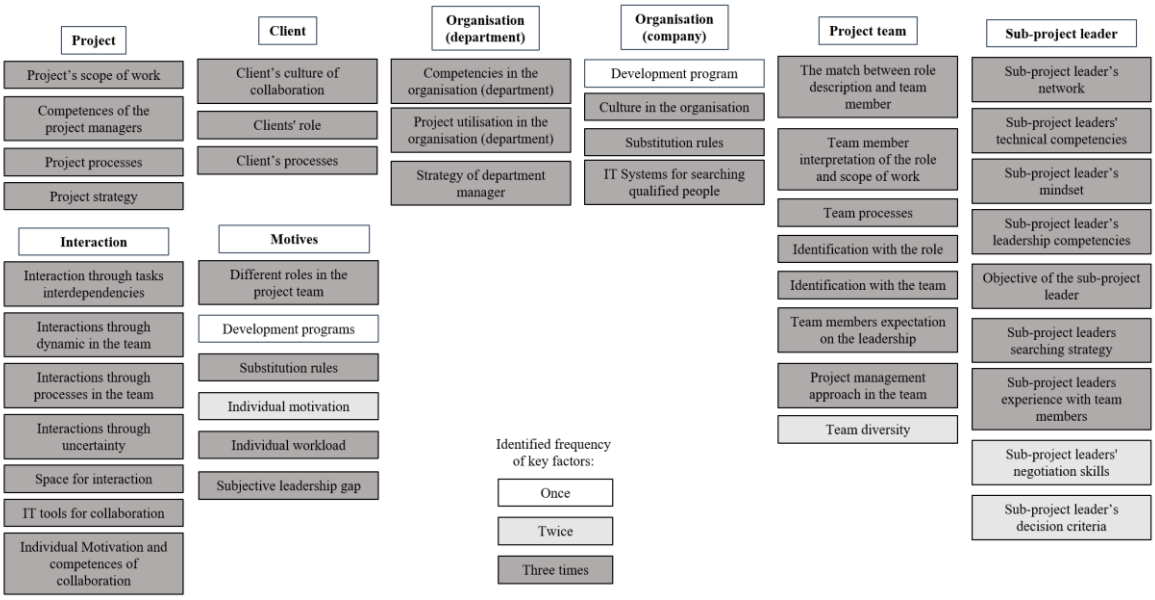


Source: Authors contribution.

4.4.1.2 Based on the team meeting observation

In the results of the key factors based on the team meeting observations, there are eight identical categories: Project, client, organisation (department), organisation (company), project team, sub–project leader, interaction, motives. I will present the key factors and the determined frequency of these key factors arranged in the categories in Figure 74:

Figure 74: Comparison of the key factors based on the team meeting observation

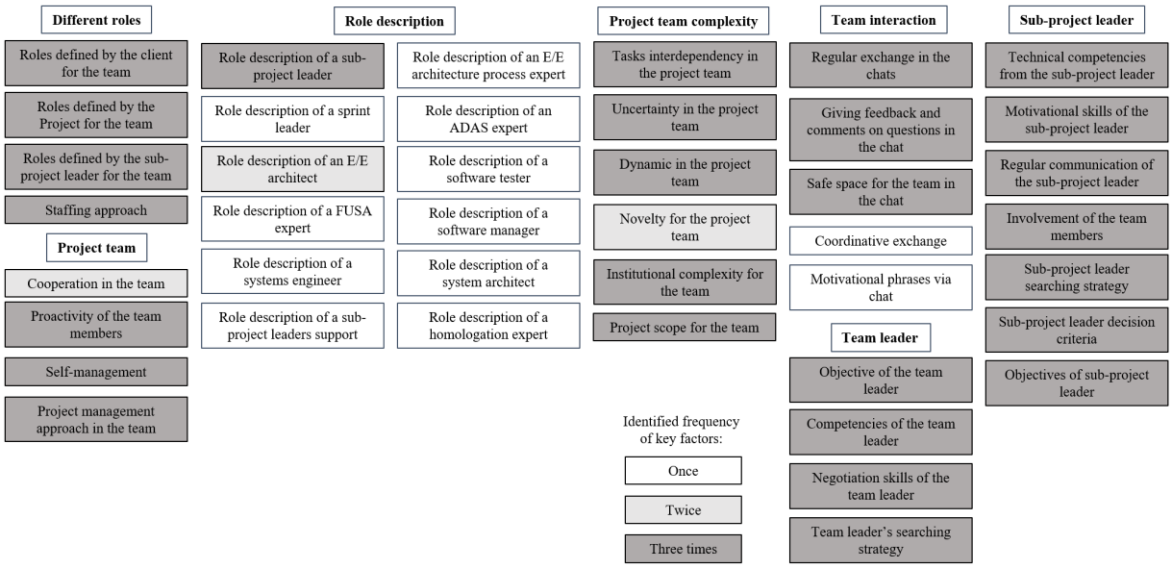


Source: Authors contribution.

4.4.1.3 Based on the internal project and team documents

In the results of the key factors based on the internal project and team documents, there are seven identical categories: Different project roles, role descriptions, project team complexity, team interaction, sub–project leader, project team and project leader. I will present the key factors and the determined frequency of these key factors arranged in the categories in Figure 75:

Figure 75: Comparison of the key factors based on the documents



Source: Authors contribution.

4.4.2 Results of the comparison of the relationships of the key factors

4.4.2.1 Based on the semi–structured interviews

The comparison of the results from the three cases based on the relation of the key factors from the semi–structured interviews (see Figure 51 – Figure 53).

The most connected key factors for Team 1 are “Activities in the project team” (8 arrows) and “Coaching programs provided by the organisation” (5 arrows). For team 2: “Team interaction” (17 arrows) and “Number and work of tickets” (8 arrows). And for team 3 “Team interactions” (16 arrows), “Number of work packages” (7 arrows) and “Implicit expectations of the team towards leadership” (6 arrows). “Team interaction” is the most strongly connected key factor and interacts with around 16 (team 2) and 16 (team3) other key factors. All key factors are linked to at least one other key factor. The connection between the factors is highest for Team 1 (47 arrows), less so for Team 1 and Team 3 (both 44 arrows). Nevertheless, the three cases only differ by 3 arrows.

4.4.2.2 Based on the team meeting observation

The comparison of the results from the three cases based on the relation of the key factors from the team meeting observations (see Figure 54 – Figure 56).

The most connected key factors for Team 1 are “Project’s scope of work” (18 arrows), “Interaction through tasks interdependency” (6 arrows) and “Interaction through process in the team (6 arrows). For team 2: “Team dynamic” (12 arrows), “Project’s scope of work” (11 arrows) and “The match between role description and team member” (6 arrows). And for team 3 “Team dynamic” (16 arrows) and “Number of work packages” (13 arrows). “Project scope of work” is the most strongly connected key factor and interacts with around 16 (Team 1), 11 (Team2), and 13 (Team 3) other key factors. All key factors are linked to at least one other key factor. The connection between the factors is highest for Team 2 (62 arrows), less so for Team 1 (46 arrows) and Team 3 (both 45 arrows).

4.4.2.3 Based on the internal project and team documents

The comparison of the results from the three cases based on the relation of the key factors from the internal team and project documents (see Figure 57 – Figure 59).

The most connected key factors for Team 1 are “Cooperation in the team” (11 arrows), “Staffing approach” (8 arrows), and tasks interdependency (7 arrows). For team 2: “Staffing approach” (9 arrows), “Project scope of the team” (8 arrows), and “Regular exchange in the chat (7 arrows). And for team 3 “Project scope of the team” (10 arrows), “Role definition by the sub–project leader for the team” (9 arrows) and “Regular exchange in the chat” (9 arrows). So, for all three times, the scope or tasks of the project team are the most connected. Based on the total number of connections, Team 3 has the most connections with 52 arrows, Team 1 has 42 connections and Team 2 has 41 connections.

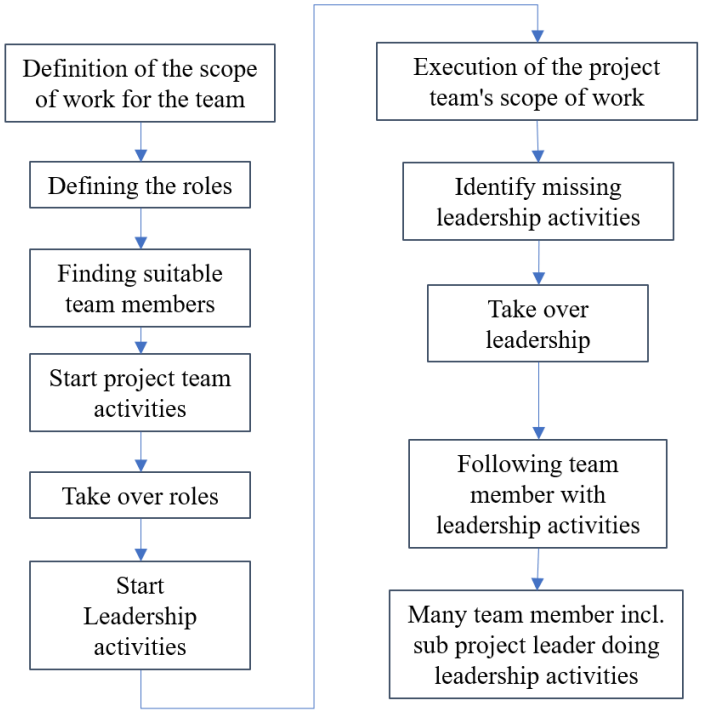
4.4.3 Results of the comparison for the processes of shared leadership emergence

In this subsection I will present the standardised processes for the shared leadership emergence for the three cases.

4.4.3.1 Results of the cross–checked process for the semi–structured interviews

I would like to standardise the results of the processes from the interviews of all three teams and present a process (Figure 76) and add comments on these events.

Figure 76: Standardised process based on the interview for all three cases



Source: Authors contribution.

I have identified 11 key events which I will now explain in a more detail below.

4.4.3.1.1 Defining the scope of work for the team

In key event “Defining the scope of work for the team” includes the activities according to the collect all the information in form of documents, discussion or workshops. The project, the client and the organisation influence the scope of work for the project team. Another decisive factor is the sub–project leader, who interprets these influences and sets the project team's own conditions. The result of his key event is clarity about what needs to be done, when and how. This is done by the sub–project leader and in close collaboration with the project manager.

4.4.3.1.2 Defining the roles

Based on the scope of work for the team the key event “Defining the roles” includes all the activities to define the roles. Different ways lead to the same results. The most roles are already defined within the organisation and needs to define. At the end of this key event the sub–project leader has the roles defined and the roles description within the condition like the need of availability.

4.4.3.1.3 Finding suitable team members

This key event includes all activities to find a team member for each role description. Together with the team leader, the sub–project leaders search for suitable team members. The team leaders provide team members, and the sub–project leader selects the team members based on their criteria.

4.4.3.1.4 Start project team activities

The key event "Start project team activities" contains the activities that lead to the project team being able to start. For example, the kick–off with the team. The team members are involved in what is happening in the project. The team members familiarise themselves with their role.

4.4.3.1.5 Take over roles

The activities in the key event “Take over roles” are that the team members take over their roles according to the role description. It can include discussions between the sub–project leader and the team member to have an alignment with the expectation from the sub–project leader.

4.4.3.1.6 Leadership activities

Based on the roles, implicit or explicit management activities are included. This key event triggers the activities based on these predefined management activities.

4.4.3.1.7 Execution of the project team’s scope of work

According to the roles and interpretation of the team members, the team begins to carry out the work. This key event symbolises the entire interaction within the team.

4.4.3.1.8 Identify missing leadership activities

During the realisation of the team's project scope, management functions are perceived as missing. These identified leadership functions form an important key event.

4.4.3.1.9 Take over leadership

Now that a leadership activity has been identified as missing, team members or the sub–project leader take over this leadership function.

4.4.3.1.10 Following team member with leadership activities

The team members with leadership tasks need followers to fulfil the leadership tasks. This key event contains all the activities that are necessary for team members to follow.

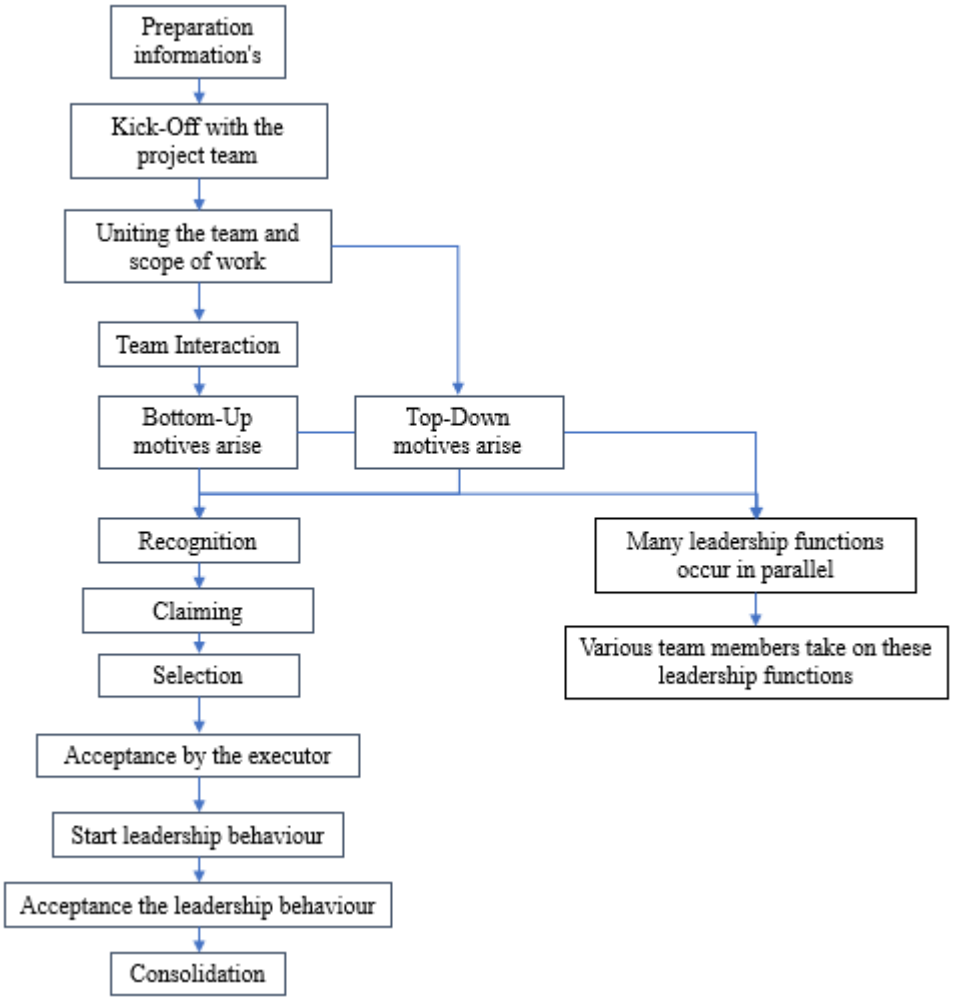
4.4.3.1.11 Many team members inclusive sub–project leader doing leadership activities

The last key event from the interview is that many team members inclusive sub–project leader doing leadership activities.

4.4.3.2 Observation

I would like to standardise the results of the processes from the observation of the team meetings of all three teams and present a process (Figure 77) and add comments on these events.

Figure 77: Standardised process based on the observations



Source: Authors contribution.

I have identified 15 key events which I will now explain in a more detail below.

4.4.3.2.1 Preparation information's

The key event "Preparation information's" is the organisation of documents for the start of the project team. Project information such as project specification, project schedule, contract and project organisation chart. Project team information such as the project team organisation chart, role descriptions, project team scope of work, team schedule. Information about the customer includes contact details (e–mail addresses), the customer's procedures and terminology. Activities include preparing a presentation for the kick–off. It is also important to create a space for filing the project team's documents. This is usually done by the sub–project leader.

4.4.3.2.2 Kick–Off with the project team

The kick–off with the project team is a key event and is a crucial event to create a symbolic meeting with the team to have an official "start". The sub–project leader organises an internal kick–off meeting at the beginning, at which the information relevant to the sub–project leader is distributed in a document. Usually, the team members meet physically and with space for the team members to get to know each other.

4.4.3.2.3 Uniting the team and scope of work

This key event contains the activities that lead to the team and the scope of work becoming one unit. The team members are given access to the relevant documents and IT systems after the Kick–Off. The sub–project leader is available to answer any questions the team members may have. Regular meetings are set up and the way in which the team communicates is explicitly and implicitly defined. The team members study the documents and base on their experience and competences, develop an understanding of their role and the roles of the team, the processes and the tasks of the project team. As roles change over time, interpretation will be an ongoing phase throughout the duration of the project. A kind of identification of the team member with their role begins. team members start by identifying their role in the project. This is expressed by the fact that they sometimes talk in the meeting about the fact that they have to fulfil certain tasks in a certain role, or they also use the role in the project in email addresses from now on. The team members identify with the project team by talking about a "we". For example, what the team is responsible for or why this team is needed. On the other hand, team members represent the project team in meetings.

4.4.3.2.4 Top–down motives arise

Based on the previous key event, the team members take on their roles and familiarise themselves with the content of the project team. In this phase, leadership functions are assumed through various motives. The team members are guided by the defined roles and role descriptions, the planned development and the rules of representation. These are top–down motives for leadership. The leadership functions come from the organisation, the project and the client and are interpreted by the sub–project manager.

The first top–down motive is role definition. The sub–project leader and the team members are subject to a defined role and associated role description that are assumed. In some cases, the defined roles are supplemented by additional requirements. The defined roles in the project team can include management functions. The role description may, for example, include responsibility for time or costs. The reason for the motive is the structured processing and completion of the work order in a team.

The second key motive for the development of a team member. The development motive comes from the organisation, the sub–projects, but also from the team members themselves and is defined in the form of a target image such as project, sub–project sprint leader or

software manager. If it comes from the organisation, it is because it helps the organisation to be more flexible across projects, as the knowledge and skills are distributed among several employees. The same applies to the sub–project leader. This increases the flexibility of the project team because it can fill a vacant role or create redundancy. If it comes from the employee, it is because they want to develop further. This usually means expanding their own competences, which has a medium to long–term impact on their career and salary. Certain target images to be developed usually also consist of management tasks that still need to be broken down. Ultimately, this is a planned development of the employee through the assumption of responsibility, which often leads to the assumption of leadership tasks.
The last top–down motives sub–process is the substitution arrangement. This is a planned substitution arrangement in the project team, for example in the event of illness, holiday, fluctuation or paternity leave. These are events that experience has shown will occur in the project team during the project. The substitution arrangement is in place at the start of the project. Who stands in for whom is usually discussed within the team during the project. The reason for this is to increase the flexibility of the team and to be able to react to events as they occur.

4.4.3.2.5 Team Interaction

The team interaction event describes the ongoing activities of the team during the execution phase of the project. The team will be in constant interaction for as long as it exists. At the beginning of the project, there is still a lot of uncertainty and ambiguity. However, as the project life cycle progresses, the content of the project becomes increasingly clear. This happens in different ways. Firstly, the team understands the tasks better as they can discuss the scope of work in more detail. Secondly, because the team is now made up of different competences and there is simply more knowledge available. But it is also because the competences develop over the course of the project and the specifications are better understood as a result. There is also a certain amount of uncertainty, as the product is being tested (including by potential customers) and the feedback will influence the product specification and at least the project team. For these reasons, there is increased communication and therefore interaction between team members to deal with uncertainty and ambiguity.

Personnel changes such as staff turnover, illness, parental leave, holidays and changes to the project team's scope of work play a decisive role and will influence interaction within the team. Personnel changes increase the interaction between team members, as there is discussion about who will take over the activities and who will be responsible for the interim period.

4.4.3.2.6 Bottom–up motives arise

Based on the interaction and the various influences, the team attempts to fulfil the defined requirements of the project team. Three key motives were identified in this "bottom–up motives": the individual workload, individual motivation and the individual expectation gap.

The workload for team members is in a constant flow. There will be phases of overload, especially for the sub–project leader. If the workload for the sub–project leader (or another team member) is too high, they will start to identify tasks that need to be handed over. This can lead to leadership functions being delegated. The individual overload is the first bottom–up motive.

The motive for individual motivation is the second bottom–up motive and arises from the fact that the team members want to expand their area of responsibility and their tasks. The reason for this is the team members' expectation that taking on more responsibility also means earning more money or making a career.

The last motive is the individual expectation gap. This means that a team member or sub–project leader has a certain expectation of the leadership and its leadership functions, but this is not being fulfilled. This can mean that a leadership function is completely missing or should be performed better/differently. This is purely a subjective perception gap of team members.

4.4.3.2.7 Recognition

The key event "Recognise" includes the activities that lead to the recognition of a leadership function. This depends on the top–down and bottom–up motives. These include recognising the leadership function through the defined project team roles, recognising the development of the team members, recognising the rules of representation, recognising the individual workload, recognising the individual motivation of the team members and recognising the individual expectation gap.

Based on the first top–down motive, it is about recognising a leadership function on the basis of the role and the associated role description. The respective team members recognise the leadership function, including the sub–project leader who has taken on this role. For example, the role description may state that the Sprint Leader is responsible for planning the sprints. Or the functional safety expert is responsible for sensitising the team to their topic. The role description usually states that the sub–project leader is responsible for the costs of their team. It is not always so clear in the role descriptions. Sometimes management functions are also recognised based on the interpretation of the role. For example, if he has already fulfilled a similar role before, he will implicitly take on a lot of it.

Based on the second top–down motive, it is about recognising a leadership function on the basis of the planned development of a team member. The motive for the development comes from various stakeholders and is therefore also recognised by various stakeholders. The target image of the role is known and must now be concretised. In this case, concretisation means expanding the tasks and responsibilities of a project member. The decomposition of the target image into management functions can be explicitly documented but can also take place implicitly in the minds of the stakeholders. The management function is not officially

documented in the role description, but it is known to the sub–project manager and the team member.

Based on the third top–down motive, it is about recognising a leadership function on the basis of the recognition of substitution rules. The rule defined by the organisation is established as an important rule for projects and their project teams. It is usually recognised by the sub–project leader but can also be recognised by the team members themselves. The substitution rule is often used when a team member wants to take a planned event such as a holiday. The substitution rule can also be recognised in the event of negative experiences such as unexpected events like illness and the unavailability of employees for this period.
Based on the first bottom–up motive, it is about recognising a leadership function on the basis of the workload of the sub–project leader or team members. The sub–project leader can recognise their workload or a team member's workload. However, an overload can also be recognised by the team members themselves.

Based on the second bottom–up motive, it is about recognising a leadership function on the basis of the individual motivation of a team member. Often the origin of this motivation is career planning and/or expectations of one's own salary. As a rule, the increase in responsibility goes hand in hand with a salary increase. As a result, employees may look specifically for this increase in responsibilities. This motive arises in the team member but can also be recognised by the sub–project leader.

Based on the third bottom–up motive, it is about recognising a leadership function on the basis of a subjective leadership gap. This is based on the individual expectations of the team members and sub–project leader with regard to leadership or leadership functions. This may be due to the fact that team members or the sub–project leader have the expectation that a leadership function is missing or that the quality of the leadership function does not fit.

4.4.3.2.8 Claiming

As soon as a leadership function has been recognised, the sub–project leader or team member must claim this leadership function. In this case, claiming means that a person from the project team claims a leadership function for the project team. The claim can be communicated explicitly in a meeting or by e–mail. However, it can also be claimed implicitly by a team member, which in this case means that no other team member is informed, and it only exists in the team member's head. Recognising and claiming a leadership function does not have to be done by the same person but can also be done by different team members. The key event "Claiming" again depends on the six motives: Claiming of a leadership function by role, by development, by substitution, by individual workload, by individual motivation, by individual expectation gap. Sometimes in the claiming of a leadership function has team members an expectation on the how should take on the leadership function, but sometimes not.

The claiming of a leadership function by roles: The team member and the sub–project leader claim their leadership function through their role in the team and their role description. This is primarily visible to the project team and is explicitly communicated during the initialisation of the project team, e.g. at the kick–off, and is documented and can be found at any time.

The claiming of a leadership function by in the development of the team members: The claim can come from different areas, such as the department or team leader, the sub–project leader or the team member themselves.

The claiming of a leadership function by organisation's rules of representation: In the beginning, these are the essential roles, but over time the goal is for all roles in the project team. It is officially communicated and documented who represents which team member or who takes over which functions of a team member.

The claiming of a leadership function by individual workload: Once the team member or sub–project manager has recognised the overload, it is important to address the specific leadership function that needs to be delegated. This can take the form of appointments or emails, for example.

The claiming of a leadership function by individual motivation: This is often an implicit claim, as the individual team member is motivated by the assumption of further responsibility and, in this case, further leadership functions. This means the team member who has recognised the leadership function tries to take it on.

The claiming of a leadership function by an individual expectation gap: As the motive is the gap in an expectation of the leadership function, the claim may be implicit. The recognised leadership functions are usually claimed by the person who has recognised them. The claim can be made throughout the course of the project.

4.4.3.2.9 Selection

If the leadership function is claimed, the next key event is to select a person for the leadership function. This is a form of initial tagging a person with a leadership function. The decisive factor here is who has selected whom. The selection can be made explicitly by one person to another person via Mail or in a meeting (transparent) or implicitly by a person selecting themselves (non–transparent).

The selection can be made by different people: Management selects team members, sub–project leader selects team member, a team member selects another team member and team member/sub–project leader selects themselves.

Selection of sub–project leader by the management: At the start of the project, management and the project manager select the sub–project managers for the project. Various criteria

certainly play a role here. However, the project manager's personal experience, recommendations within management and availability are often decisive.

Selection of a team member by the head of the sub–project: For example, by assigning people a role and the associated management functions. Or assigning a leadership function due to an expectation gap in the team.

Selection of a team member by another team member. This usually happens when a team member has already taken on a certain role or similar leadership functions (and in the expected quality). For example, when it comes to leadership roles that influence the schedule, the team member tries to select the Sprint Leader.

Sub–project leader chooses himself for the leadership function: This may be the case if the sub–project leader believes that this leadership function is best in his hands, if the leadership function corresponds to his role, or if the sub–project leader is of the opinion that he can implement this leadership function ‘better’ than others. This form of selection can be implicit and non–transparent for the other team members.

A team member chooses himself: Particularly with the motives of individual motivation and individual expectation happiness, team members select themselves for the leadership function. This form of selection can be implicit and non–transparent for the other team members.

4.4.3.2.9.1 Acceptance by the executor

I could also have called this key event "Acceptance by the leader", but I deliberately chose not to. The reason for this is that I believe that leader and non–leader would be misleading, as I deliberately want to separate the leadership function and the person.

Once the sub–project leader and the team member for the leadership functions have been selected, a kind of acceptance by the person who is to take on the leadership function takes place.

The key event includes the acceptance of the leadership function by the sub–project leader and the acceptance of the leadership functions by the team members. It was found that there are different procedures for the acceptance of leadership functions. A distinction can be made between explicit and implicit consent. Explicit consent is given when the team member explicitly confirms the selection verbally or in writing. Implicit consent exists when a team member accepts the assumption of a leadership function/behaviour without explicitly communicating this or making it recognisable to others in any other way.

According to the acceptance of the leadership function by the sub–project leader: It can be the acceptance of the role, the acceptance of a substitution, and all the associated leadership

functions or just a single leadership function by the sub–project leader. In the case of self–selection of a leadership function, the acceptance has already taken place with the selection. Due to the acceptance of the leadership function by the team member: It can be also the acceptance of the role, the acceptance of a substitution, the acceptance of a development program and all the associated leadership functions or just a single leadership function by the team member. In the case of self–selection of a leadership function, the acceptance has already taken place with the selection.

4.4.3.2.10 Start leadership behaviour

One of the key events is the “Starting leadership behaviour”. As soon as the sub–project leader or team member has accepted the leadership function, the realisation of this function begins. This is reflected in the various leadership behaviours of the sub–project leader and the team member. I spoke previously of implicit and explicit steps. In this process step, the non–transparent or implicit path comes to an end. If the "non–transparent path" has been followed, the other team members (and the sub–project leader) perceive for the first time that a team member is exercising leadership behaviour.

A possible start for the initial leadership behaviour can arrive from the sub–project leader. This can be an invitation to discuss the status of team activities in a regular meeting, the exchange of expectations according to the team's self–organisation or the monitoring of costs. Basically, it is about the sub–project leader starting with the accepted leadership functions. The quality of the initial leadership behaviour is certainly related to the leadership competence and understanding of the project.

Another possible start for the initial leadership behaviour can arrive from team members. This can be the initiation of a technical meeting with all team members to collect all relevant technical issues. This can be the development of a plan for an area or the entire team. It can also be the monitoring of team activities or the execution of team tasks, such as the creation of a holiday schedule or templates that the whole team will use. If a team member already has experience and skills, this will certainly help with leadership behaviour.

4.4.3.2.11 Acceptance the leadership behaviour

This key event is about accepting the execution of the initial leadership behaviour. Acceptance must be made by two parties: The acceptance of the leadership behaviour by the sub–project leader and the acceptance of the team members, which I would like to explain in more detail here. Leadership always means leading and following. In order to implement the leadership functions, there need to be people (team members and/or the sub–project leader) who support the implementation of the leadership function. Like people who provide information.

Acceptance by the sub–project leader. In this case, two different things need to be accepted. Firstly, he must accept the initial leadership behaviour for the project team and secondly, he

must accept it by supporting someone in the implementation of the leadership function. For example, if the sub–project manager considers the leadership function to be unimportant, he can veto it and ensure that it is not pursued further. He can also do this for one of his management functions. If he himself is an important participant in achieving the leadership function, the sub–project leader must accept to support the leadership function.

Acceptance of the initial leadership behaviour by the team member(s). For example, they take part in a technical meeting and communicate their status verbally. Or the team members (followers) communicate their planned activities to another team member (leader), who in turn translates them into a plan for the entire team. The number of team members assisting in the execution of the leadership function can range from one to all.

4.4.3.2.12 Consolidation

The next key event and the last when it comes to the emergence of a leadership function is the "Consolidation of the leadership function". At the end of this key event, the team member/sub–project leader get tagged in the team with the leadership function. I identified three activities: continue and expand the leadership behaviour, the positive feedback and the tagging the leadership function to the person.

The first activity is the continuity and development of leadership behaviour in the leadership function. Most leadership functions are not a one–off leadership behaviour, but a continuous process. For example, solving technical problems, structuring and planning or monitoring. The expansion of leadership behaviour can take place in two ways. On the one hand, the topic in the function itself is expanded, e.g. to include other areas when solving technical issues. Or another "similar" topic of the leadership function is adopted (recognition of the leadership function). In the case of the "structuring and planning" leadership function, for example, this could be timing or costs and that of the "monitoring" leadership function.

The second activity is the feedback for performing the leadership function. Over time, he/she can receive feedback on his/her performance in the leadership role. Based on the feedback or his/her own experience, the team member adapts the leadership function/behaviour. Feedback can also take the form of no feedback. This means that the person with the leadership behaviour does not receive any information on performance. Which means to continue. This was found to be the case with the sub–project manager, as it is presumably assumed that he is responsible anyway and that it is part of his job.

The third activity is the tagging of the leadership function to a team member. This can lead to this team member being designated as the first point of contact in the selection step if a leadership role is missing. This person is assigned an identity by the other team members, which influences the occurrence of further leadership functions.

4.4.3.2.13 Many leadership functions occur in parallel

This key event contains all activities that lead to many different management functions being created in parallel. I have already described this in detail in section 4.3.10.1.

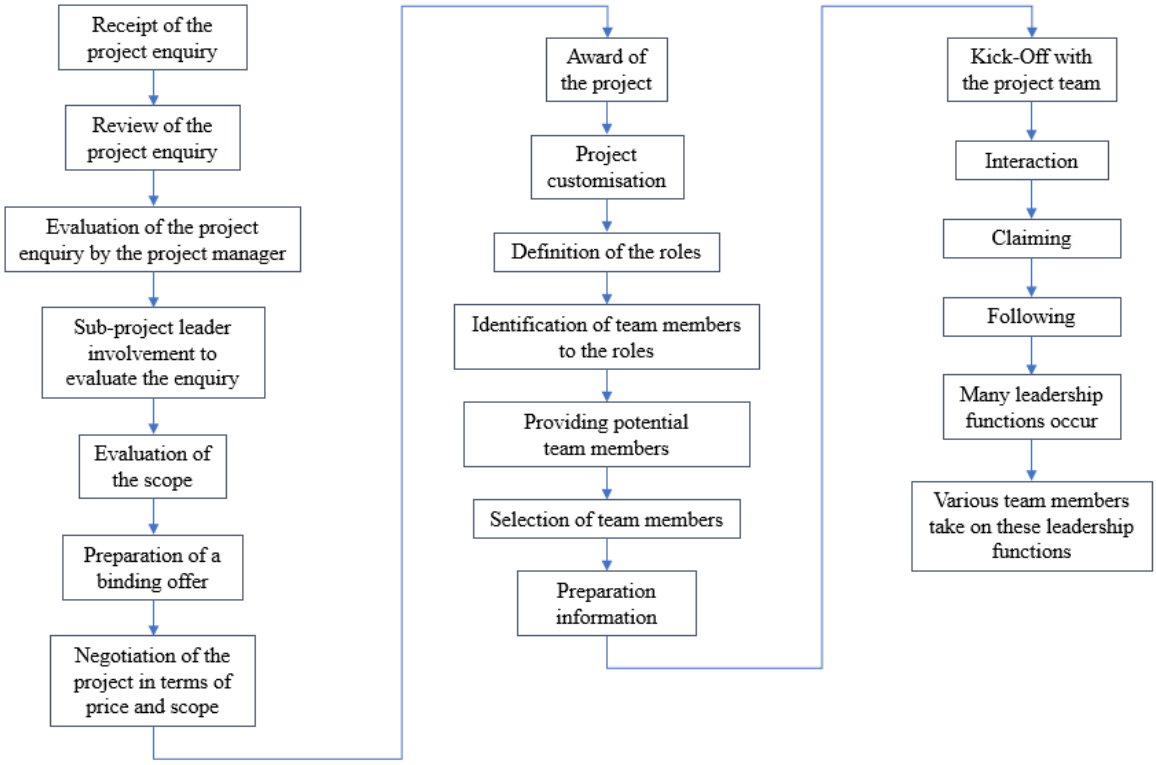
4.4.3.2.14 Various team members take on these leadership functions

This key event contains all activities that lead to that various team members take on these leadership functions. I have already described this in detail in section 4.3.11.

4.4.3.3 Documents

I would like to standardise the results of the processes from the internal project and team documents of all three teams and present a process (Figure 78) and add comments on these events.

Figure 78: Standardised process based on the internal project and team documentation



Source: Authors contribution.

I have identified 20 key events which I will explain in a more detail below.

4.4.3.3.1 Receipt of the project enquiry

The first key event is the "receipt of the project enquiry". This event is the first touch point of the project and the starting point for activities. The activities include checking the submission deadline and the initial reading to understand the content and select a proposal project manager.

4.4.3.3.2 Review of the project enquiry

This event includes the initial review of the project enquiry. During the review, all relevant documents are viewed and at least initially read by the project manager. At the end of this event, all relevant documents and information required to assess the enquiry should be collected.

4.4.3.3.3 Evaluation of the project enquiry by the project manager

This event includes an initial assessment of the enquiry in terms of availability of skills, duration, financial scope and identification of the relevant specialist departments. It may already be possible to say here that it makes no sense to process the enquiry.

4.4.3.3.4 Sub–project leader involvement to evaluate the enquiry

Based on the project manager's initial assessment, the specialist departments select a sub–project leader who is not focussed on their area of work. The process up to the submission of an offer is defined and templates are provided. There is often a kind of offer kick–off where the conditions of the offer are discussed. Interface issues are discussed so that everyone is clear about what needs to be evaluated. The sub–project managers, who have more experience, familiarise themselves with the documents. Supplements the scope of work for his/her work area in detail if necessary.

4.4.3.3.5 Evaluation of the scope of work

The sub–project managers assess the costs for the scope of work in their area of responsibility. All the sub–project leaders do this in parallel and define what is in the scope and what is out of the scope. What are the assumptions and what the limitations. In this calculation, the sub–project leader derives the tasks for his/her work area and determines the roles, amount of this roles and an estimate of the duration of each of these roles. This is important because behind each role there is an hourly rate that is charged for the use of this role. The initial teams are defined for the project.

4.4.3.3.6 Preparation of a binding offer

Based on the assessment of the sub–project leader, an overall calculation and a presentation of the enquiry is created. The content of the presentation is very individual and depends on many factors. In the end, it is sent to the customer.

4.4.3.3.7 Negotiation of the project in terms of price and scope

The client will collect the offer (based on the calculation) and invite to meetings to discuss the offer to get a common understanding what is offered. In some cases, they will then discuss what is and what is not included in the project. As a rule, negotiations are then held regarding the price.

4.4.3.3.8 Award of the project

After the negotiation, the contract may be awarded. This usually takes the form of a letter and an email. The organisation is informed, and the next steps are discussed. The first coordination meetings with the plan for the launch are held in smaller groups. The sub–project leaders are defined (not necessarily the person who was involved in preparing the bid).

4.4.3.3.9 Project customisation

As negotiations have taken place and changes have been made to the offer, it is now necessary to look again at exactly where these changes have taken place. As a rule, each sub–project leader then must make changes to their scope again, which also influences the initial team planning.

4.4.3.3.10 Definition of the roles

The sub–project leader begins to define the roles for their work area/team. As this has already been done during the calculation and adjustments after the negotiation, it is now necessary to make additions, as the customer sometimes has specific requirements. There are also other influences on the definition and descriptions of the roles.

4.4.3.3.11 Identification of team members to the roles

Now the defined roles must be found, which are searched for exclusively within the organisation. This is initiated by the sub–project leader by deciding how to involve the organisation and what information to share (and withhold) based on their search strategy. Additional activities are in the role of team leader, searches for available project roles via the IT systems. And finally, the sub–project leader uses his network (e.g. abroad) to expand the search area.

One of the activities is the search strategy of the sub–project leader. This can be multi–layered. On the one hand, it must be determined which people are to be included via which medium and with which information. For example, an email to the head of an organisation with a request to distribute the roles and ask for feedback. Or a very targeted approach to

departments or even team leaders via video calls. Furthermore, the sub–project leader decides which information he/she wants to distribute. For example, by dividing up the roles or adding/deleting competences to increase the likelihood of a positive search.

Another activity is the search in sub–project leader's network. This is closely linked to the previous activity. If the sub–project leader has a larger network, the search area is larger and therefore the probability of finding a suitable employee for the role is higher.

The IT systems support the identification of employees. These IT systems primarily serve as data storage for employee competences, for (cross–project) workload planning for team members and for presenting requests and requirements in the form of a ticket system. Only the team leaders have access to the IT system and can view and maintain their employees' data. All team leaders have access to the tickets for displaying requests and requirements, but only see the employee profiles in anonymised form. A tool alone is only as good as the information it is used and utilised with. It is therefore extremely important that these tools are fed with real–time information from employees.

4.4.3.3.12 Providing potential team members

This key event includes all activities according to the “Providing potential team members”. The overall aim that the employees' competencies and availability match to the role description and the planned workload. It is also very important that the team leader recognises this and makes a match explicit. The head of the department's strategy, the team leader's objectives and employee development programmes influencing the key event providing potential team members.

It is important that the competences and availability of the majority of employees match the role description and the planned workload. This point is purely about the fact that employees have the required experience and competences, or that they have similar competences and would like to develop into this role. In addition, the required availabilities (in per cent) must match the availability of the employees.

The team leader should always be informed about the current status of their team (competence and work planning). In addition, the team leader should regularly obtain information and participate in coordination meetings and discussions. Sometimes, it is an advantage to be quick, as some project teams need to be filled quickly.

Another influence in the key event “Providing potential team member” is the department's strategy. This may mean that the head of department wants to reflect a range of competencies in his department and therefore wants to recruit employees with the right skills. Or certain projects are prioritised, and employees are not made available. Or he wants to develop in a certain area in the long term and wants employees to develop in this area. All these strategies will have an impact on employee recruitment.

Another influence is the team leader's objectives. This can be very diverse. One goal could be to ensure that all employees are fully utilised, and that the same employee is available in several project teams. Or the goal is to expand or deepen a competency with the help of project teams. The aim can be to have more team members from his team in the same project, because this ensures better communication and exchange.

One positive influencing factor is the availability of development programmes for employees. These (official and unofficial) programmes provide for employees to develop through projects, which in turn influences the availability of employees. This program can bring an advantage for the selection of the provided employee.

4.4.3.3.13 Selection of team members

This key event is the selection of the team members. It is a decision made by sub–project leader. Each sub–project leader has different decision criteria. These criteria can be the majority match of competencies and roles. However, the perceived motivation of the employees provided, the planned development of the employees, a lack of alternatives, a certain personality or a specific location are also criteria. These are the more explicit criteria's.

A less obvious criterion is the previous experience with the employee provided. This can mean that the sub–project leader has had good or bad experiences, which can lead to the selection or non–selection of the employee provided. This also includes the fact that there have been conflicts between two employees in the past, which can lead to an employee not being selected.

At the end of this key event will be a negotiation between the sub–project leader and the team leader. Various arguments and strategies can come into play here. For example, which employee might be a perfect fit or that the sub–project leader will receive favourable conditions if he decides in favour of the employee. Negotiations are also underway to make an employee from another project and earlier available for this project team.

4.4.3.3.14 Preparation information

The key event "Preparation information's" is the organisation of documents for the start of the project team. Project information such as project specification, project schedule, contract and project organisation chart. Project team information such as the project team organisation chart, role descriptions, project team scope of work, team schedule. Information about the customer includes contact details (e–mail addresses), the customer's procedures and terminology. Activities include preparing a presentation for the kick–off. It is also important to create a space for filing the project team's documents. This is usually done by the sub–project leader.

4.4.3.3.15 Kick Off with the project team

The kick–off with the project team is a key event and is a crucial event to create a symbolic meeting with the team to have an official "start". The sub–project leader organises an internal kick–off meeting at the beginning, at which the information relevant to the sub–project leader is distributed in a document. Usually, the team members meet physically and with space for the team members to get to know each other.

4.4.3.3.16 Interaction of the team members

The team interaction event describes the ongoing activities of the team during the execution phase of the project. The team will be in constant interaction for as long as it exists. At the beginning of the project, there is still a lot of uncertainty and ambiguity. However, as the project life cycle progresses, the content of the project becomes increasingly clear. This happens in different ways. Firstly, the team understands the tasks better as they can discuss the scope of work in more detail. Secondly, because the team is now made up of different competences and there is simply more knowledge available. But it is also because the competences develop over the course of the project and the specifications are better understood as a result. There is also a certain amount of uncertainty, as the product is being tested (including by potential customers) and the feedback will influence the product specification and at least the project team. For these reasons, there is increased communication and therefore interaction between team members to deal with uncertainty and ambiguity.

Personnel changes such as staff turnover, illness, parental leave, holidays and changes to the project team's scope of work play a decisive role and will influence interaction within the team. Personnel changes increase the interaction between team members, as there is discussion about who will take over the activities and who will be responsible for the interim period.

4.4.3.3.17 Claiming

This key event contains that team members and the sub–project leader claim leadership functions. During the entire interaction in the project team, various leadership functions are claimed. Here too, various motives can lead to a management function being applied for.

4.4.3.3.18 Following

This key event contains that team members and sub–project leader follow leadership functions. Following can be voluntary, but also formal, for example through the role description.

4.4.3.3.19 Many leadership functions occur

This key event contains all activities that lead to many different management functions being created in parallel. I have already described this in detail in section 4.3.10.1.

4.4.3.3.20 Varius team members take on these leadership functions

This key event contains all activities that lead to that various team members take on these leadership functions. I have already described this in detail in section 4.3.11.

4.5 Process–oriented framework for shared leadership emergence

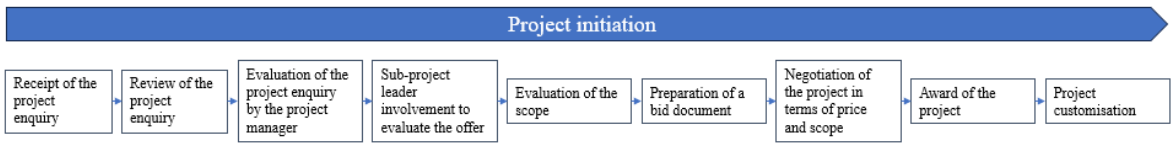
Based on the standardised processes and key events of the cases I want to bring the results in a process–oriented framework for the emergence of shared leadership. I have done this by putting the key events in a logical order. I only highlight the positive way in which shared leadership arises. The key events are categorised in:

- Project initiation
- Team composition
- Team initialisation and interaction
- Occurrence of the leadership function
- Occurrence of many leadership functions

4.5.1.1 Project initiation process

The “Project initialisation” includes 9 key events: Receipt of the project enquiry, review of the project enquiry, evaluation of the project enquiry by the project manager, sub–project leader involvement to evaluate the enquiry, evaluation of the scope, preparation of an offer document, negotiation of the project in terms of price and scope, award of the project and project customisation (Figure 79).

Figure 79: Project initiation process and key events



Source: Authors contribution.

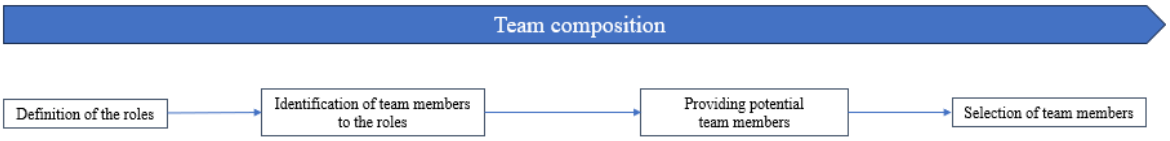
I deliberately started with this process, as it sets the course for the emergence of shared leadership. The project initiation is the process for getting an overview of the project content and conditions. It is the first touch point of the project from the contractor side. Documents are read and additions are made in order to be able to make an assessment. Part of this phase is the Understanding the conditions and have a structure of the project teams. At the

beginning, the project manager then expands the circle with the sub–project leaders. At the end of the process, the contractor is awarded the contract for the project.

4.5.1.2 Team composition process

The team composition includes 4 key events: Definition of the roles, identification of team members to the roles, providing potential team members and selection of team members (Figure 80).

Figure 80: Team composition process and key events



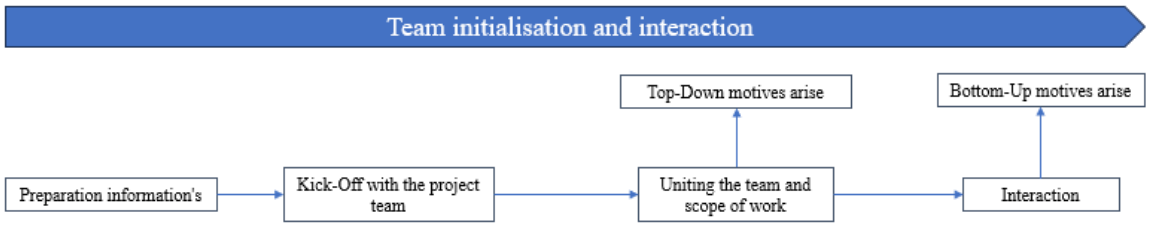
Source: Authors contribution.

The team composition process is the transition from the what (scope of work of the team) to the how (competencies and people are needed). It should be added that forming a project team is subject to many subjective interpretations and conditions. In addition, several criteria lead to many strategic and utilisation–oriented decisions being made when selecting employees. As a result, for many positions in the team, the perfect match of role and competencies of the employee is not always found, but the best alternatives at the time are created. In some cases, these are decisions that are future orientated. Irrespective of this, an initial team is put together in this process.

4.5.1.3 Team initialisation and interaction

The team initialisation and interaction include six key events: Preparatory information, Kick off with the project team uniting the team and scope of work, top–down motives arise, interactions and bottom–up motives arise (Figure 81).

Figure 81: The key events of the team initialisation and interaction



Source: Authors contribution.

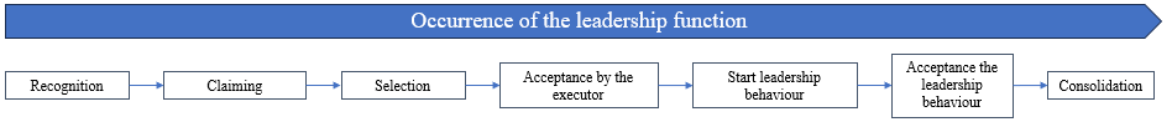
The "Team initialisation and interaction" represents the execution phase of the project team. The sub–project leader prepares the project team for the realisation of the project work in the team. The sub–project leader does this by appropriately organising the information that forms the basis for coordination with the team in various documents and defining a filing

system. This usually involves general information about the customer, the project content, the project objectives, the organisation chart, the project processes, the team roles, the expectations and the time frame. In this phase, leadership functions are already assigned to various people. This is done through the motives of predefined roles, planned employee development and the substitute rules. This is a top–down approach, as the team members are given their leadership functions by the project, sub–project leader, client or organisation. The entire team now starts its work and interacts with each other. Based on the scope of work, but also other factors, there is a series of interactions between the team members. Over time, this gives rise to further motives for leadership functions among the team members (individual motivation, individual workload of team members and individual expectation gap). This is about the leadership needs within the project team, so it is a bottom–up approach. The top–down and bottom–up motives are the starting point and can lead to the occurrence of leadership functions, which will be the process.

4.5.1.4 Occurrence of the leadership function

The “Occurrence of the leadership function” includes seven key events: Recognition, claiming, selection, acceptance by the executor, start leadership behaviour, acceptance the leadership behaviour, and consolidation (Figure 82).

Figure 82: The key events for the occurrence of the leadership function



Source: Authors contribution.

The top–down motives (role–, development– and substitution rules–motives) and bottom–up motives (individual motivation, individual overload and individual expectation gap) form the basis for the occurrence of leadership functions. The "Occurrence of the leadership function" therefore takes place during "Team initialisation and interaction".

The “Occurrence of the leadership function” is showing how the leadership function occurs. The leadership function is recognised through the "top–down" and "bottom–up" motives. In the next step, these leadership functions are claimed and assigned to a person. As soon as the designated person has accepted this, they can begin with the behaviour that ensures that the leadership function is implemented. As soon as the behaviour is accepted by the individual team members and the sub–project manager, a kind of solidification takes place. When developing leader functions, processes can occur that are not visible to the entire team, including the sub–project manager. This is particularly the case with bottom–up motives. For example, when a team member pursues the motive of personal motivation and actually tries to achieve leadership functions. Or also when the motive is individual expectations of the leadership function. Non–transparency usually ends with the step of adopting the leadership behaviour or accepting the leadership behaviour.

The key events shown is a successful illustration of the assumption of leadership functions. However, there are a number of scenarios as to why a leadership function does not materialise or is discontinued. The process steps are intended to serve this purpose. For example, if no one in the team recognises the leadership function, it does not come about. Or if no one claims the recognised leadership function. It can also happen that two people take on a management function at the same time, which leads to one of them subsequently giving up.

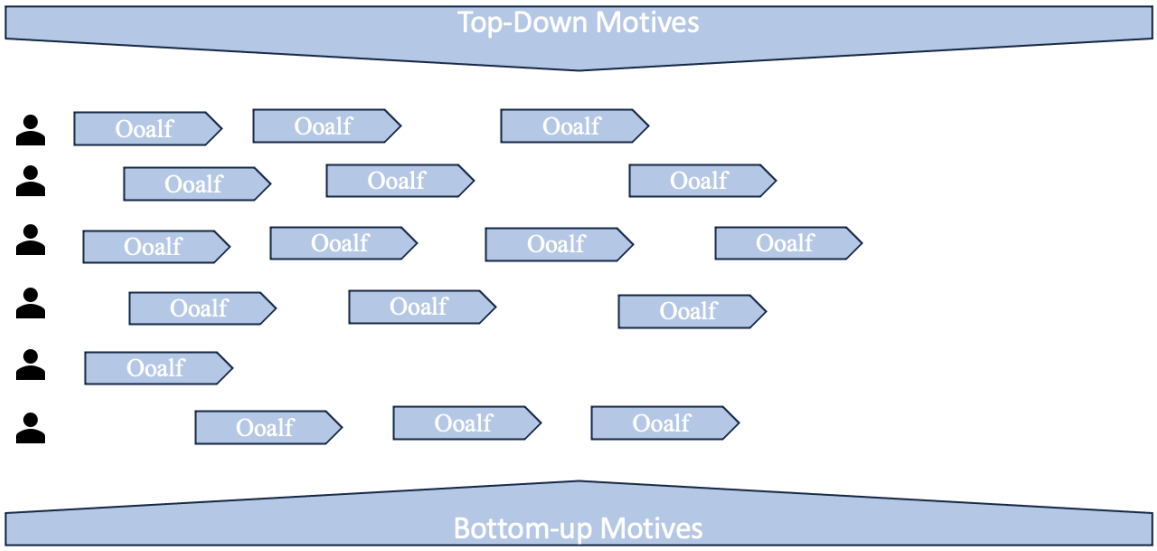
I would also like to address the temporal aspect of occurrence. What is not clear in the description of the "Occurrence of the leadership function" is the duration of the occurrence of leadership functions. This can vary greatly. For example, the leadership function may be in the role description, but is only realised after a delay. On the other hand, a subjective leadership gap can lead to someone assuming a leadership function within a short period of time.

Another aspect is the fact that different people and roles drive the key events in the development of the leadership function. From recognising the leadership functions to taking over and tagging the person, it can be implemented by one person, but it must be different team members can be involved in recognising, claiming and selecting the leadership function. For example, in the case of the leadership functions of the role descriptions, one team member can remind another that they should please fulfil the function in accordance with the role description. In the ‘Occurrence of the management function’, the leadership functions are assumed by the sub–project manager and the team members.

4.5.1.5 The occurrence of many leadership functions at several team members

Based on the findings that many leadership functions occur and are shared in the team, I would like to illustrate "The occurrence of many leadership functions with several team members", in Figure 83. I have shown that the top–down and bottom–up motives that arise during team initialisation and interaction. I have symbolically represented these two motives above and below. I have also drawn the motives over the entire duration to show that these motives are present throughout the team life cycle. The left side is meant to symbolise different people. In the centre we see arrows from left to right, each representing the occurrence of a leadership function (Ooalf). On the horizontal plane, we can thus see which people take on which leadership functions.

Figure 83: Generalised representation for the occurrence of many leadership functions at several team members

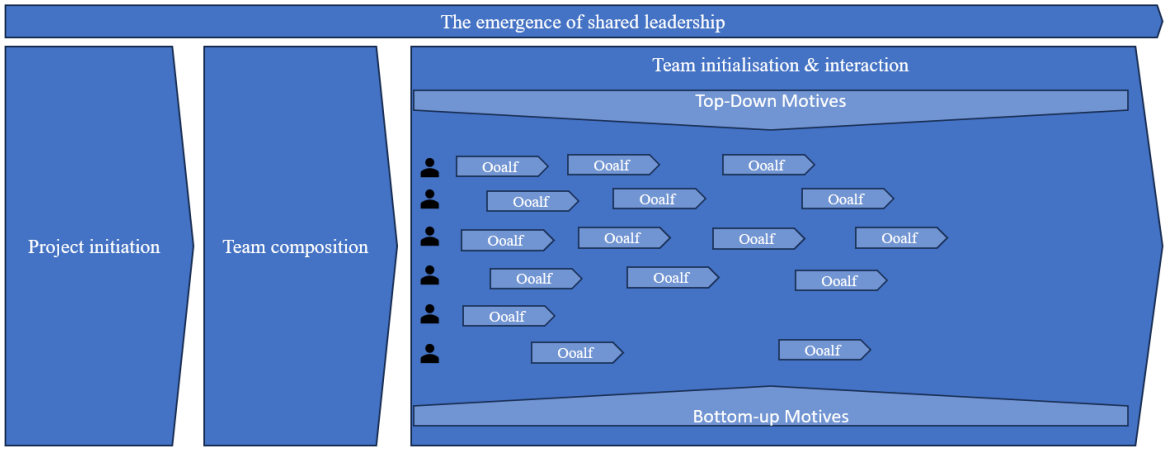


Source: Authors contribution.

4.5.1.6 Definition of the process–oriented framework for shared leadership emergence

Figure 84 shows the process framework for the emergence of shared leadership in product development project teams. The process framework includes the project initialisation, team composition, team initialisation and team interaction. I have integrated the bottom–up and top–down motives and the resulting leadership functions assumed by different team members into the team initialisation and team interaction.

Figure 84: A process–oriented framework for the emergence of shared leadership



Source: Authors contribution.

I want to emphasise the dynamics of the process framework. At first glance, the process framework for the emergence of shared leadership appears linear and sequential. This is not the case. Instead, the sub–processes are in constant interaction with each other. This is undoubtedly due to the dynamic and uncertain nature of projects. It is also possible for the

team to be in different super–processes at the same time. For example, team members may already be interacting (team initialisation and interaction), while the sub–project leader is still looking for employees for his team (team composition).

4.6 Conclusion

I presented the results of the analysis in the results chapter. Based on the first sub–research question, I have presented various factors for the emergence of shared leadership in teams and data collection methods. I have done the same for the relationship between the key factors and the process of shared leadership emergence. I also compared the results across teams. Furthermore, based on the processes, I created a process–orientated framework for the emergence of shared leadership based on the processes. With all these results, I was able to answer the research question of how shared leadership emerges in a product development project team.

The next section is the discussion. In this section I will interpret the results and place them in the broader context of science and practice.

5 DISCUSSION

The discussion section places the results in a broader context by interpreting the results and categorising the contribution to the current state of science and the implications for practice. Finally, the limitations and restrictions of the research are outlined.

Before categorising the results into the two sub–chapters on the contribution to science and the implications for practice, I would like to explain the similarities between them because the theory of shared leadership is practice oriented. This is due to the constant interaction between theory and practice. It was observations from practice that led to the development of this theory. The continuous supply of practice data ensured that this theory was expanded and validated. In other words, shared leadership theory is deeply rooted in and based on practice. This became apparent when the focus shifted from the leadership to the leader.

The theory of shared leadership emerged in the 1990s and early 2000s with significant input from academics such as Pearce and Conger based on observations in organisations and practical needs (Pearce and Conger 2003). The observation was that complexity is increasing in today's organisations, bringing with it new and changing challenges. Traditional hierarchical management often fails to meet the demands of a knowledge–intensive environment. In this environment, flexible leadership models are required (Pearce 2004, 44). The theory of shared leadership has been developed from a very practical perspective. The focus is on daily social interactions and not on leaders. Leadership should be understood as process, practice and interaction (Crevani et al. 2010, 77). Shared leadership theory responds to modern organisational needs and is characterised by practical applications. It adapts to changing conditions: The dynamic and emergent nature of shared leadership allows it to adapt to changing team compositions, project phases and organisational contexts. This adaptability makes it a practical choice for organisations working in complex environments. In recent years, a great deal of research has focussed on empirical validation. Numerous empirical studies have demonstrated the benefits of shared leadership in practice and in organisations.

5.1 Contribution to science

The results of my research contribute by extending several existing theories: mainly to the theory of shared leadership, but also with influences on the theory of emergence of leadership and the theory of functional leadership. Research on shared leadership focuses mainly on the preconditions and outcomes of shared leadership. Leadership emergence theory, on the other hand, is mainly concerned with how individual leaders develop and functional leadership theory with the leadership functions that can be shared within the team. In identifying the processes, I focussed on the emergence of an individual leader due to bottom–up motives and on shared leadership through the emergence and distribution of leadership functions. With this approach, another part of the theoretical contribution is to show the connection between shared leadership, the emergence theory of leadership and the theory of functional leadership.

5.1.1 Shared leadership theory

The emergence of shared leadership has not yet been sufficiently researched. My contribution consists primarily of expanding the theory of shared leadership through the results of the three sub-research questions. The extension of the theory relates to the following areas:

- Factors and their relationship on shared leadership emergence
- Enhance established frameworks of shared leadership
- The relationship between project complexity and shared leadership emergence
- Value for project management research
- Enhancing the definition of shared leadership
- A link between team dynamic and shared leadership emergence
- Emergent team processes and states
- The bottom–up vs top–down approach in shared leadership
- Valuable empirical data

5.1.1.1 Factors and their relationship on shared leadership emergence

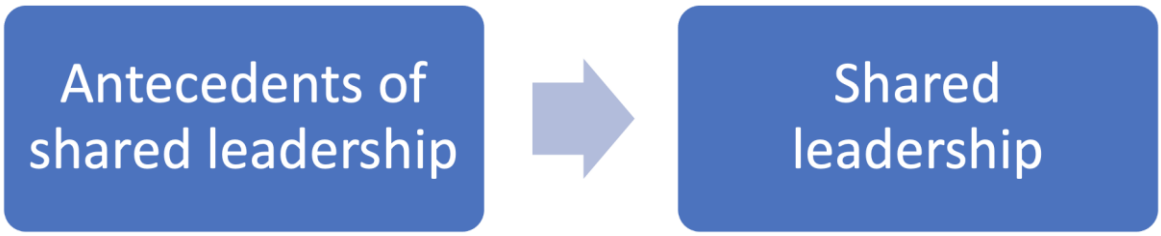
When it comes to the emergence of shared leadership, antecedents are of central importance in research (Scott–Young et al. 2019, 573). Antecedents describe factors that increase the likelihood of the emergence of shared leadership. Based on the first and second sub-research question, my study adds value to current research by confirming state of the art antecedents and by identifying additional factors and their interrelationships.

I would like to discuss the identified antecedents. These include the factors that deal with the project context, such as the project strategy or collaboration with the client. I have recognised the situational antecedents here, such as the work characteristics of Park (2018, 61–62): Challenging work, need for innovative/creative outcomes, unexpected situation/uncertainty. However, these seem to me to be very generalised. In addition, I have so far noticed few factors such as motivational factors in research on shared leadership. However, the motives identified represent an important driver for the emergence of leadership.

5.1.1.2 Enhance established frameworks of shared leadership

My research aimed to create a process–orientated framework for the emergence of shared leadership. With the results of my third sub-research question, I contribute to expanding the established shared leadership framework to include the emergence of shared leadership. Most shared leadership research frameworks currently represent the antecedents that shared leadership develops over time (Scott–Young et al. 2019, 572). Figure 85 is a simplified but nevertheless clear illustration of the framework conditions.

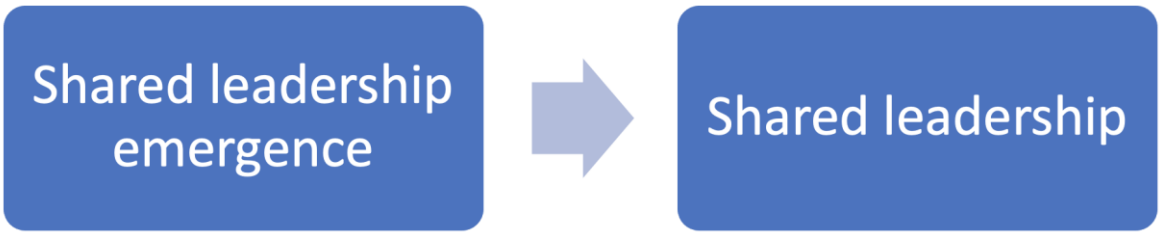
Figure 85: Simplified presentation of current research on the emergence of shared leadership



Source: Authors contribution.

Such frameworks describe the development of shared leadership in a very abstract way or merely by their premises. With the process–orientated framework I have identified, I would like to offer a further approach. Indeed, it does not necessarily have to be the use of my approach (shared leadership emergence through the occurrence of leadership functions), yet emergence should be given greater importance in the frameworks of shared leadership. Future research into the framework of shared leadership should consider the emergence of shared leadership in some way (see Figure 86). Far from labelling the antecedents as irrelevant, I want to consider them more intensively by contextualising the antecedents and giving them a structure.

Figure 86: New strategy for shared leadership frameworks



Source: Authors contribution.

5.1.1.3 The relationship between project complexity and shared leadership emergence

The theory of shared leadership was and is influenced by complexity theory (Uhl–Bien et al. 2007, 298). Ultimately, shared leadership is a research response to complex environments (Sweeney et al. 2019, 115). However, there is no more detailed description how complexity influence shared leadership. By including the motives and the link to the project complexity, I would like to provide an explanation. In the results section, I identified motives that influence the emergence of shared leadership. Specifically, I have shown that the top–down and bottom–up motives arise during the process step of team initialisation and interaction and lead to the emergence of leadership functions. The question of why these motives arise remains largely unanswered. I would like to take a look at the research on this. The literature states that leadership functions arise from needs that want to be satisfied in the team (Kozlowski et al. 2016, 36–37). Thus, my identified motives represent needs. I would argue that it is also about satisfying the needs of the team to deal with the complexity of the project.

Therefore, I want to explain a possible connection between the project complexity categories (based on the research of de Rezende and Blackwell (2019, 131)) called structural complexity, uncertainty, pace, dynamics, novelty, socio–political complexity, and institutional complexity and the identified top–down and bottom–up motives.

5.1.1.3.1 Structural complexity

Different roles: The various roles and their descriptions are designed in such a way that they do justice to the technological and organisational complexity.
Subjective leadership gap: If the structural complexity is not subjectively covered by the defined roles, individual team members will try to fill this over time.

5.1.1.3.2 Dynamics

Substitution rules: The substitution rule is intended to ensure that the dynamics in the form of fluctuation and illness are made manageable.

Individual workload: The motif of the individual workload helps to react to the dynamics of capacity utilisation in order to avoid permanent overload.

Subjective leadership gap: The changes and dynamics in the project are difficult to predict. The subjective leadership gap motif attempts to manage the dynamics here.

5.1.1.3.3 Uncertainty

Different roles: If the project is subject to greater uncertainty, additional roles can be assigned to the team. Furthermore, roles can be defined that have a higher level of expertise to deal with this uncertainty.

Substitution rules: The substitution rule helps to spread knowledge more widely and helps to handle the uncertainty in projects.

Subjective leadership gap: The changes and dynamics in the project are difficult to predict. The subjective leadership gap motif attempts to manage the dynamics here.

5.1.1.3.4 Pace:

Different Roles: If there is a higher speed or criticality, the role description is considered according to these requirements. For example, a senior instead of a junior for the role.
Individual leadership gap: If individual team members are of the opinion that speed and criticality are not suitable for the team, this can lead to an individual leadership gap.

5.1.1.3.5 Novelty:

Different roles: If the project is subject to greater level of newness, roles can be defined that have a higher level of expertise to deal with this novelty.

Subjective leadership gap: If individual team members are of the opinion that the expected novelty are not met, this can lead to an individual leadership gap motive.

5.1.1.3.6 Institutional complexity

Different Roles: If there is a higher speed or criticality, the role description is considered according to these requirements. For example, a senior instead of a junior for the role.

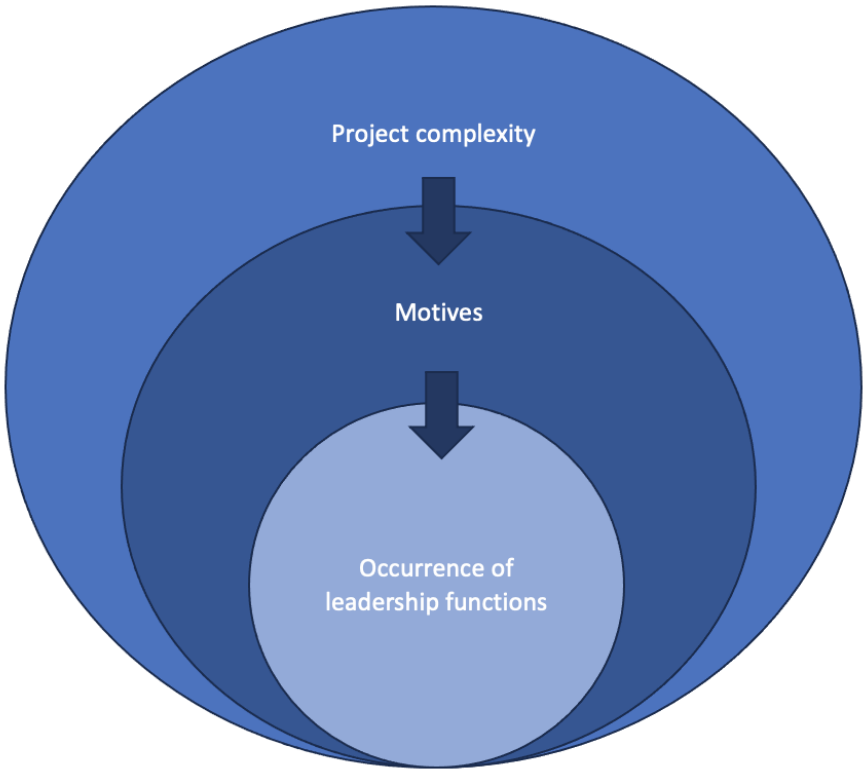
5.1.1.3.7 Socio–political complexity

Development program: People want to develop, and this guided development programme helps to meet the needs of the individuals and the organisation.

Bottom–up: Individual motivation: People have their implicit goals. The individual motivation is the motive to handle the complexity throw social–political.

To summarise, my research contributes to this by demonstrating the influence of project complexity on the emergence of shared leadership. Figure 87 shows the relationship between project complexity and motives, which in turn influence the emergence of leadership functions.

Figure 87: Relation Project complexity, motives and occurrence of leadership functions



Source: Authors contribution.

5.1.1.4 Value for project management research

My research makes a contribution by linking research on shared leadership with project management research. Compared to people–centred leadership theories, pluralistic leadership theories, such as shared leadership, are still uncommon in project management literature. For a comprehensive overview of leadership theories in project management, see Turner and Müller (2005, 49–55) or Clarke (2012a, 130–142). The first studies on shared leadership can be found in renowned project management journals. For example the literature review and multilevel conceptual model of shared leadership from Scott–Young et al. (2019, 565 ff.) but also from Karppi et al. (2024, 1 ff.) with the emergence of shared leadership in project teams. My study extends the current debate on shared leadership and thus may influences future research. My study confirms that project characteristics, such as complexity, are suitable objects of investigation for shared leadership. My research thus confirms the trend of plural leadership models such as the studies by Müller et al. (2018, 83 ff.) on the theory of balanced leadership.

5.1.1.5 Enhancing the definition of shared leadership

Over the years, several definitions of shared leadership have emerged. I have reported on this in detail in Chapter 2. In my study, I used Small and Rentsch (2010, 203) definition of

shared leadership as a phenomenon that results from the sharing of leadership functions by two or more people. With my study, I add value to the literature on shared leadership theory by adding information to the definition. Namely, what exactly this emergent phenomenon looks like in product development project teams.

5.1.1.6 A link between team dynamic and shared leadership emergence

In a meta–study, shared leadership is defined as a dynamic team phenomenon (D'Innocenzo et al. 2016, 1968). My study confirms and underline this with additional information by outlining the processes for the emergence of shared leadership in product development project teams. My research adds value to Tuckman's research on team dynamics. This is because Tuckman's team development phases (Tuckman and Jensen 1977, 419), referred to as forming, storming, norming, performing and adjourning, and the emergence of shared leadership have similarities that I would like to illustrate here.

1 Forming: Team members are introduced, roles are assigned, and they start to understand their objectives. This stage reflects the process steps of my study: Preparation information, Uniting the team and scope of work, top–down motives
2 Storming: Conflicts and competition arise as team members assert opinions and vie for positions. This stage reflects the process steps: Interaction, Bottom–up motives
3 Norming: The team establishes norms and standards, developing stronger relationships and cooperation. This stage reflects the sub–process steps: The occurrence of the leadership function, the occurrence of many leadership functions undertaken by several team members.
4 Performing: The team reaches high productivity and efficiency, working collaboratively towards goals. This stage was not the subject of my research, and no data was collected.
5 Adjourning: The team disband after achieving its goals, reflecting on accomplishments and relationships. This stage was not the subject of my research, and no data was collected.

5.1.1.7 Emergent team processes and states

Another contribution of my research is the expansion of emergent team processes and states. Research on teams and team processes is already very comprehensive (Mathieu et al. 2017, 458–460) with a central focus on understanding the dynamic nature of teams. The concept of team emergent states (TESs)—defined as "properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al. 2001, 357) has received significant attention (Rapp et al. 2021, 68–69). However, despite the extensive focus on TESs, relatively few studies have examined their "emergent" element in depth (Fyhn et al. 2023, 1). Scott–Young et al. (2019, 572) integrated team emergent processes and states into their multi–level system model of shared leadership. More longitudinal studies could increase our knowledge of TES temporal dynamics (Fyhn et al. 2023, 16). My research contributes to this field by exploring the input factors, the

process of shared leadership emergence, and the output of TES in the context of shared leadership. This process–oriented framework enhances our understanding of the dynamic nature of team emergent states and provides a more comprehensive model for future research and practice.

5.1.1.8 Involved team members

Shared leadership is defined as team–level phenomenon, where leadership is carried out by the team as a whole, rather than exclusively by those at the top or by those in formal leadership positions (Carson et al. 2007, 1217). There are various academic discussions and approaches regarding the number of the involved people in shared leadership. The range includes shared leadership as shared leadership functions from two (e.g. O'Toole et al. 2002, 65) to all team members (e.g. Pearce and Sims Jr 2002, 172). My results show that in one team, five of the seven team members take on a leadership role. In the other two teams, all team members take on a leadership functions. My study helps to ensure that all team members in a product development project team tend to take on leadership roles and not just a few. However, there are differences in the extent of participation in shared leadership as measured by the number of leadership roles assumed.

Another discussion centres around the question of whether the formal leader is also part of the shared leadership team or should be considered separately. Based on the results of my research, I assume that all members of the team have equal rights. Similarly, the formal project leader can take on other leadership functions that are not included in their role description. However, the formal leader has a greater influence on the emergence of shared leadership, which can be seen in my research. Nevertheless, the sub–project leader is subject to a role description and an expectation attached to it.

5.1.1.9 Bottom–up vs top–down

In research, there are different approaches to the emergence of shared leadership. Some describe shared leadership as a bottom–up approach (Steinheider and Wuestewald 2014, 145). In the context of leadership, bottom–up means that team members share shared leadership among all members of an organisation or team through self–organisation, rather than focusing on a single leader or a small group of leaders at the top. Pearce (2004, 47) , in turn, highlighted that shared leadership emerges from the top down and from the bottom up. This means a mixed approach of top–down (by formal leaders) and bottom–up (by team members). This is consistent with my findings. I also found that shared leadership emerges from bottom–up and top–down motives. However, no one claims that shared leadership can emerge from the top down. However, my results show that, in theory, shared leadership can emerge from top–down motives. I have identified three top–down motives, which I have described as role–orientated, substitution rule–orientated and development–orientated motives. If different roles with integrated leadership functions are used in the role description in a team, distributed leadership can already arise as a result.

5.1.1.10 Valuable empirical data

As with any research, it is important to carefully consider what data is collected and from whom (parts of the methodology). Because to understand the phenomenon of emergence, including the emergence of distributed leadership, context is important. I think, and this is what the research says, to understand the phenomenon of emergence of shared leadership, the dynamics and interaction of social processes is a key element to understand.

A lot of empirical data was and is collected by students. Certainly, this data is valuable and meaningful, but I would like to point out that representation and generalisation should be questioned. I obtained my data from real projects that took place in the economy under current market conditions. Thus, the validity of my research is more "real". However, choosing the right context is only half the battle. The data collection method is also crucial. I also opted for the data collection method of observation. In qualitative research, I have very often noticed data from semi–structured interviews in the literature on shared leadership (e.g. Lyndon and Pandey (2021, 1), 1 or Karppi et al. (2024, 4)). For this, it is necessary to look at real projects or the respective context. Therefore, I think that my research has a high value for research because my research is based on data from observations in real projects.

5.1.2 Leadership emergence theory

Emergence theory is used in shared leadership theory because the emergence theory describes that leader or leadership can emerge from the bottom (Pearce and Conger 2003, 4). My findings enhances the leadership emergence theory, which has been gaining popularity in recent years (e.g. Acton et al. 2019, 145 ff.; Badura et al. 2022, 2069 ff.) to include a different perspective on the emergence of leadership. Most of the research on leadership emergence is person–oriented and concentrates on the emergence of leader/follower identities by a claiming and granting process (DeRue and Ashford 2010, 631; Lyndon and Pandey 2021, 367). I have followed the path of the emergence of leadership by focusing on the emergence of leadership functions independent of people. Our process framework also includes a form of claiming and granting, but not for the emergence of identities, but for the emergence of leadership functions.

The identified process framework for the emergence of shared leadership can be considered as additional mechanisms in the state of research on the emergence of leadership (Acton et al. 2019, 152–153). The key factors I have identified that promote the occurrence of leadership functions add value to current research on the antecedents of leadership emergence (Wu et al. 2020, 4).

Leadership emergence is described as a multilevel phenomenon (individual, relational and collective level) (Acton et al. 2019, 154). When focusing on the emergence of leadership functions, this is still the case because the occurrence of a leadership function contains the individual and relational levels. The fact that many leadership functions occur in parallel leads to shared leadership, representing the collective level.

Much of the empirical research on leadership emergence has been conducted with students (Cox et al. 2022, 9) rather than in an organisational setting, although research suggests that leadership emerges differently in different contexts (Kozlowski et al. 2013, 5). For example, when team members work on projects (Carson et al. 2007, 1229). My study extends the empirical literature on the emergence of shared leadership with data from a real projects.

5.1.3 Functional leadership theory

The theory of leadership functions and the theory of shared leadership show points of contact. This is precisely the case if following the definition of shared leadership, as a an emergent team process defined by distributed leadership functions among multiple team members (Small and Rentsch 2010, 203). My theoretical contribution lies in the identification of the motives of leadership functions, the defined process for the occurrence of leadership functions, the extension of a detailing of the leadership function and the overview of the leadership functions that have occurred.

The first contribution deals with the motives identified for the management functions. The leadership functions focus on the central leadership behaviour to satisfy the team's needs (Kozlowski et al. 2016, 36–37). I have identified six motives that lead to the emergence of leadership functions in a product development project team. In the theoretical contribution on shared leadership, I showed the connection between the motives and project complexity. There seems to be a need for team members to manage complexity. The top–down motives seem to satisfy the organisation's and the customer's needs for the team. In the case of bottom–up motives, on the other hand, the needs of the team members appear to satisfy those of the team.

The next theoretical contribution is defining a process for the occurrence of leadership functions, which has not yet been done in current research. I used the leadership functions according to Morgeson et al. (2010, 10) and created a process for all identified leadership functions.

The following theoretical contribution to the functional leadership theory is the recommendation to add detail to the leadership function. One of my findings was that the same leadership function occurs several times. I added a domain for the leadership function to be able to differentiate between them. By a domain, I mean cost, time or a technical area. Functional leadership research should take this into account in its concept and operationalisation. I think this extension is urgently needed to maintain transparency and to gain a complete understanding of the leadership functions.

The last theoretical contribution is the empirical data on the leadership functions that occur in product development project teams. I have found that some leadership functions occur more frequently, some not at all, and that some team members take on leadership functions

and others do not. The data illustrates which leadership functions occur in complex project teams, and which do not.

In summary, my research extends shared leadership theory by introducing a process–oriented framework for its emergence, emphasising the importance of contextualising antecedents. It connects shared leadership with project complexity, demonstrating how various complexity factors influence the emergence of leadership functions. Additionally, the study links shared leadership with project management research, confirming that complex project characteristics are suitable for investigating shared leadership. It also enhances the definition of shared leadership by detailing its manifestation in product development teams and expands on emergent team processes and states. Finally, my research identifies top–down and bottom–up motives in shared leadership emergence, contributing new insights into leadership emergence theory and functional leadership theory.

5.2 Implication for practice

In addition to the scientific contribution, the findings also have practical implications. These are relevant for various practitioners, especially for managers (including project managers), team members, project management institutions, project management offices, and clients working in a complex environment such as a product development project.

I have categorised the practical implications as follows:

- Understanding the “elephant in the room”
- Enhancing the perspective of leadership
- Enhancing leadership functions
- Influencing shared leadership emergence
- Improving team performance
- Enhance project management standards
- Handling project complexity
- Enhancing practical training in leadership

5.2.1 Understanding the "elephant in the room"

For practitioners, there is an elephant in the room on shared leadership, as shared leadership is practised in project teams, but no one knows about it. A discussion with practitioners revealed that the theoretical concept of shared leadership, including the emergence of shared leadership, is not well known (Mueller et al. 2023, 154). However, I showed in a study that it was practised in several product development project teams (Mueller 2021, 25). This is certainly because it is difficult for practitioners to grasp the phenomenon of shared leadership emergence, as many things happen during a project that influences it (Mueller et al. 2023, 154). This is certainly not only the case for project development projects, but for projects with a certain complexity of any kind or teams working in complex environments.

This makes it difficult to distinguish what influences it and what does not. The process–orientated framework is a structured representation of the phenomenon that people can understand. In this way, a picture can emerge in the minds of practitioners and the phenomenon can be formulated. This is my first contribution for all practitioners working in complex organisations.

5.2.2 Enhancing the perspective of leadership

The next practical implication is to broaden the perspective of leadership for practitioners working in a complex organisation like product development project teams. Leadership in organisations is still very much linked to roles. With my research into the emergence of shared leadership and the creation of a process–orientated framework, practitioners are offered another perspective on leadership. It is important to note that my process focuses on the emergence of leadership functions rather than the emergence of leaders. Leadership decoupled from roles and as a team phenomenon will be new to many practitioners and will help to gain an understanding of shared leadership.

5.2.3 Enhancing leadership functions

Another practical implication of my research is to improve the distribution of leadership functions in teams for organisational managers. The debate on pluralistic leadership arose from the practical benefits of sharing leadership functions between two or more people in appropriate situations (Pearce 2004, 47). Accordingly, project managers and sub–project leaders can use the framework to facilitate the sharing of leadership responsibilities among team members and ensure that leadership is distributed across multiple roles. This can lead to greater team engagement as members feel empowered and accountable for the success of the project. It also helps across projects that the team capability is increased.

But there are also several advantages when practitioners have the concept of shared leadership in mind. For example, when appropriate leaders are not available, divide the leadership into leadership functions and share the burden among many team members. In a study by PMI (2021), the demand for professional project staff will increase steadily over the next few years, and the gap between demand and supply is expected to widen. The concept of shared leadership can help narrow this gap. Furthermore, people will look at the activities rather than the role when replacing people. In addition, looking at employee leadership activities rather than roles or competencies allows for the identification of team members with high potential. In other words, the people who efficiently and effectively perform or take on leadership functions. This transparency helps staff future project teams and achieve a better fit between the requirements of the project and the people.

5.2.4 Influencing shared leadership emergence

The process–orientated framework offers particular help here, but the factors should also be taken into consideration. The factors and their connections show, for example, what to look

out for and what the preconditions should be. The process–oriented framework will show practitioners (department manager, project manager, project team leader, team leader and team members) how they can influence the emergence of shared leadership. This is particularly interesting to those involved in this process or those indirectly affected by the projects. Department and project managers, team leaders, team members, and the client are essential as they are part of the process and can directly influence the emergence of shared leadership. However, a project management office or other institution can also do this, which can affect the projects in the organisation. In this context, I would like to refer to the difference between the top–down and bottom–up approaches. In the top–down approach, the department manager, project managers, and team leaders can explicitly divide the leadership functions between different roles. This is in contrast to the current concept of appointing one person as a dedicated leader with the expectation that this person will take on all leadership tasks, as is usually the case. By specifically managing the top–down approach, a balance of leadership functions can be distributed to team members with roles. In addition to roles, managers can set organisational rules, such as high flexibility of the project team or developing individuals with potential for leadership or management roles, which also impacts the emergence of shared leadership. A bottom–up influence can be created by empowering team members according to the critical factors in the leadership emergence phase. Empowering team members increases the likelihood of different team members taking on a leadership role because they recognise more leadership gaps.

5.2.5 Improving team performance

The following impact on practice is the indirect improvement in team performance. This information can be relevant for the organisational management, project manager and sub–project leader. Leadership is one of the most important ingredients of team success (Avolio et al. 1996, 175). Many empirical studies have recognised the benefits of shared leadership in a complex environment. For example, shared leadership influences individual/team performance (Liu et al. 2014, 291), team effectiveness (Pearce and Sims Jr 2002, 172), task performance in a project (Hoch et al. 2010, 105) and organisation effectiveness (Pearce and Sims Jr 2002, 172) as well as team member satisfaction (D'Innocenzo et al. 2016, 1969; Robert Jr and You 2018, 510–511). Much is known about the benefits of shared leadership in practice. The process–orientated framework for the emergence of shared leadership serves as a means to influence and create shared leadership in teams. Thus, the framework is an indirect tool to achieve the added value presented.

5.2.6 Enhanced project management standards

Several project management standards, e.g., the International Project Management Association (Individual Competence Baseline 4) and the Project Management Institute (the PM Book Guide 7th Edition), are just two major institutions with a very valuable contribution to project management practice. None of these standards explains the topic of shared leadership, let alone the emergence of shared leadership. Instead, the hierarchical leadership model is still used here. Leadership should be presented more diversely in the

literature. Please do not misunderstand. I don't want to cast doubt on hierarchical leadership but expand it to include shared leadership. The findings from my research especially with the process–orientated framework of shared leadership could also be used here. Another practical implication for project management institutions would be the inclusion of shared leadership and the emergence of shared leadership in project management standards. At least the project managers should learn about the benefits of shared leadership and how to support how it can be achieved.

5.2.7 Handling project complexity

The research results will help department heads and project managers to develop a suitable strategy for the effective management of project complexity. Managing project complexity is a key factor for project success (Dao et al. 2016, 477**)**. The process–orientated framework helps to recognise the influence of project complexity. This can help organisations and teams to manage this complexity, for example, by prioritising role descriptions or empowering team members. Considering the empirical findings, introducing shared leadership in teams working in complex environments is not just a suggestion but a necessity. Such environments' dynamic and uncertain nature requires a flexible, adaptable and shared leadership approach, making shared leadership an ideal solution.

5.2.8 Enhancing practical training in leadership

My final implication for practice is the expansion of practical leadership training in organisations with the topic of shared leadership, which also includes the emergence of this phenomenon. This is relevant for managers and team members working in complex organisations. As a rule, managers are trained with leadership training, as in practice, an image of the formal sole manager is still conveyed. My research has shown that leadership functions are assumed by different team members within the team. Two topics should, therefore, be highlighted in leadership training. Firstly, the formal leader should be trained in the emergence of shared leadership. In particular, their influence, e.g. in the role of sub–project manager, should be emphasised here. On the other hand, the organisation should consider a strategy for developing the team regarding shared leadership. Day et al. (2004, 859) offer comprehensive training for team leadership in their study.

5.3 Research limitations and boundaries

My study has limitations and boundaries that require further research to refine and extend the study of shared leadership emergence. I have distinguished between contextual, methodological, functional and definitional limitations and boundaries.

5.3.1 Contextual limitations and boundaries

When investigating the emergence of shared leadership, context is crucial, as shared leadership develops differently in different contexts due to the form of contextual factors

(Kozlowski et al. 2013, 600). My selected product development project teams have various contextual factors, which in turn represent a limitation. The teams analysed are product development project teams in the automotive industry of a German company. I would now like to systematically emphasise the limiting points.
A project like a product development project can be seen as a temporary organisation (Turner and Müller 2003, 1; Lundin and Söderholm 1995, 437). Temporary organisation and permanent organisation are different according to the tasks. Figure 88 is showing these differences. In a temporary organisation with unique tasks the emergence of shared leadership is more likely. In short, I focused on a temporary organisation with all the limitations and boundaries.

Figure 88: Difference of the tasks in permanent and temporary organisation

Table 1. Unique and repetitive tasks

	Repetitive tasks	Unique tasks
Goals	Immediate, specified	Visionary, abstract
Experience	Own or codified by professions	Others' or none
Competence	In codes and tacit knowledge	Diverse or unknown, requires flexibility and creativity
Leadership/ owner of temporary org'n	Low or middle managers	Top management
Development process	Reversible	Irreversible
Evaluation	Result orientated	Utility orientated
Learning	Refinement	Renewal

Source: Ludin and Söderholm 1995, 441.

The studied project teams are in a product development project. Next to the development of a new product are many different project types (for an overview see Figure 89) with differences in the type of worker, degree of uncertainty, time of pressure, stability of the scope, level of technology and the importance of costs. The context of my research is a product development project and a limitation, because different types of projects have different characteristics. New products and software projects and their characteristics seem to be good conditions for the emergence of shared leadership. In other types of projects this can look quite different.

Figure 89: Overview different types of projects

Type Projects by Product	Type of Worker	Degree of Uncertainty	Time Pressure	Stability of Scope	Level of Technology	Importance of cost
1. Administrative	White	Low	Low	High	Low	Low
2. Construction	Blue	Low	Low	High	Low	High
3. Software	High Tech	High	Medium	Low	High	Low
4. Design	White	Medium	Medium	Medium	High	Medium
5. Maintenance	Blue	High	High	Low	Low	Low
6. Event	White	Low	Medium	High	Medium	Medium
7. Equipment	Blue	Low	Low	High	Low	Low
8. New Product	White	High	High	Low	High	Low
9. Research	High Tech	High	Low	Low	High	Low

Source: Youker 1999, 1.

In addition to the focus on the temporary organisation, I concentrate on a single team of three different project and not on the entire project. The teams I have observed are at the lowest hierarchical level of the projects. These are mainly day–to–day operational and sometimes very technical tasks and less administrative tasks in the project team that can have an impact. Another limitation is that I focused on the culture of a German automotive company. I am specifically targeting the limitation of cultures here. The culture influences the behaviour of the employees in the project team or according to the Cambridge University (2024), the culture is "the attitudes, behaviour, opinions, etc. of a particular group of people within society." The shared mental model, for example, is a antecedent of shared leadership. Different cultures therefore influence the emergence of shared leadership and are therefore a limitation of my research.

The teams I examined are embedded in a matrix organisation. There is a division between the project managers and the team leaders. The project manager is responsible for the success of the project and the team leader is responsible for the motivation and development of the team members. This must be considered as the team leader has an influence on the process, especially on the provision of team members for the project team. Teams influence the emergence of shared leadership because different people influence the dynamics. A different form of organisation affects my research and is a contextual limitation.

Due to the impact that the world is still in the post–Corona situation and home office is offered and a preferred workplace for employees. As a result, the team is split up locally and mainly works remotely. Remote working was part of the project teams and is a limitation, because for teams with who are located at one office, shared leadership will probably different.

5.3.2 Methodological limits and boundaries

Since my research is initially exploratory in nature and served the purpose of matching theoretical findings outlined by the literature with insights from practices through the case study. The choice of a qualitative study entails several limitations due to the contextual limitations and boundaries.

Another methodological limitation is the selection and availability of the collected data. I obtained my data from semi–structured interviews, internal project and team documents and meeting observations. There were certainly other interactions between team members and meetings that I did not capture due to my capacity. There are probably other project documents that I never got to see because they were never published or saved locally. Of course, there are many more activities of the project team going on in the background that I was unable to record, but which could certainly have been useful.

5.3.3 Limits and boundaries of the selected leadership functions

In the development of the process framework, I have focused on the 15 leadership functions according to the research from Morgeson et al. (2010, 10). There are also other leadership functions which can have an influence on the concept of shared leadership emergence. Like the leadership functions from Bowers and Seashore (1966, 238): support, interaction facilitation, goal emphasis, and work facilitation or the leadership functions from Marks et al. (2001, 354): Mission analysis, goal specification, strategy formulation and planning, monitoring progress towards goals, systems monitoring, team monitoring and backup, coordination, conflict management, motivation and coincidence building, and affect management. The leadership functions are the "what" in the phenomena of shared leadership emergence and with a different "what" there will be a different "how", depending on the emergence.

5.3.4 Limits of the definition

There are many definitions of shared leadership. I have chosen for the definition of shared leadership as an evolving process in which members of teams influence each other and share leadership functions between two or more people (Small and Rentsch 2010, 203). The selection of one definition excludes different definitions. For example, the definition could also have been shared leadership as a shared leadership role or as shared leadership behaviour (e.g. Barry 1991, 34; Carte et al. 2006, 323). The choice of definition has implications for the events of the process I am analysing. I chose to focus on the emergence of shared leadership through the occurrence of leadership functions that are shared by several team members. The choice of definition influenced the events identified as I focussed on the leadership functions. For example, if the definition of shared leadership refers to the shared leadership roles, the events and ultimately the process will look different. The events then relate more to the identity and social identity of a people. Thus, the decision results in a limitation for my research.

5.4 Conclusion

To summarise, I made several contributions to the shared leadership theory, but also to the leadership emergence theory and functional leadership theory. This is because these three theories are more closely linked. In addition, I have made implications for practice, as the findings of my research can bring benefits to complex projects or temporary complex projects. Finally, in the chapter I have discussed limitations and boundaries. The study has several limitations and boundaries that require further research into the emergence of shared leadership. In terms of content, the study is limited to product development teams in a German automotive company, which limits the generalisability of the results due to specific cultural and organisational circumstances. Methodologically, the study's qualitative approach and the data collection methods, including semi–structured interviews and observation of meetings, may not capture all relevant interactions and documents. In addition, the focus on specific leadership functions and definitions limits the scope and may exclude other essential factors and perspectives of shared leadership. Finally, the focus on team–level dynamics and the time–limited nature of project organisations further limits the transferability of the findings to other contexts and organisational structures.

6 CONCLUSION

The study investigates how shared leadership emerge in product development product teams by a qualitative research approach. The aim of this section is to summary the key findings of the doctoral thesis and give recommendations for future research.

Before I begin with the results, I would like to say a few words about the originality of my work. The originality of my work lies in its comprehensive approach to a previously under–researched area, in the use of qualitative methods to uncover the factors, their relationship, processes and in the development of a novel process–orientated framework for the emergence of shared leadership. In addition, my research makes practical and theoretical contributions to the field of leadership research. My research offers new insights and actionable guidelines, making a significant and innovative contribution to the understanding and implementation of shared leadership.

6.1 Summary of findings

The summary of my findings is categorised in:

- Leadership research is a broad topic
- Leadership in projects is a complex construct
- Shared leadership emergence is under–researched
- Shared leadership is not included in the project management standards
- Qualitative research is the key
- Empirical data from real–life projects are important
- Shared leadership emergence is a multi–level and multiple discipline construct
- Influence of project complexity
- Using events to understand the process of shared leadership emergence
- Understanding the needs
- Leadership functions must be more precisely defined
- Leadership functions are dynamic
- Added value for scientists and practitioners
- Different theories of fusion have an intersection
- The value of process–oriented frameworks

6.1.1 Leadership research is a broad topic

On my research journey and search for my research topic, I started reading academic books and research papers on leadership. When I started, I could not have imagined how deep and broad the topic of leadership can be and how long its history is. Over time, I read a lot about leadership, but the more I read, the more I realised how much knowledge there was in the research. By choosing shared leadership, I was able to narrow the topic down a bit. However, I was also able to observe how leadership is established in other disciplines such as

psychology or, for example, in physics on the topic of emergence and complexity theory, which was relevant to me. That is certainly one of my realisations, namely that it is certainly important to be open to the topic, and at the same time, once you have found a topic, it is important to narrow it down.

6.1.2 Leadership in projects is a complex construct

Leadership research has a long history and continues to receive intensive attention. And every type of research certainly has its advantages and disadvantages. However, I would like to emphasise the complexity of leadership in projects. Even in the teams analysed, the dynamics at work in the development of leadership functions and ultimately in leadership itself become apparent. One of my key findings is that leadership is an extremely complex construct. Leadership is not just the result of individual skills or charismatic qualities, but arises from a complex interplay of social, cultural and organisational factors. It turns out that leadership processes depend heavily on the interaction between team members, the organisational context and situational conditions. The same leader can be perceived and be effective in entirely different ways in different contexts and teams. I would, therefore, like to expressly warn against simplifying research on leadership or reducing it to one–dimensional explanatory approaches. I can only develop a profound understanding of the mechanisms and dynamics of leadership by taking a comprehensive look at the diverse influencing factors and their interactions. A reductionist approach would not do justice to the complexity of the topic and could lead to erroneous conclusions. It is, therefore, crucial that future research takes into account the multidimensionality and complexity of leadership.

6.1.3 Shared leadership emergence is under–researched

When I reviewed the literature on shared leadership, I was surprised at how little is known about the phenomenon of the emergence of shared leadership. By that I mean in research, but also in practice. For example, it started with when does the emergence of shared leadership actually begin? What should I pay attention to when it comes to the emergence? What exactly should be shared in the end? Is it responsibility, leadership positions, leadership behaviour, or something else entirely? How should the emergence of shared leadership be analysed? Many questions remain unanswered at present. It is a huge research gap that cannot be filled with a single doctoral thesis. Therefore, a key finding of my research is the identification of the research gap and the fact that the emergence of shared leadership is under–researched. My part is just the beginning of a great research journey and with all kinds of qualitative research.

By stating that shared leadership is not well researched, I contribute to filling a significant gap in the existing literature. In times of complexity, I consider the emergence of shared leadership to be a very promising topic for the future and would like to inspire and motivate researchers to pursue this topic further.

6.1.4 Shared leadership is not included in the project management standards

Another finding is the fact that little is known about shared leadership, not only in research but also in the practical literature. Leadership is seen as an important competence in all standards and is also given space, yet there are few to no pluralistic leadership theories such as the concept of shared leadership. As a result, little is known about the topic in training courses and therefore in practice.

6.1.5 Qualitative research is the key

The next key finding lies in the methodology for investigating the emergence of shared leadership. On the one hand, this is certainly because the phenomenon has been little researched and more fundamental information is needed. But on the other hand, because the concept of emergence of shared leadership is a complex construct and must be considered very divergently. I recommend data collection through observation. Observation makes it possible to capture the actual behaviour and interactions of individuals in real time. This is particularly important as shared leadership often emerges informally and dynamically, which may not be fully captured by other methods such as interviews or questionnaires. To summarise, qualitative research allows for a more nuanced and in–depth examination of the processes and dynamics involved in the emergence of shared leadership.

6.1.6 Empirical data from real–life projects are important

In my case, I researched the emergence of shared leadership in a product development project team. The context and the subjects of the data collected play an enormously important role in the study of the emergence of shared leadership. It is a fact that context influences emergence. Therefore, it is essential to use empirical data from real projects to analyse the emergence of shared leadership. For example, I do not find case studies with students conducting a product development project beneficial, as it has little to do with the real–life environment. This brings me to another important realisation of my research: empirical data should be taken from a running operation. The data I have collected provides rich empirical insights. These insights can open up new perspectives and deepen the understanding of the dynamics of shared leadership.

6.1.7 Shared leadership emergence is a multilevel and multiple discipline construct

An important finding is that the emergence of shared leadership is a multi–level and multi–disciplinary phenomenon. Multilevel here refers to the individual, relational and collective levels. The individual level describes personal characteristics and abilities. This level examines how individuals' individual characteristics, skills, attitudes and behaviours contribute to the emergence of shared leadership. This includes factors such as the willingness to take on leadership responsibility, confidence in one's leadership abilities and motivation to work together. The relational level encompasses relationships and interactions. This level focuses on the dyadic relationships and interactions between team members. It

examines how the quality of relationships (e.g., trust, communication, mutual respect) and the patterns of interactions influence the distribution and sharing of leadership roles. The collective level corresponds to team and group processes. This level examines how the team shares leadership and organises collective decision–making and collaboration. It is about how common goals, visions and values are shared and implemented within the team.

On the other hand, shared leadership emergence includes several disciplines, mainly from psychology, sociology and physics. Psychology deals with questions of how individual differences and psychological processes influence the emergence of shared leadership. Sociology clarifies how social structures and networks within groups influence the distribution of leadership. Physics addresses questions about how complexity and self–organisation affect leadership. To summarise, 'Shared leadership emergence: a multilevel and multiple discipline phenomenon' means that the emergence of shared leadership is a complex phenomenon that is investigated at different levels (individual, relationship, collective) and requires knowledge from several scientific disciplines to fully understand.

6.1.8 Influence of project complexity

My final realisation is the influence of complexity on the emergence of shared leadership. I have already indicated in the previous findings that context plays a significant role in the emergence of shared leadership. Projects are characterised by their uniqueness, complexity and limited resources. I want to emphasise project complexity in this context. In my opinion, project complexity influences the motives for the emergence of leadership functions and, thus, the emergence of shared leadership. Due to the uniqueness of projects, it can be assumed that every project will be different, and therefore, the emergence of shared leadership will also be different. Nevertheless, my process–orientated framework provides a good guideline for this.

6.1.9 Using events to understand the process of shared leadership emergence

Another finding lies on the view of events to understand the process. The event–structure analysis helped me to focus on the importance of events. Previously I had thought in other directions to create the process and the process framework, but events seem an appropriate approach to understand shared leadership emergence.

6.1.10 Understanding the needs

I would like to emphasise that shared leadership emerges from top–down and bottom–up motives. I identified three top–down motives (role–, development– and flexibility–driven) and three bottom–up motives (individual workload, individual motivation and individual subjective leadership gap). This is in line with Pearce (2004, 46) research that shared leadership occurs through top–down and bottom–up pressures. I also found it impressive how irrationally and merely on the subjective opinion of individual people leadership functions have developed. The reason, as my research shows, lies in the needs of people and

the organisation. These needs in turn lead to motives, which in turn lead to the emergence of leadership functions. This leads me to the next valuable insight, namely that shared leadership arises from needs.

6.1.11 Leadership functions must be more precisely defined

I came to another important finding when analysing the occurrence of leadership functions. The point is that leadership functions require additional information in order to be able to make a distinction when the same leadership function occurs more than once. After all, the same leadership functions occurred multiple times in all teams. I decided to add an additional area, for example cost, time or the area of a technology. This addition of additional information on the leadership function helps to get a more comprehensive picture of the phenomenon of the occurrence of leadership functions and, thus, of shared leadership.

6.1.12 Leadership functions are dynamic

Another important realisation is the fact that leadership functions are for the most part not static, but dynamic. It means that leadership functions can change over time. For example, a leadership function may initially arise through a role with a team member, but over time, this leadership function may be transferred to another person. It is also possible for leadership functions to end over time. On the other hand, two people or the entire team may be involved in realising the leadership function. Or the following people may join or leave during the realisation of the management function.

6.1.13 Added value for scientist and practitioners

Another finding of my research is that academics and practitioners will benefit equally from my research.

Scientifically, I have contributed various extensions to the theory of shared leadership. In addition, during my doctoral research, I recognised a connection between the concept of leadership emergence, the leadership functions and the emergence of shared leadership. The leadership functions are the "what". What exactly is shared leadership? The emergence of leadership provides explanations of the "how". Namely, how individual leaders who come from below emerge. Shared leadership brings everything together and takes a collective view.

My practical contribution lies in the general groundwork. Practitioners are not familiar with shared leadership, nor is it consciously promoted (Mueller et al. 2023, 154). It would make sense to familiarise practitioners with the findings on the emergence of shared leadership in order to promote it more targeted. I have, therefore, used processes to define what leads to improved team performance under certain conditions.

6.1.14 Different theories of fusion have an intersection

Another finding lies in the fact that theories cannot always be clearly separated. Sometimes there are overlaps. In my case, for example, it was shared leadership, leadership emergence and functional leadership theory. It is also important to understand at least the basics of all the theories involved.

6.1.15 The value of process–oriented frameworks

One of the key findings of my research is the process–oriented framework for the emergence of shared leadership. This framework provides a structured way to understand how shared leadership develops over time and offers new insights into the mechanisms and conditions that facilitate this type of leadership. Such a framework is useful for the practice, because on one view the whole process is provided. This brings a value for practitioners, because practitioners are used to receiving knowledge in a rather compact form. Especially at management level, there is often a lack of time (or priority) to understand a topic in depth. Since the findings from research should flow back into practice, a process–orientated framework helps as a transfer medium. This is also one of my findings to have a process–oriented framework to bring the results of the research back into practice.

6.2 Recommendation for future research

The present research has provided fundamental insights into the emergence of shared leadership, identifying several relevant factors, the relationships of these factors and a process framework. Nevertheless, I have entered less explored terrain, so future research should deepen and broaden my findings. The recommendation for future research is based on the boundaries and limitations of my research. Interdisciplinary approaches and studies in different contexts could uncover additional facets of this complex topic. The established process–orientated framework or parts of it, such as the processes, should be validated through quantitative research. Quantitative methods could help to verify and statistically underpin the general validity of my findings. In addition, the linking of factors and events could provide added value for research. Finally, I would like to address the currently very topical and explosive issue of artificial intelligence. Future research could considerably benefit from its possibilities.

6.2.1 Deepen and broaden my findings

I would like to start the recommendations for future research based with the deepen and broaden of my findings. This can be done by adding further information depending on the definition, team, project, organisation, industry, culture, and definition.

An extension of my research to team level can be done by looking at different levels in the team or by looking at different gender distributions. Depending on the size and structure of the project, a project can consist of several teams. I have focussed on teams at the lowest

level, but there are also teams at a higher level, such as the project management team. This team consists of project managers, for example, the technical project manager, the administrative project manager, and the project management assistance. Future research can investigate this type of team. Another future study could focus on the gender distribution of the team. The teams I studied were predominantly male. Gender leadership research shows a difference in behaviour between men and women. This difference in behaviour could impact team dynamics and, thus, the emergence of shared leadership.

An extension of my research to the project level can be achieved by looking at teams working in different project types, the number of teams in the project, studying the project level, the change in project complexity, or consideration of the entire project life cycle. The teams that I analysed were involved in product development projects. This would certainly be extremely interesting, and future research could investigate other projects, such as research, organizational, or construction projects. Future studies could investigate the influence of the number of teams in the project. I think that this also influences team dynamics and emergence. My work has focused on the emergence of shared leadership in teams. Future research can capture the project as a whole by observing and analysing the dynamics of the teams. I have mentioned several times in my work that project complexity plays a role in the emergence of shared leadership. It would be interesting to see how different project complexity affects the emergence. I have identified six motives that lead to the emergence of leadership functions. These motives are an essential component of process–orientated frameworks. Future research should take a closer look at these motives. In particular, the influence of project complexity on the motives. I assume that other motives will emerge that I have not yet identified. It would also be very exciting to study the teams throughout the project life cycle. Shared leadership is an evolving process, and it would be an added value of my research to study the project life cycle and the dynamics in shared leadership teams. For example, are there phases in which more shared leadership emerges?

An extension of my research to the organisational level can be achieved by looking at project teams established in different organisational forms, which in turn leads to very different internal processes, for example, in the project management process. The teams I examined belonged to an organisation that has a matrix organisation. Matrix organisations differ. For example, strong (more power for the project manager), weak (more power for the line manager) or many facets in between. Here my research would benefit from how different matrix organisations influence the emergence of shared leadership. Or what about project teams in different project organisations or line organisations? Again, additional data from additional forms of organisation would enhance my research.

Looking at additional industries can extend my research. The teams I have studied work in the automotive industry. Further research could include data from project teams working in other industries, such as building construction, financial services, or energy.

The project teams I analysed are based in Germany and are predominantly made up of Germans. I would like to point out that there are different cultures at national level.

Investigating the influence of nations on project teams and their dynamics would offer added value. Future studies could investigate how shared leadership in project teams in the USA or China is affected by the influence of nationality. Or the influence on project teams through projects with globally distributed teams and the interaction of different nationalities.

An extension of my research can be achieved by focussing on a different definition of the emergence of shared leadership or/and deepening the definition used. My consideration was the emergence of shared leadership through the emergence of leadership functions among the team members. Future research could focus on other definitions of shared leadership like by sharing leadership roles or sharing leadership behaviour. The change of the definition will enhance my research by further processes for the emergence of shared leadership. An extension of my research can be achieved by examining the emergence of shared leadership through the lens of another definition and/or deepening the definition used. The focus of my definition was on the emergence of shared leadership through the occurrence of leadership function among team members. Future research could focus on other definitions of shared leadership, such as the emergence of distributed leadership through shared leadership roles or shared leadership behaviours. Changing the definition will identify more processes and factors, which in turn can complement my created framework. In addition to a different definition of shared leadership, there is scope for future research that looks at deepening the definition used and focussing on the functions and factors of shared leadership. In my research, I focused on the 15 leadership functions outlined by Morgeson et al. (2010, 10). Using another concept of leadership functions can improve the research of shared leadership emergence. Another improvement could be to look at the composition of leadership functions. For example, are there leadership functions and areas that are more important than others? Is there a minimum number of leadership functions in a team? Are there too many leadership functions or too few? And what about the distribution of leadership functions to different team members? Is there a minimum or maximum level of distribution? All these questions will enhance the research of shared leadership emergence. And what about the dynamics of leadership functions? My research shows that leadership functions can change over time. This means that leadership functions are transferred from one person to another. What you don't see in my research is which team members lose leadership functions again. This could be considered in further studies. As I have focused on the leadership functions and their emergence, the factors are correspondingly different. On the other hand, there are many researched factors from the research area of leadership emergence. Future research could integrate factors from the area of leadership emergence into my process–orientated framework. An additional improvement to my research could be to focus on the interactions between the identified factors. For example, is there a connection between the factors in a process step or across process steps? Further research on the influence of individual factors will enhance the research of shared leadership emergence.

6.2.2 Validating the findings

The previous recommendation for future research refers to the expansion of my model by collecting additional qualitative data. The previous recommendation for future research

refers to the expansion of my model by collecting additional qualitative data. This already offers great potential for further research. Another focus for future research could be the quantitative validation of my findings. Quantitative validation of the factors, their relationships and the process–oriented framework for the emergence of shared leadership would be an important step to check the generalisability and statistical robustness of the qualitative results. The first step would be operationalisation and consists of construct identification and item generation. For construct identification, the key processes of the framework to be quantified should be identified. Item generation is about developing questionnaires or scales to measure the identified constructs. This can be done through literature research, expert interviews or workshops. After a pre–evaluation of the questionnaires and scales in a pilot study, the methods of quantitative research can be used to validate the process–orientated framework.

6.2.3 Linking the factors with the events

My research and the current state of research separated the factors (antecedents) and the events (process) of shared leadership emergence. Future research can be linking these two perspectives. For example, with the network analysis the link between the factors and the events can be identified. This integrates the antecedents into the process. In my opinion, this makes sense because it allows to say exactly which factors come into play in the emergence and, above all, when in the process. This makes it possible to react more specifically to the emergence of shared leadership.

6.2.4 Value of artificial intelligence

While I was writing my doctoral thesis, the topic of artificial intelligence (AI) became freely accessible to everyday life and could be used by anyone. It is therefore hardly surprising that artificial intelligence is one of the current trends in project management research. If you haven't already done so, I recommend that you at least consider the topic of AI in shared leadership research for future research. I would like to make three specific recommendations for future research on AI in shared leadership. Firstly, I would like to know the influence of AI on the emergence of shared leadership. Can AI give me recommendations for action to drive the emergence of shared leadership, when and how? Secondly, can AI take on leadership functions and thus be part of distributed leadership? In this way, AI would also become part of the emergence of shared leadership. There are already leadership functions taken over by machines (IT systems), such as managing and monitoring deadlines and sending emails when the responsible team member is overdue. Thirdly, due to the limited capacity of the researcher, artificial intelligence can be used to collect, interpret and analyse additional data in order to improve the research. For example, all emails sent could be recorded and searched in advance by AI. Or during the analysis by specifically searching for first, second and third–order codes.

6.3 Conclusion

The final section of my thesis helps to summarise the results of my research and make a recommendation for future research.

I have presented several findings, such as the fact that leadership research is a broad topic. I was able to show that project leadership is a complex construct. I found out that shared leadership emergence is under–researched and is also little described in the current standards on project management. I was able to identify that qualitative methods and empirical data from real life projects are key in exploring the phenomenon of shared leadership emergence. I have identified the influences of complexity on leadership emergence and how valuable events are in creating processes. I found that needs influence the emergence of shared leadership and that leadership functions should be described more precisely. I also found that leadership functions are very dynamic. Another finding was that research and practice benefit equally from my research. Finally, I realised, that different scientific theories can have intersections and that a process–oriented framework is a way of feeding the results back into practice.

Future research should deepen and extend the findings by examining different contexts, team structures and project complexities and integrating interdisciplinary approaches. Quantitative methods should be used to validate the process–orientated framework. In addition, a link between the factors and the events can be beneficial for future research. Finally, the impact of artificial intelligence on the emergence and functioning of shared leadership should be investigated.

Ethical statement

All procedures performed in this study involving human participants were in accordance with the ethical standards of AME University, Slovenia and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent: An informed consent was obtained from all individual participants included in the research, and the data used in this study are completely anonymised.

7 LIST OF LITERATURE AND SOUCES

1. Aaltonen, Kirsi, and Jaakko Kujala. 2016. "Towards an improved understanding of project stakeholder landscapes." *International journal of project management* 34 (8): 1537–1552.
2. Acar, F Pınar. 2010. "Analyzing the effects of diversity perceptions and shared leadership on emotional conflict: a dynamic approach." *The International Journal of Human Resource Management* 21 (10): 1733–1753.
3. Acton, Bryan P, Roseanne J Foti, Robert G Lord, and Jessica A Gladfelter. 2019. "Putting emergence back in leadership emergence: A dynamic, multilevel, process–oriented framework." *The Leadership Quarterly* 30 (1): 145–164. doi: https://doi.org/10.1016/j.leaqua.2018.07.002.
4. Aga, D Assefa, Niels Noorderhaven, and Bertha Vallejo. 2016. "Transformational leadership and project success: The mediating role of team–building." *International Journal of Project Management* 34 (5): 806–818. doi: https://doi.org/10.1016/j.ijproman.2016.02.012.
5. Ahern, Terence, Brian Leavy, and PJ Byrne. 2014. "Complex project management as complex problem solving: A distributed knowledge management perspective." *International journal of project management* 32 (8): 1371–1381.
6. Ali, Ahsan, Hongwei Wang, Mohsin Ali Soomro, and Tahir Islam. 2020. "Shared leadership and team creativity: construction industry perspective." *Journal of Construction Engineering and Management* 146 (10): 04020122.
7. Ashmos, Donde P, Dennis Duchon, Jr McDaniel, Reuben R, and John W Huonker. 2002. "What a mess! Participation as a simple managerial rule to 'complexify'organizations." *Journal of Management studies* 39 (2): 189–206.
8. Aubé, Caroline, Vincent Rousseau, and Eric Brunelle. 2018. "Flow experience in teams: The role of shared leadership." *Journal of occupational health psychology* 23 (2): 198.
9. Avolio, Bruce J, Dong I Jung, William Murry, and Nagaraj Sivasbramaniam. 1996. "Building highly developed teams: Focusing on shared leadership process, efficacy, trust, and performance." *Advances in interdisciplinary studies of work teams: Team leadership* 3: 173–209.
10. Avolio, Bruce J, Fred O Walumbwa, and Todd J Weber. 2009. "Leadership: Current theories, research, and future directions." *Annual review of psychology* 60: 421–449.
11. Baccarini, David. 1996. "The concept of project complexity—a review." *International journal of project management* 14 (4): 201–204.
12. Badura, Katie L, Benjamin M Galvin, and Min Young Lee. 2022. "Leadership emergence: An integrative review." *Journal of Applied Psychology* 107 (11): 2069.
13. Bakhshi, Javad, Vernon Ireland, and Alex Gorod. 2016. "Clarifying the project complexity construct: Past, present and future." *International journal of project management* 34 (7): 1199–1213.
14. Barrick, Murray R, Bret H Bradley, Amy L Kristof–Brown, and Amy E Colbert. 2007. "The moderating role of top management team interdependence: Implications for real teams and working groups." *Academy of Management journal* 50 (3): 544–557.

15. Barry, David. 1991. "Managing the bossless team: Lessons in distributed leadership." *Organizational dynamics* 20 (1): 31–47.
16. Bartol, Kathryn M, and David C Martin. 1986. "Women and men in task groups." *The social psychology of female–male relations*: 259–310.
17. Bass, Bernard M. 1949. "An analysis of the leaderless group discussion." *Journal of Applied Psychology* 33 (6): 527.
18. Bass, Bernard M. 1990. "From transactional to transformational leadership: Learning to share the vision." *Organizational dynamics* 18 (3): 19–31.
19. Bass, Bernard M, and Ruth Bass. 2008. *The Bass handbook of leadership: Theory, research, and managerial applications*. 4 ed: Simon and Schuster.
20. Bass, Bernard M, and Ralph Melvin Stogdill. 1990. *Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications*: Simon and Schuster.
21. Bedau, Mark A. 1997. "Weak emergence." *Philosophical perspectives* 11: 375–399.
22. Bell, Suzanne T. 2007. "Deep–level composition variables as predictors of team performance: a meta–analysis." *Journal of applied psychology* 92 (3): 595.
23. Benne, Kenneth D, and Paul Sheats. 1948. "Functional roles of group members." *Journal of social issues* 4 (2): 41–49.
24. Berger, Joseph, Bernard P Cohen, and Morris Zelditch Jr. 1972. "Status characteristics and social interaction." *American Sociological Review*: 241–255.
25. Bergman, Jacqueline Z, Joan R Rentsch, Erika E Small, Shaun W Davenport, and Shawn M Bergman. 2012. "The shared leadership process in decision–making teams." *The Journal of social psychology* 152 (1): 17–42.
26. Bettis, Richard A, and Michael A Hitt. 1995. "The new competitive landscape." *Strategic management journal* 16 (S1): 7–19.
27. Bhattacharya, Shantanu, Viswanathan Krishnan, and Vijay Mahajan. 1998. "Managing new product definition in highly dynamic environments." *Management Science* 44 (11–part–2): S50–S64.
28. Birkinshaw, Julian, Tina C Ambos, and Cyril Bouquet. 2017. "Boundary spanning activities of corporate HQ executives insights from a longitudinal study." *Journal of Management studies* 54 (4): 422–454.
29. Bolden, Richard. 2011. "Distributed leadership in organizations: A review of theory and research." *International journal of management reviews* 13 (3): 251–269. doi: https://doi.org/10.1111/j.1468–2370.2011.00306.x.
30. Bosch–Rekveldt, Marian, Yuri Jongkind, Herman Mooi, Hans Bakker, and Alexander Verbraeck. 2011. "Grasping project complexity in large engineering projects: The TOE (Technical, Organizational and Environmental) framework." *International journal of project Management* 29 (6): 728–739.
31. Bowers, David G, and Stanley E Seashore. 1966. "Predicting organizational effectiveness with a four–factor theory of leadership." *Administrative Science Quarterly*: 238–263.
32. Bradbury, Hilary, and Benyamin M Bergmann Lichtenstein. 2000. "Relationality in organizational research: Exploring the space between." *Organization science* 11 (5): 551–564.

33. Brown, Shona L, and Kathleen M Eisenhardt. 1997. "The art of continuous change." *Administrative science quarterly* 42 (1): 1–34.
34. Brunet, Maude, Fernando Fachin, and Ann Langley. 2021. "Studying Projects Processually." *International Journal of Project Management* 39 (8): 834–848.
35. Buchanan, David A, Rachael Addicott, Louise Fitzgerald, Ewan Ferlie, and Juan I Baeza. 2007. "Nobody in charge: Distributed change agency in healthcare." *Human Relations* 60 (7): 1065–1090.
36. Burke, C Shawn, Stephen M Fiore, and Eduardo Salas. 2003. "The role of shared cognition in enabling shared leadership and team adaptability." *Shared leadership: Reframing the hows and whys of leadership* 103.
37. Cakiroglu, Sultan Serkan, António Caetano, and Patrícia Costa. 2020. "How do mid–senior multinational officers perceive shared leadership for military teams? A qualitative study." *Team Performance Management: An International Journal*.
38. Campbell, Donald J. 1988. "Task complexity: A review and analysis." *Academy of management review* 13 (1): 40–52.
39. Cannon–Bowers, JA, E Salas, and Sharolyn Converse. 1993. "Shared mental models in expert team decision making." In *Individual and group decision making: Current issues*, 221–246. New Jersey: Lawrence Erlbaum.
40. Carson, Jay B, Paul E Tesluk, and Jennifer A Marrone. 2007. "Shared leadership in teams: An investigation of antecedent conditions and performance." *Academy of management Journal* 50 (5): 1217–1234.
41. Carte, Traci A, Laku Chidambaram, and Aaron Becker. 2006. "Emergent leadership in self–managed virtual teams." *Group Decision and Negotiation* 15 (4): 323–343.
42. Carter, Dorothy R, Leslie A DeChurch, Michael T Braun, and Noshir S Contractor. 2015. "Social network approaches to leadership: An integrative conceptual review." *Journal of Applied Psychology* 100 (3): 597.
43. Cavaleri, Steven, and Fred Reed. 2008. "Leading dynamically complex projects." *International Journal of Managing Projects in Business*.
44. Chiu, Chia–Yen Chad, Bradley P Owens, and Paul E Tesluk. 2016. "Initiating and utilizing shared leadership in teams: the role of leader humility, team proactive personality, and team performance capability." *Journal of Applied Psychology* 101 (12): 1705.
45. Chung, Yunhyung, and Susan E Jackson. 2013. "The internal and external networks of knowledge–intensive teams: The role of task routineness." *Journal of Management* 39 (2): 442–468.
46. Clarke, Nicholas. 2012a. "Leadership in projects: what we know from the literature and new insights." *Team Performance Management: An International Journal* 18 (3/4): 128–148.
47. Clarke, Nicholas. 2012b. "Shared leadership in projects: a matter of substance over style." *Team Performance Management: An International Journal*.
48. Clegg, Stewart, and David Courpasson. 2004. "Political hybrids: Tocquevillean views on project organizations." *Journal of management studies* 41 (4): 525–547.
49. Clift, Thomas B, and Mark B Vandenbosch. 1999. "Project complexity and efforts to reduce product development cycle time." *Journal of Business Research* 45 (2): 187–198.

50. Conger, Jay A, and Rabindra N Kanungo. 1988. "The empowerment process: Integrating theory and practice." *Academy of management review* 13 (3): 471–482.
51. Corbin, Juliet, and Anselm Strauss. 2015. *Basics of qualitative research: Techniques and procedures for developing grounded theory*: Sage publications.
52. Cox, Jonathan F, Craig L Pearce, and Monica L Perry. 2003. "Toward a model of shared leadership and distributed influence in the innovation process: How shared leadership can enhance new product development team dynamics and effectiveness." In *Shared leadership: Reframing the hows and whys of leadership*, 48–76. SAGE Publications Inc.
53. Cox, Julie Wolfram, Karryna Madison, and Nathan Eva. 2022. "Revisiting emergence in emergent leadership: An integrative, multi–perspective review." *The Leadership Quarterly* 33 (1): 101579.
54. Crevani, Lucia, Monica Lindgren, and Johann Packendorff. 2010. "Leadership, not leaders: On the study of leadership as practices and interactions." *Scandinavian journal of management* 26 (1): 77–86. doi: https://doi.org/10.1016/j.scaman.2009.12.003.
55. Curnin, Steven, Christine Owen, and Cain Trist. 2014. "Managing the constraints of boundary spanning in emergency management." *Cognition, technology & work* 16: 549–563.
56. D'Innocenzo, Lauren, John E Mathieu, and Michael R Kukenberger. 2016. "A meta–analysis of different forms of shared leadership–team performance relations." *Journal of Management* 42 (7): 1964–1991.
57. Dansereau Jr, Fred, George Graen, and William J Haga. 1975. "A vertical dyad linkage approach to leadership within formal organizations: A longitudinal investigation of the role making process." *Organizational behavior and human performance* 13 (1): 46–78.
58. Dao, Bac, Sharareh Kermanshachi, Jennifer Shane, Stuart Anderson, and Eric Hare. 2016. "Identifying and measuring project complexity." *Procedia Engineering* 145: 476–482.
59. Day, David V, Peter Gronn, and Eduardo Salas. 2004. "Leadership capacity in teams." *The leadership quarterly* 15 (6): 857–880. doi: https://doi.org/10.1016/j.leaqua.2004.09.001.
60. de Rezende, Leandro Bolzan, and Paul Blackwell. 2019. "Revisiting project complexity: a new dimension and framework." *The Journal of Modern Project Management* 6 (3).
61. de Rezende, Leandro Bolzan, Juliano Denicol, Paul Blackwell, and Herbert Kimura. 2022. "The main project complexity factors and their interdependencies in defence projects." *Project Leadership and Society* 3: 100050.
62. DeChurch, Leslie A, C Shawn Burke, Marissa L Shuffler, Rebecca Lyons, Daniel Doty, and Eduardo Salas. 2011. "A historiometric analysis of leadership in mission critical multiteam environments." *The Leadership Quarterly* 22 (1): 152–169.
63. Denis, Jean–Louis, Lise Lamothe, and Ann Langley. 2001. "The dynamics of collective leadership and strategic change in pluralistic organizations." *Academy of Management journal* 44 (4): 809–837. doi: https://doi.org/10.5465/3069417.
64. Denis, Jean–Louis, Ann Langley, and Viviane Sergi. 2012. "Leadership in the plural." *Academy of Management Annals* 6 (1): 211–283.
65. DeRue, D Scott. 2011. "Adaptive leadership theory: Leading and following as a complex adaptive process." *Research in organizational behavior* 31: 125–150.

66. DeRue, D Scott, and Susan J Ashford. 2010. "Who will lead and who will follow? A social process of leadership identity construction in organizations." *Academy of management review* 35 (4): 627–647. doi: https://doi.org/10.5465/amr.35.4.zok627.
67. Dooley, Kevin. 2002. "Organizational complexity." *International encyclopedia of business and management* 6: 5013–5022.
68. Drescher, Marcus A, M Audrey Korsgaard, Isabell M Welpe, Arnold Picot, and Rolf T Wigand. 2014. "The dynamics of shared leadership: Building trust and enhancing performance." *Journal of Applied Psychology* 99 (5): 771.
69. Drucker, Peter. 1954. *The practice of management*. New York: Harper.
70. Dulewicz, Victor, and Malcolm Higgs. 2000. "Emotional intelligence–A review and evaluation study." *Journal of managerial Psychology*.
71. Dulewicz, Victor, and Malcolm Higgs. 2003. "A new approach to assessing leadership dimensions, styles context." *Competency and Emotional Intelligence Quarterly* 11 (2): 224–232.
72. Dvir, DOV, Arik Sadeh, and Ayala Malach–Pines. 2006. "Projects and project managers: The relationship between project managers' personality, project types, and project success." *Project Management Journal* 37 (5): 36–48.
73. Elkington, Rob, Madeleine Van Der Steege, Judith Glick–Smith, and Jennifer Moss Breen. 2017. *Visionary leadership in a turbulent world: Thriving in the new VUCA context*: Emerald Publishing Limited.
74. Elster, Jon. 2003. "Marxism, functionalism, and game theory." In *Debates in contemporary political philosophy*, 22. London and New York: Routledge.
75. Engwall, Mats. 2003. "No project is an island: linking projects to history and context." *Research policy* 32 (5): 789–808.
76. Ensley, Michael D, Keith M Hmieleski, and Craig L Pearce. 2006. "The importance of vertical and shared leadership within new venture top management teams: Implications for the performance of startups." *The leadership quarterly* 17 (3): 217–231.
77. Ensley, Michael D, Allison Pearson, and Craig L Pearce. 2003. "Top management team process, shared leadership, and new venture performance: A theoretical model and research agenda." *Human Resource Management Review* 13 (2): 329–346.
78. Erez, Miriam, and Revital Arad. 1986. "Participative goal–setting: Social, motivational, and cognitive factors." *Journal of applied psychology* 71 (4): 591.
79. Erkutlu, Hakan. 2012. "The impact of organizational culture on the relationship between shared leadership and team proactivity." *Team Performance Management: An International Journal*.
80. Fang, Jian, Yong Fu, and Deli Yao. 2010. "Application of meta–synthesis method in project management of large–scale complex projects." *Management & Engineering* (1): 3.
81. Fausing, Maj S, Hans Jeppe Jeppesen, Thomas S Jønsson, Joshua Lewandowski, and Michelle C Bligh. 2013. "Moderators of shared leadership: work function and team autonomy." *Team Performance Management: An International Journal*.
82. Fausing, Maj Schoeler, Thomas Skriver Joensson, Joshua Lewandowski, and Michelle Bligh. 2015. "Antecedents of shared leadership: empowering leadership and interdependence." *Leadership & Organization Development Journal*.

83. Festinger, Leon. 1954. "A theory of social comparison processes." *Human relations* 7 (2): 117–140.
84. Finkelstein, Sydney. 2002. "Planning in organizations: One vote for complexity." In *The many faces of multi–level issues*. Emerald Group Publishing Limited.
85. Fleishman, Edwin A, Michael D Mumford, Stephen J Zaccaro, Kerry Y Levin, Arthur L Korotkin, and Michael B Hein. 1991. "Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation." *The leadership quarterly* 2 (4): 245–287.
86. Floricel, Serghei, John L Michela, and Sorin Piperca. 2016. "Complexity, uncertainty–reduction strategies, and project performance." *International Journal of Project Management* 34 (7): 1360–1383.
87. Follett, Mary Parker. 1924. *Creative experience*: Longmans, Green and Company.
88. Forsyth, Donelson R. 2010. *Group dynamics*: Wadsworth Cengage Learning.
89. Foti, Roseanne J, Robert E Knee Jr, and Rachel SG Backert. 2008. "Multi–level implications of framing leadership perceptions as a dynamic process." *The Leadership Quarterly* 19 (2): 178–194.
90. Fransen, Katrien, Ellen Delvaux, Batja Mesquita, and Stef Van Puyenbroeck. 2018. "The emergence of shared leadership in newly formed teams with an initial structure of vertical leadership: A longitudinal analysis." *The Journal of Applied Behavioral Science* 54 (2): 140–170.
91. Fyhn, Bård, Vidar Schei, and Therese E Sverdrup. 2023. "Taking the emergent in team emergent states seriously: A review and preview." *Human Resource Management Review* 33 (1): 100928.
92. Geraldi, Joana G, and Gerald Adlbrecht. 2007. "On faith, fact, and interaction in projects." *Project management journal* 38 (1): 32–43.
93. Geraldi, Joana, Harvey Maylor, and Terry Williams. 2011. "Now, let's make it really complex (complicated) A systematic review of the complexities of projects." *International journal of operations & production management* 31 (9): 966–990.
94. Gibeau, Émilie, Wendy Reid, and Ann Langley. 2016. "Co–leadership: Contexts, Congurations and Conditions." In *The Routledge companion to leadership*, 247–262. Routledge.
95. Gioia, Dennis A, Kevin G Corley, and Aimee L Hamilton. 2012. "Seeking qualitative rigor in inductive research: Notes on the Gioia methodology." *Organizational research methods* 16 (1): 15–31. doi: https://doi.org/10.1177/1094428112452151.
96. Gleick, J. 1988. "Chaos: Making a New Science (Viking Penguin Inc.)." *New York*.
97. Goleman, D., R.E. Boyatzis, and A. McKee. 2002. *The New Leaders: Transforming the Art of Leadership Into the Science of Results*. London: Little, Brown.
98. Graen, George B, and Terri A Scandura. 1987. "Toward a psychology of dyadic organizing." *Research in organizational behavior*.
99. Gransberg, Douglas D, Jennifer S Shane, Kelly Strong, and Carla Lopez del Puerto. 2013. "Project complexity mapping in five dimensions for complex transportation projects." *Journal of Management in Engineering* 29 (4): 316–326.

100. Griffin, Abbie. 1993. "Metrics for measuring product development cycle time." *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association* 10 (2): 112–125.
101. Griffin, Abbie. 1997. "Modeling and measuring product development cycle time across industries." *Journal of engineering and technology management* 14 (1): 1–24.
102. Griffin, Larry J. 2007. "Historical sociology, narrative and event–structure analysis: Fifteen years later." *Sociologica* 1 (3): 0–0.
103. Grille, Amelie, Eva–Maria Schulte, and Simone Kauffeld. 2015. "Promoting shared leadership: A multilevel analysis investigating the role of prototypical team leader behavior, psychological empowerment, and fair rewards." *Journal of Leadership & Organizational Studies* 22 (3): 324–339.
104. Guastello, Stephen J. 2007. "Non–linear dynamics and leadership emergence." *The Leadership Quarterly* 18 (4): 357–369. doi: https://doi.org/10.1016/j.leaqua.2007.04.005.
105. Hackman, J Richard, and Ruth Wageman. 2005. "A theory of team coaching." *Academy of management review* 30 (2): 269–287.
106. Hackman, J Richard, and Richard E Walton. 1986. "Leading groups in organizations." In *Designing effective work groups*, 79–119. San Francisco: Jossey–Bass.
107. Haslam, S Alexander, and Stephen Reicher. 2007. "Identity entrepreneurship and the consequences of identity failure: The dynamics of leadership in the BBC prison study." *Social psychology quarterly* 70 (2): 125–147.
108. Hazy, James K. 2006. "Measuring leadership effectiveness in complex socio–technical systems." *Emergence: Complexity & Organization* 8 (3).
109. Hazy, James K. 2008. "Toward a theory of leadership in complex systems: Computational modeling explorations." *Nonlinear Dynamics, Psychology, and Life Sciences* 12 (3): 281.
110. Hazy, James K, and Mary Uhl–Bien. 2013. "Changing the rules: The implications of complexity science for leadership research and practice." *The Oxford Handbook of Leadership and Organizations. Oxford Handbooks Online Available December* 17: 2013.
111. He, Qinghua, Lan Luo, Yi Hu, and Albert PC Chan. 2015. "Measuring the complexity of mega construction projects in China—A fuzzy analytic network process analysis." *International journal of project management* 33 (3): 549–563.
112. Heise, David R. 1989. "Modeling event structures." *Journal of Mathematical Sociology* 14 (2–3): 139–169.
113. Hiller, Nathan J, David V Day, and Robert J Vance. 2006. "Collective enactment of leadership roles and team effectiveness: A field study." *The Leadership Quarterly* 17 (4): 387–397.
114. Hobday, Mike. 1998. "Product complexity, innovation and industrial organisation." *Research policy* 26 (6): 689–710.
115. Hoch, Julia E. 2013. "Shared leadership and innovation: The role of vertical leadership and employee integrity." *Journal of Business and Psychology* 28 (2): 159–174.

116. Hoch, Julia E, and James H Dulebohn. 2013. "Shared leadership in enterprise resource planning and human resource management system implementation." *Human Resource Management Review* 23 (1): 114–125.
117. Hoch, Julia E. 2014. "Shared leadership, diversity, and information sharing in teams." *Journal of Managerial Psychology* 29 (5): 541–564.
118. Hoch, Julia Elisabeth, Craig L Pearce, and Linda Welzel. 2010. "Is the most effective team leadership shared? The impact of shared leadership, age diversity, and coordination on team performance." *Journal of Personnel Psychology* 9 (3): 105.
119. Hodgson, Geoffrey M. 2000. "The concept of emergence in social sciences: its history and importance." *Emergence, A Journal of Complexity Issues in Organizations and Management* 2 (4): 65–77.
120. Hoegl, Martin, Katharina Weinkauf, and Hans Georg Gemuenden. 2004. "Interteam coordination, project commitment, and teamwork in multiteam R&D projects: A longitudinal study." *Organization science* 15 (1): 38–55.
121. Hofman, Mariusz, Grzegorz Grela, and Magdalena Oronowicz. 2023. "Impact of shared leadership quality on agile team productivity and project results." *Project Management Journal* 54 (3): 285–305.
122. Hogg, Michael A. 2001. "A social identity theory of leadership." *Personality and social psychology review* 5 (3): 184–200.
123. Hollander, Edwin P. 1958. "Conformity, status, and idiosyncrasy credit." *Psychological review* 65 (2): 117.
124. Hollander, Edwin P. 1961. "Some effects of perceived status on responses to innovative behavior." *The Journal of Abnormal and Social Psychology* 63 (2): 247.
125. Hollander, Edwin Paul. 1959. *Emergent leadership and social influence*: Washington University, The Social Science Institute.
126. Homans, George C. 1958. "Social behavior as exchange." *American journal of sociology* 63 (6): 597–606.
127. Hsu, Jack Shih–Chieh, Yuzhu Li, and Hua Sun. 2017. "Exploring the interaction between vertical and shared leadership in information systems development projects." *International Journal of Project Management* 35 (8): 1557–1572.
128. Hülsheger, Ute R, Neil Anderson, and Jesus F Salgado. 2009. "Team–level predictors of innovation at work: a comprehensive meta–analysis spanning three decades of research." *Journal of Applied psychology* 94 (5): 1128.
129. Imam, Hassan, and Muhammad Kashif Zaheer. 2021. "Shared leadership and project success: The roles of knowledge sharing, cohesion and trust in the team." *International Journal of Project Management* 39 (5): 463–473.
130. Kardes, Ilke, Ayse Ozturk, S Tamer Cavusgil, and Erin Cavusgil. 2013. "Managing global megaprojects: Complexity and risk management." *International business review* 22 (6): 905–917.
131. Karppi, Marion, Heli Aramo–Immonen, Ursula Hyrkkänen, and Markku Jokisaari. 2024. "Emergence of shared leadership in project teams: The role of events." *Project Leadership and Society* 5: 100145.
132. Keene, Angelique. 2000. "Complexity theory: the changing role of leadership." *Industrial and Commercial Training*.

133. Kelley, Robert E. 1988. *In praise of followers*: Harvard Business Review Case Services Brighton, MA, USA.
134. Kennedy, Deanna M, S Amy Sommer, and Phuong Anh Nguyen. 2017. "Optimizing multi–team system behaviors: Insights from modeling team communication." *European Journal of Operational Research* 258 (1): 264–278.
135. Kerr, Steven, and John M Jermier. 1978. "Substitutes for leadership: Their meaning and measurement." *Organizational behavior and human performance* 22 (3): 375–403.
136. Ketokivi, Mikko, and Thomas Choi. 2014. "Renaissance of case research as a scientific method." *Journal of operations management* 32 (5): 232–240.
137. Kian Manesh Rad, Ehsan, Ming Sun, and Frédéric Bosché. 2017. "Complexity for megaprojects in the energy sector." *Journal of Management in Engineering* 33 (4): 04017009.
138. Kim, Jongbae, and David Wilemon. 2003. "Sources and assessment of complexity in NPD projects." *R&d Management* 33 (1): 15–30.
139. Kirkpatick, Shelley A, and Edwin A Locke. 1991. "Leadership: do traits matter?" *Academy of management perspectives* 5 (2): 48–60.
140. Klein, Cameron, Deborah DiazGranados, Eduardo Salas, Huy Le, C Shawn Burke, Rebecca Lyons, and Gerald F Goodwin. 2009. "Does team building work?" *Small group research* 40 (2): 181–222.
141. Kleinschmidt, Elko J, Ulrike De Brentani, and Sören Salomo. 2007. "Performance of global new product development programs: a resource-based view." *Journal of Product innovation management* 24 (5): 419–441.
142. Kozlowski, Steve WJ, and Bradford S Bell. 2003. "Work groups and teams in organizations." *Handbook of psychology: Industrial and organizational psychology* 12: 333–375.
143. Kozlowski, Steve WJ, Georgia T Chao, James A Grand, Michael T Braun, and Goran Kuljanin. 2013. "Advancing multilevel research design: Capturing the dynamics of emergence." *Organizational research methods* 16 (4): 581–615. doi: https://doi.org/10.1177/1094428113493119.
144. Kozlowski, Steve WJ, and Daniel R Ilgen. 2006. "Enhancing the effectiveness of work groups and teams." *Psychological science in the public interest* 7 (3): 77–124.
145. Kozlowski, Steve WJ, Stanton Mak, and Georgia T Chao. 2016. "Team–centric leadership: An integrative review." *Annual Review of Organizational Psychology and Organizational Behavior* 3: 21–54.
146. Kozlowski, Steve WJ, Daniel J Watola, Jaclyn M Jensen, Brian H Kim, and Isabel C Botero. 2009. "Developing adaptive teams: A theory of dynamic team leadership." In *Team effectiveness in complex organizations*, 147–190. Routledge.
147. Krippendorff, Klaus. 2018. *Content analysis: An introduction to its methodology*: Sage publications.
148. Langley, Ann. 1999. "Strategies for theorizing from process data." *Academy of Management review* 24 (4): 691–710.
149. Langley, ANN, Clive Smallman, Haridimos Tsoukas, and Andrew H Van de Ven. 2013. "Process studies of change in organization and management: Unveiling temporality, activity, and flow." *Academy of management journal* 56 (1): 1–13.

150. Larsson, Johan, Per Erik Eriksson, Thomas Olofsson, and Peter Simonsson. 2015. "Leadership in civil engineering: Effects of project managers' leadership styles on project performance." *Journal of management in engineering* 31 (6): 04015011. doi: https://doi.org/10.1061/(ASCE)ME.1943–5479.0000367.
151. Lee, Dae Sung, Kun Chang Lee, and Young Wook Seo. 2015. "An analysis of shared leadership, diversity, and team creativity in an e–learning environment." *Computers in Human Behavior* 42: 47–56.
152. LePine, Jeffery A, Ronald F Piccolo, Christine L Jackson, John E Mathieu, and Jessica R Saul. 2008. "A meta-analysis of teamwork processes: tests of a multidimensional model and relationships with team effectiveness criteria." *Personnel psychology* 61 (2): 273–307.
153. Lichtenstein, Benyamin B, and Donde Ashmos Plowman. 2009. "The leadership of emergence: A complex systems leadership theory of emergence at successive organizational levels." 617–630.
154. Lichtenstein, Benyamin B, Mary Uhl–Bien, Russ Marion, Anson Seers, James Douglas Orton, and Craig Schreiber. 2006. "Complexity leadership theory: An interactive perspective on leading in complex adaptive systems." *Emergence: Complexity & Organization* 8: 2–12.
155. Lipman–Blumen, Jean. 2000. *Connective leadership: Managing in a changing world*: Oxford University Press.
156. Liu, Peng, and Zhizhong Li. 2012. "Task complexity: A review and conceptualization framework." *International Journal of Industrial Ergonomics* 42 (6): 553–568.
157. Liu, Songbo, Jia Hu, Yuhui Li, Zhen Wang, and Xiaoshuang Lin. 2014. "Examining the cross–level relationship between shared leadership and learning in teams: Evidence from China." *The Leadership Quarterly* 25 (2): 282–295.
158. Lord, John, and Peggy Hutchison. 1993. "The process of empowerment: Implications for theory and practice." *Canadian journal of community mental health* 12: 5–5.
159. Lord, Robert G, Douglas J Brown, Jennifer L Harvey, and Rosalie J Hall. 2001. "Contextual constraints on prototype generation and their multilevel consequences for leadership perceptions." *The Leadership Quarterly* 12 (3): 311–338.
160. Lord, Robert G, David V Day, Stephen J Zaccaro, Bruce J Avolio, and Alice H Eagly. 2017. "Leadership in applied psychology: Three waves of theory and research." *Journal of Applied Psychology* 102 (3): 434.
161. Lord, Robert G, Christy L De Vader, and George M Alliger. 1986. "A meta–analysis of the relation between personality traits and leadership perceptions: An application of validity generalization procedures." *Journal of applied psychology* 71 (3): 402.
162. Lord, Robert G, and Jessica E Dinh. 2014. "What have we learned that is critical in understanding leadership perceptions and leader–performance relations?" *Industrial and Organizational Psychology* 7 (2): 158–177. doi: https://doi.org/10.1111/iops.12127.
163. Lord, Robert G, Jessica E Dinh, and Ernest L Hoffman. 2015. "A quantum approach to time and organizational change." *Academy of Management Review* 40 (2): 263–290.
164. Lorinkova, Natalia M, and Kathryn M Bartol. 2021. "Shared leadership development and team performance: A new look at the dynamics of shared leadership." *Personnel Psychology* 74 (1): 77–107.

165. Lu, Yunbo, Lan Luo, Hongli Wang, Yun Le, and Qian Shi. 2015. "Measurement model of project complexity for large–scale projects from task and organization perspective." *International journal of project management* 33 (3): 610–622.
166. Lundin, Rolf A, and Anders Söderholm. 1995. "A theory of the temporary organization." *Scandinavian Journal of management* 11 (4): 437–455.
167. Luo, Lan, Qinghua He, Edward J Jaselskis, and Jianxun Xie. 2017. "Construction project complexity: Research trends and implications." *Journal of construction engineering and management* 143 (7): 04017019.
168. Lyndon, Shiji, and Ashish Pandey. 2021. "Deconstructing the shared leadership emergence process in entrepreneurial teams." *Journal of Small Business and Enterprise Development* 28 (3): 360–379. doi: https://doi.org/10.1108/JSBED–04–2020–0136.
169. Manz, Charles C, David E Keating, and Anne Donnellon. 1990. "Preparing for an organizational change to employee self–management: The managerial transition." *Organizational dynamics* 19 (2): 15–26.
170. Manz, Charles C, and Henry P Sims Jr. 1980. "Self–management as a substitute for leadership: A social learning theory perspective." *Academy of Management review* 5 (3): 361–367.
171. Marchiondo, Lisa A, Christopher G Myers, and Shirli Kopelman. 2015. "The relational nature of leadership identity construction: How and when it influences perceived leadership and decision–making." *The Leadership Quarterly* 26 (5): 892–908.
172. Marion, Russ, and Mary Uhl–Bien. 2001. "Leadership in complex organizations." *The leadership quarterly* 12 (4): 389–418.
173. Marion, Russ, and Mary Uhl–Bien. 2003. "Complexity theory and Al–Qaeda: Examining complex leadership." *Emergence* 5 (1): 54–76.
174. Marks, Michelle A, John E Mathieu, and Stephen J Zaccaro. 2001. "A temporally based framework and taxonomy of team processes." *Academy of management review* 26 (3): 356–376.
175. Martinsuo, Miia, and Martina Huemann. 2021. "Designing case study research." *International journal of project management* 39 (5): 417–421.
176. Mathieu, John E, Peter T Gallagher, Monique A Domingo, and Elizabeth A Klock. 2019. "Embracing complexity: Reviewing the past decade of team effectiveness research." *Annual Review of Organizational Psychology and Organizational Behavior* 6: 17–46.
177. Mathieu, John E, John R Hollenbeck, Daan van Knippenberg, and Daniel R Ilgen. 2017. "A century of work teams in the Journal of Applied Psychology." *Journal of applied psychology* 102 (3): 452.
178. Maylor, Harvey, Kate Blackmon, and Martina Huemann. 2017. *Researching business and management*. London: Palgrave.
179. Maylor, Harvey, Richard Vidgen, and Stephen Carver. 2008. "Managerial complexity in project–based operations: A grounded model and its implications for practice." *Project Management Journal* 39 (1_suppl): S15–S26.
180. Mayo, E. 1933. "The human problems of an industrial civilization, by Elton Mayo." *NY: Macmillian*.

181. Mayr, Ernst. 1988. "Is biology an autonomous science?" *Toward a New Philosophy of Biology*: 8–21.
182. McGrath, JE. 1962. "Leadership behavior: some requirements for leadership training United States Civil Service Commission." *Office of Career Development*.
183. Meuser, Jeremy D, William L Gardner, Jessica E Dinh, Jinyu Hu, Robert C Liden, and Robert G Lord. 2016. "A network analysis of leadership theory: The infancy of integration." *Journal of management* 42 (5): 1374–1403.
184. Meyer, Alan D, Vibha Gaba, and Kenneth A Colwell. 2005. "Organizing far from equilibrium: Nonlinear change in organizational fields." *Organization science* 16 (5): 456–473.
185. Miles, D Anthony. 2017. "A taxonomy of research gaps: Identifying and defining the seven research gaps." Doctoral student workshop: finding research gaps–research methods and strategies, Dallas, Texas.
186. Morgan, Conwy Lloyd. 1927. *Emergent Evolution: The Gifford Lectures... 1922*: Williams and Norgate.
187. Morgan, Lloyd C. 1933. *The emergence of novelty*. Edited by First Edition. London: William and Norgate.
188. Morgeson, Frederick P, D Scott DeRue, and Elizabeth P Karam. 2010. "Leadership in teams: A functional approach to understanding leadership structures and processes." *Journal of management* 36 (1): 5–39.
189. Mueller, Maximilian. 2021. "Empirical research into shared leadership in a product development project in the automotive industry." 9th Scientific Conference with international Participation. All about people: Digital Transformation in Science, Education and Arts, Maribor.
190. Mueller, Maximilian, Constanta–Nicolet Bodea, and Mladen Radujković. 2023. "Shared Leadership Emergence in Product Development Project Teams—A Reflective Practice Perspective." *Open Journal of Leadership* 12 (2): 144–159. doi: https://doi.org/10.4236/ojl.2023.122010.
191. Muethel, Miriam, and Martin Hoegl. 2016. "Expertise coordination over distance: Shared leadership in dispersed new product development teams." *Leadership lessons from compelling contexts* 8: 327–348. doi: https://doi.org/10.1108/S1479–357120160000008012.
192. Müller, Ralf, Shankar Sankaran, Nathalie Drouin, Anne–Live Vaagaasar, Michiel C Bekker, and Karuna Jain. 2018. "A theory framework for balancing vertical and horizontal leadership in projects." *International Journal of Project Management* 36 (1): 83–94.
193. Müller, Ralf, and J Rodney Turner. 2007. "Matching the project manager's leadership style to project type." *International Journal of Project Management* 25 (1): 21–32.
194. Müller, Ralf, and Rodney Turner. 2006. "Choosing appropriate project managers: Matching their leadership style to the type of project."
195. Müller, Ralf, and Rodney Turner. 2010. "Leadership competency profiles of successful project managers." *International Journal of project management* 28 (5): 437–448.
196. Murphy, Albert J. 1941. "A study of the leadership process." *American Sociological Review*: 674–687.

197. Neuman, William Lawrence. 2014. *Basics of social research*. Toronto: Pearson.
198. Newman, Mark. 2018. *Networks*: Oxford university press.
199. Nicolaides, Vias C, Kate A LaPort, Tiffani R Chen, Alan J Tomassetti, Eric J Weis, Stephen J Zaccaro, and Jose M Cortina. 2014. "The shared leadership of teams: A meta–analysis of proximal, distal, and moderating relationships." *The leadership quarterly* 25 (5): 923–942. doi: https://doi.org/10.1016/j.leaqua.2014.06.006.
200. Novikov, Valentin. 2016. "Shared leadership in a department of defense acquisition project management team." *The Coastal Business Journal* 15 (1): 15.
201. O'Toole, James, Jay Galbraith, and Edward E Lawler III. 2002. "When two (or more) heads are better than one: The promise and pitfalls of shared leadership." *California management review* 44 (4): 65–83.
202. Oedewald, Pia, and Nadezhda Gotcheva. 2015. "Safety culture and subcontractor network governance in a complex safety critical project." *Reliability engineering & system safety* 141: 106–114.
203. Osborn, Richard N, James G Hunt, and Lawrence R Jauch. 2002. "Toward a contextual theory of leadership." *The leadership quarterly* 13 (6): 797–837.
204. Osborn, Richard N, and James G Jerry Hunt. 2007. "Leadership and the choice of order: Complexity and hierarchical perspectives near the edge of chaos." *The Leadership Quarterly* 18 (4): 319–340.
205. Park, Jong Gyu. 2018. "Shared Leadership in Project Teams: A Qualitative Examination of Theoretical Themes, Antecedents, and Outcomes." PhD, The Pennsylvania State University.
206. Pearce, Craig L. 2004. "The future of leadership: Combining vertical and shared leadership to transform knowledge work." *Academy of Management Perspectives* 18 (1): 47–57.
207. Pearce, Craig L, and Jay A Conger. 2003. *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks, London, New Delhi: Sage Publications.
208. Pearce, Craig L, and Henry P Sims. 2000. "Shared leadership: Toward a multi–level theory of leadership." *Team Development* 7: 115–139.
209. Pearce, Craig L, and Henry P Sims Jr. 2002. "Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational, and empowering leader behaviors." *Group dynamics: Theory, research, and practice* 6 (2): 172.
210. Pearce, Craig Lewis. 1997. "The determinants of change management team (CMT) effectiveness: A longitudinal investigation." Doctor of Philosophy, University of Maryland, College Park.
211. Perry, Monica L, Craig L Pearce, and Henry P Sims Jr. 1999. "Empowered selling teams: How shared leadership can contribute to selling team outcomes." *Journal of Personal Selling & Sales Management* 19 (3): 35–51.
212. Plowman, Donde Ashmos, Stephanie Solansky, Tammy E Beck, LaKami Baker, Mukta Kulkarni, and Deandra Villarreal Travis. 2007. "The role of leadership in emergent, self–organization." *The leadership quarterly* 18 (4): 341–356.
213. PMI. 2021. Talent gap: Ten-year employment trends, costs, and global implications. https://www.pmi.org/learning/careers/talent-gap-2021.

214. Pokorny, Jennifer J, Alex Norman, Anthony P Zanesco, Susan Bauer–Wu, Baljinder K Sahdra, and Clifford D Saron. 2018. "Network analysis for the visualization and analysis of qualitative data." *Psychological methods* 23 (1): 169.
215. Polanyi, Michael. 1967. *The tacit dimension*. London: Routledge and Kegan Paul.
216. Ponti, Marisa. 2012. "Uncovering causality in narratives of collaboration: Actor–network theory and event structure analysis." *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research.* 13(1) Art 11.
217. Qureshi, Sheheryar Mohsin, and ChangWook Kang. 2015. "Analysing the organizational factors of project complexity using structural equation modelling." *International journal of project management* 33 (1): 165–176.
218. Rajasekar, D, and Rajesh Verma. 2013. *Research methodology*: Archers & Elevators Publishing House.
219. Rapp, Tammy, Travis Maynard, Monique Domingo, and Elizabeth Klock. 2021. "Team emergent states: What has emerged in the literature over 20 years." *Small Group Research* 52 (1): 68–102.
220. Reimer, Torsten, Tillman Russell, and Christopher Roland. 2017. "Groups and teams in organizations." *The International Encyclopedia of Organizational Communication*: 1–23.
221. Remington, Kaye, and Julien Pollack. 2007. *Tools for complex projects*: Routledge.
222. Robert Jr, Lionel P, and Sangseok You. 2018. "Are you satisfied yet? Shared leadership, individual trust, autonomy, and satisfaction in virtual teams." *Journal of the association for information science and technology* 69 (4): 503–513.
223. Robins, Garry, and Jennifer Boldero. 2003. "Relational discrepancy theory: The implications of self–discrepancy theory for dyadic relationships and for the emergence of social structure." *Personality and social psychology review* 7 (1): 56–74.
224. Rose, Robert, Lars Groeger, and Katharina Hölzle. 2021. "The Emergence of Shared Leadership in Innovation Labs." *Frontiers in Psychology* 12: 1–13.
225. Rosenthal, Cindy Simon. 1998. "Determinants of collaborative leadership: Civic engagement, gender or organizational norms?" *Political research quarterly* 51 (4): 847–868. doi: https://doi.org/10.1177/106591299805100401.
226. San Cristóbal, José R, Luis Carral, Emma Diaz, José A Fraguela, and Gregorio Iglesias. 2018. "Complexity and project management: A general overview." *Complexity* 2018.
227. Sawyer, R Keith. 2005. *Social emergence: Societies as complex systems*. Cambridge: Cambridge University Press.
228. Scandura, Terri A, George B Graen, and Michael A Novak. 1986. "When managers decide not to decide autocratically: An investigation of leader–member exchange and decision influence." *Journal of applied psychology* 71 (4): 579.
229. Scott–Young, Christina M, Maged Georgy, and Andrew Grisinger. 2019. "Shared leadership in project teams: An integrative multi–level conceptual model and research agenda." *International Journal of Project Management* 37 (4): 565–581. doi: https://doi.org/10.1016/j.ijproman.2019.02.002.
230. Seers, Anson. 1989. "Team–member exchange quality: A new construct for role–making research." *Organizational behavior and human decision processes* 43 (1): 118–135.

231. Seers, Anson. 1996. "Better leadership through chemistry: Toward a model of emergent shared team leadership." *Advances in interdisciplinary studies of work teams* 3: 145–72.
232. Serban, Andra, and Ashley JB Roberts. 2016. "Exploring antecedents and outcomes of shared leadership in a creative context: A mixed–methods approach." *The leadership quarterly* 27 (2): 181–199.
233. Serban, Andra, Francis J Yammarino, Shelley D Dionne, Surinder S Kahai, Chanyu Hao, Kristie A McHugh, Kristin Lee Sotak, Alexander BR Mushore, Tamara L Friedrich, and David R Peterson. 2015. "Leadership emergence in face–to–face and virtual teams: A multi–level model with agent–based simulations, quasi–experimental and experimental tests." *The Leadership Quarterly* 26 (3): 402–418.
234. Sergi, Viviane, Lucia Crevani, and Monique Aubry. 2020. Process studies of project organizing. SAGE Publications Sage CA: Los Angeles, CA.
235. Shenhar, Aaron, Dov Dvir, Dragan Milosevic, Jerry Mulenburg, Peerasit Patanakul, Richard Reilly, Michael Ryan, Andrew Sage, Brian Sauser, and Sabin Srivannaboon. 2005. "Toward a NASA–specific project management framework." *Engineering Management Journal* 17 (4): 8–16.
236. Shenhar, Aaron J. 2001. "One size does not fit all projects: Exploring classical contingency domains." *Management science* 47 (3): 394–414.
237. Shenhar, Aaron J, and Dov Dvir. 1996. "Toward a typological theory of project management." *Research policy* 25 (4): 607–632.
238. Shenhar, Aaron J, and Dov Dvir. 2007a. "How projects differ and what to do about it." In *The Wiley Guide to Project, Program and Portfolio Management*, 177–198. Hoboken, New Jersey: John Wiley & Sons, Inc.
239. Shenhar, Aaron J, and Dov Dvir. 2007b. *Reinventing project management: the diamond approach to successful growth and innovation*: Harvard Business Review Press.
240. Shenhar, Aaron J, Dov Dvir, Thomas Lechler, and Michael Poli. 2002. "One size does not fit all: True for projects, true for frameworks." Proceedings of PMI research conference.
241. Shenhar, Aaron J, Vered Holzmann, Benjamin Melamed, and Yao Zhao. 2016. "The challenge of innovation in highly complex projects: What can we learn from Boeing's Dreamliner experience?" *Project Management Journal* 47 (2): 62–78.
242. Sivasubramaniam, Nagaraj, William D Murry, Bruce J Avolio, and Dong I Jung. 2002. "A longitudinal model of the effects of team leadership and group potency on group performance." *Group & Organization Management* 27 (1): 66–96.
243. Skulmoski, Gregory J, and Francis T Hartman. 2010. "Information systems project manager soft competencies: A project–phase investigation." *Project Management Journal* 41 (1): 61–80.
244. Small, Erika Engel, and Joan R Rentsch. 2010. "Shared leadership in teams: A matter of distribution." *Journal of Personnel Psychology* 9 (4): 203–211.
245. Snowden, David J, and Mary E Boone. 2007. "A leader's framework for decision making." *Harvard business review* 85 (11): 68.
246. Solomon, Adrian, Frank J Loeffler, and George H Frank. 1953. "An analysis of co–therapist interaction in group psychotherapy." *International Journal of Group Psychotherapy* 3 (2): 171–180.

247. Sousa, Milton, and Dirk Van Dierendonck. 2016. "Introducing a short measure of shared servant leadership impacting team performance through team behavioral integration." *Frontiers in psychology* 6: 2002.
248. Stacey, Ralph D. 1995. "The science of complexity: An alternative perspective for strategic change processes." *Strategic management journal* 16 (6): 477–495.
249. Stein, R Timothy, and Tamar Heller. 1979. "An empirical analysis of the correlations between leadership status and participation rates reported in the literature." *Journal of Personality and Social Psychology* 37 (11): 1993.
250. Steinheider, Brigitte, and Todd Wuestewald. 2014. "From the bottom–up: Sharing leadership in a police agency." In *Police Reform from the Bottom Up*, 39–57. Routledge.
251. Stevenson, William, Heidi Zinzow, and Sanjeev Sridharan. 2003. "Using event structure analysis to understand planned social change." *International Journal of Qualitative Methods* 2 (2): 43–52.
252. Stewart, Greg L, and Charles C Manz. 1995. "Leadership for self–managing work teams: A typology and integrative model." *Human relations* 48 (7): 747–770.
253. Stogdill, Ralph M. 1948. "Personal factors associated with leadership: A survey of the literature." *The Journal of psychology* 25 (1): 35–71.
254. Stone, Thomas H, and William H Cooper. 2009. "Emerging credits." *The Leadership Quarterly* 20 (5): 785–798.
255. Strickland, Lloyd H, Paul D Guild, John C Barefoot, and Stuart A Paterson. 1978. "Teleconferencing and leadership emergence." *Human relations* 31 (7): 583–596.
256. Sweeney, Anne, Nicholas Clarke, and Malcolm Higgs. 2019. "Shared leadership in commercial organizations: A systematic review of definitions, theoretical frameworks and organizational outcomes." *International Journal of Management Reviews* 21 (1): 115–136. doi: https://doi.org/10.1111/ijmr.12181.
257. Takeuchi, Hirotaka, and Ikujiro Nonaka. 1986. "The new new product development game." *Harvard business review* 64 (1): 137–146.
258. Tatikonda, Mohan V, and Stephen R Rosenthal. 2000. "Technology novelty, project complexity, and product development project execution success: a deeper look at task uncertainty in product innovation." *IEEE Transactions on engineering management* 47 (1): 74–87.
259. Thompson, James D. 1967. *Organizations in action: Social science bases of administrative theory*: New York: McGraw–Hill.
260. Tsoukas, Haridimos, and Robert Chia. 2002. "On organizational becoming: Rethinking organizational change." *Organization science* 13 (5): 567–582.
261. Tuckman, Bruce W, and Mary Ann C Jensen. 1977. "Stages of small–group development revisited." *Group & organization studies* 2 (4): 419–427.
262. Turner, CE. 1933. "Test room studies in employee effectiveness." *American Journal of Public Health and the Nations Health* 23 (6): 577–584.
263. Turner, J Rodney, and Ralf Müller. 2003. "On the nature of the project as a temporary organization." *International journal of project management* 21 (1): 1–8.
264. Turner, J Rodney, and Ralf Müller. 2005. "The project manager's leadership style as a success factor on projects: A literature review." *Project management journal* 36 (2): 49–61.

265. Turner, John Rodney, John Rodney Turner, and Turney Turner. 2008. *The handbook of project–based management: improving the processes for achieving strategic objectives*. 3rd ed: McGraw Hill Companies.
266. Uhl–Bien, Mary. 2006. "Relational leadership theory: Exploring the social processes of leadership and organizing." *The leadership quarterly* 17 (6): 654–676.
267. Uhl–Bien, Mary, and Michael Arena. 2017. "Complexity leadership: enabling people and organizations for adaptability." *Organizational dynamics* 46 (1): 9–20.
268. Uhl–Bien, Mary, Russ Marion, and Bill McKelvey. 2007. "Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era." *The leadership quarterly* 18 (4): 298–318. doi: https://doi.org/10.1016/j.leaqua.2007.04.002.
269. University, Cambridge. 2024. "Cambridge Dictionary." accessed January 1, 2024. https://dictionary.cambridge.org/de/worterbuch/englisch/culture.
270. Van Knippenberg, Daan, and Michael A Hogg. 2003. "A social identity model of leadership effectiveness in organizations." *Research in organizational behavior* 25: 243–295.
271. Victoria, Akpa, Asikhia Olalekan, and Adeleke Adedeji Abraham. 2021. "Leadership: A Review of Definitions and Theories." *International Journal of Advances in Engineering and Management* 3 (1): 273–291.
272. Vroom, Victor H, and Philip W Yetton. 1973. *Leadership and decision–making*. Vol. 110. Pittsburgh: University of Pittsburgh Press.
273. Wahyuni, Dina. 2012. "The research design maze: Understanding paradigms, cases, methods and methodologies." *Journal of applied management accounting research* 10 (1): 69–80.
274. Waldman, David A, and Leanne E Atwater. 1994. "The nature of effective leadership and championing processes at different levels in a R&D hierarchy." *The Journal of High Technology Management Research* 5 (2): 233–245.
275. Walker, Derek HT, Peter R Davis, and Andrew Stevenson. 2017. "Coping with uncertainty and ambiguity through team collaboration in infrastructure projects." *International Journal of Project Management* 35 (2): 180–190.
276. Wang, Danni, David A Waldman, and Zhen Zhang. 2014. "A meta–analysis of shared leadership and team effectiveness." *Journal of applied psychology* 99 (2): 181. doi: https://psycnet.apa.org/doi/10.1037/a0034531.
277. Wang, Qi, Xiaoqin Wang, Yaolong Chen, and Kehu Yang. 2016. "Research gap of guidelines might be an important approach to prioritization (Letter commenting on: J Clin Epidemiol. 2015; 68: 341–6)." *Journal of clinical epidemiology* 69: 251–252.
278. Wheatley, Margaret. 2006. *Leadership and the new science: Discovering order in a chaotic world*. 3 ed. San Francisco: Berrett–Koehler.
279. Whyte, Jennifer, Angelos Stasis, and Carmel Lindkvist. 2016. "Managing change in the delivery of complex projects: Configuration management, asset information and 'big data'." *International journal of project management* 34 (2): 339–351.
280. Williams, Terry. 2005. "Assessing and moving on from the dominant project management discourse in the light of project overruns." *IEEE Transactions on engineering management* 52 (4): 497–508.

281. Williams, Terry M. 1999. "The need for new paradigms for complex projects." *International journal of project management* 17 (5): 269–273.
282. Wu, Qiong, and Kathryn Cormican. 2016. "Shared leadership and team creativity: A social network analysis in engineering design teams." *Journal of technology management & innovation* 11 (2): 2–12.
283. Wu, Qiong, Kathryn Cormican, and Guoquan Chen. 2020. "A meta–analysis of shared leadership: Antecedents, consequences, and moderators." *Journal of Leadership & Organizational Studies* 27 (1): 49–64.
284. Xia, Weidong, and Gwanhoo Lee. 2005. "Complexity of information systems development projects: conceptualization and measurement development." *Journal of management information systems* 22 (1): 45–83.
285. Yammarino, Francis. 2013. "Leadership: Past, present, and future." *Journal of Leadership & Organizational Studies* 20 (2): 149–155.
286. Yang, Qing, Ting Lu, Tao Yao, and Bo Zhang. 2014. "The impact of uncertainty and ambiguity related to iteration and overlapping on schedule of product development projects." *International Journal of Project Management* 32 (5): 827–837.
287. Yin, Robert K. 2018. *Case study research and applications*. Los Angeles: Sage.
288. Youker, Robert. 1999. "The difference between different types of projects." Proceedings of the 30th Annual Project Management Institute 1999 Seminars & Symposium, Philadelphia, PA, USA.
289. Yukl, Gary, and William L. Gardner. 2020. *Leadership in Organizations*. 9th ed: Pearson Education Limited.
290. Zaccaro, Stephen J, Andrea L Rittman, and Michelle A Marks. 2001. "Team leadership." *The leadership quarterly* 12 (4): 451–483. doi: https://doi.org/10.1016/S1048–9843(01)00093–5.
291. Zhou, Wencang. 2013. "Shared leadership in teams: An empirical study of dispositional antecedents." Academy of Management Proceedings.
292. Zhou, Wencang. 2016. "When does shared leadership matter in entrepreneurial teams: the role of personality composition." *International Entrepreneurship and Management Journal* 12 (1): 153–169.
293. Zhu, Jin, and Ali Mostafavi. 2017. "Discovering complexity and emergent properties in project systems: A new approach to understanding project performance." *International journal of project management* 35 (1): 1–12.

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