Errata Notice

The influence of governance and complexity on project outcomes in international development

Author of Notice: Javad Bakhshi

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Errata:

On the Acknowledgments page, the following text:

"I also thank Mrs. Valerie Williams for her excellent English language knowledge, which has helped me improve my expression in English. "

Amendments:

Should be amended to read:

"I also thank Ms. Valerie Williams for her excellent English language knowledge, which has helped me improve my expression in English. Furthermore, I acknowledge the assistance of AI writing tools, including Grammarly and Wand.ai, for their support in editing and proofreading the thesis. Their contributions have been invaluable across the document."

The influence of governance and complexity on project outcomes in international development

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Javad Bakhshi

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School of Project Management

Faculty of Engineering

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Author Attribution

The work contained in the body of this thesis, except otherwise acknowledged, is the result of my own investigations.

This thesis contains material published in [Bakhshi, J., Ireland, V., & Gorod, A. (2016). Clarifying the project complexity construct: Past, present and future. International journal of project management, 34(7), 1199-1213]. This includes some of Chapter two's material, pages 26-44].

In addition to the statements above, in cases where I am not the corresponding author of a published item, permission to include the published material has been granted by the corresponding author.

Javad Bakhshi *30/06/2023*

As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

Professor Lynn Crawford *07/07/2023*

Thesis statement of originality

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Javad Bakhshi | June 2023

Acknowledgments

I am thankful to my supervisors, Professors Lynn Crawford and Petr Matous, for all their support and help. Without them, I could never have completed this thesis. I also thank Mrs. Valerie Williams for her excellent English language knowledge, which has helped me improve my expression in English. I would also like to thank my family and parents for their positive and supportive thoughts. Last, I would like to thank my beautiful son, Sooshian, who made me feel like the best person in the world.

در کوی نیکنامی ما را گذر ندادند / گر تو نمی پسندی تغییر کن قضا را

Upon the path of honour, our passage was denied/ If it's not your wish, let fate's course decide.

(Hafez, 14th century)

Thesis Highlights

- Comprehensive analysis of international development projects over the past two decades.
- Exploring the link between governance and project outcomes at both national and project levels.
- Evaluating how governance indicators influence the success of international development projects.
- Applying complexity theories within the realm of international development.
- Offering a range of governance network models and their effects on development project outcomes.
- Identifying key factors impacting international development project performance, utilising Natural Language Processing (NLP).
- Investigating how complexity affects governance frameworks, with the goal of enhancing the efficacy of governance practices in various settings.

Abstract

In this study, the impact of governance on the outcomes of international development projects is assessed and role of complexity in moderating this relationship is explored. Governance, in this context, includes definition of relationships, principles, rights and rules for different participants and stakeholders and the process of controlling project behaviour, together with ensuring its status remains within the boundaries of the subject project's objectives. International development projects are essentially collaborative and are in many cases highly complex due to the number and nature of relationships, external context and other factors. Over the past 70 years, the United Nations (UN) has mediated the distribution of trillions of dollars of development aid. Even though most of this aid has failed to deliver the expected outcomes for which it was assigned, a significant proportion of projects can be considered successful. The question posed by this study is: how does governance affect international development project outcomes and to what extent is this relationship moderated by project complexity? No study has yet comprehensively documented the relationship of governance and complexity, when invoked to deliver project outcomes in aid projects.

The research question is addressed using a multi-method approach drawing upon records of the World Bank's projects over the past 20 years. Almost 7,000 projects and 250,000 contracts were reviewed, resulting in an empirical data set of 3,683 projects. Results of the study confirm that governance, at both the national and project levels, positively impacts on the achievement of project objectives; however, no evidence was found for a similar influence on the on-time completion of projects. A strong positive relationship was not found between project outcomes and governance at the national level but 12 complexity factors were found to moderate the relationship between governance and project outcomes. Most complexity proxies negatively moderated the influence of governance on project outcomes; however, the study revealed the existence of positive relationships between some variables. The relationship between complexity factors and project outcomes and their effects on governance status with project outcomes were tested using a Logistic Regression Model. All complexity factors were found to have marginal effects on governance and project outcomes with varying levels of probability. The research results recognised different governance networks for their efforts to address project complexity. Results contribute to understanding of the influence of governance on project outcomes when affected by different complexity factors and will be of interest to countries, local governments, the UN and financial institutions alike when establishing governance mechanisms.

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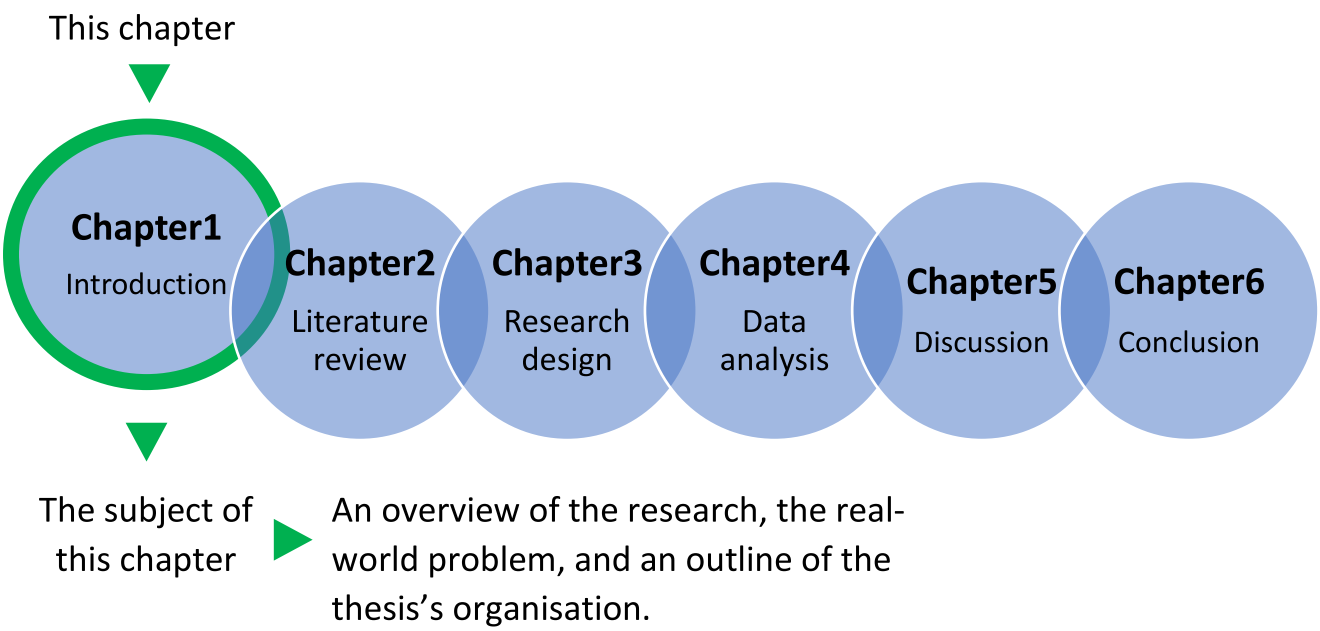
Appendices

Chapter 1



1.1 Preface

My enthusiasm and curiosity have sown the seed of this thesis. I was born during the war between Iran and Iraq in 1981. My first vocational ambition was to become a medical doctor, but my childhood dream was shattered by war, aggression, fear, poverty, unfairness and uncertainty. One year after the war, my hometown was hit by a major earthquake, with its epi-centre being the nearby city of Manjil–Rudbar and a total death toll of about 50,000 and 100,000 people injured. For many days, we had to live on the streets due to the uncertainty of what would happen next! From my childhood memories, I am deeply aware of how international aid and post-disaster projects are crucial for people who need them. Therefore, I set out on my PhD journey with the aim of investigating international development (ID) projects. I also understand the role of governance and governmentality in the outcomes and performance of international development projects, with this being the main focus of current research.

As I grew to adulthood, I realised I had experienced a ***complex*** situation. Years later, I read Donald Rumsfeld's statement (2002), "there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say, we know some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know". I realised that most of my childhood had passed subject to uncertainty and complexity!

Time passed. I decided to gain experience in industry at the age of 19 while I was studying for my undergraduate degree. In 2001, I began working as a quality assurance officer in a large company. There, I became curious about collaboration between universities and industry. The commercialisation of innovation and ideas led me to jointly found my own company in 2006. At the same time, I graduated with a Master's degree for which I had to write my first article. I then became engaged in different state and private sector projects and grants.

After eight years of hard work in entrepreneurship and academia, I moved to Australia to expand my academic life. I joined the Master of Philosophy (MPhil) program at the University of Adelaide to gain a deeper understanding of complexity in projects, becoming familiar with new research designs and processes. Consequently, I focused in my studies on the nature of different project types by considering the leading schools of thought, with my research outcomes successfully presented at a Project Management Institute (PMI) conference and published in two high-ranking related journals. I was then presented with an Australian Postgraduate Award to study for a PhD degree.

Throughout these years, I have experienced various challenges and problems in my professional and academic life. For me, complexity is not attributed to constraints and difficulties but to the nature of a system that is prone to becoming complex. Complex systems embody systems known for their high levels of: (1) uncertainty; (2) ambiguity; and (3) unpredictability which, in general, defy the linear and reductionist thinking rationales. Each system requires a unique mindset if seeking to comprehend and manage it in an efficient manner, or at least the alternative ‘thinking outside the box’ method can be followed, allowing problems to be approached in a different manner. The complexity thinking approach is the core of this thesis.

1.2. Introduction

International development (ID) projects constitute the dominant means through which financial aid is distributed between eligible countries. Over the last 70 years, the distribution of trillions of dollars of development aid has been, and is, mediated through the United Nations (UN). However, the outcomes of many of these projects have fallen short of expectations (Chambers et al., 2022; Ika, 2012). Even though the obvious question is what factors contribute to the success or failure of projects, no study has yet comprehensively documented the relationship between the governance arrangements applied when delivering aid projects and achieving project outcomes. This study seeks to address the critical gap by examining the intricate interplay between governance arrangements, project complexity, and project outcomes in the context of international development projects.

International development projects encompass a diverse range of initiatives, including medium to large or mega public projects and programs. These projects are typically funded and implemented by international organisations, governments, non-governmental organisations (NGOs), and other entities (Youker, 1999). Their primary goal is to improve living conditions, reduce poverty, enhance infrastructure, provide access to education and healthcare, and address various development challenges in the target areas (Ahsan & Gunawan, 2010). As with other projects, international development projects deliver goods or services. Initially, the majority of projects were classified as ***hard*** projects, such as civil engineering works, railways, power plants, and so on. However, the project portfolio has evolved to encompass a growing proportion of ***soft*** projects, including those associated with education, health, human development, capacity building, and more. (Diallo & Thuillier, 2005; Kacou et al., 2022; Youker, 2003). For about 70 years, a substantial investment has been made in international development projects, with the outcomes of some projects not reported (Ika et al., 2020). Although many projects in this endeavour fail to deliver the much-needed effect for beneficiaries (Andrews, 2018; Banerjee et al., 2011; Ika, 2012), many successful international development projects are conducted (Feeny & Vuong, 2017; Honig, 2018; Ika et al., 2020). Although managerial expectations for project failures in international development and other projects seem similar, appropriate research is lacking that would distinguish them (Ika et al., 2020; Muriithi & Crawford, 2003). International development projects follow transactional processes codified by lending institutions and subject to guidelines to ensure that projects can withstand hardship and are transparent in their conduct and the contracts awarded (Diallo & Thuillier, 2005).This reality gives rise to a paradox within the governance system, where the interests and capabilities of other stakeholders become a matter of concern. Understanding the existing governance systems within projects and identifying areas for potential improvement are major topics to be further assessed (Levie et al., 2017).

International aid development serves as a lifeline for eligible countries, providing essential infrastructure crucial for their national economic growth. The UN has made a major contribution in its role of mediating the delivery of project aid. Since 2000, the World Bank has concluded over 7,000 international development projects (World Bank, 2022). Although it is much appreciated that without efforts by the UN, poverty alleviation and developmental growth would not have been accomplished, it is also true that a considerable number of UN projects have fallen far short of delivering the positive outcomes for which funding was allocated (Riddell, 2008).

Numerous initiatives have been undertaken to identify deficiencies that contribute to project failures. These efforts have been made by various scholars such as (Ika et al., 2020; Jessop, 1998; Stretton, 2018). The following six factors, identified by Ika et al. (2020), are among the many documented components leading to sub-optimal outcomes and can all be viewed through a governance lens: (1) corruption and bias; (2) poor management and skill level of workers; (3) inefficient access to resources; (4) opaque regulatory frameworks; (5) undue government interference; and (6) general policy instability. Despite these governance related challenges, no study has systematically explored the correlation between governance and project outcomes, especially within the context of the inherent complexities associated with international development projects.

Thus, the following questions are asked. How does the governance system impact project outcomes, particularly in light of the ever-evolving complexities inherent in international development endeavours? How does the evolving complexity of international development projects influence the impact of governance systems on project outcomes? What factors/features influence the performance and outcome of international development projects? Given the complexity of international development projects, is there a discernible influence of governance at both national and project levels on fostering project performance, and how do these levels interact? What are the lessons learned from past international development projects concerning governance arrangements?

These and other related questions converted into academic research language, appear later in this introduction and throughout the thesis as the study's findings are analysed and interpreted.

1.3. The dynamics of collaboration

We are entering an era of profound change in science and management knowledge, driven by significant global shifts. As a result of significant incremental global changes and effects, a new thinking pattern needs to be developed. While these changes present challenges, addressing them can lead to simplistic and formulaic solutions in this field. The dynamic and interconnected nature of systems demands a departure from the singular dogma that prevailed in the late medieval period, urging us toward a deeper understanding of complexity and interaction (Snowden, 2002).

Importantly, in the context of international development projects, collaboration stands out as a critical element. These projects involve the coordinated efforts of a diverse array of stakeholders, including aid agencies (funders), various levels of government, implementing agencies, contractors, suppliers, users, and other participants (Hermano et al., 2013; Ika & Donnelly, 2017; Winters, 2010). This collective engagement introduces a high level of collaboration and inherently adds to the complexity of such endeavours.

Recognising and addressing this complexity is paramount. As Snowden (2003); Snowden and Boone (2007) argue, it is crucial to recognise, discuss, and cultivate the emergence of patterns and interactions. In today's interconnected global landscape, the prevalence of complex, global networks underscores the necessity for collaboration, particularly when facing large-scale challenges like the COVID-19 pandemic or global warming. These crises highlight the need for collective action, where collaboration is not just beneficial but essential (Helbing, 2013).

Collaboration, defined as the process where individuals or groups work together towards a common goal (Lai, 2011), becomes vital when a task requires a combination of diverse skills, resources, and knowledge.. Zeng et al. (2008) and Kalay (2001) note that in projects, collaboration not only speeds up task completion but also enhances learning and perspective among participants. Collaboration extends beyond individuals to encompass projects, companies, communities, and even countries. Dietrich et al. (2010) categorise collaboration into three levels: cross-functional collaboration (CFC), project team collaboration (PTC), and inter-organisational relationships (IOC). This thesis focuses on the IOC level, as illustrated in Figure 1.1.

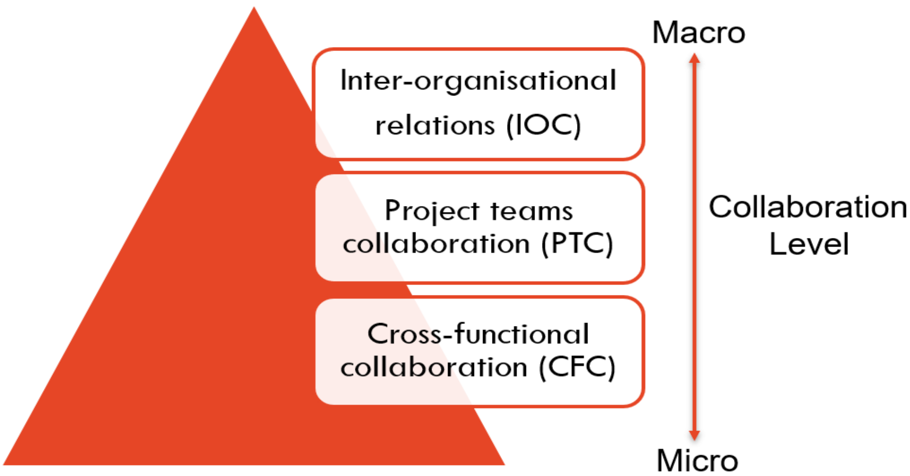


Fig. 1.1 Collaboration levels (Source: Authors' own creation)

In managing projects, especially those with diverse and autonomous actors, complexity is inevitable (Bakhshi, 2016; Picciotto, 2020). International development (ID) projects serve as a prime example of managing collaboration in complex environments (Ika et al., 2010). These projects typically involve a wide range of stakeholders, including national and local state authorities, and various financing, supplying, and implementing agencies, each with their unique goals and approaches (Hermano et al., 2013; Ika & Hodgson, 2014).

Recent literature suggests that the dynamics of collaboration in ID projects differ significantly from those in conventional projects. Factors like cultural diversity, varying stakeholder objectives, and complex donor-host country relationships shape these differences (Ahsan & Gunawan, 2010; Ika & Donnelly, 2017). The governance aspect of this donor-host country relationship is especially pivotal in ID projects. Effective governance not only steers the direction of project execution but also significantly impacts the outcomes (Ika, 2012; Kaboré & Sané, 2022a). Therefore, understanding and managing these governance aspects become essential for the effective administration and realisation of ID projects.

1.4. Brief introduction to project complexity

What does 'complex' mean? How can we characterise and understand whether an issue is complex? Through which theory(s) can we better understand 'complexity'? According to (Ramalingam et al., 2008), concepts from complexity science provide a manner to better describe and understand the dynamics and processes of change within the range of physical and biological phenomena. Complexity theory contributes to an understanding of the nature of complexity and provides ideas for how to deal with and embrace it (Ryan, 2009). It offers a possible way to overcome the difficulties caused by adopting the mechanistic rules of Newtonian physics when examining the modern world's systems which are characterised as complex rather than complicated (Omarova, 2016).

Project complexity may be defined as an intricate arrangement between different interrelated parts which can change and constantly evolve while affecting project objectives (Baccarini, 1996; Bakhshi et al., 2016). Vidal and Marle (2008a, p. 1101) refer to project complexity as "the property of a project which makes it difficult to understand, foresee and keep its overall behaviour under control, even when there exists reasonably complete information about the project system". Baccarini (1996) was the first to define project complexity in its systematic sense by emphasising differentiation and connectivity, while introducing complexity as a subjective concept by focusing on the difficulty of understanding the object. According to Baccarini, structural complexity and project complexity can be inferred based on communication, coordination and control integrity. The uncertainty of objectives and methods of achieving project outcomes are also important factors contributing to a project's complexity (Turner & Cochrane, 1993). These two studies (Baccarini, 1996; Turner & Cochrane, 1993) constitute the foundations for further research and practice in the complex project management literature.

A consensus is found in the complex project management literature with the following findings evident (Bakhshi et al., 2016) and Chapter 2 provides more details:

a) project scope and boundaries are unclear
b) causal mechanisms are not explicit, and simple cause–effect relationships between sections do not apply
c) project tasks, teams and inputs are autonomous and independent
d) predictability is low, and control is impossible to achieve
e) project governance is decentralised
f) project is self-organised and adaptable
g) project exhibits dynamic, emergent and evolving behaviour
h) many plausible options and references exist
i) transparency of objectives, processes, methods, etc. is low

1.5. Research questions

As international development projects are collaboration-oriented and complex, traditional governance approaches are often insufficient, requiring new structures and mechanisms to contribute to developing a better vision to increase the rate of project performance. Project governance approaches are modified from profit maximisation to viability preservation by replacing a reductionist approach with an integrative and holistic mechanism and diverting from symptoms to causal relationships (Müller et al., 2017). Governance constitutes the processes of controlling project behaviour, together with assurance that a project's status lies within the boundaries of its objectives. Governance can be viewed as a continuous monitoring measure that regulates the project to ensure that it remains on the right path (Ireland, 2016). Defining relationships, principles, rights and rules for different participants and stakeholders is another major contribution of governance (Müller, 2016a).

This thesis begins with general observations and thematic questions about the nature of complex collaborative projects and the contribution of governance to improving project outcomes. The study involves analysis of data from World Bank projects. The road map in the next few paragraphs provides an initial orientation. The objectives of this thesis are:

- To provide clarification on the epistemology of governance arrangements, the dynamics of collaboration, and complexity (subjective and objective).
- To assess the contribution of governance indicators to the performance of international development projects
- To understand the variety of governance network designs based on their influence on international development performance across the world.

❖ To identify primary factors affecting the performance of international development projects by considering different governance streams and project complexity.

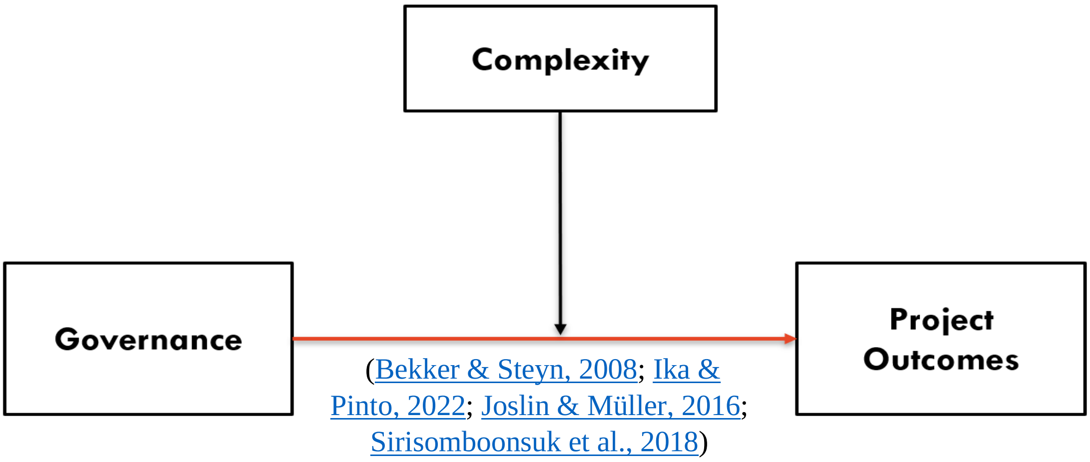


Fig. 1.2 Theoretical framework of this study

Therefore, the main research question immediately below is as follows:

Q1. How does governance affect international development project outcomes and to what extent is this relationship moderated by project complexity?

This then leads to the following research questions:

Q2. How does project complexity affect international development project outcomes?

Q3. Does governance improve the performance of international development projects?

Q4. How does monitoring and evaluation as sound governance impact project outcomes?

Q5. What governing factors have influenced international development project outcomes?

Q6. Is governance more effective in projects implemented by developed countries than in projects by developing or least developed countries?

The current study applies text analysis and classification methods to 20 years of secondary data from the World Bank. The data and information applied here are obtained from three different datasets on the World Bank website: (1) international development project completion dataset; (2) international development project procurement dataset; and (3) worldwide governance indicators. Structural equation modelling (SEM) and social network analysis (SNA) are run to analyse structural relationships between the variables. Chapter 3 provides more information and details.

1.6. Theoretical underpinning of this thesis

This thesis explores the relationship between governance and project outcomes through the lens of complexity theories. These theories serve as the foundation for understanding the multifaceted context and interactions within research variables. They are instrumental in answering key questions about the behaviour of systems and their responses to environmental changes (Eisenhardt & Graebner, 2007).

Complexity science helps us to better understand projects as diverse and living systems such as cells, ecosystems, human beings, and organisations. This approach prioritises holism, focusing on the interconnected patterns within systems rather than reductionism, which breaks down systems into individual components (Zimmerman et al., 1998). Importantly, complexity science is not monolithic but comprises various theories, each shedding light on different characteristics of complex projects. These characteristics and their relevance to governance will be elaborated upon in Chapter 2.To fully grasp complexity science, it is essential to explore related concepts and theories, such as systems thinking, chaos theory, and complex adaptive systems. Boulding's general systems theory (1956) provides a foundational classification of systems based on complexity, ranging from simple frameworks to transcendental systems (see Table 1.1).

Table 1.1

Boulding's classification of systems and their level of complexity (source: Ireland (2013))

Level of Complexity	Example	Characteristics
Level 1	Frameworks	Static structure, linear relationship
Level 2	Clockwork	Dynamic, moving, predictable, must be controlled externally
Level 3	Cybernetic device, such as thermostat	Dynamic, predictable, capable of self-regulation within certain limits
Level 4	The cell	Open, dynamic, programmed for self-maintenance under changing external conditions
Level 5	The plant system	Open, dynamic, genetically determined, capable of self-regulation through wide range of changing external and internal conditions
Level 6	The animal system	Open, dynamic, genetically determined system that adjusts to its environment by making internal adjustments and by forming simple social groups
Level 7	Humans	Open, dynamic, self-regulating, adaptive through wide circumstances due to ability to think abstractly and communicate symbolically
Level 8	The social organisation	More complex than an individual, more open to environmental influence, more adaptive to circumstance due to collective experience and wider reservoir of skills
Level 9	The transcendental	Most freely adaptable to circumstance as it rises above and extends beyond the boundaries of both individuals and social systems

David Snowden's Cynefin framework (1999) further clarifies the concept of complexity. It categorises systems into three types: ordered, complex, and chaotic, each with unique characteristics and implications for decision-making (Snowden, 2002; see Figure 1.3). This framework helps differentiate between various system states, from the predictable 'known unknowns' of simple systems to the unpredictable and emergent nature of complex systems.

The relationship between cause and effect is evident in simple systems, which fall under the domain of "known unknowns". These systems are self-evident, predictable, and repeatable. Complicated systems, on the other hand, involve cause-and-effect relationships that may be debatable and are not self-evident. Expertise and knowledge are required to navigate these systems and overcome their challenges. In both simple and complicated domains, we can rely on sense-categorised and sense-analysed responses, best practices, and good practices. However, there are also unknown unknowns, or areas where we are unaware of what we don't know. Complex systems are characterised by ambiguity, uncertainty, interdependency, non-linearity, unique local conditions, autonomy, emergent behaviours, and indefinite boundaries. Chaotic systems are subject to global crises and disasters, making it necessary to act quickly and apply novel practices to stabilise the situation (Kurtz & Snowden, 2003; Snowden, 2002).

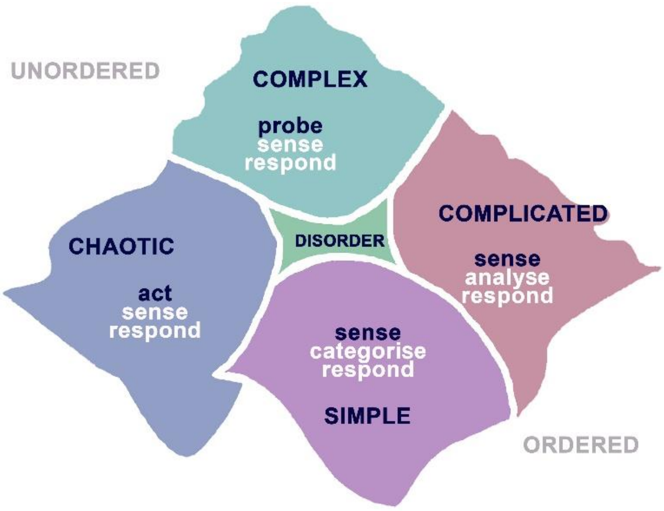


Fig. 1.3 Cynefin framework

(Source: adopted from Snowden and Boone (2007))

A critical question arises: how can we measure complexity within these system classifications? For instance, how do we differentiate the complexity levels of various human tissues in Boulding's system classification? Although much has been written to address this issue, a practical tool for measuring complexity is lacking, and agreement on this point is not found among academics. Addressing this gap, I developed a complexity index framework, known as the DEBACCS Framework, during my Master of Philosophy studies (Bakhshi, 2016). This framework identifies seven dimensions—size, connectivity, autonomy, belonging, context, diversity, and emergence—to measure complexity levels.

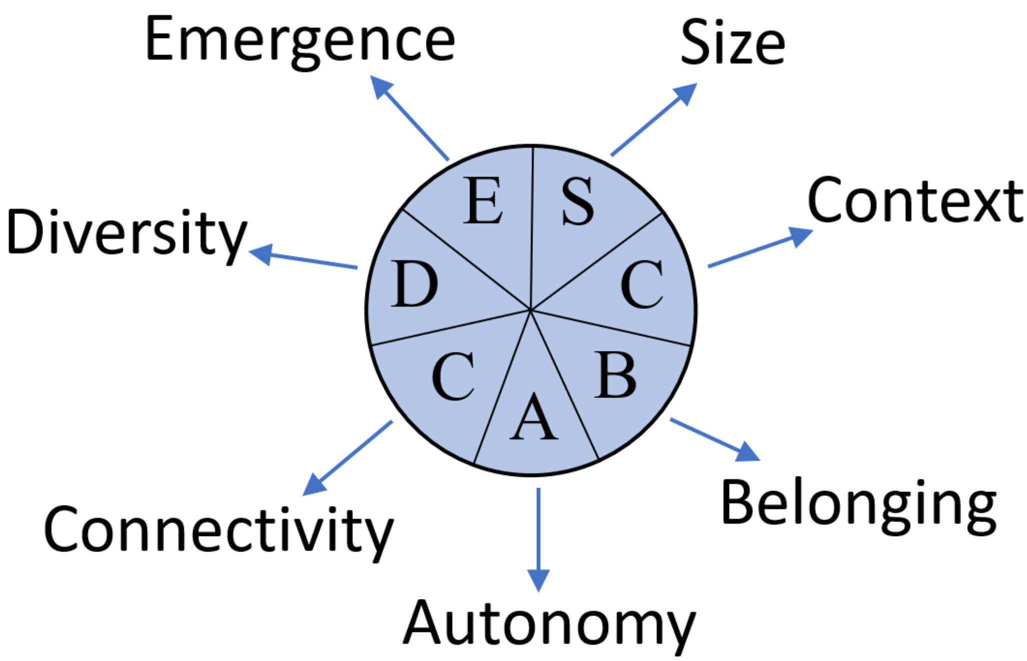


Fig. 1.4 Complexity drivers (Source: Authors' own creation)

A project's context, including its environment and project organisation, is related to the nature, scope and environment in which the needs and expectations of the project are met (Cicmil, 1997; Snowden, 2002). Autonomy is exercised by constituent systems, teams or partners in order to fulfil the purpose of the project. Constituent departments and/or partners choose to be involved as they believe in the overall project while it also assists them with fulfilling their own independent objectives. The ability of agents in a system and/or group to link with other parts of the project is titled ‘connectivity’. Diversity can be defined as the distinct elements or qualities in a group, that is, the variation of social and cultural identities among people in the project. The appearance of new properties or behaviours in the course of the project’s development or evolution is viewed as ‘emergence’ (Boardman & Sauser, 2006; Ireland et al., 2015). Such measures are instrumental in understanding the complexity within various systems, such as differentiating between human body tissues based on these dimensions. This theoretical foundation forms the bedrock of the thesis, providing insights into the complexity inherent in projects and the governance mechanisms that guide them. Detailed discussions on governance theories will be presented in Chapter 2.

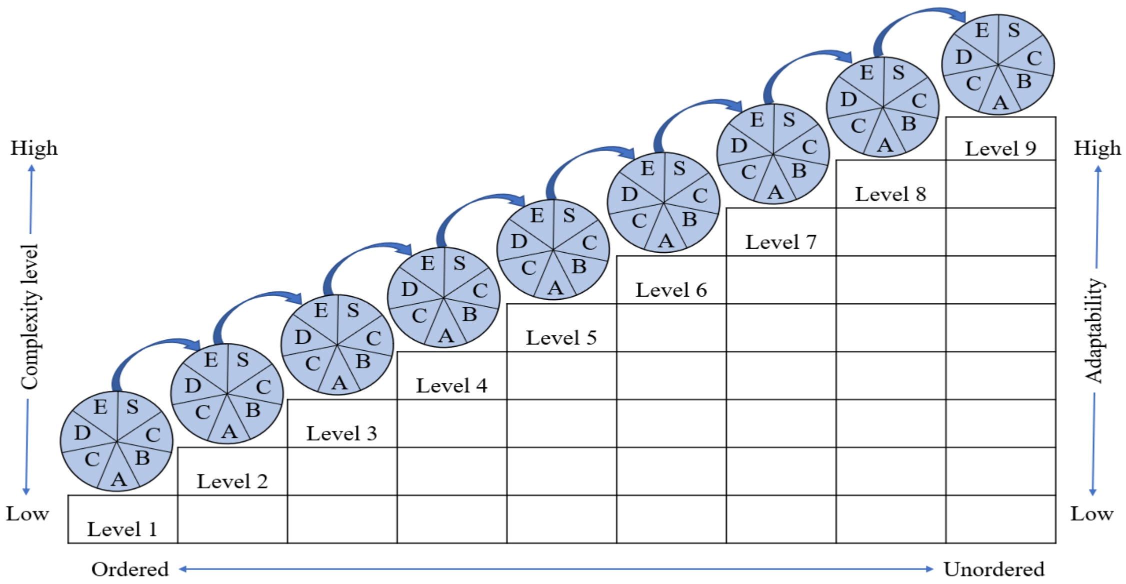


Fig. 1.5 Systems classification and their level of complexity (Source: Authors’ own creation)

1.7. World Bank's project cycle and governance system

The World Bank maintains the largest dataset of development projects, encompassing over 12,000 projects in its lending portfolio since 1947. The governance system is designed to uphold certain principles throughout the project cycle, including country ownership and partnership, project cycle management, monitoring and evaluation, procurement, and financial management.

The project cycle consists of five distinct phases, as shown in Figure 1.6. The preliminary phase involves a systematic country diagnostic and the formulation of a country partnership framework. The identification phase is when projects are proposed by borrowing governments. The projects can be aimed at the overall economy or specific sectors. Factors such as the beneficiaries, cost-benefit analysis, and alternative options are carefully considered during this phase (World Bank, 2022).

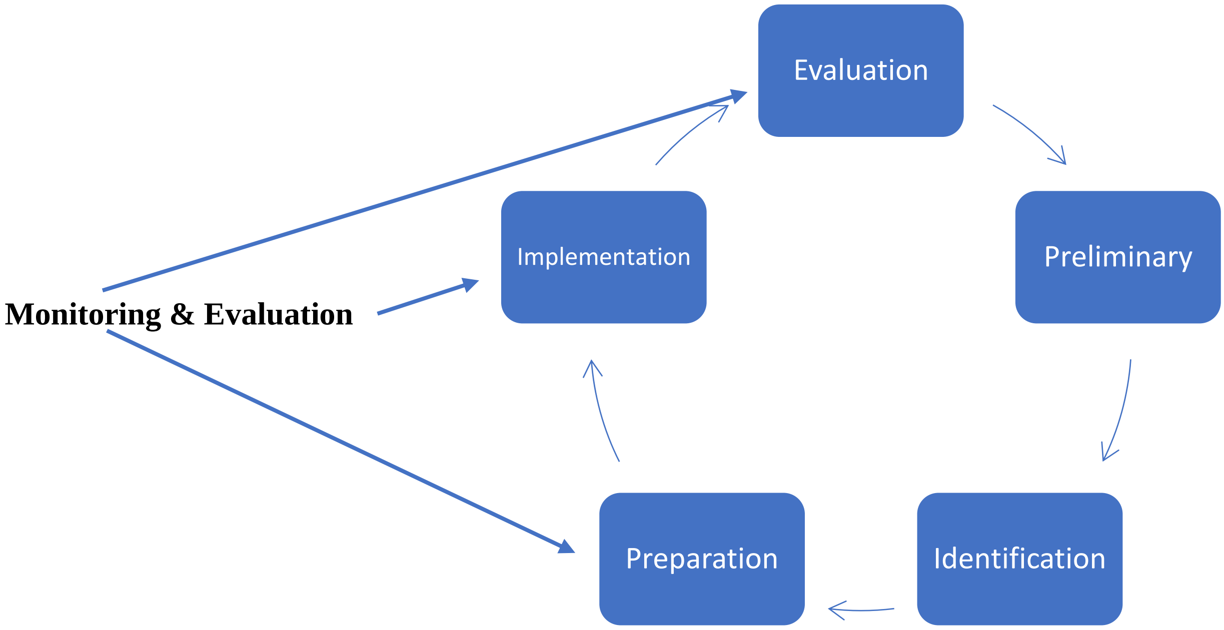


Fig. 1.6 World Bank project cycle (Source: Authors' own creation)

Once a project is identified, it becomes part of the World Bank's multi-year lending program, ensuring sustained resource availability for project completion. While the World Bank provides assistance, the borrowing country assumes responsibility for assessing the technical, economic, social, and environmental aspects of the project. During the preparation phase, the project timetable is outlined (World Bank, 2022).

The World Bank conducts an independent appraisal of the project during this stage. Technical, institutional, economic, and financial aspects are thoroughly analysed. Monitoring and evaluation (*M&E*) as the centre of sound governance play a crucial role in ensuring project progress and compliance with requirements. Effective monitoring and evaluation facilitate evidence-based policy-making, decision-making, and accountability, ultimately contributing to successful project closure (Crawford & Bryce, 2003; Levie et al., 2017).

The appraisal report, along with recommendations, forms the basis for negotiations between the World Bank and the borrower. These negotiations involve addressing any issues that arose during the preparation and appraisal stages through a give-and-take process. Once negotiations are concluded, the appraisal report, modified based on the negotiations, is presented to the World Bank's executive board of directors for final approval (World Bank, 2022).

The implementation phase marks the actual execution of the project. The World Bank emphasizes the proper allocation of loan proceeds for their intended purposes. On-site supervision is conducted by World Bank staff, spending about 10 staff weeks annually per project. This supervision helps identify and address project-related challenges, and the World Bank can provide technical assistance to borrowers during this phase (Ika, 2015).

An independent department within the World Bank, known as the Operations Evaluation Department (OED), assesses the outcomes of the projects. Reports from the OED are submitted directly to the executive board of directors and the World Bank President to ensure impartiality. These evaluations compare project costs, benefits, timetables, and efficiency with initial predictions, offering insights to enhance future project performance (Grasso et al., 2003).

To enhance transparency and knowledge sharing, the World Bank publishes an annual review called "Evaluation Results," which is available to the public. This review provides valuable information for stakeholders involved in the research and development of international development projects.

In summary, the World Bank's governance system for international development projects focuses on promoting transparency, accountability, and effectiveness. Through a comprehensive project cycle, involving identification, preparation, implementation, and evaluation, the World Bank ensures that projects align with the goals of the borrowing countries and contribute to their social and economic progress. Rigorous monitoring, evaluation, and independent assessments play a vital role in improving project performance and informing future initiatives.

1.8. World Bank’s procurement system

The procurement system in World Bank-funded projects is designed to ensure that the goods, works, and services required for the projects are obtained at the best value for money while also promoting transparency, fairness, and competition. Many procurement mechanisms are adopted within the World Bank. The number of methods adopted in a project indicates the level of project complexity (Vidal et al., 2011b). The World Bank adopts 32 of these methods in its contracts for different types of projects. Notably, about 97% of projects are conducted through 11 of these methods: (1) international competitive bidding; (2) national competitive bidding; (3) quality and cost-based selection; (4) individual consultant selection; (5) single source selection; (6) direct selection; (7) qualification selection consultant; (8) request for bids; (9) shopping; (10) selection based on consultant's qualification; and (11) quality based selection procurement methods, each of which is explained separately below (Górski, 2016).

According to the World Bank (2014), the objective of international competitive bidding (ICB) is to furnish all eligible bidders with adequate information regarding the borrower country's requirements and to give bidders equal opportunity to apply for the required goods, non-consulting services and works carried out on time. The World Bank's (2014) national competitive bidding (NCB) guideline is defined as a competitive bidding method adopted and implemented in the borrower country, usually for public procurement. This method is the most practical for goods, non-consulting services and works that do not absorb foreign competition with lower prices than that of the international market. These reasons are due to: (1) contract size and value; (2) distribution of works in the sense of geographical time; (3) labour-intensive works, or (4) availability of goods, works and non-consulting services at prices lower than the international market.

Quality and cost-based selection (QCBS) is the other method adopted by the World Bank in this context. This competitive method is conducted among shortlisted consulting firms, with a firm's selection subject to the quality offered and the service cost. According to the World Bank (2020), the consultant qualification selection (CQS) and selection based on consultant's qualification (SBCQ) are almost similar as: (1) the borrower country makes its request for expressions of interest and (2) at least three eligible companies need to provide information about their experience and qualifications to the borrower country. From these three companies, the borrower country selects the one with the best experience and qualifications and asks that company to submit its technical and financial proposals for negotiations. These methods are practical for small-scale or emergency contracts, where the preparation and evaluation of competitive bids are of concern (World Bank, 2020). Another method adopted extensively by the World Bank is quality-based selection (QBS) where only the quality of the offer is evaluated. After the bidder's experience, financial ability and requested project team are assessed, the bidder with the highest technical score is asked to submit its bid for negotiations. The bid with the highest combined qualifications and cost score is considered the best. This method is appropriate for projects in which, due to complexity, technical risks or evolving scope, the provision of clear and stable criteria at the beginning is difficult (Adamtey, 2022; Molenaar & Gransberg, 2001).

According to the World Bank guideline, individual consultant selection is practical when selected directly, with appropriate justifications. According to the World Bank (2020), the circumstances for selecting this method are: (1) resuming works unfinished by the individual consultant after competitive selection; (2) finding works with a due date of six months or less; (3) finishing urgent works; and (4) when an individual consultant has relevant experience and valuable competency in performing tasks. The single source selection (i.e., sole-source selection) and direct selection methods are subject to a direct selection approach, where negotiations are conducted with only one company. These methods are practical when only one company has exceptional and valuable experience that qualifies it to perform the tasks, provided that the selection of a preferred company is already justified, or if a contract has a limited short period (e.g., emergency restructuring) (Molenaar & Gransberg, 2001; World Bank, 2020). The single source selection method, which can be viewed as limiting competition, is rarely applied in public sector projects.

In this context, the request for bids method is competitive. This method is adopted when the borrower is to provide goods, non-consulting services or works as specified through the definite detailed requirements for a bidder upon submitting the bid. Records in the World Bank (2020) indicate that this method is a one-step process. Shopping is a competitive behavioural method based on comparing prices obtained from different suppliers (commodities), different contractors (civil works) and different service providers (non-consulting services). This method is practical for small, simple, limited and low-volume trade, construction and services, but is not practical in more competitive methods that may not be justified based on cost and efficiency (World Bank Group, 2016). The current study investigates the impact of complexity factors on project outcomes, encompassing variables such as the quantity of contracts, variety of procurement mechanisms, and approaches employed for supplying goods and services.

1.9. Thesis structure

To fully reveal governance's influence on the outcomes of international development projects, this thesis is structured as follows:

Chapter 1 introduces the historical and social context of international development projects. This chapter provides research background and identifies gaps in the literature and explains the need for this research.

Chapter 2 systematically reviews the relevant project complexity, governance, and international development literature. This chapter consists of three parts: first, the literature that explains project complexity is reviewed; second, an in-depth literature review of project governance is conducted; third, a review of project governance literature where project complexity is addressed; and, last, the chapter concludes with a review of international development literature, specifically considering the intersections of governance and project success.

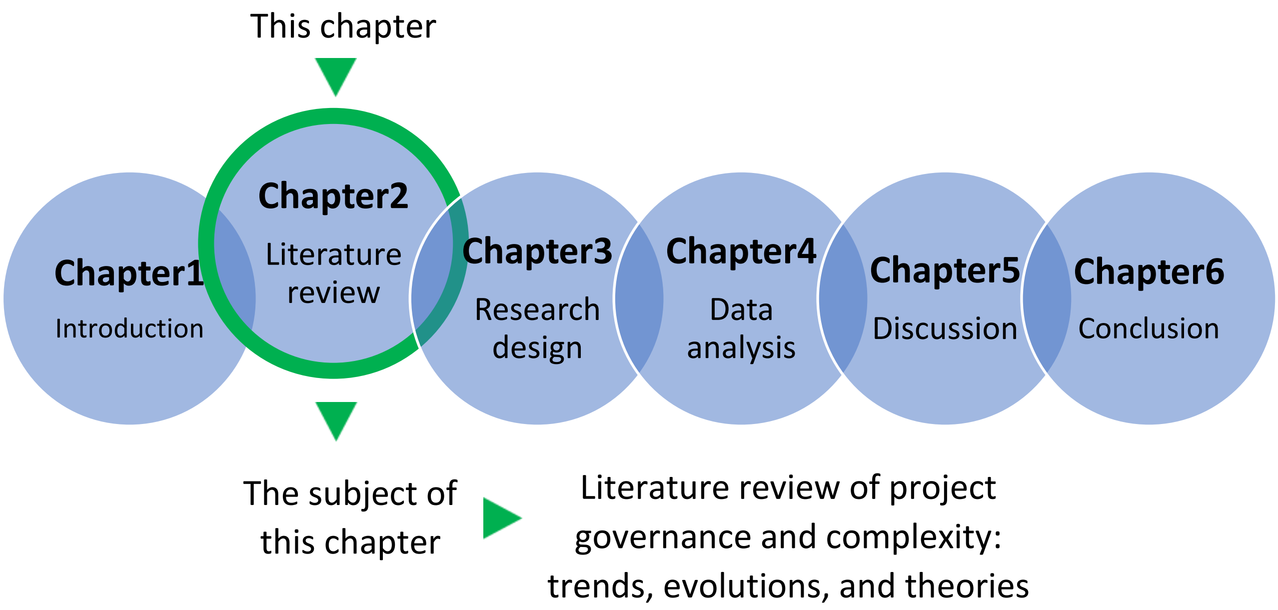
Chapter 3 is concerned with the research design and how the study was conducted. In this chapter, the research philosophy and theoretical framework are first discussed. The research process then consists of four stages: data collection, and statistical, network and content analysis with these fully explained. Different research models are also analysed.

Chapter 4 describes the data analysis and provides results of the research. In this chapter, firstly, the results of all models are presented, with all hypotheses then tested. Secondly, factors affecting project outcomes are identified and categorised through natural language processing.

Chapter 5 interprets the data analysis and connects the findings to research questions. This chapter discusses and leads to a set of conclusions based on the research outcomes.

Chapter 6 discusses the research outcomes and presents the conclusion. In this chapter, the research results, along with their contribution to the body of knowledge, are discussed. This chapter also considers how the research outcomes relate to managerial implications, as well as the implications for theory and practice. Finally, the research limitations are addressed.

Chapter 2



This chapter consists of four parts: the first part presents a discussion of studies in the literature that explain project complexity; the second part discusses the study's in-depth review of the literature on project governance; the third part provides an assessment of project governance while also undertaking a review of project complexity; finally, the fourth part synthesizes all these concepts within the context of international development literature. In conducting the literature review for this study, empirical evidence of the evolution of theory in project governance and complexity research was collected and analysed; the structure of the research field was mapped; and interrelationships between the research questions and the related literature were highlighted to provide the study with its theoretical foundation. To undertake this work, the study followed pre-specified systematic review procedures which allow subjective interference by a researcher to be minimised (Higgins & Green, 2008, p. 6)). The details of the literature review process are presented in Figure 2.1.

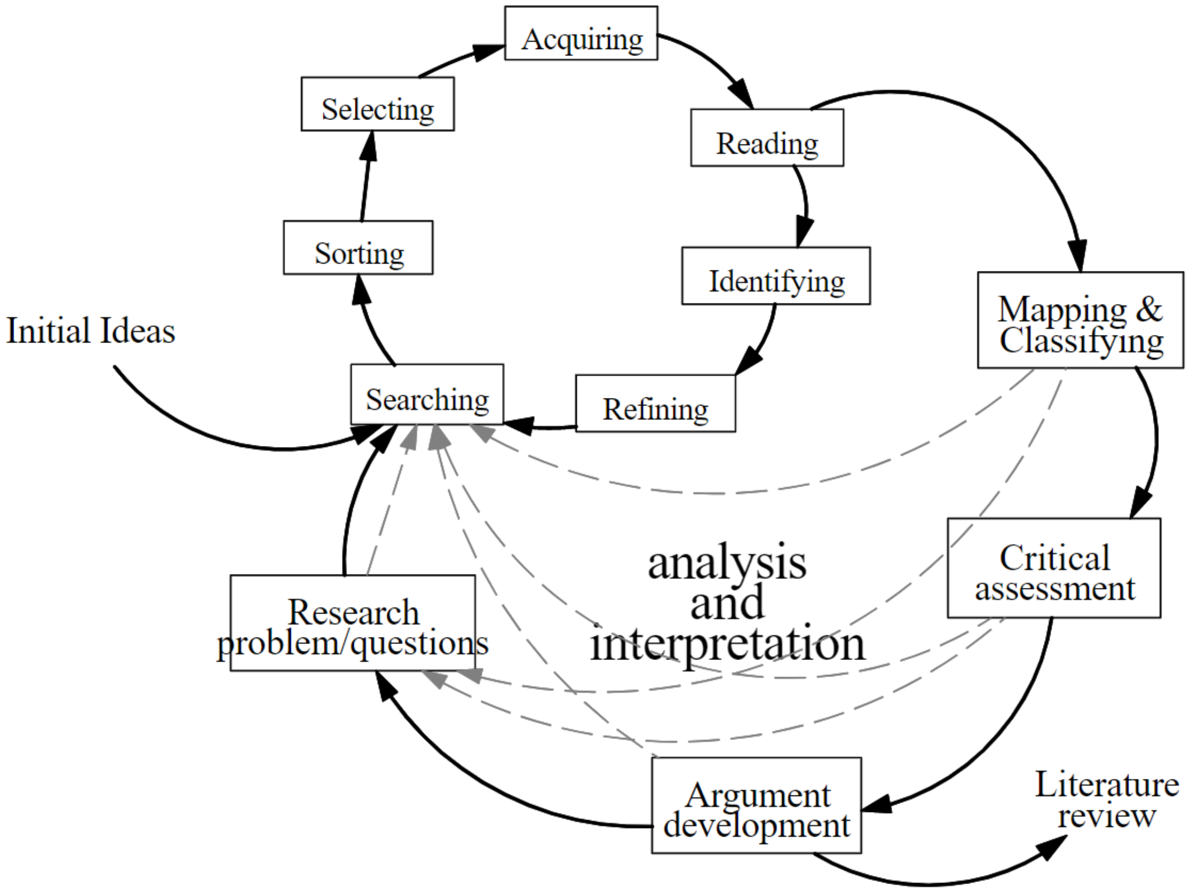


Figure 2.1 Literature review process

(Source: Boell and Cecez-Kecmanovic (2014))

The articles selected for the literature review were stored and managed in Endnote software (The EndNote Team, 2013). NVivo software (QSR International Pty Ltd, 2018) was employed for cataloguing, organising, analysing and synthesising the dataset, as NVivo provides opportunities to conduct content analysis and identify connections between articles. The article title, author/s' names and affiliations, abstract, keywords and references were stored in the RIS format and applied in the source evaluation and analysis (Moosavi et al., 2021). The literature review outcome is presented in the following section.

2.1. What is project complexity?

Even the most straightforward project in today's global arena is not without varying complexities. This is evident in the initial definition of complexity which can be defined as an entity consisting of different interrelated concepts and elements of tasks and interdependence (Hornby & Wehmeier, 1995). This highly controversial and inseparable aspect is evident in all disciplines, with no universally accepted definition of complexity available (Ireland, 2013). Stephen Hawking's assertion in 2000 that the 21st century would be the "century of complexity" aptly reflects this perspective. The Project Management Institute (2021) underscores this reality in its "seventh edition of the Guide to the Project Management Body of Knowledge (PMBOK Guide)," emphasizing that complexity is an inextricable and growing aspect of project management. The manner in which organisations predict, perceive and navigate complexity is crucial, often determining their success or failure (PMI, 2013, p. 5).

In complex systems, a wide array of behaviours can be observed. The self-organisation and emergent properties inherent in such systems often defy intuition, thereby restricting the effectiveness of external or top-down control measures (Helbing, 2013). This is primarily due to the diverse elemental properties and interactions at play, where straightforward cause-and-effect correlations are absent. Consequently, complexity is defined as the inability to predict the behaviour of a system due to sizable constituent components within the system and the concentrated correlations (Sheard & Adviser-Mostashari, 2012).

Many studies are found in this area, but there appears to be a lack of understanding of what constitutes project complexity. In this section: (1) an attempt is made to clarify what, according to the literature, constitutes project complexity based on different schools of thought and why it is of significance especially in relation to complex project management and (2) the factors which constitute a complex project are determined from different perspectives, with consideration given to how these factors can be measured.

2.1.1. Simple versus complex at first glance

Although determinable through environmental effect, project goal, project control, management style, etc., the differences between traditional and complex projects are considerable (Shenhar et al., 2004). Figure 2.2 compares traditional and complex project management styles. As depicted, no project can be easily and definitively classified on one side of this balance beam.

Before delving into a more intricate analysis of complexity definitions, it is crucial to assess the project's hierarchy and determine whether it falls into a state of simplicity, complexity, complication, or chaos. Simple projects encompass temporary activities aimed at producing goods or providing services, guided by clear and predefined cause-effect conditions. In such projects, all participants possess the necessary information to appropriately respond to different situations. This domain encompasses "known unknowns," which are self-evident, predictable, and repeatable. Examples of simple projects include catering, manufacturing basic household appliances, and constructing small structures (Bakhshi et al., 2015).

Complicated projects introduce a level of uncertainty regarding the cause-effect relationship between tasks and elements, warranting significant attention. Both knowledge and expertise are crucial for navigating and overcoming the challenges inherent in complicated projects (Snowden & Boone, 2007). Complicated projects encompass simple projects as subsets but cannot be reduced to that scale. The nature of complicated projects is not solely determined by their scale but also by the coordination and specialised expertise required (Glouberman & Zimmerman, 2002). Examples of complicated projects include launching a rocket to the moon, manufacturing aircraft, and constructing buildings (Geraldi et al., 2011).

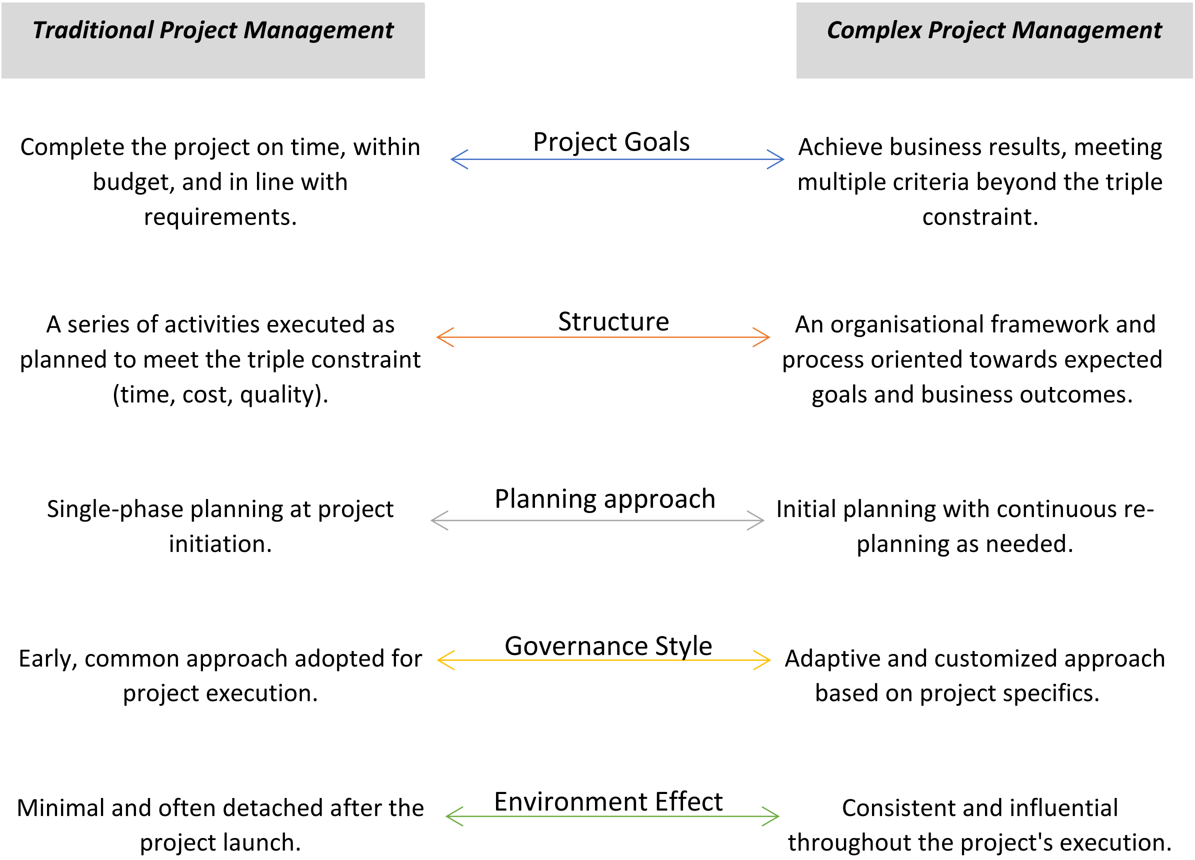


Figure 2.2 Comparison of project management styles

(Source: Authors' own creation)

Managing complex projects is a formidable task that demands project managers to comprehend the relevant development approaches and focus on project complexity factors (Bakhshi et al., 2015). Chaotic projects, on the other hand, are characterised by an unmanageable time frame, often stemming from global crises and disasters (Snowden & Boone, 2007) .

It is important to acknowledge that most projects fall somewhere along the continuum of these four defined states rather than being strictly confined to one extreme or the other (Bakhshi et al., 2016).

2.1.2. A journey of project complexity development

In 1776, Adam Smith introduced the principle of the division of labour, which emphasised the simplification of tasks and the allocation of specific responsibilities to individuals. While this principle revolutionised various business and trade sectors, it also laid the foundation for new approaches and theories in management (Wren & Bedeian, 1994). Notably, this historical development serves as an essential backdrop to understanding the complexity that characterises modern international development projects. These projects involve intricate challenges arising from their multidisciplinary nature, diverse stakeholders, and unpredictable socio-political contexts (Ika, 2015).

The concept of project complexity has evolved over time as scholars and practitioners have sought to analyse and comprehend the intricacies of international development initiatives. Often, these complexities are not straightforward, transparent, or linear, leading to the realisation that "sometimes we do not know what we do not know" – a realisation encapsulated by the term 'complexity,' which, like a blanket, covers all such issues (Bakhshi, 2016).

Unlike traditional projects, international development projects are far from immune to complexity and its profound impacts (Bamberger et al., 2015; Kim & Nguyen, 2021). Complexity affects every stage of these projects, with ambiguous and unpredictable conditions emerging as primary concerns for researchers and practitioners (Gajić & Palčič, 2019; Gransberg et al., 2013; Michael, 2004). In fact, complexity stands as a significant contributing factor to project failure (Sheard & Adviser-Mostashari, 2012; Williams, 2005).

Early attempts to address complexity in projects can be traced back to Turner and Cochrane (1993), who assessed uncertainty in objectives and methods as a significant factor in project complexity, particularly in construction projects. However, they primarily focused on reducing uncertainty rather than embracing the broader concept of project complexity. Baccarini (1996) expanded the discussion by introducing structural project complexity, emphasising communication, coordination, and control. His work addresses complexity in projects in a first attempt to present it by defining two aspects: (1) emphasis on differentiation and connectivity and (2) its introduction as a subjective concept based on difficulty and perception of its objects' dimensions. This perspective laid the groundwork for understanding how the integrity of these factors contributes to complexity in international development projects. Williams (1999) further refined the definition of project complexity by incorporating structural uncertainty and the uncertainty of objectives and methods into a holistic view. This broader perspective on complexity acknowledges the interconnectedness of elements within a project – a crucial insight when applied to international development initiatives where various stakeholders and factors interact. Technological complexity also plays a vital role in international development projects due to the often novel and unfamiliar nature of the technologies involved. Tatikonda and Rosenthal (2000) explored the connection between technology novelty and project complexity within the context of project performance, emphasising the dynamic and uncertain aspects of technology. However, it's essential to consider other unknown factors, such as novelty in process technology, which contribute to complexity and require further assessment. According to Shenhar (2001) introduced the idea that different types of project exhibit varying degrees of complexity. He highlighted three levels of complexity in projects, shedding light on how projects in low-tech and high-tech domains differ in terms of uncertainty. This distinction is particularly relevant when studying international development projects with varying degrees of technological complexity in different sectors.

Snowden (2002) added depth to the understanding of project complexity by categorising projects based on the degree of knowledge required. His classification into known, knowable, complex, and chaotic states is valuable for assessing the informational aspects of international development projects. Xia and Lee (2004) emphasised that, in information system development projects in North America, organisational complexity often outweighs technological complexity in influencing project outcomes. As their research is empirical, their results could be beneficial to the current study.

As the literature evolved, scholars like Snowden and Boone (2007) applied the Cynefin model to prepare flexible scenarios for managing organisations, highlighting the differences between traditional and complex projects. They extend the definitions for simple, complicated, complex and chaotic projects, defining some of the functions of leaders of these projects. They describe some warning signals for each type of project and identify appropriate responses. This model categorises projects based on environmental effects, objectives, control, and management style, providing valuable insights into the unique challenges of international development projects. Vidal and Marle (2008b) introduced a systematic framework for understanding project complexity, which included size, project variety, project interdependencies, and contextual elements. This framework offers a comprehensive view of complexity that can be applied to the international development context.

In relation to project complexity, Remington, Zolin and Turner (2009) discuss the correlation between size and budget, focusing on this issue and assessing the characteristics that contribute to complexity. The focus of their study is on pace and uncertainty. They distinguish between the dimensions and severity factors by interviewing 23 managers from the Defence Materiel organisation. Their findings indicate that the factors contributing the most to project complexity are: the project's objectives, stakeholders, interfaces and dependencies, technology, management processes, work practices and time. The small sample size of their study limits its generalisability and applicability to other project contexts.

A case study (Antoniadis et al., 2011) on construction projects in the United Kingdom (UK) reveals the effect of social and organisational complexity on the performance of projects. These researchers, in seeking to define more than 20 complexity characteristics and their causes, find that an increase in the number of interconnections increases the complexity, while verifying socio-organisational issues as positive factors in project performance. Although their focus is only on construction projects with a low level of complexity compared to projects in the areas of defence or information systems (IS) with a high level of complexity, their findings contribute to the identification of structural complexity characteristics.

Bosch-Rekveldt et al. (2011) assess large engineering projects to determine their complexity factors. They examine case studies and conduct semi-structured interviews with 18 researchers. Combining their findings and those of experts in the related literature, they propose the application of the technical, organisational and environmental (TOE) framework to project complexity, but with no reference to complexity in informational, structural, exceptionally autonomous or independent projects. Their study is an excellent attempt to concentrate on large engineering projects which are not considered in previous studies. In general, the structural complexity, uncertainty and, to a certain degree, dynamic aspects are investigated in their work.

Geraldi, Maylor and Williams (2011) focus on project complexity with a systematic review of studies in the related literature, assessing the two quite different aspects of the complexity ***of*** the projects' stream rather than the complexity ***in*** the projects' stream. They extract all articles related to project complexity from the Scopus and Web of Science databases and, based on a systematic approach, select 25 articles. After clarifying the epistemology ***of*** complexity, they insert these aspects into structural complexity, uncertainty, dynamic, pace and socio-political indexes. Their work serves as the foundation for the literary criticism section of this thesis, contributing significantly to the systematic review and sample selection. It is important to note that their study is among the notable attempts to investigate various aspects of complexity, encompassing structural, uncertainty, dynamic, pace, and socio-political dimensions (Maylor & Turner, 2017).

Vidal, Marle and Bocquet (2011a) first assess the complexity of projects through the analytic hierarchy process (AHP) technique. Before evaluating their findings, complexity measures in the literature are checked, with these researchers arguing that many limitations/drawbacks exist, such as non-reliability and non-intuitiveness for end-users, and refer to a project model. They next apply the Delphi method, employing a panel of 38 experts (19 men and 19 women). They identify 71 complexity measures and propose a systematic thinking approach to clarify all aspects, finally evaluating seven projects and ranking them through the analytic hierarchy process (AHP). The same researchers (2011b) assess project complexity factors, but add no new contribution beyond that in their previous article. In the latter study, they apply the Delphi method to develop project complexity factors and evaluate seven projects as they did in the first study. These three articles (Vidal & Marle, 2008b; Vidal et al., 2011a, 2011b) are very close in their context and findings.

While these early contributions shaped the discourse on project complexity, more recent research has emphasised the need for a systemic approach in managing complex projects (Ireland et al., 2012). The authors suggest three categories of complex projects: (a) exceptional projects, which involve traditional system-of-systems projects or the integration of existing projects to achieve new goals, such as the Air and Space Operations Centre (ASOC) in the United States (USA); (b) projects that focus on different aspects of the systemic concept, such as defining stakeholders and system boundaries or applying system dynamics to develop optimal solutions; and (c) projects that involve combining independent assets to create an extensive system, such as global distribution centres (GDCs). International development projects, in particular, often exhibit exceptional complexity, as they involve integrating diverse systems, stakeholders, and goals.

The Project Management Institute (2013) identified multiple stakeholders and ambiguity as key features of project complexity. This recognition is particularly relevant in the context of international development projects, which involve numerous stakeholders with varying interests and objectives. Cooke (2013) explored the role of technology in mitigating complexity in projects, underscoring the importance of the informational aspect. Such insights have direct applicability to international development initiatives, where technology plays a critical role in achieving project goals (Ika & Hodgson, 2014). Understanding the organisational perspective of projects is also crucial in explaining project complexity. Qureshi and Kang (2014) focused solely on organisational complexity in projects, shedding light on the dynamics of internal complexity in different projects. In another attempt to focus on equivocality and dynamism in terms of complexity, Ramasesh et al. (2014) introduce a new term ‘unk unks’ in project complexity (a shortened form of ‘unknown unknowns’) to be applied in reducing project complexity, complicatedness, mindlessness and pathologies. This research seeks to assist project managers in choosing the best project risk management styles. The stimulants of unk unks in complex project management are many. Although their article is rich in complexity, they rely on their experiences and analyses of existing theories. Their reductionist approach towards complexity could be considered their limitation, with only the structural, uncertainty, dynamic and pace complexity factors investigated. In another empirical research, Brahm and Tarziján (2015) assess mega-projects in the mining industry to determine the effect of project complexity on: (1) the make (managing project delivery internally) vs. ally (by appointing a specialised engineering contractor through a partnering agreement) choice in the project implementation stage and the fixed-price vs. cost-plus decision in choosing a contract when an ally is chosen; and (2) the extent to which prior interactions with a contractor at earlier stages of the same project influence the fixed-price vs. cost-plus decision(s). The researchers reveal that project complexity promotes the idea of allying with external contractors while, as expected, it also promotes the concept of the cost-plus contract.

To address the level of unity between project emergent properties and complexity, Zhu and Mostafavi (2017) propose an integrated performance assessment framework based on complexity and emergent properties in project systems. The underlying premise of their proposed complexity and emergent property congruence (CEPC) framework is the existence of a higher level of constancy between project-emergent properties and complexity which can potentially promote the possibility of achieving performance objectives in construction projects. By conducting an electronic survey, semi-structured, and in-depth interviews, You et al. (2018) assess the effects of uncertainty on a supplier’s opportunistic behaviour and the moderating effects of contractual complexity. They classify uncertainty into environmental and behavioural effects, while contractual complexity is distinguished from a functional perspective through its control, coordination and adaptation elements.

In more recent years, researchers have turned their attention to the governance of institutional complexity in mega-projects, shedding light on the complex dynamics at play in such endeavours. For instance, Qiu et al. (2019) conducted a case study on the Hong Kong–Zhuhai–Macao Bridge project, examining where institutional complexity arose, how it impacted project outcomes, and the ways in which it shaped actors' behaviours. Their research sheds light on the complex dynamics at play in mega-projects and underscores the importance of effectively managing institutional complexity to achieve successful project outcomes. They find that institutional complexity stems from external actors (macro-level environments) and internal actors (micro-level environments), with regulatory, political and social complexity and cultural, evolutionary and relational complexity as the constituents, respectively. They reveal that institutional complexity stemming from macro environments will lead to constraint conflicts in mega-projects, while the different practices and identities of a project’s micro-actors will lead to organisational conflicts.

In another example, Winch and Maytorena-Sanchez (2020) developed a theory of institutional field change to examine how projects can contribute to changes within institutions. They combined recent findings on institutional projects with institutional logic and complexity to address the question of how institutional projects can act as vectors of change in institutional fields by providing bounded spaces to work through the implications of institutional complexity. Winch and Maytorena-Sanchez empirically assessed their theory by examining strategic field change implementation in a mature, complex, institutional field.

How to design project control modes to improve knowledge integration, subject to different types of uncertainty, is assessed by Lin et al. (2019) in a multiple case study on the engineering, software, machinery and infrastructure industries, and project control design. They suggest that behaviour control improves the efficiency of knowledge integration concerning computational complexity; self-control improves the efficiency of knowledge integration concerning the complexity of project novelty; clan control enhances the flexibility of knowledge integration concerning ambiguity in the complexity of user requirements; and outcome control enhances the scope of knowledge integration concerning technological complexity. These studies highlight the importance of effectively managing institutional complexity to achieve successful project outcomes in international development projects.

While this literature review provides a historical perspective on the development of the concept of project complexity, it is important to note that there is still a dearth of empirical studies exploring the impact of complexity on various project management styles and governance structures within the context of international development projects. This research aims to address this gap by investigating how complexity influences the relationship between governance indicators and project outcomes in the realm of international development.

In light of the identified research gap and based on the observations made in the literature review, this study proposes the following hypothesis: 'Complexity has a negative effect on project outcomes' (Hypothesis 2). This hypothesis is grounded in the observation that increased project complexity often leads to challenges in project management, potentially resulting in less favourable outcomes. The subsequent research will focus on empirically testing this hypothesis, thereby contributing to the existing body of knowledge on the impact of complexity on project outcomes in international development.

2.1.3. Characteristics of project complexity

A precise and comprehensive explanation for project complexity is difficult to define as it would need to encompass all its constituent features/aspects and boundaries, with formal definitions from the prior literature having little commonality (Grisogono, 2006). From this study's review of the related literature, the most frequently applied key phrases used in defining complex projects are identified as:

a) Interdependence of the elements, such as tasks, teams and inputs
b) Causality is networked while the simple cause–effect correlation between the constituent parts are not networked
c) Dynamic emergence context
d) Predictability and control are reduced
e) Project scope and boundaries are unclear
f) Project governance is decentralised and autonomous
g) Number of plausible options and references
h) Project is self-organised and adaptable
i) Low level of objective transparency, process, methods, etc.
j) Diversity of resources

With the above phrases in mind, and after conducting an in-depth literature review, project complexity is defined as "an intricate arrangement of the varied interrelated parts where the elements can change and evolve constantly with an effect on the project objectives" (Bakhshi et al., 2016, p. 1203). The most commonly used project complexity definitions from various schools of thought are presented in Table 2.1.

Table 2.1

Commonly used project complexity definitions

Study	Project complexity definition	Features/keywords
Turner & Cochrane (1993)	Whether the objectives and methods of accomplishing them are well defined	Uncertainty of/in both the objective and methods
Baccarini (1996)	Consisting of many varying, interrelated sections, applicable in terms of differentiation and interdependency	Operational interdependencies, multi-organizational structure, technological complexity
Maier (1998)	Operational and managerial interdependency of the elements – evolutionary development – emergent behaviour – geographic distribution	Interdependency, evolutionary development, emergence, geographic distribution
Tatikonda & Rosenthal (2000)	The nature, quantity and magnitude of organizational sub-tasks and sub-task interactions posed by the project	Interdependency in technology – objectives' novelty – project hardship
Ribbers & Schoo (2002)	Variety, variability and integration of the system	Variety – variability – integration
Cicmil & Marshall (2005)	Invokes ambiguity, paradox and the dimensions of time, space and power of the organizing processes in project settings	Flux and change, high unpredictability, conversational and power-related ambiguity of the process, social interaction
Geraldi & Adlbrecht (2007)	The complexity of fact, faith and interaction	Dynamics, uniqueness and customization, immaturity, interdependence, size, sources, transparency, reference, empathy, pace
Remington, Zolin, & Turner (2009)	The count of features to an extent and severity level that makes it extremely difficult to predict project outcomes and to control or manage the project	Hierarchy, communication, addictedness, fitness landscape, edge of chaos
Vidal, Marle & Bocquet (2011b)	The feature of a project which makes it hard to understand, predict and keep its overall behaviour under control, even in the presence of reasonably complete information about the project system	Organisational complexity, technological complexity, interdependencies, project property, project difficulty
Bosch-Rekveldt et al. (2011)	Technical, organisational, and environmental (TOE) aspects of project	Structural dynamic, categories, subcategories and elements
Dao et al. (2017)	The degree of interrelatedness between project attributes and interfaces, and their consequential impact on predictability and functionality	Stakeholder management, governance, legal, fiscal planning, interfaces, scope, location, technology, resources, quality and execution targets
Maylor and Turner (2017)	Structural, socio-political, and emergent complexity dimensions	Pace, respond, planning and control, relationship development, flexibility
GAPPS (Global Alliance for the Project Professions) (2021)	Uncertainty, ambiguity, and the interactions of multiple stakeholders with different perspectives are the primary sources of complexity	Individual perceptions, experience, confidence, familiarity, novelty, culture and social values

Past research offers frameworks for evaluating and managing project complexity (Boardman & Sauser, 2006; Gorod et al., 2021). Project complexity can be assessed using predefined scales (see Figure 2.3). Boardman and Sauser (2006) proposed a framework, which was further expanded by Bakhshi (2016), who introduced seven complexity drivers: (1) context; (2) autonomy; (3) belonging; (4) connectivity; (5) diversity; (6) emergence; and (7) size. These drivers provide a solid foundation for measuring the level of complexity in projects and form the theoretical basis for this research. Each complex project consists of interconnected, autonomous, and independent sections, along with various structures. Consequently, diversity is observable to some extent when actors, tasks, and sections come together in a complex project, potentially giving rise to unexpected emergent properties. The project's context refers to the environment and organisation-related factors that shape its nature, scope, and required conditions. Autonomy is exercised by constituent departments, teams or partners to accomplish the project's objectives. Constituent departments/partners decide to become involved, firstly, due to the cost–benefit analysis of the endeavour and, secondly, owing to their belief in the overall project which assists them to accomplish their independent objectives: this ability is named 'belonging'. Connectivity encompasses distinct or dissimilar elements or qualities within a group, variation and connection in the social and cultural identities of project participants. Emergence is heightened by deliberately avoiding prediction, although its crucial importance is recognised, and by fostering an environment that supports the early detection and elimination of deviant behaviours (see Figure 2.3) (Bakhshi, 2016; Bakhshi et al., 2015).

Simple Projects		*Complex Projects*
Order Where the requirements for and expectations of the project are specific	Context	**Unorder** Where the requirements for and expectations of the project fluctuate
Conformance Autonomy is given by parts to grant autonomy to the project	Autonomy	**Independence** Autonomy is exercised by constituent projects to accomplish the main project
Centralisation Parts are akin to family members; they did not choose themselves but were generated from parents. Belonging is in the nature of parts	Belonging	**Decentralisation** Constituent projects are chosen on a cost/benefits basis to achieve greater fulfilment of their purposes, and owing to belief in the project's super purpose
Platform-centric Prescient design, with parts, and simple linear relationship between departments, tasks, teams, etc.	Connectivity	**Network-centric** Provided dynamically by constituent projects with every possibility of myriad connections between constituent projects, possibly through a net-centric-architecture, to enhance project capability
Homogeneous Managed, i.e., reduced or minimised by modular hierarchy; parts' diversity encapsulated to create a known discrete module with nature to project simplicity into the next level of the hierarchy	Diversity	**Heterogeneous** Increased diversity in project capability achieved by released autonomy, committed belonging and open connectivity
Forecast/prediction Predicting both the good and bad behaviours, designed or tested as appropriate	Emergence	**Indeterminable** Enhanced by deliberately not being predicted, though its crucial importance is, and by creating an emergence capability climate, that would support early detection and elimination of deviant behaviors
Small The elementary objects' size is limited	Size	**Large** The elementary objects' size is unlimited

Figure 2.3 Project complexity characteristics

(Source: Bakhshi (2016))

Many factors exist that affect and change the degree of complexity. Although over the last 25 years, project complexity factors have been, and continue to be, collected and applied in academic studies and practical experiments, no international consensus exists on these factors due to the many ambiguous points. The comprehensive literature review undertaken by Bakhshi (2016) identifies more than 125 known factors from different articles (see Appendix 1). To assist in increasing awareness of these factors, a clear framework needed to be defined; consequently, Bakhshi (2016) developed a new framework by applying findings from studies by (Sauser et al., 2009a; Vidal et al., 2011b) (see Figure 2.4).

Figure 2.4 Project complexity drivers (Source: Authors' own creation)

Having reviewed the literature and arrived at a preferred framework for understanding and measuring relative complexity in projects, the following section addresses the aspect of governance. Its primary objective is to gain insights into the contextual background and the progressive development of theories within project governance literature.

2.2. What is governance in the realm of project management?

The definitions of governance originate from the classical theory of management and have evolved through a strong theoretical basis (Turner & Keegan, 1999).

According to the Business Dictionary, governance is defined as:

> [t]he establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members (with the associated accountability), and their primary duty of enhancing the prosperity and viability of the organization. (Njoku, 2014, p. 70)

The Project Management Institute (2021) defines project governance as the guidance of project activities through the framework, processes and functions aligned with strategic, organisational and operational goals to introduce a unique product, service or result. This definition includes different types of governance: organisational, organisational project management (OPM), portfolio, program and project. In the context of governance, a board of directors provides control and direction of portfolios, programs and projects through a set of predefined processes and policies. This definition is more related to processes when projects are monitored and controlled. Consequently, the international standard for governance of information technology (IT) in an organisation, that is, the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 38500:2015, defines project governance as a subset of organisational or corporate governance. According to the

Organisation for Economic Co-operation and Development (OECD, 2004), the organisation's systems are directed and controlled through governance.

The Association for Project Management (APM) defines project governance as a domain of corporate governance project activities. Crawford et al. (2008) define project governance as a collection of structures, processes and principles through which projects are undertaken and managed. This could apply to portfolios, programs or individual projects. The correlation between governance structures and the type of contract is another aspect of project governance (Reve & Levitt, 1984; Turner & Simister, 2001).

Müller (2016a) refers to three categories of project governance definitions:

A) Governance as a system of controls: governance is a set of control structures and mechanisms, with project outcomes regularly monitored and the project guided on the right course before it diverges too far (Ireland, 2016).
B) Governance as processes: governance relies on processes responsive to the rights and requirements of stakeholders, with these controlling and directing projects (Müller, 2016a; OECD, 2004).
C) Governance as relationships: rights and responsibilities among different actors and stakeholders are the primary focus. Stakeholders can be internal and/or external participants in the project, such as regulators, auditors, government bodies, etc. (Derakhshan et al., 2019; Müller, 2016b).

To collate the empirical evidence of theoretical evolution in project governance research, to map the structure of the research field and to highlight interrelationships between actors and organisations driving this field forward, the current study followed pre-specified systematic review procedures which allows the extent of subjective interference by researchers to be kept relatively low (Barlow et al., 2016; Higgins & Green, 2008, p. 6). Firstly, the keyword ‘governance’ was used to search in the Scopus database and following journals for articles to include in the literature review: *International Journal of Project Management* (IJPM), *Project Management Journal* (PMJ), *International Journal of Managing Projects in Business* (IJMPB), *International Journal of Project Organisation and Management* (IJPOM), *Journal of Modern Project Management* (JMPM), *International Journal of Information Technology Project Management* (IJITPM), *Journal of Project Program & Portfolio Management* (JPPPM), *International Journal of Construction Project Management* (IJCPM) and *Built Environment Project and Asset Management* (BEPAM). The date range criterion was set to “All years to present”, that is, up to 12 July 2021. All literature review articles, with the most commonly used traditional definitions (as shown in Table 2.1), were closely examined and included in the dataset. In total, 381 articles were collected, of which 255 were published in the seven project management journals highlighted below in Table 2.2. The study’s analysis focused on this sample.

As previously mentioned, Endnote software (The EndNote Team, 2013) was used to store and manage the articles, while cataloguing, organising, analysing, and synthesising the dataset was undertaken using NVivo software (QSR International Pty Ltd, 2018), with this software providing opportunities to conduct content analysis and identify connections between articles. This was useful, for example, in coding the articles in terms of their predominant focus on governance controls, processes or relationships.

Table 2.2

Top project management journals contributing to project governance over past 20 years

Journal Name	Publishing year											
	Up to 2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
International Journal of Project Management	18	3	3	2	21	14	16	10	15	8	13	**123**
International Journal of Managing Projects in Business	7	3	4	1	3	3	2	9	9	11	12	**64**
Project Management Journal	4	1	4	3	2	1	4	3	4	5	4	**35**
Journal of Modern Project Management				1	1	1	1	1	1	2	4	**12**
International Journal of Project Organisation and Management	2		2	1		1		1		2		**9**
Built Environment Project and Asset Management			1				1			3	4	**9**
International Journal of Information Technology Project Management										1	2	**3**
Total	**31**	**7**	**14**	**8**	**27**	**20**	**24**	**24**	**29**	**32**	**39**	**255**

The article title, author/s' names and affiliations, abstract, keywords and references were stored in the RIS format with source evaluation and analysis undertaken. Bibliographic coupling analysis (BCA) was complemented by network analysis in Gephi, an open-source network analysis and visualisation software package) (Bastian et al., 2009) and UCINET (a general social network analysis software package) (Borgatti et al., 2002) to identify evolving relationships between the main project governance concepts in the literature, to map clusters of theories in project governance research articles and to visualise the collaboration structure between key actors and organisations engaged in advancing the research field (Fahimnia et al., 2015). The current study also employed BCA to determine the relatedness of articles based on the number of shared references as described in Boyack and Klavans (2010). The outcome of the BCA was further elaborated by a descriptive content analysis of a selected set of articles using NVivo (Gaur & Kumar, 2018).

While the first article in the study's dataset was published in 1999, a substantial growth in the number of articles on project governance is evident from 2015 (Figure 2.5). Among these articles, a relatively smaller number was assessed as being focused on system of controls in comparison to those with a focus on processes and relationships in project governance.

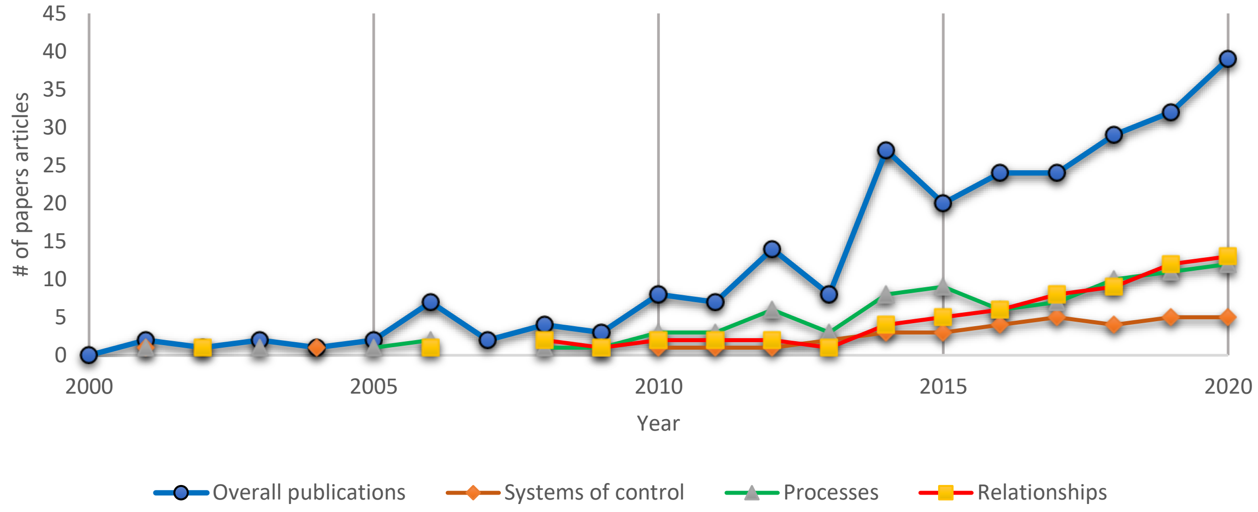


Figure 2.5 Project governance articles with their predominant focus compared

Note: the graph shows the total number of selected articles on project governance by year and the proportion with a predominant focus on controls, processes or relationships.

2.2.1. Bibliometric analysis

A descriptive examination of keywords stated in journal articles across a research field sheds light on the field's canonical range (Hood & Wilson, 2001). The most frequently occurring keywords in published research articles on project governance in the study's sample are 'organisation' (16% of articles include this keyword) and 'project success' (12%). These are followed by moderately frequently occurring keywords: ‘contractual governance’ (6%), ‘public–private partnerships’ (6%), ‘project performance’ (6%), ‘public projects’ (6%), ‘megaprojects’ (6%), ‘risk management’ (6%) and ‘project network’ (5%). Other repeatedly observed keywords but in fewer than 5% of project governance articles are: ‘trust’ (4%), ‘innovation’ (4%), ‘procurement’ (3%), ‘governance framework’ (2.5%), ‘decision making’ (2.5%), ‘ethics’ (2.5%), ‘infrastructure’ (2%), ‘corporate governance’ (2%), ‘sustainability’ (2%), ‘critical success factors’ (2%), ‘governmentality’ (2%), ‘knowledge governance’ (2%) and ‘IT governance’ (2%). The content behind these keywords and their links to theories and chronological evolution are discussed later in next subsections.

Network analysis is employed to identify the most central institutions in the co-authorship network of the identified project governance articles (presented in Figure 2.6) to ascertain the structure of cross-institutional collaboration activity in this field (Ammann et al., 2002; Knoke & Yang, 2019). The degree and betweenness (as presented in Table 2.3) are well-established basic measures of network centrality. Degree centrality indicates the number of collaborating institutions in the project governance research field for each institution. Betweenness centrality determines which institutions act as ‘bridges’ between institutions in different clusters of the research collaboration network. Betweenness centrality is counted by the number of the shortest pathways in a network between all pairs of actors. An institution with many connections (i.e., high degree centrality) can score low on betweenness if all these connections are in the same densely interconnected network cluster.

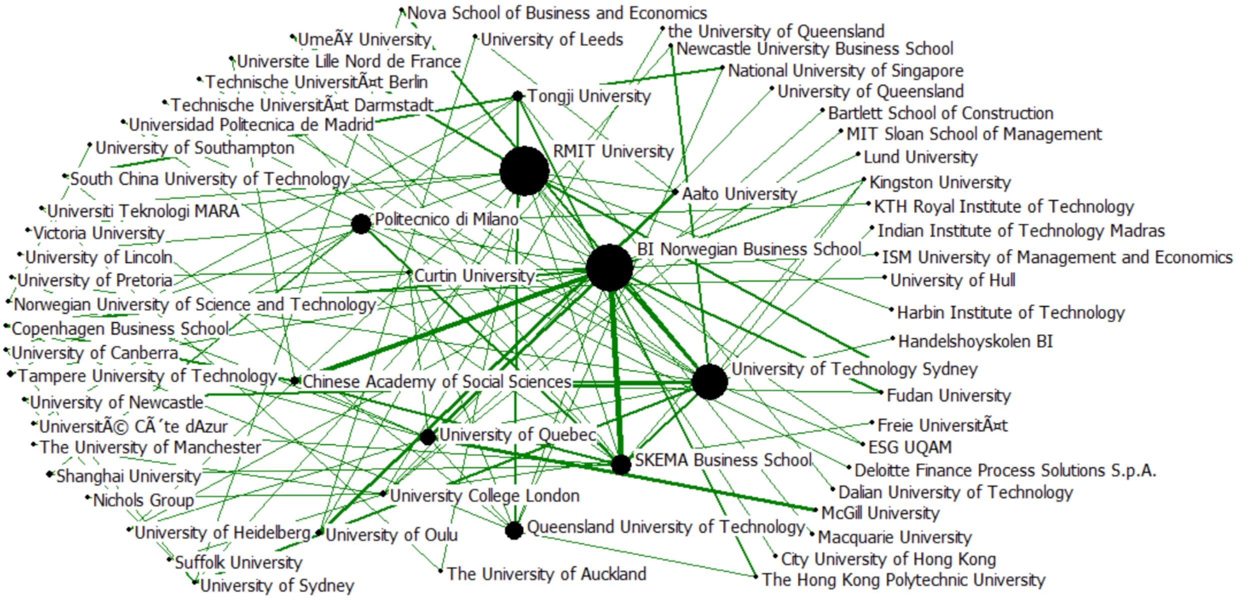


Figure 2.6 Collaboration network of institutions contributing to selected project governance literature

Notes: The most central institutions are displayed in the core of the diagram, while the least central institutions are listed around the periphery. The width of the lines illustrates the number of joint co-written articles between these institutions in the project governance field.

Conversely, an institution with fewer connections (i.e., lower degree centrality) can score higher on betweenness centrality if its connections reach out to institutions not densely interconnected with one another. Thus, betweenness can be a better measure of access to diverse pools of knowledge or "brokering" of knowledge between different network cliques than degree centrality.

Table 2.3

Top 10 institutions contributing to selected project governance literature by publication count and network centrality in the project governance co-authorship network

Institution	Country	No. of articles	Degree	Betweenness
BI Norwegian Business School	Norway	41	19	1477
University of Technology Sydney	Australia	30	17	818

RMIT University	Australia	23	17	1416
SKEMA Business School	France	22	11	451
University of Quebec	Canada	26	10	282
Chinese Academy of Social Sciences	China	18	10	94
Politecnico di Milano	Italy	12	9	841
Tongji University	China	13	7	215
University College London	UK	12	8	89
Norwegian University of Science and Technology	Norway	17	2	1

BI Norwegian Business School stands out with the highest number of project governance articles, highest number of co-authorship connections to other institutions (i.e., degree centrality) and the highest betweenness, indicated by the wide spread of collaborations across the research network. This school alone has 41 articles published on project governance, comprising almost 17% of the total body of literature selected in the current study. The University of Technology Sydney and RMIT University, both in Australia, are the second and third most prolific institutions in published project governance research. Interestingly, although the number of published project governance articles by RMIT University is close to half that of BI Norwegian Business School, the difference in their betweenness centrality is negligible. These measures show RMIT researchers' broad connectivity and abundant collaboration with counterparts across the world. The Norwegian University of Science and Technology is exceptional, having 17 articles published with almost no collaboration with other institutions in this research domain. The Chinese Academy of Social Sciences is the only research institute (i.e., not a university) with a high contribution in the project governance field with 18 articles. The most influential institutions, their collaborations on project governance articles and the theories most commonly applied in these articles are visualised in Figure 2.7.

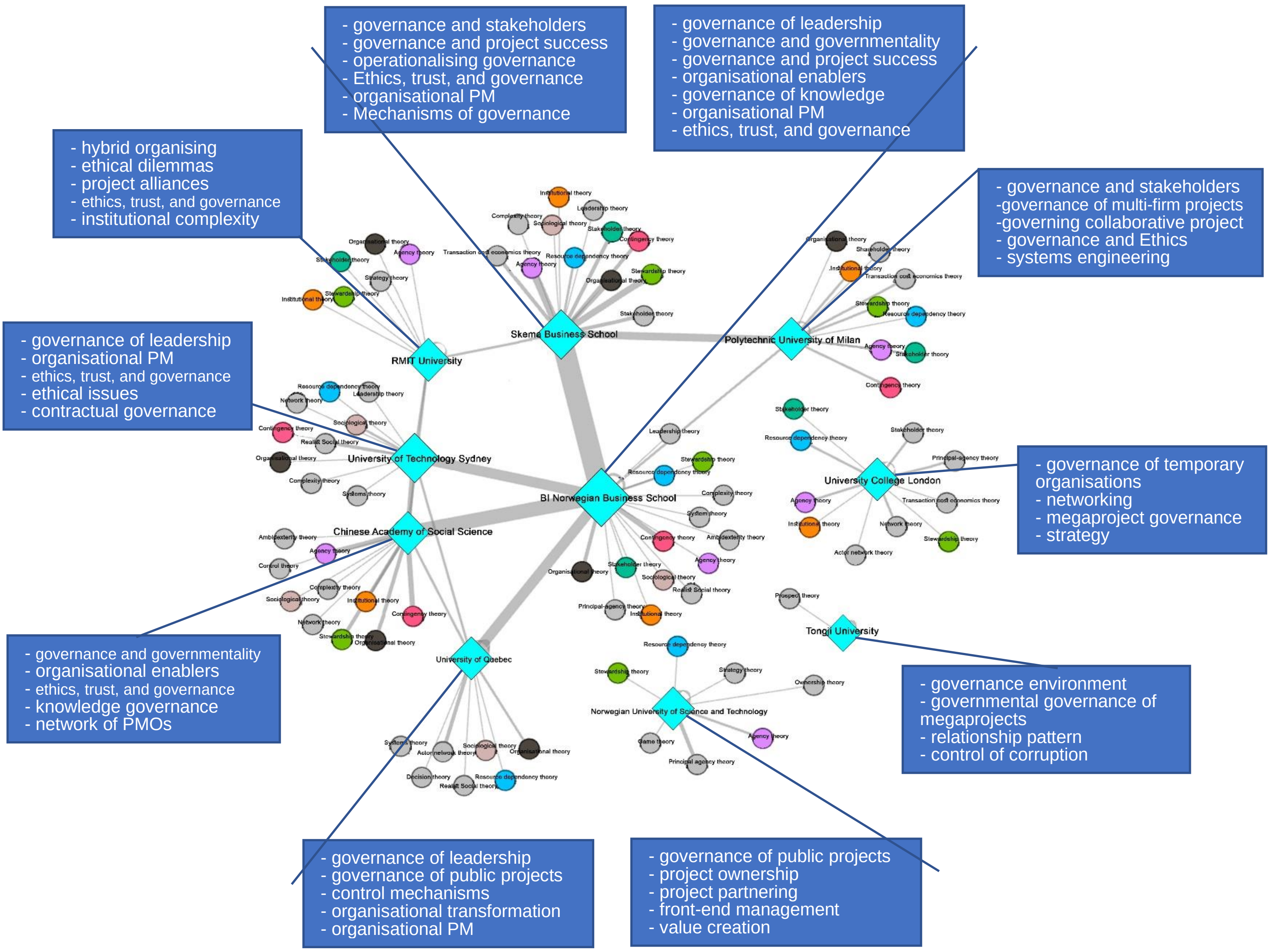


Figure 2.7 Collaboration network of institutions influential in selected project governance research and their applied theoretical angles

Notes: Partnerships with a higher number of co-authored articles on project governance are depicted by a wider link. PM = project management; PMO = project management office.

2.2.2. Chronology of project governance development

The concept of project governance was first introduced in the project management literature by Turner and Keegan (1999; Turner & Keegan, 2001). In the two decades since then, this concept has been explored by academics, with its evolution portrayed in Figure 2.8.

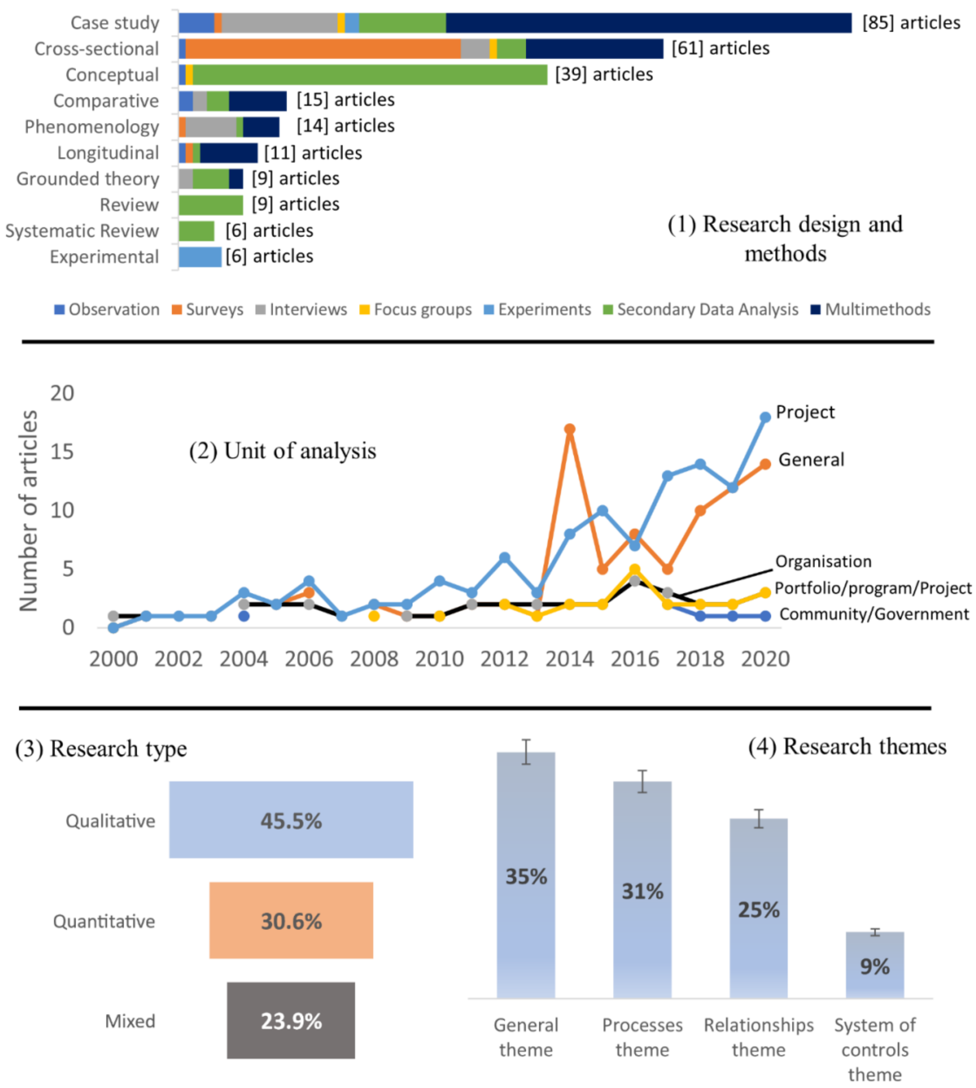


Figure 2.8 Project governance articles over 20 years of research

Notes: The case study was the most popular research approach and the project-unit was the most popular analytical level. Most empirical studies were either qualitative or mixed-methods in nature, with less than one-third purely quantitative. System of controls, as elements of governance, were significantly less studied than processes and relationships or governance in general.

The chronology of the analysis of project complexity's primary elements at different evolutionary intervals is next explored. Four classes are defined over a period of almost five years, signifying each interval's time length (see Table 2.4) (Jaradat et al., 2014).

Table 2.4

Research Interval sections

Interval	Interval years
1	1999–2005
2	2006–2010
3	2011–2015
4	2016–2020

Interval 1 1999–2005

A summary of key themes that emerged in the literature in Interval 1 is next presented. Although project governance as a system was first introduced by Turner and Keegan (1999; 2001), an article by Reve and Levitt (1984) was published in the *International Journal of Project Management* several years prior to their work. In that article, transaction cost analysis is considered the feasible theoretical perspective, with the primary focus in a construction project being on the relationships between the client, the contractor and the engineering consultant. Following this earlier article, Turner and Keegan (1999) reveal that, rather than adopting linear process chains, managers need to recognise that organisations are essentially multi-dimensional, with dimensions consisting of: (1) the hierarchy linked to governance; (2) different models for operational control and governance; and (3) the four elements of operational control: managing clients, inputs, processes and outputs. Cannon et al. (2000) assess the performance implications of governance structures involving contractual agreements and relational social norms both individually and in combination, subject to varying conditions and forms of transactional uncertainty and relationship-specific adaptation. Turner and Keegan (2001) describe governance structures adopted by project-based firms, indicating that the contributions of the broker and steward are evident in project management.

Winch (2001) proposes a conceptual framework which is considered to be a significant foundation of the project governance literature. This framework provides a structure for exploring the governance of transactions through the construction project life cycle, combining the diverse perspectives of construction law, economics and management.

In the current study's literature review, it was noted that, from 1999–2003, only 10 studies published investigations on project governance. Although the project governance literature experienced an upturn in 2004 with 14 articles published that year, none were in leading project management journals. In this period, two key concepts were introduced: principal–agency theory and the social network. Turner and Müller (2004) assess communications in projects against the background of principal–agency theory. They identify that, in the best performing projects, the client develops a medium-level structure with high collaboration with the project manager, indicating an appropriate, trusting, working relationship, while empowering the project manager to challenge the risk that inevitably arises on projects, leaving the client with some control options. The social network concept is introduced in the project governance literature by (Pryke, 2004) who proposes an analytical framework in which the construction project is conceptualised as a network of information exchange–correlation. In this framework, governance involves contractual and incentive performance correlation.

Also, at this time, the Association for Project Management (2004) introduced a guideline for project governance management. This guideline explains the advantages of governance requirements when applied in the direction and management of an organisation's project portfolio, regardless of whether projects are in the public, private or third sectors. Some case studies can be found on managing cross-border cooperation (Birrell & Hayes, 2004); the governance of contractual relationships (Grimsey & Lewis, 2004; Turner, 2004); strategic alliances (Gerwin & Ferris, 2004; Thorogood et al., 2004); and information technology (IT) governance (Peterson, 2004). Figure 2.9 presents project governance knowledge themes and key articles, illustrating their chronological development through these four intervals.

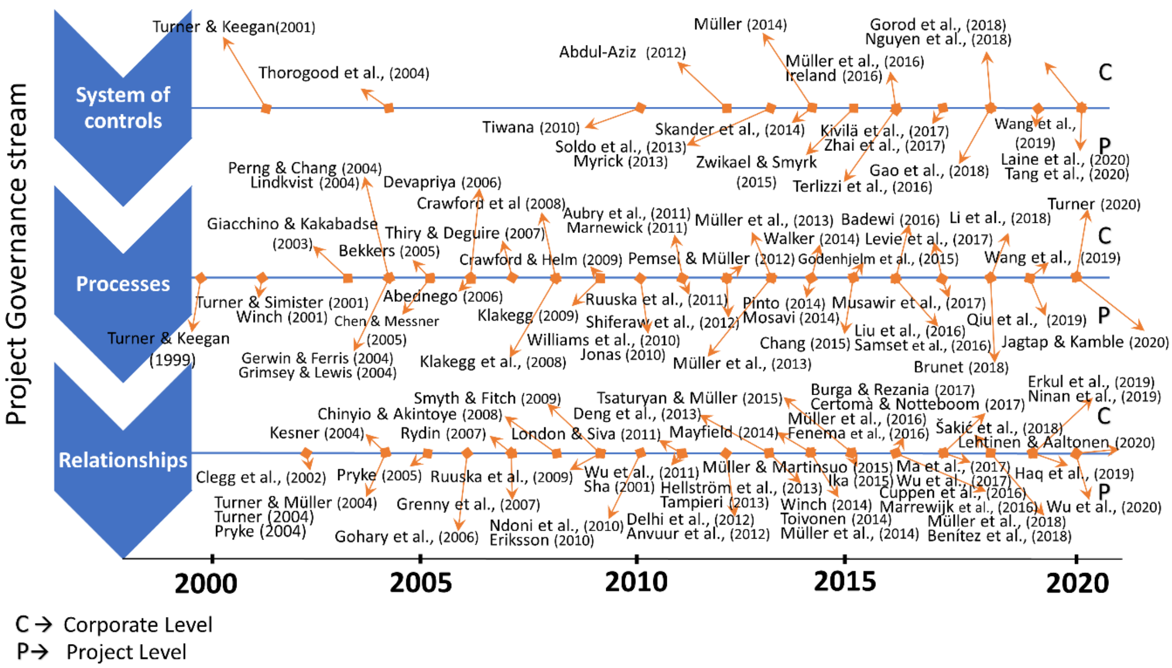


Figure 2.9 Chronological development of project governance knowledge themes and key articles

Notes: Articles in Figure 2.9 are classified according to their predominant contribution to the understanding of governance controls, processes or relationships and their main level of governance conceptualisation: corporate-level studies are above each timeline and project-level studies are below each timeline.

Interval 2 2006–2010

Key themes emerged from the 56 articles published during Interval 2, with their research design also examined in the current study. The majority of articles are in the case study, cross-sectional or conceptual formats. In this context, most data are collected through secondary data analysis, multiple methods and interviews. The terms ‘systems thinking’, ‘cybernetic’, ‘sustainability’ and ‘good governance’ occur frequently in these articles.

In Interval 2, researchers seek to understand the relationships between different contractual approaches, such as public–private partnerships and governance (Abednego & Ogunlana, 2006; Devapriya, 2006). Concepts explored include the perception of risk allocation; debt and equity arrangements; and the influence of the project management approach on strategy and governance, with the relevant studies outlined below. In line with the motivations identified by Abednego and Ogunlana (2006) and Devapriya (2006), the perception of risk allocation, when developing the good governance concept between different parties involved in public–private partnerships (PPPs), stems from the nature, form and unique governance issues in debt and equity arrangements in regulated PPP organisations. Thiry and Deguire (2007) assess how the widespread adoption of a project management approach within organisations gradually influences their strategy and governance approaches. In case studies conducted on five collaborative projects by Cameron (2006), the governance structures, mechanisms and methods are compared to clarify the issues and to adopt appropriate approaches for this type of project.

As previously mentioned, Pryke and Pearson’s (2006) introduction of social network analysis (SNA) provides a very flexible and adaptable tool for observing project coalition governance by selecting appropriate transaction sets and analysing the activities of construction coalitions. In a qualitative study, 12 interviews are conducted with British companies, in which the contribution of stakeholder management and the manner of the company's response to stakeholder dynamism are highlighted (Chinyio & Akintoye, 2008). The experience of a nuclear power plant in Finland, Olkiluoto 3, constitutes the launching pad for developing a distance framework between actors in a project network. This paves the way for a new management concept in a project in which many firms are engaged in the governance sphere (Ruuska et al., 2009). In another study by (Crawford & Helm, 2009), the relationship between government and project governance is assessed through the realisation of investment volume in project management in four Australian state organisations. Their study reinforces the proposition put forth by Thomas and Mullaly's (2007), highlighting that investing in a specific form of project management yields distinct benefits within a particular context. Open system characteristics are recognised by many researchers in Interval 2 who believe that projects need specific governance mechanisms to withstand environmental threats (Artto & Kujala, 2008). The focus of most studies is on problem-solving tools and on promoting managerial procedures, such as procurement (Ayyagari et al., 2006; Miller & Hobbs, 2005). In other studies, the focus is on the process in which stakeholders are identified, analysed and classified (Abednego & Ogunlana, 2006).

In 2010, Cambridge University Press published an analytical work that provides a comprehensive overview of the methodology employed in the Worldwide Governance Indicators (WGI) project. This publication, authored by Kaufmann et al., encompasses an extensive assessment of six governance dimensions across more than two hundred countries and territories, starting from 1996. The dimensions evaluated include Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption (Kaufmann et al., 2010). It is important to note that this report undergoes annual updates, and all the detailed data and results are made publicly available. In the present study, these six indicators have been utilised to evaluate governance at the national level (refer to Chapter 3 for further details).

Interval 3 2011–2015

In reference to the reviewed literature from Interval 3, the following summary presents the key themes that emerged. In Interval 3, formal and informal control mechanisms and the authority and hierarchy of project management, based on the system of controls genre, are investigated (Aubry, 2011; Tiwana, 2010). In Malaysia, private partner compliance is assessed through control mechanisms applied in public agencies (Abdul-Aziz, 2012). Müller and Lecoeuvre (2014) measure projects' operational behaviour in the sense of its shareholder–stakeholder orientation toward four governance paradigms where the behaviour–outcome control is applied.

Delhi et al. (2012) identify different challenges in governance and the preventive mechanisms that can be applied within build–operate–transfer (BOT) projects. The governance genre adopted by an organisation and its parenting mechanisms can be influential in reaching decisions in a project in relation to the ethical context. Ethics and many other abstract issues are investigated by researchers during this period (Müller, 2014; Müller et al., 2013; Walker & Lloyd-Walker, 2014). Articles are found in the current study's literature review on the following: the originality of project governance concepts by (Ahola et al., 2014); multi-level project governance by (Biesenthal & Wilden, 2014); risk, uncertainty and governance in mega-projects by (Sanderson, 2012); organisational enablers for governance by (Müller, Pemsel, et al., 2014); and project governance schools of thought by (Bekker, 2014).

In this context, Aubry et al. (2014) assess the tensions between hierarchy and the newly proposed forms of arrangements, with hierarchy and control values versus complementary collaborative governance arrangements. By applying the framework of these competing values as a magnifying lens for exploring these tensions, they conduct a participatory action study in a university hospital during its major organisational transformation. Locatelli et al. (2014) focus on how systems engineering can convert the governance concept from project governance to system governance to improve the performance of projects delivered in a complex set-up. The impact of governance on project delivery in complex private finance initiative (PFI) projects is assessed by (Patel & Robinson, 2010).

Interval 4 2016–2020

In Interval 4, the literature revealed the following key themes, with reference to specific articles. Studies indicate their interest and concern with project complexity, also exploring the relationship between project complexity and governance, both of which the current study sought to investigate. With some diversion from the mega-project theme, generating value for society in terms of trust building is briefly addressed by Klakegg et al. (2016) and Xie et al. (2017), whereas facility development is investigated by Kivilä et al. (2017); however, in all three studies, the focus does not consider external stakeholders as value generators. Essential elements that constitute the basis for a highly productive partnership include: defining communication protocols; introducing democratic and participative decision making; tolerating the disagreements raised; overcoming difficulties in relationships; and ensuring that effective communication is on course at all levels (Nisar, 2013).

Regarding the issue of complexity in Interval 4, (Chakkol et al., 2018) conduct a study based on a qualitative analysis of 29 semi-structured interviews. The study assesses and identifies how collaboration can be effectively governed in complex projects through the emerging contribution of the collaboration standard and its impact on contractual and relational governance mechanisms. The specific case of a Flemish PPP program in Belgium is explained by Hurk and Verhoest (2015) by exposing the interaction between the manner of governance and the interference of complexity. The distinctions between three types of project complexity are assessed by (Gao et al., 2018) who reveal the relational and performance risks caused by each project complexity dimension. Applying tools and techniques for the governance of complex projects is investigated by many academics, for example, networks by (Adami & Verschoore, 2018); command-and-control and the network by (Gorod et al., 2018); environmental scanning by (Baugh, 2015); enterprise architecture by (Carter et al., 2016); the viable system model by (Bathallath et al., 2019; Kummamuru & Hussaini, 2016); and complex adaptive systems by (Statsenko et al., 2018). Two good review articles are available, one on agile project governance by (Lappi et al., 2018) and the other on project governance and stakeholders by (Derakhshan et al., 2019).

After conducting a comprehensive review of the governance literature and its evolution, it would be beneficial to delve into governance-related theories and examine their contributions to the development of the governance landscape. This serves as the primary objective of the forthcoming sub-section.

2.2.3. Project governance theories

Project governance theories offer researchers valuable tools for understanding why certain governance approaches are adopted and exploring the reasons organisations use to justify their existence and potential contributions to governance in both practice and theory. By applying these theories, researchers can gain insights into the factors that motivate organisations to adopt specific governance approaches and the benefits they hope to achieve through their governance practices. This study reveals how a cohesive research stream of project governance emerged from a set of theoretically fragmented case studies in the early 2000s by gradually coalescing around few strongly interconnected streams of studies employing agency theory and stakeholder theory together with transaction cost and institutional theoretical lenses. Moreover, we observed significant growth in complexity, network, leadership, organisational, and viable system theories in project governance literature. The theories below are adopted in different situations and are described, along with their gradual development and evolution (see Figure 2.10 and Figure 2.11). Here, only an introductory description is provided to shed more light ways in which they have been used and to provide a better understanding of each theory.

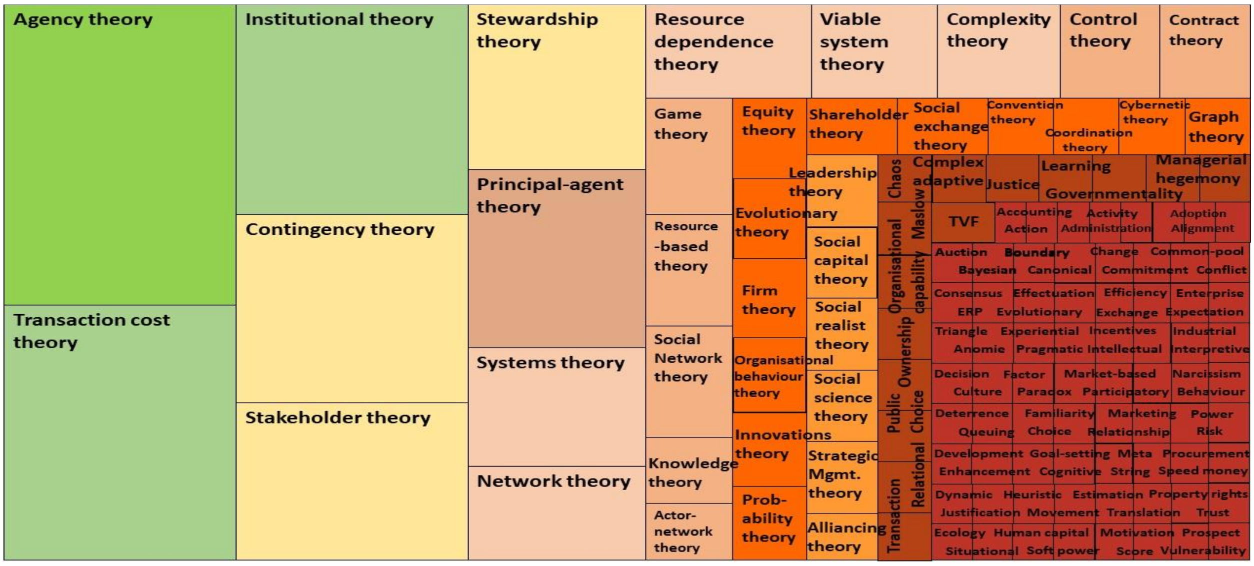


Figure 2.10 Tree of theories contributing to project governance literature (Source: Authors' own creation)

Agency theory

Agency theory has an economic base and assumes that individuals are rational and self-serving. Originally developed to explain relationships between owners (shareholders) and managers within firms (Jensen & Meckling, 1976), agency theory has expanded to encompass broader principal-agent relationships (Davis et al., 1997). This theory is based on the distinction between task ownership (by an agent) and task control (by a principal) and a hypothesis, leading to a potential principal–agent conflict due to each side's different interests. This conflict occurs as the principal relies on the agent to act on their behalf, without knowing whether the action is in the agent's interest (Bergen et al., 1992; Jensen & Smith, 2000), especially when both are labelled as self-interested, utility-maximising parties. Utility maximisation may be supported through lack of information from the other party, thus creating an information imbalance. In the project design, utility maximisation occurs when the principal and the agent are not in mutual agreement, as the agent, in comparison to the principal, is more aware of the project, thus having an advantage. In international development projects, characterised by their multidisciplinary nature and diverse stakeholders, agency theory becomes increasingly relevant. The management of informational imbalances and conflicts is critical in these complex environments (Gutner, 2005; Parker et al., 2018).

Transaction cost economics (TCE)

Transaction cost economics (TCE) addresses administrative costs in project transactions, akin to the friction in physical systems. While sharing some economic foundations with agency theory, TCE takes a broader view, focusing on the negotiation, control, and enforcement of contracts (Müller, 2016a).

According to Williamson (1986, 1987), transaction costs are contingent on the following three main dimensions:

1. Degree of asset specificity: describing the extent to which an object in a transaction is, or is not, specific to the individual transaction.
2. Degree of uncertainty, consisting of:

A. lack of communication or emission of false and misleading signals

B. general uncertainty in human behaviour

C. general risk in undertaking the project

3. Transaction frequency: unlike unique transactions, repetitive routine transactions require no specialised governance structures.

TCE considers factors such as asset specificity, uncertainty, and transaction frequency when analysing governance structures. In the context of complexity theory, TCE can help organisations adapt their governance structures to minimise transaction costs and ensure efficient project execution. Given the intricacies of international development projects, where external and internal dependencies are common, TCE provides valuable insights into governance strategies (Rindfleisch, 2020).

Institutional theory

In terms of social structure, institutional theory evolves into deep and resilient concepts to shape the processes through which patterns, regulations, norms and daily conduct take form as authoritative measures. Most relevant studies focus on describing and analysing formal and legal institutions (Peters, 2011). Although somewhat replaced by individualistic approaches that consider the political system, due to the progress made in institutionalism, the study of institutions is gaining momentum. In these studies, the concept of the institution is assumed as being the core. In terms of effective governance, the nature of institutions prevails over the political system. The contribution of institutions in providing opportunities for involvement in governance becomes crucial when one takes governance as an inherent contributing factor in social behaviour (Bevir, 2010). Institutions have dual functions: (1) reaching internal decisions and (2) promoting democratic interactions extended through social actors (Sørensen & Torfing, 2005) which, in turn, emphasise the necessity to further assess common differences between presidential and parliamentary institutions (Schmitt, 2005) in which a more comprehensive range of institutional arrangements are of concern. Institutions play a crucial role in facilitating governance interactions in complex socio-political environments, making their understanding pivotal in international development projects.

Contingency theory

A contingent state is when something or some knowledge depends on the status quo; consequently, contingency theory is referred to as situational theory. In this context, the effectiveness of an organisation is the product of the balance between the characteristics of an organisation and the associated contingencies (Donaldson, 2001). Any variable that can withstand the effect of organisational characteristics on performance is a contingency. These variables consist of external and internal attributes, such as the organisation's environment (Geiger et al., 2006; Hambrick, 1983; Hoque, 2004) and its strategy (Langfield-Smith, 1997). Gaining distance from ideas characterised by early classical management theory is the objective of this theory which indicates that an ideal organisation is established in different ways (Bradshaw, 2009). This complex pattern is based on the perception that organisational effectiveness results from fitting the characteristics of the organisation, such as its structure, to contingencies that reflect the organisation's situation (Donaldson, 2001, p. 1).

Stakeholder theory

Stakeholder theory is a corporate governance theory adopted by corporations. In applying this theory, the organisation justifies its existence through providing its products and services to establish a new market, consisting of many stakeholder groups, which need to be served to keep the market afloat. The co-existence of different stakeholder groups, such as shareholders, customers, employees and their families, suppliers, the local community, environmental groups, etc., is assumed in this theory (Clarke, 2004). As their requirements vary, the corporation must align itself to these requirements to maintain its market. By adopting this theory, an organisation seeks to align itself with the varying interests and claims of stakeholders, thus promoting its goodwill.

Stakeholders are not only closely linked groups and communities but include industries and members of society as a whole. In international development projects, stakeholders encompass a wide range of actors, including government agencies, local communities, non-governmental organisations, and more (Smillie et al., 2013). Complexity theory helps us appreciate the intricate web of relationships and interests among these stakeholders, guiding organisations in aligning their governance strategies with the multifaceted demands of these projects (Julian, 2016).

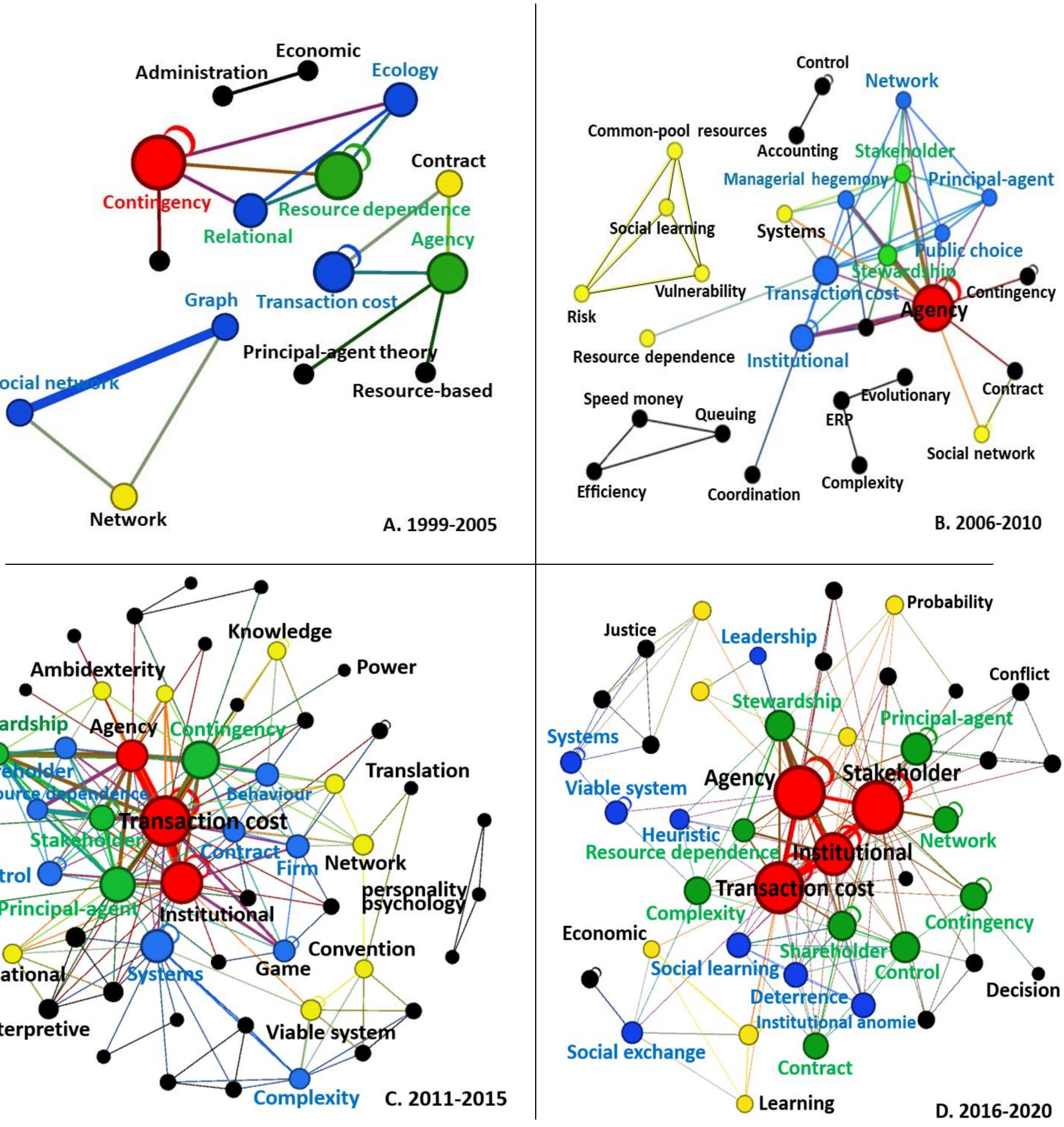


Figure 2.11 Cross-pollination between jointly applied theoretical perspectives in the project governance research field evolution

Notes: Theoretical perspectives are coloured according to their frequency of occurrence within the period (red > green > blue > yellow > black). Theories that have been jointly leveraged in the same studies are linked with the link width indicating the frequency of this co-occurrence. The networks have been laid out so interrelated theories as applied in the same studies appear closer together.

Stewardship theory

Stewardship theory, grounded in psycho-sociological aspects, assumes that individuals' behaviour is pro-organisational and trustworthy, in contrast to agency theory's focus on self-interest (Davis et al., 1997). This behaviour is explained in stewardship theory in terms of the principal–steward relationship, in which the steward is guided by a commitment to the organisation and motivated by intrinsic factors, such as the work itself, leading to the prioritisation of collectivistic objectives over individual objectives. According to Davis et al. (1997), stewardship theory's psychological foundation, unlike agency theory, corresponds to that of the higher levels of Maslow's hierarchy of needs. Stewards apply personal power and follow value involvement-oriented conditions. In comparison to agency theory, stewardship theory is relatively new and is yet to reach the level of recognition of other governance theories, such as the widely accepted agency theory and transaction cost economics (TCE) (Williamson, 1986, 1987). Adoption of stewardship theory is expanding, especially in studies conducted on more contemporary organisational designs (Franck & Jungwirth, 2003).

Although Van Puyvelde et al. (2012) find, in governance studies, that for-profit organisations have a preference for agency theory, its appropriateness for the not-for-profit sector continues to be questioned. According to Sundaramurthy and Lewis (2003), modern enterprises must have simultaneity of agency theory-type control and stewardship theory-type-collaborative structures, with the relative importance of either theory being subject to the organisation's history. In this context, successful organisations will remain, while those that are less successful will enter a self-reinforcing circle. For aspects characterised by diversity and shareholder involvement, these authors recommend more stewardship-type approaches which are accomplished by promoting people's trust in human capabilities to balance collaboration and control and ignoring humanistic limitations and task-related cognitive conflict among governance actors. According to (Clarke, 2004; Hernandez, 2012; Müller & Lecoeuvre, 2014), any state between these flawless approaches can be achieved in corporate reality (Müller, 2016a).

Resource dependence theory (RDT)

Valuable insights on the allocation, prioritisation and facilitation of organisational resources are provided through resource dependence theory (RDT) (Oliver, 1991), suggesting that organisational success is subject to the organisation's ability to control external and internal interdependent resources (Clarke, 2004). A matter of concern in RDT is that organisational behaviour is affected by external resources applied in a project, such as external audit. These resources vary in form and can contribute to an organisation's capital. The variety of resources applied can be specific to an organisation and influential in its governance structure (Hillman & Dalziel, 2003). Resource dependence theory (RDT) provides grounds for considering that the diverse needs of an organisation may differ at different stages of the organisation's existence and for determining how resources can be applied to overcome the organisation's limitations. This theory considers resources as the primary supports of a governance system/structure. Consequently, this theory may contribute to understanding the essence of the allocation and prioritisation of different resources that are often shared among project programs and portfolios (Biesenthal & Wilden, 2014). Resource dependence theory (RDT) is being audited in many reviews and meta-analytic studies, for example, by Hillman et al. (2009); Davis and Cobb (2010); Drees and Heugens (2013); and Khieng & Dahles (2015). These researchers discuss its importance in interpreting organisational conduct through founding units, conditions, joint ventures, and mergers and acquisitions, to overcome organisational dependencies and promote autonomy and legitimacy.

General systems theory

General systems theory, often coupled with cybernetics, is instrumental in understanding complex systems and their components. International development projects, with their multifaceted challenges, benefit from the holistic perspective offered by general systems theory. It encourages organisations to consider the interconnectedness of project components and how they collectively contribute to project outcomes (McEvoy et al., 2016). When faced with a narrow, short-term challenge, resorting to general systems theory is one of the ways to provide a more appropriate all-round solution (Bevir, 2010). The system is a very abstract concept, slightly more than a metaphor, through which any complex set of parts is described as forming a greater whole. In its purest abstract sense, this concept solely considers macro structures in terms of the relationships of their composite units. The system classifies objects into their parts and associated references, with the objective being to facilitate problem solving. Begley (2001) describes nine levels of complexity, beginning from a structural framework, like an organisational chart, and ending in transcendence, all freely adaptable to circumstances.

Network theory

The study of graphs as the representation of either symmetric or asymmetric relationships between discrete objects is the subject of network theory which is applied to assess characterisation and to model the methods within a complex network. These complex networks have some standard features, such as their scale-free degree of distribution. A network founded on relationships contains a set of objects (nodes) and the mapping or description of connections between the objects or nodes (Kadushin, 2004). In this theory, the focus is on the relationships between people instead of their characteristics. These relationships are comprised of mutual feelings, information exchange or more tangible exchanges, such as goods and money, between people (Chowdhury et al., 2011). Network analysis (social network theory) is the study of how the social structure of concern that surrounds a person, group or organisation affects beliefs or behaviours. In international development projects, these networks often involve stakeholders including donors, host countries, implementing agencies, and others, each having diverse interests and roles. This theory significantly contributes to an understanding of relationships and the design of many-to-many marketing (Gummesson, 2007).

Shareholder theory

Shareholder theory is oriented to corporate governance and assumes that a corporation exists to maximise the wealth of its co-owners through profit maximisation (Friedman & Miles, 2006). Maximising shareholder wealth, the return on investment (ROI) and the share price are governed by policies developed and implemented in the corporation (Müller, 2016a). This orientation toward corporate governance has an inherent organisational value system through which the interests of shareholders are prioritised over those of other stakeholders. The focus of this theory is mainly on quantitative financial yield, with this compensated by more qualitative objectives, such as employee well-being, ethical standards and good relationships with society. Advocates of this theory often refer to the need to direct management's view of a single bottom line to fulfil corporate and shareholder objectives and to overcome the difficulties involved in managing a more diverse set of stakeholders in diversified governance structures. This risk within diversification leads to a loss of concentration on the needs of the prioritised stakeholder group/s and shareholders' requirements. This theory is discussed in many corporate governance studies, including those conducted by Blomquist and Müller (2006); Aaltonen (2010); Walton (2013); and Derakhshan & Turner (2022).

Recognising the interplay between these project governance theories and complexity theory enriches our understanding of how governance mechanisms are chosen and tailored to meet the distinct challenges of international development projects. This multidimensional approach allows us to navigate the intricacies of project governance in complex environments, ultimately contributing to more effective project outcomes.

2.2.4. Theoretical frameworks connected to popular project governance research themes

Overall, the current study identified 53 theories in the project governance literature over the last 20 years. Appendix 2 displays the most common themes ranked in columns from left (most popular) to right. These theories are cross-tabulated with most common research keywords ranked by their popularity from top to bottom. For example, agency theory, transaction cost theory and institutional theory are the most popular theories in project governance research. 'Transaction cost theories', 'organization', 'project success' and 'PPP' are the most popular keywords. The cross-tabulation frequencies identify which theories are popular for studying certain topics and which topics are unsuitable or overlooked in the applications of these theories. For instance, the often-examined topic of governance in PPPs has been frequently examined through the lens of institutional theory but never through that of agency theory although the latter is generally more frequently applied in project governance research. Transaction cost theory is commonly leveraged to study contracts but has not been explicitly used to increase the understanding of stakeholder management. Network theory has been broadly applied to a wide variety of topics but never to understand the otherwise frequently studied issues of 'project success' and 'project risk'. Curiously, contingency theory has never been used in studies with keywords focused on leadership, with these predominantly in the domain of agency theory and stewardship theory. This summary highlights areas of proven publication success in top project management journals but also potentially understudied niches in terms of the application of proven theories to novel topics.

2.2.5. Project governance models and paradigms

This subsection presents a brief overview of prevalent models for organisational project governance and their diverse ontological origins. It proceeds by combining the theories discussed earlier and formulating an all-encompassing organisational project governance model, with a specific focus on how these models relate to international development projects.

2.2.5.1 Models of organisational project governance

According to Müller (2016a), the following four project governance models are most frequently used in studies in the literature. These models are examples of the many ontological and theoretical perspectives inherent in governance models.

1. **Process models**

Turner (2009) proposes a process- and role-based model which, through its process perspective, identifies three processes, their associated roles and their relationships in project governance. This model is described as three concentric circles of governance processes: (1) the innermost circle; (2) the intermediate circle; and (3) the project result circle. In this model, a minimum of four governance positions are defined, as follows (Müller, 2016a):

- Sponsor—this role identifies and justifies the project's necessity and benefits, with a mandate to secure the required resources, including donor funding and support.
- Steward—this role works in conjunction with the sponsor to define the project output and the potential benefit(s), aligning them with the development goals and local needs of the hosting country.
- Project manager—this role defines and manages the process with successful project monitoring and control mechanisms, thus ensuring good project delivery.
- Owner or business change manager—ensures project deliverability and the realisation of anticipated benefits, emphasising sustainability and positive impacts on the host community.

This model promotes transparency by aligning the steward with the project manager and owner/business change manager, fostering accountability and fairness (Müller, 2016a).

2. Governance and governmentality-based models

Walker et al. (2008) propose a model for establishing equilibrium in the balance between governance (a hard factor) and governmentality (a soft element). The complicated nature of the structures, rules and regulations applied to systematically identify accountability and responsibility for the delivery of project objectives consists of elements, such as an organisational design pathway, to structure transparency, accountability and responsibility (Levie et al., 2017). These elements include policies and procedures, work processes, regulations and codes of practice that clarify responsibility and accountability, as well as legal requirements, audits, reporting, performance measures and stakeholder disclosure to address all four governance principles (Müller, 2016a). In international development, this model adapts to address the intricate relationships between donors, host countries, implementing agencies, and local communities (Watts, 2017). This model establishes equilibrium in governance and governmentality through trust and credibility between actors, based on clear accountability, transparency, known responsibility and required fairness (Müller, 2016a).

3. Nested models

Too and Weaver (2014) propose a three-layered, nested model of organisational project governance. At its core, a project delivery system is executed by middle and front-line managers and, while at the highest level, a governance system is implemented and overseen by the board of directors. The emphasis of this model is on the mutual dependency of the governance and management systems. In this model, the governance system defines the structures, rights, responsibilities and requirements to ensure work efficiency.

Governance has two primary functions in this model:

1) Formulating decisions on which projects are to be approved, funded and supported through communication with management regarding the strategic framework for selecting the appropriate project mechanisms, practical resources, utility rules, procedures, and rights and responsibilities of participants.
2) Providing supervision and assurance, with these accomplished through agreements and possible modification of the strategic plan to ensure a project's alignment with that plan.

According to prior studies, good project governance is achieved through the optimisation of the balance between four elements: (1) portfolio management; (2) project sponsorship; (3) project management offices (PMOs); and (4) organisational elements of projects and programs (Müller, 2016a).

4. Layered models

The layered model is proposed by Müller (2009), with project governance levels, programs, portfolios and boards of directors' interfaces explained through the institutional, agency and stewardship theories and transaction cost economics (TCE). At the project governance level, governance instances, similar to guiding group meetings, act as intermediaries to stakeholders and the public. This is achieved by being responsible for project legitimacy in the project's professional execution and transparency in performance, making this a principal act for the project manager. Guiding groups, with a predominantly agency theory perspective towards their project managers, assign the agent's role to the project manager and support monitoring as the governance mechanism. In contrast, guiding groups, that mainly support stewardship approaches, apply trust as their primary governance mechanism. It is deduced that agency and stewardship theories describe the pairwise and situational relationships between the governor and the governed in a particular instance. The governor's view of the entire governance life cycle and the emphasis on reducing unnecessary transaction costs are explained through transaction cost economics (TCE).

In the layered model, the same principle applies to the interface between the guiding group (as agent/steward) and portfolio management and between portfolio management and the board of directors. The project management offices (PMOs), in a consulting and training role, would act as agents or stewards for higher levels of management, such as guiding groups or program/portfolio managers, and act as principals for project managers in their domain (Müller, 2016a).

2.2.5.2. Governance paradigms

This subsection describes a model that incorporates four governance paradigms, with the model developed by Müller (2009) and endorsed by subsequent studies including Müller and Lecoeuvre (2014); Aubry et al. (2012); Müller et al. (2014), and Bernardo (2014). These paradigms link corporate governance to organisational project governance through two types of corporate governance orientation and control structures in a project's parent organisation's dimensions (Müller, 2016a). The four governance paradigms developed by (Müller, 2016a) are as follows: conformist, flexible economist, versatile artist and agile pragmatist, covering the two main dimensions: shareholder orientation versus stakeholder orientation and behaviour control versus outcome control, are presented in Figure 2.12.

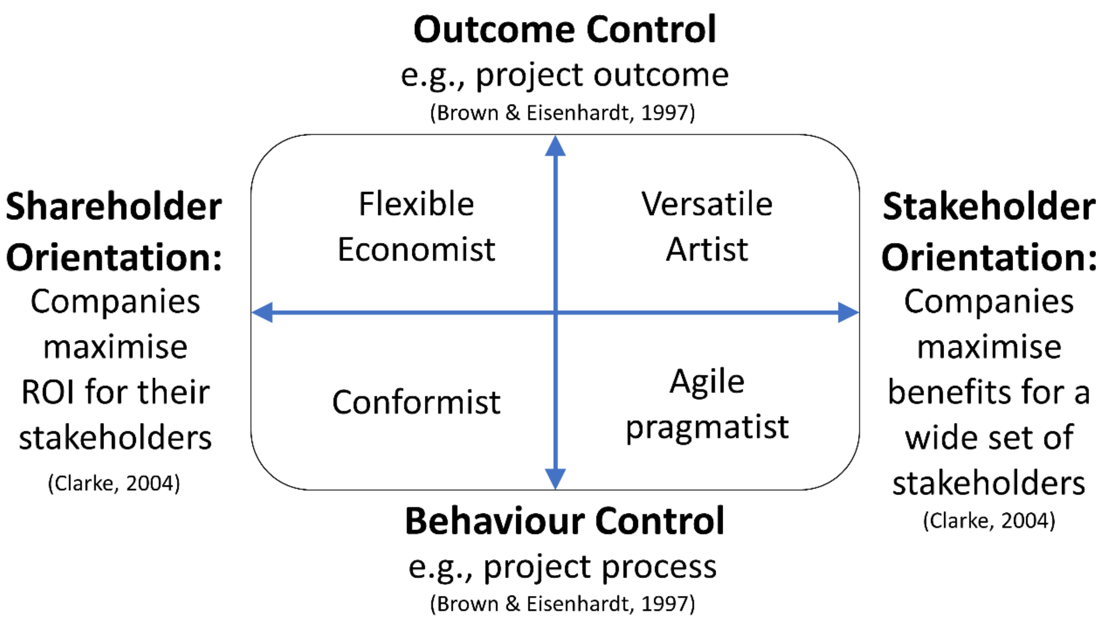


Figure 2.12 Shareholder vs. stakeholder orientation and behaviour versus outcome control (source: Müller (2016a))

1. Conformist Paradigm:

- Characteristics: Shareholder orientation in governance with a focus on behaviour control.
- Governance Design: Process and methodology compliance geared towards securing the highest return on investment (ROI) for shareholders (Müller, 2016a).
- Applicability to International Development: Particularly relevant for international development projects characterised by simplicity and a homogeneous set of projects (Ika, 2012). Efficiently managing projects is crucial with a focus on shareholder control and interests (Clegg & Clegg, 2013; Humphrey & Michaelowa, 2013).

2. Flexible Economist Paradigm:

- Characteristics: Combination of shareholder orientation and an outcome control focus.
- Governance Objective: Application of the most effective project management methods, tools, techniques, and approaches to maximise ROI for shareholders.
- Support Mechanism: PMOs provide training and support for professional project managers, emphasising the core competency of project management in these organisations (Müller, 2016a).
- Adaptation for International Development: In the international development context, adaptability is crucial (Lin et al., 2020). This paradigm aligns with the need for effective and efficient project management, taking into account diverse stakeholder interests and complex project environments (Ekboir et al., 2013).

3. Versatile Artistic Paradigm:

- Characteristics: Stakeholder orientation with an outcome control focus.

- Versatility: Essential for aligning diverse and often conflicting requirements.
- Expertise: Organisations employ senior and experienced project managers who customise or develop new methodologies and practices to fit project needs. PMOs serve business and operational purposes, linking strategic, tactical, and operational levels in projects (Müller, 2016a).
- Application in International Development: In international development projects, this paradigm addresses the multifaceted demands and diverse stakeholder interests, allowing for flexibility and adaptability in project execution (Manning, 2017).

4. Agile Pragmatist Paradigm:

- Characteristics: Stakeholder orientation with a behaviour control focus.
- Emphasis: Process compliance and objective delivery of time-phased functionalities, especially in IT projects.
- Flexibility: Project sponsors prioritise functions or user needs in alignment with business value, allowing flexibility in responding to changes in scope or other stakeholder requirements unique to this paradigm (Müller, 2016a).
- Relevance to International Development: Particularly suited for international development projects where the balance of diverse stakeholder requirements and flexibility in adapting to changes are paramount for success (Ika & Hodgson, 2014; McDowell & Drechsler, 2018).

Despite the significant contributions to the governance literature in the realms of project management and international development, there has been comparatively less focus on the variations in governance performance and its correlation with project outcomes. As evidenced in the literature, governance profoundly influences project performance. This observation leads me to formulate the following research hypothesis: 'Governance exerts a positive impact on project outcomes' (Hypothesis 1). This hypothesis, which posits a direct relationship between governance and project success, will be rigorously tested in the context of international development projects worldwide in the subsequent chapter.

In the following sub-section, I will review the relevant literature concerning governance and complexity.

2.3. Review of studies in which project governance is addressed in relation to project complexity

In the literature review conducted for this study, I identified 15 articles within the project management literature that specifically explore the intersection of governance and complexity. These articles are distributed across various themes, with five focusing on 'governance as processes,' two on 'governance as relationships,' one on 'governance as a system of controls,' and seven addressing 'general project governance issues.' Regarding their research design, the majority fall within the qualitative research category, predominantly relying on secondary data as the primary information source (see Table 2.5).

Patel and Robinson (2010) assess the impact of governance on project delivery in the realm of complex private finance initiative (PFI) projects. They introduce a two-stage approach, firstly, conducting a literature review and a multiple case study to address the research questions. The second stage, based on detailed semi-structured interviews conducted with project directors and executive managers, provides a comprehensive view on how two major PFI projects are planned, managed and delivered, with the National Health Service

(NHS, UK) being the subject. Their findings reveal that project governance is influential on project delivery in relation to cost, quickness, quality and financial viability and labelled these as the major components for providing a clear organisational structure, decision-making patterns and control processes.

Aubry et al. (2014) apply the competing values framework, emphasising the competing aspect, to highlight different sets of values and preferences on which the evaluation of the PMO takes place. Their participatory action research approach is adopted in a university hospital undergoing a major organisational transformation. The findings reveal the paradoxes between hospital executives and the PMO's performance and how these paradoxes evolve. The findings also highlight both the existing contradictions and the dynamic process(s) related to performance assessment within a transformation project. In their multi-method study, Chakkol et al. (2018) conduct qualitative analyses of 29 semi-structured interviews, with primary data obtained from meetings and events, and supported by secondary data. They assess the governance of collaboration and its enactment in practice in relation to complex projects. Their study identifies how cooperation should be governed effectively in complex projects through its emerging standard(s) and its impact on contractual and relational governance mechanisms.

Matinheikki et al. (2019) reveal how public buyers of a tunnel construction project form a hybrid multi-party project alliance to respond to institutional complexity. In this project, a process of temporary hybridisation is introduced through which the competing rationales of a bureaucratic state, corporate market and multiple professions are combined in the temporary project alliance organisation. Their case study on the governance of institutional complexity in a mega-project, the Hong Kong–Zhuhai–Macao Bridge project, aims to elaborate on the origin of institutional complexity and identify how institutional complexity affects project outcomes and shapes actors' behaviours. To these authors, the emergence of institutional complexity is subject to both external complexities (macro-level), consisting of regulatory, political, social-cultural and evolutionary complexities, and internal relational complexities (micro-level) in actors' environments. Institutional complexities evolve due to macro-level complexities that promote arguments in mega-project organisations (external) and add to the constraints, while practices at the project's micro-levels may be infiltrated by organisational disputes. They find that actors in organisations conducting mega-projects resort to different responses when faced with various types of institutional complexities (Qiu et al., 2019).

The following two studies have as their theme 'governance as relationships'. Hurk and Verhoest (2015) assess the contradictory achievements of the Flemish Sports Infrastructure Program, finding that the governance format applied by the Belgian government is inadequate and leads to interference in political, multi-actor and technical complexities which, in turn, compromises the program's performance. A mismatch is observed between the complicated governance approach and the relatively straightforward infrastructure developed, indicating that a higher level of contingency is required for public–private partnership (PPP) programs. Most governments realise that they must be very aware, when adopting PPP programs, that these programs embody clusters of procurement and mandating agreements. These programs are not without their complexities which may emerge before the merits of the agreements are delivered.

Table 2.5
Main project governance research addressing complexity

No	Title	Author/s	Genres	Research stream	Level of analysis	Research type	Research design	Research method
1	The governance of collaboration in complex projects	Chakkol et al. (2018)	Processes	Consequences	Project	Qualitative	Cross-sectional	Multi-methods (interviews + secondary data analysis)
2	Governing projects under complexity: Theory and practice in project management	Pitsis et al. (2014)	General	Design	Project	Qualitative	Conceptual	Secondary data analysis
3	Governance performance in complex environment: The case of a major transformation in a university hospital	Aubry et al. (2014)	Processes	Consequences	Organisation/ Project	Qualitative	Phenomenology	Multi-methods (interviews + questionnaire)
4	Complex project management as complex problem solving: A distributed knowledge management perspective	Ahern et al. (2014)	General	Design/ Consequences	Project	Qualitative	Conceptual	Secondary data analysis
5	Systems engineering to improve the governance in complex project environments	Locatelli et al. (2014)	General	Design	Organisation/ Project	Qualitative	Conceptual	Secondary data analysis
6	The governance of public–private partnerships in sports infrastructure: Interfering complexities in Belgium	Hurk & Verhoest (2015)	Relationships	Consequences	Program	Qualitative	Case study	Multi-methods (desk research + semi-structured interviews)
7	Politics, public servants, and profits: Institutional complexity and temporary hybridization in a public infrastructure alliance project	Matinheikki et al. (2019)	Processes	Consequences	Project	Qualitative	Case study	Multi-methods (interviews + secondary data analysis)
8	Enterprise resource planning systems implementation as a complex project: A conceptual framework	Ghosh & Skibniewski (2010)	General	Consequences	Project	Qualitative	Review	Secondary data analysis
9	Impact of governance on project delivery of complex NHS PFI/PPP schemes	Patel & Robinson (2010)	Processes	Consequences	Project	Qualitative	Case study	Multi-methods (interviews + secondary data analysis)
10	Addressing project complexity: The role of contractual functions	Gao et al. (2018)	System of controls	Consequences	Project	Quantitative	Cross-sectional	Surveys (questionnaires)
11	Computational experiment study on selection mechanism of project delivery method based on complex factors	Ding et al. (2014)	General	Consequences	Project	Quantitative	Experimental	Experiments
12	Regional models on managing the public–private partnership projects in housing and communal complex	Filushina et al. (2015)	General	Consequences	Project	Qualitative	Conceptual	Secondary data analysis
13	Implications of network relations for the governance of complex projects	Adami & Verschoore (2018)	Relationships	Design/ Consequences	Project	Mixed method	Comparative	Multi-methods (interviews + questionnaire (forms) + secondary data analysis)
14	Governance of institutional complexity in megaproject organizations	Qiu et al. (2019)	Processes	Consequences	Project	Qualitative	Case study	Multi-methods (interviews + secondary data analysis + observation)
15	Project management canvas: a systems thinking framework to address project complexity	Elia et al. (2020)	General	Consequences	General	Qualitative	Systematic review	Secondary data analysis

Adami and Verschoore (2018) adopt the social network approach to assess project network implications, seeking to respond to the requirements of studies conducted on new perspectives of complex projects and their governance. Their study analyses the quantitative and qualitative data of two flow and theoretical coordination models. The study's findings reveal how supply, contractual and information networks impact on the governance of project networks.

The contribution of contractual functions is addressed by Gao et al. (2018) through their study on a control system's impact on project governance. The study differentiates the three types of project complexity and explains the correlational and performance risks caused by each dimension. The practical contractual functions and hypotheses concerning the type of project complexity are also distinguished. Their empirical results indicate that contractual coordination can encounter risks induced by the technical, organisational and environmental (TOE) complexities (Bosch-Rekveldt et al., 2011), and that the adaptation function can encounter risks related to environmental complexity. They find that contractual control is ineffective when either technical or environmental complexity is high.

In six of the seven articles in which the general theme is project complexity, secondary data are employed as the source of analysis. Ahern et al. (2014) assess two organisations that develop complex project management (PM) expertise as a form of complex problem solving (CPS). They propose that the distributed coordination mechanism in both, at its best, can be considered as a standard will of mutual interest, a self-organising process supported by project goals in the project's life cycle.

Locatelli et al. (2014) assess how systems engineering, by transforming governance from project governance to system governance, can improve the performance of projects delivered in a complex environment.

Ding et al. (2014) establish a multi-agent model solely to verify how project complexity, governance strength and the market environment affect the project owner's decision about participative decision making (PDM). The findings from their experimental study indicate that project owners usually prefer the design–build method when the project is very complex within a specific range. Elia et al. (2020) provide an articulated project management model with related insights to address the complexity of current project activities. Their model, based on a design science process and applying business management concepts, comprises: (a) a systems view of a project and (b) a flow diagram showing the fundamental relationships between project attributes; and (c) discusses system archetypes identifiable within project management in any form.

The existing literature underscores the urgent need for deeper investigation into the interplay between governance and complexity. Future research endeavors should strive to understand how governance can create a more effective framework for managing complexity and, in turn, how complexity can mold the impact of governance on project success. This understanding forms the basis for the formulation of the following research hypotheses: Complexity exerts a negative effect on governance (Hypothesis 3) and complexity negatively moderates the relationship between governance and project outcomes (Hypothesis 4). These hypotheses, which posit that complexity can undermine governance and its positive influence on project outcomes, will be rigorously tested in the subsequent chapters of this research.

In the final leg of my literature review, I intend to scrutinise studies that investigate the relationship between governance and project success within the specific context of international development projects. Given that the concept of project success varies depending on the context, this section predominantly centers around the ID setting (Jugdev & Müller, 2005). This examination serves a dual purpose: to gain insights into the outcomes of current studies and to inform a more robust research design, addressing the overarching questions posed in the thesis.

2.4. Governance and success in the context of international development

International development aims to uplift communities, nations, and regions from poverty, inequality, and underdevelopment. Success in this context is a nuanced concept that extends beyond traditional projects (Diallo & Thuillier, 2005; Khang & Moe, 2008). This sub-section of the literature review explores the various dimensions that contribute to the performance of international development, acknowledging the diverse perspectives and challenges inherent in this dynamic arena.

1. Economic Growth and Poverty Alleviation:

Historically, success in international development has often been equated with economic growth and poverty reduction (Vetterlein, 2007). GDP growth rates and declining poverty rates have been key indicators. Countries achieving sustained economic progress are often seen as success stories. For instance, the remarkable economic transformation of countries like South

Korea and Singapore stands as a testament to the impact of development initiatives (Low, 2001).

The collection of studies provides a comprehensive exploration of the relationship between economic growth and poverty alleviation in various global contexts, shedding light on the inherent complexities of international development projects. For instance, a comparative study of Indonesia and Nigeria underscores the pivotal role of political institutions in shaping economic growth, thereby influencing poverty alleviation efforts (Lewis, 2009). This highlights the need for international development projects to consider the political landscape and institutional capacity of the countries they operate in. Briguglio et al. (2014) offer an overall understanding of economic vulnerability and resilience, emphasising the importance of robust policies in areas such as macroeconomic stability and good governance for mitigating the impacts of exogenous shocks. This underscores the need for international development projects to incorporate resilience-building measures and to adapt to the economic vulnerabilities of the communities they serve (Béné et al., 2014). In another aspect, recommendations include embracing complexity and uncertainty when considering projects for approval, offering organisational incentives to ensure project success rather than solely focusing on accurate Economic Rate of Returns (ERRs), reallocating resources from appraisal to implementation phases, and redefining the nature of project supervision (Ika & Feeny, 2022).

Dolan & Roll (2013) and Hanusch (2012) both delve into the dynamics of global business and its implications for poverty alleviation. These studies underscore the need for international development projects to consider global market dynamics and the perceptions and needs of local communities. In another study, Lahiri-Dutt (2015) offers a critical perspective on the medicalisation of menstruation, arguing that it constructs repressive expectations of normality for the female body. This highlights the importance of considering gender dynamics and health issues in international development projects.

In response to disasters and their impact on economic growth and poverty, much has been written, particularly after COVID-19. For instance, Omoleke et al. (2016) provide a stark reminder of the societal impacts of health crises, such as the Ebola viral disease in West Africa, which can exacerbate poverty and hinder economic growth. Barletta et al. (2022) assess the impact of COVID-19 on household consumption poverty, relying on existing estimates of macroeconomic impacts and applying them in Mozambique.

2. Social Equity and Inclusive Development:

A broader and more contemporary understanding of success involves a focus on social equity and inclusive development. Success is not solely measured by economic indicators but also by the extent to which marginalised communities benefit from development interventions (Gross et al., 2002). Inclusive policies, aligned with governance indicators such as Voice and Accountability (VA), aim to address gender disparities (Cornwall & Rivas, 2015), mitigate social inequality (Peters, 2020), and promote social justice (Hanson & Nieuwenhuys, 2013). Evaluating the success of these policies in international development projects requires attention to governance indicators, ensuring that decision-making processes are inclusive, violence is minimised, government policies are effective, regulations are of high quality, and the rule of law is upheld (Gisselquist, 2012; Merry, 2011).

Moser & Moser (2005) highlight the progress made in gender mainstreaming policies in international development institutions. However, they also point out the poor implementation of these policies and the largely unknown outcomes in terms of gender equality (Moser &

Moser, 2005). Similarly, Cornwall & Rivas (2015) argue that the terms ’gender equality’ and ’women’s empowerment’ have been stripped of their conceptual and political impact, emphasising the need for new frameworks to demand rights and justice. These findings underscore the necessity for more robust evaluation of social equity mainstreaming policies, considering governance indicators, and the development of more effective strategies for promoting gender equality.

3. Sustainability:

In recent decades, the recognition of environmental sustainability as a core component of success has gained prominence (Bebbington, 2001; Ika & Pinto, 2022). Development initiatives that neglect environmental considerations risk long-term consequences. Success is redefined to encompass projects that not only foster economic and social development but also ensure the preservation of ecosystems and natural resources for future generations (Liebenthal, 2002).

In line with this, there has been an increased interest in using sustainability indicators for evaluating the impacts of international development projects (Agol et al., 2014). These indicators serve as powerful tools for measuring the outcomes of various interventions when used appropriately and adequately. A comparative analysis across multiple projects from countries like Kenya, Indonesia, and Brazil, which aimed to conserve biodiversity and improve livelihoods, has shown that impact evaluation processes present good opportunities for applying sustainability indicators (Agol et al., 2014). The role of sustainability indicators in post-project evaluation is explored by Chasanah et al. (2023), who proposes a comprehensive framework for project sustainability evaluation using a complex systems approach. This approach provides valuable insights into project sustainability dimensions, governance, performance, and changes.

However, it is important to note that project proponents often face challenges with establishing the full impacts of interventions (Ika, 2018). These challenges are rooted in monitoring and evaluation processes, a lack of evidence-based impact assessments, difficulties in measuring certain outcomes, and concerns regarding the scale of various impacts (Agol et al., 2014). Therefore, the role of a robust Monitoring and Evaluation system becomes crucial as a sound governance instrument in assessing the environmental sustainability of International Development projects (Bamberger et al., 2010). In this study, the quality of the monitoring and evaluation system in World Bank-funded projects is considered one of the governance indicators at the project level (further details in the next chapter).

4. Governance and Institutions:

The quality of governance and strength of institutions play a pivotal role in determining success (Booth, 2011). Countries with transparent, accountable, and effective governance structures are more likely to achieve sustainable development outcomes (Wenar, 2006). Success is thus linked to the establishment of faith-based institutions that can withstand economic shocks, political instability, and external pressures (Clarke, 2007). There are various research themes in the context of international development literature including the importance of flexibility, trust, and cultural considerations in the governance of development projects.

The study by Kaboré and Sané (2022b) explores the influence of relational norms and trust on opportunism in a collectivist culture, highlighting the importance of trust as a significant factor in reducing opportunism. This is echoed in Kaboré and Sané (2022a)'s work, which also emphasises the negative impact of opportunism on project success and the positive influence of a collectivist cultural context.

The importance of project supervision, a key aspect of Monitoring & Evaluation (ME), is highlighted in Ika (2015)'s work. The study suggests that while project supervision positively influences project management success, it may not influence project impact, underscoring the need for more focus on project planning, context, and governance to achieve impact.

In another study by Martin (2015) provides a practical example of the applicability of best practice in local planning, financial management, and citizen involvement in a challenging context like the Democratic Republic of the Congo. The study emphasises the importance of reducing practices to the bare minimum to achieve the required result, highlighting the difference between the additive nature of 'best practice' and a pragmatic, reductive methodology. This aligns with the governance indicator of Rule of Law (RL), which emphasises the importance of contract enforcement and property rights.

The challenges in Ethiopia’s forest and landscape restoration (FLR) governance context are explored by Wiegant et al. (2022), who identify five cross-scale and cross-level challenges, emphasising the need for alignment between governance levels and fit with the temporal and spatial dimensions of FLR processes. This aligns with the governance indicators of Government Performance (GP) and Sponsor Performance (SP), which emphasise the importance of effective collaboration by both the government and project donors/funders.

The importance of flexibility in the success of International Development Projects (IDPs) is highlighted by several scholars like (Boakye & Liu, 2015; Castillo & Salgado, 2015), suggesting that flexibility improves the effectiveness of IDPs. This aligns with the governance indicator of Control of Corruption (CC), which emphasises the importance of limiting corruption within the government.

5. Cultural Sensitivity and Community Engagement:

A successful international development project must be culturally sensitive and involve active community engagement (Geekiyanage et al., 2020). Recognising the unique context of each community, understanding local customs, and involving community members in decision-making processes contribute to the success of development initiatives (Ika et al., 2012). Projects that respect and incorporate local knowledge are more likely to be sustainable and impactful.

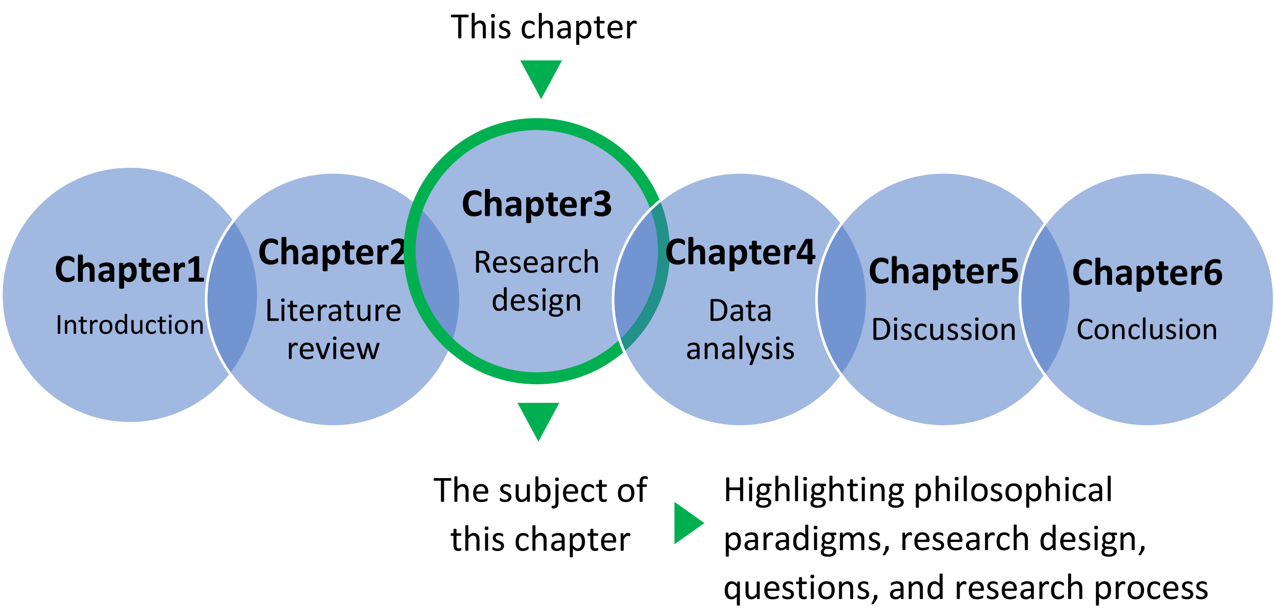
The study by Sanggoro et al. (2022) emphasises the importance of understanding social values and norms that influence the local community's life in Indonesian infrastructure projects. The research highlights that social conflicts can be avoided, and project performance can be achieved according to the specified goals when project managers develop conflict management strategies according to local socio-cultural conditions (Sanggoro et al., 2022). The importance of community engagement is further highlighted in Kabalan et al. (2014)'s work on a micro-hydroelectric system in Ifugao, Philippines. The authors adopted a bottom-up approach for the planned micro-hydroelectric system, emphasising that community engagement is paramount for the success of any rural development project as it gives the community a sense of ownership and empowerment.

It is worth mentioning that the World Bank employs a comprehensive measure of success through its Outcome Index. The World Bank defines project objectives, and at the conclusion of projects, an independent centre evaluates the project outcomes using the Outcome Index. This evaluative process, guided by predefined project objectives, serves as a critical determinant for the success of World Bank-funded international development projects (Independent Evaluation Group, 2008). Projects meeting or exceeding their defined outcomes are deemed successful, contributing to the broader understanding of success in international development (Honig, 2020). In this thesis, the achievement of objectives is considered as the measure of project success, which will be discussed in the following chapter.

It is clear from the existing literature that further research is needed to expand our knowledge of the impact of project governance on project performance, particularly in the context of project complexity. Another area where a gap in the literature exists is the evaluation of the contribution of governance to the performance of international development projects. Several questions arise, such as: how does governance affect international development project outcomes, to what extent is this relationship moderated by project complexity, and how does project complexity impact international development project outcomes? Furthermore, there is a need to understand how monitoring and evaluation, as a sound governance practice, impacts project outcomes (Hypothesis 5). It is therefore essential to understand the various governance network designs and their influence on international development performance worldwide. Additionally, it appears that project outcomes vary in performance across different categories of countries - least developed, developing, and developed. This observation leads to the formulation of the following research hypothesis: The positive correlation between governance and project outcomes is stronger in developed countries (Hypothesis 6). All research hypotheses will be rigorously tested in Chapter 4 of this thesis. The study contributes to the theoretical and practical knowledge of project governance in the international development context, ultimately informing policymakers and practitioners on best practices for effective project governance.

The following chapter presents an exploration of philosophical paradigms, research design, processes, and the detailed methods employed to assess the impact of governance and complexity on international development projects.

Chapter 3



3.1. Introduction

This chapter explains the philosophical paradigm and research design that have been chosen to assess the impact of governance and complexity on international development projects. The subsequent sub-sections explore various aspects of the research methodology, including:

Section 3.2 discusses the research from a more philosophical perspective. We perceive the research as a progressive journey, starting with an exploratory study and evolving towards a confirmatory approach rooted in criticalism and a multi-method approach to data collection and analysis. This section delves into the epistemological, ontological, and methodological inquiries through the examination of research paradigms and the researcher's philosophical standpoint.

Section 3.3 demonstrates the research methodology employed in this study. It presents the sequential steps undertaken, which are substantiated by the choice of combined research methods. The research design, particulars, sampling methods, and data collection techniques are subsequently discussed. Ethical considerations and limitations of the research are also explicated.

In Section 3.4, the research variables, encompassing governance, complexity, and project outcome variables, are elucidated. Furthermore, the nature of the data and its limitations pertaining to the availability of research variables are addressed.

Section 3.5 provides a comprehensive account of the methods employed in this study. Firstly, statistical analysis techniques are succinctly introduced. Subsequently, social network analysis (SNA) is expounded upon as a means to discern the structure of the governance system, with a particular focus on identifying the optimal governance network that yields enhanced project outcomes in the face of complexities. Lastly, a review of natural language processing (NLP) is presented, outlining its relevance to the study.

3.2. Research paradigm

Gliner et al. (2011, p. 17) define a paradigm as a way of thinking about and conducting research, which is more of a guiding philosophy than a strict methodology. According to Kuhn (1962) as cited by Brad Wary (2011), a research paradigm consists of shared beliefs and agreements among scientists about how problems should be perceived and addressed. The research paradigm influences the researcher's perspective on reality and knowledge creation, as well as their argumentative style and research outcomes. It also shapes the research design and development of data collection and analysis methods, and determines the types of valid research questions and context in which they are interpreted (Gliner et al., 2011). The research paradigm's importance lies in its impact on the fundamental assumptions that underlie the researcher's perspective and the subsequent research approach chosen (Krauss, 2005).

In every research paradigm, the following four essential concepts are considered: (1) ontology; (2) epistemology; (3) methodology; and (4) methods. Ontology refers to the study of existence, of becoming, of being and reality. It consists of our beliefs and assumptions about reality (Knight, 2006). After assuming reality, epistemological questions are concerned with the way of understanding the relationship between the inquirer and reality. Epistemology is "the branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and validated" (Gall et al., 2003, p. 13 as cited in Rehman & Alharthi, 2016). Somekh and Lewin (2005) define methodology as "the collection of methods or rules by which a particular piece of research is undertaken" (p. 346). The methodology is the overall approach to the research that links it to the paradigm, whereas the method refers to the "systematic modes, procedures or tools used for collection and analysis of data" (Mackenzie & Knipe, 2006, p. 5).

According to Krauss (2005) and Mackenzie & Knipe (2006), the most commonly recognised research paradigms in the literature are the positivist, interpretive/constructive, and critical paradigms. However, other paradigms exist, including post-positivist, post-modernist, complexity theory, transformative, deconstructivist, emancipatory, and pragmatic paradigms.

3.2.1. Positivist paradigm

The positivist paradigm refers to 'science research', where reality, existing independent of human assumptions, is known to be single, fragmentable and tangible. This paradigm is based on "the rationalistic, empiricist philosophy initiated by Aristotle, Francis Bacon, John Locke, August Comte, and Emmanuel Kant" (Mertens, 2023). The positivist concept can be applied in 'social research' through observation and reasoning, provided that a method exists for assessing a value-free social world along with providing explanations of a causal nature (Mertens, 2023). This paradigm corresponds to methods such as quantitative data collection and analysis (Mackenzie & Knipe, 2006).

In the current research, this paradigm underpins the foundation for developing a sequential design that explores the correlations between governance arrangements and project outcomes, taking into account the complexity factor. The research methodology places a strong emphasis on the use of structural equation modelling (SEM).

3.2.2. Interpretive paradigm

Any attempt to understand social phenomena through assessing how knowledge is constructed in its social sense, by exploring shared meanings, language, consciousness and experience, is subject to the interpretive paradigm (Crotty, 1998; Schwandt, 1994). This paradigm comprises the perception of the world of human experience (Myers, 2000), indicating that "reality is a social construct" (Mertens, 2023, p. 12). The interpretive paradigm, originating from Edmund Husserl's phenomenology and the doctrine of Wilhelm Dilthe, as well as other German doctrines, is the way in which the interpretive understanding named "hermeneutics" is assessed (Mertens, 2023).

In its epistemological sense, according to interpretivism, the social process cannot be measured by hypothetical means; on the contrary, it is measured through entering the world of humans who are responsible for this process (Goldkuhl, 2012). In this study, the interpretive approach is relevant for understanding the key factors that influence project outcomes through quantitative analysis.

3.2.3. Critical Paradigm

In the critical paradigm, critical theorists conducting social studies seek to find exposed structures of analysis built on an engrained philosophy of social criticism, with this being inevitable (Swartz, 1996). The objective of critical educational research is not limited to explaining or understanding society, as it seeks to change society (Patton, 2002). Followers of this paradigm criticise both the positivist and interpretive approaches, regarding them as "enmeshed in dominant ideology … neither has an interest in changing the world nor has an emancipatory goal" (Scott & Usher, 2000, p. 35 as cited in Rehman & Alharthi, 2016). The positivist and interpretive paradigms' lack of knowledge generation regarding the social world and their preservation of the status quo is indicated by Kincheloe (2008). Researchers following the critical paradigm seek to reveal the beliefs and conduct that are restricting freedom, while intending to transform the situation. Critical educational researchers' mission is to oppose those in high positions and open their eyes to the oppressive structures that enslave their populations, causing inequality within these populations (Rehman & Alharthi, 2016). In the current research, the critical paradigm is considered for the interpretation of the shreds of evidence available on the completion of different projects, with critical factors collected as a result.

3.2.4. Ontology and epistemology of the research

This study delves into the ontology and epistemology of governance and complexity within international development projects, with the aim of understanding the impact of governance on project outcomes and the moderating role of complexity. By exploring the relationship between governance, project outcomes, and complexity, this study contributes to the existing body of knowledge in project management and offers insights for countries, local governments, the United Nations (UN), and financial institutions when establishing governance mechanisms.

The ontology of this research is grounded in understanding the nature of governance, international development projects, and complexity. It acknowledges the existence of multiple relationships, principles, rights, and rules that define governance within the context of international development projects. It recognizes the crucial role governance plays in shaping project behaviour and ensuring alignment with project outcomes. Additionally, it acknowledges that international development projects often involve collaboration and are characterised by complexity due to factors such as political instability, diverse procurement practices, and the involvement of numerous stakeholders.

The epistemology of this research adopts a multi-method approach, incorporating both qualitative and quantitative methods. This approach aims to generate knowledge and understanding of the impact of governance on international development project outcomes and the moderating role of complexity. Recognising the multifaceted nature of knowledge in this field, this study emphasises the need to employ a combination of methods to provide a comprehensive understanding of the relationship between governance, complexity, and project outcomes.

The qualitative component of the study involves content analysis primarily based on secondary data covering a 20-year period. This includes project completion reports, guidelines, and procedures obtained from the World Bank's website. Given the extensive dataset, the study utilises natural language processing (NLP) techniques to analyse the reports of 3,683 projects. This qualitative approach facilitates the identification of key themes and features contributing to project performance, accounting for contextual aspects and capturing the interpretive nature of the data.

In addition, the quantitative component of the study employs statistical analysis techniques such as structural equation modelling (SEM) and logistic regression modelling (LRM). These methods provide a systematic approach to examine the relationships between governance indicators, complexity factors, and project outcomes. Through the use of statistical tools, the study evaluates the impact of governance on project objectives while considering the moderating effects of complexity. Social network analysis (SNA) is used to extract the optimal governance network that enhances project outcomes in dealing with complexities.

It is important to acknowledge the limitations of this research. Firstly, reliance on secondary data sources, such as project reports, may introduce potential limitations in terms of accuracy and completeness. Secondly, the focus solely on projects sponsored by the World Bank might restrict the generalisability of the findings to other international development projects. Additionally, assumptions of linear and causal relationships in the structural equation modelling may oversimplify the complexity of real-world scenarios. Moreover, the study acknowledges potential biases in data collection and interpretation.

Overall, this study recognises the complex essence of governance and its impact on international development projects. By combining qualitative and quantitative approaches, the research aims to generate comprehensive knowledge, considering both the interpretive aspects of governance and the statistical relationships between variables. Such an approach facilitates an in-depth exploration of the ontology and epistemology of the research (See Figure 3.1).

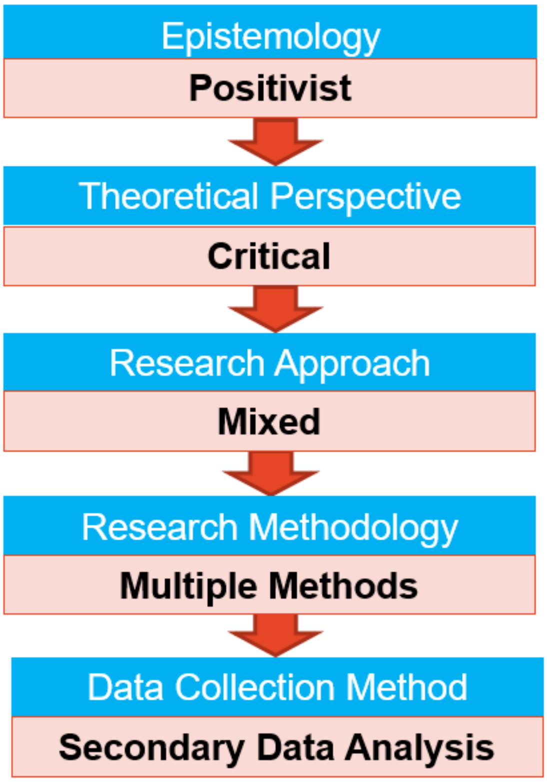


Fig. 3.1 Research design

3.3. Research steps in this study

This section discusses the development of the study's line of argument and its motivation. The research process and the coding process used to move from the qualitative primary data source (the World Bank project completion documents) to the data that formed the basis of the statistical analysis are clarified. Lastly, the link between the research questions and the methods used is clearly articulated. The research process and how each research method employed in the study addresses the relevant questions are depicted in Figure 3.2. This process is further elaborated in the following sections, providing detailed explanations.

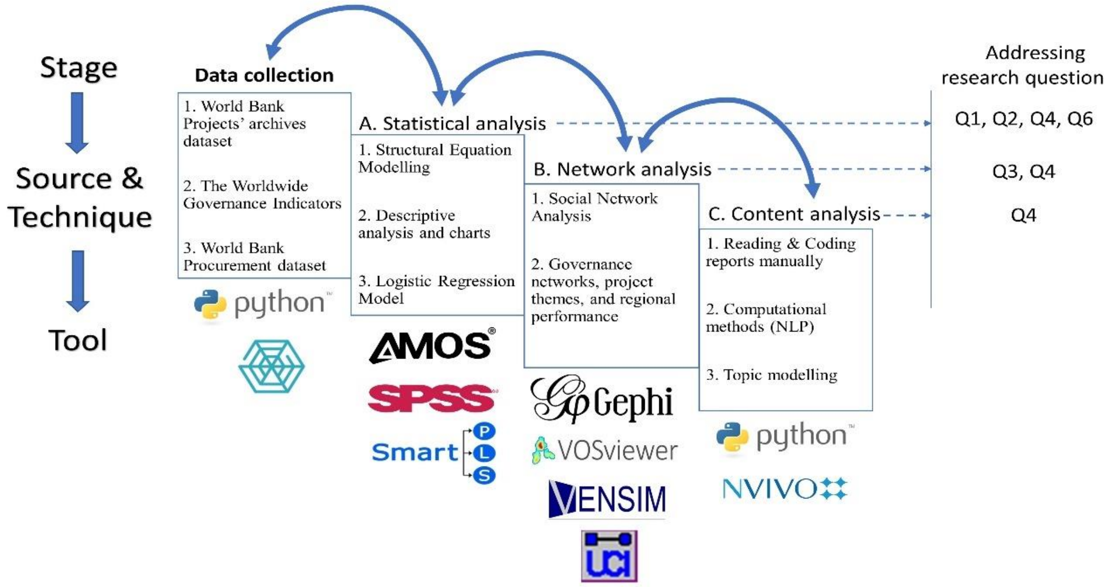


Fig. 3.2 Research process

3.3.1. Developing a line of argument for research hypotheses

Following the literature review, the study's theoretical framework was developed which hypothesises that governance has a significant positive effect on project outcomes. The direct effect of complexity on governance and project outcomes is another focus of the current research. The study also investigates the moderation role of complexity on the relationship between governance and project outcomes (see Figure 3.3). The following hypotheses, rooted in existing literature and empirical evidence, are posited to provide a comprehensive understanding of the underlying dynamics that influence the achievement of international development project objectives and their on-time completion. Consequently, the study formulated the following six sets of main group hypotheses:

Hypothesis 1 (Direct Effects): suggests that governance plays a pivotal role in the success of international development projects. It posits that good governance positively influences the achievement of project objectives (H1a) and their on-time completion (H1b). By investigating this relationship, the study seeks to emphasise the importance of transparency, accountability, and rule of law in fostering a conducive environment for development projects.

H1a. Governance has a positive effect on the achievement of project objectives.
H1b. Governance has a positive effect on a project's on-time completion.

Hypothesis 2 (Direct Effects): examines the negative impact of project complexity on the achievement of international development project objectives (H2a) and their on-time completion (H2b). Understanding the level of influence and challenges associated with complexity and identifying strategies to mitigate these detrimental effects is crucial for improving project outcomes.

H2a. Complexity has a negative effect on the achievement of project objectives.
H2b. Complexity has a negative effect on a project's on-time completion.

Hypothesis 3 (Direct Effects): highlights the negative impact of complexity on governance. This hypothesis is significant as it suggests that the World Bank needs to consider the effect of complexity on governance, particularly at the project level, when planning and implementing development projects. By recognising the interdependence between complexity and governance, the World Bank can adopt strategies to enhance governance arrangements and ensure that the management of complex projects is effective.

H3. Complexity has a negative effect on governance.

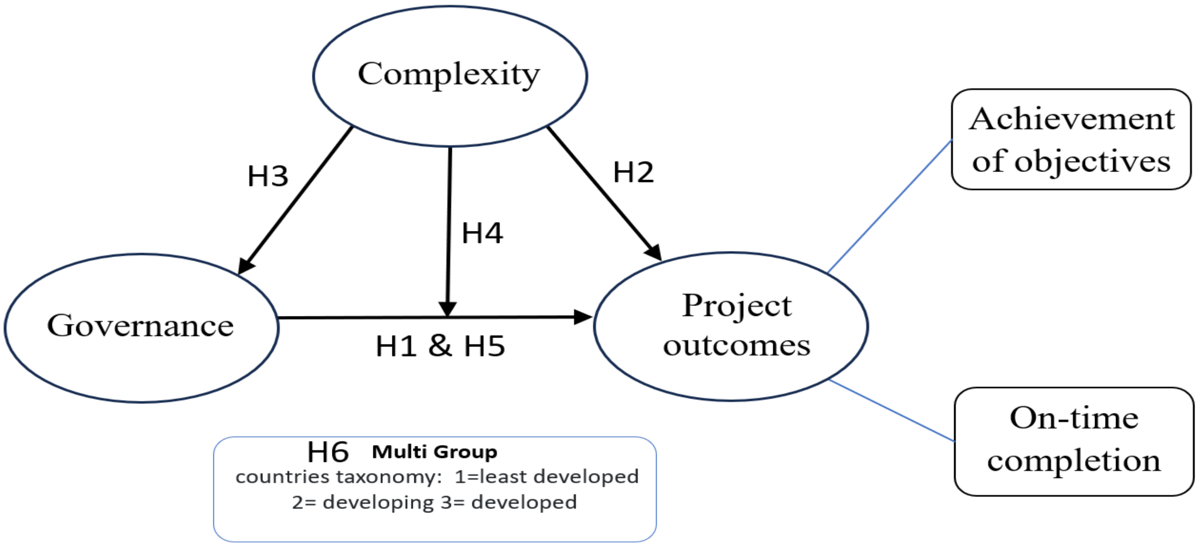


Fig. 3.3 Research theoretical model

Hypothesis 4 (Moderated Effects): explores the interaction between complexity and governance, proposing that complexity weakens the positive relationship between governance and the achievement of project objectives (H4a) and on-time completion (H4b). By examining this moderated effect, the study aims to emphasise the importance of addressing project complexity to fully harness the benefits of effective governance. This investigation can help practitioners and policymakers develop tailored strategies that consider the specific challenges posed by complex projects, thus enhancing overall project performance.

H4a. Complexity weakens the positive relationship between governance and the achievement of project objectives.

H4b. Complexity weakens the positive relationship between governance and a project's on-time completion.

Hypothesis 5 (Direct Effects): highlights the significance of monitoring and evaluation (M&E) in international development projects. It postulates that M&E has a positive effect on both the achievement of project objectives (H5a) and their on-time completion (H5b). By examining this relationship, the study underscores the value of continuous, systematic M&E processes in identifying and addressing potential issues throughout the project lifecycle, ultimately contributing to project success.

H5a. Monitoring and evaluation (M&E) has a positive effect on the achievement of project objectives.

H5b. Monitoring and evaluation(M&E) has a positive effect on project's on-time completion.

Hypothesis 6 (Multigroup Effects): investigates the multigroup (least developed, developing, and developed countries) effects of governance on project outcomes, suggesting that the positive relationship between governance and project outcomes is stronger for developed countries (H6). This implies that developed countries, with their more robust institutional frameworks and capacities, are better equipped to capitalise on effective governance to ensure successful project implementation.

H5. The positive relationship between governance and project outcomes is stronger for developed countries.

Results of testing these hypotheses is presented in the next chapter. Addressing these hypotheses in the context of international development projects is of significant importance, as it contributes to the body of knowledge on project management and offers valuable insights to practitioners and policymakers alike. By understanding the complex interplay of governance, complexity, and project outcomes, the World Bank and borrowing countries can work towards the development and implementation of effective strategies that enhance the success and impact of international development projects.

3.3.2. Coding process: a journey from qualitative source of data to quantitative variables

This study mainly applies text analysis and classification methods based on secondary data collected over 20 years and sourced from the World Bank. As previously mentioned, this study used data and information from the international development project completion reports, guidelines and procedures from the World Bank website. The World Bank provides low-interest loans and grants mostly to the least-developed and developing countries. The ensuing projects cover many sectors and themes including infrastructure, health, education, public administration, transportation, energy and extractives, information and communications technologies, agriculture and social protection (World Bank, 2022). Some projects are co-financed with other parties, such as governments, commercial banks, export credit agencies, private sector investors and other multilateral institutions. In this study, the World Bank is considered the main sponsor for all projects; thus, details of co-financers are beyond the study's scope and not applicable. The international development project documents are obtained from the World Bank website <https://projects.worldbank.org/>. Overall, there are six main phases involved in extracting data from World Bank's website (Arasu & Garcia-Molina, 2003):

(1) Identify the project completion reports.
(2) Choose a PDF downloading and parsing tool.
(3) Extract the selected data from the completion reports.
(4) Clean and format the extracted data.
(5) Save the extracted data and connect all records with the project ID.
(6) Handle possible errors and exceptions.

Due to a large number of reports (almost 7000 projects), we conducted a complex procedure for extracting data from the world bank website that involved using a web scraper tool to automate the process of gathering information from the website. To make sure the data set is valid, we examine the findings at random. The following provides more details on data acquisition procedure:

Step 1: Identify the project completion reports. The World Bank releases various reports with valuable data and information on international development trends. One of the important publications is the Implementation Completion and Results report (ICRs) which consists of a core ICR and an Intensive Learning ICR (ILI) for selected projects. Once the final ICR is submitted to the board, it will be automatically disclosed to the public via the operations portal (https://documents.worldbank.org/en/publication/documents-reports/).

Step 2: Collect and download the project completion reports. Once we have identified the project ID, we need to collect other necessary data for that project. The project ID is a unique identifier the World Bank assigns to each project. In this study, a web scraping tool based on Python has been used to extract completion reports from the World Bank's website.

Step 3: Extract specific data from the reports. According to the research theoretical framework and questions, we have collected many fields for every project, and all fields have been connected to the related record. These fields include *region name, country name, project name, approval date, start date, closing date, closing original date, lend project cost, sectors, themes, project outcome rate, bank performance, government performance, implementing agencies performance, quality of monitoring and evaluation, risk to development, supervisor support*, etc.

Step 4: Link and connect the data to the project ID. All extracted data stored in a spreadsheet and an aggregated data set is created.

Step 5: Clean and format the extracted data and final checking. Finally, all records have been checked and cleaned manually. Moreover, other fields, including procurement and governance data, have been added to the related project record.

The World Bank's Independent Evaluation Group is responsible for assessing project outcomes. This evaluation group evaluates outcomes against the original project goals, the sustainability of the results and the impact on institutional development. The current study uses the evaluation group's results of overall project performance rates to compare and assess project outcomes. Moreover, the World Bank procurement data set is used to analyse the status of contracts and suppliers in different projects. The procurement data set comprises over 247,000 contracts linked to the original projects and is obtained from <https://finances.worldbank.org/procurement>. The Worldwide Governance Indicator (WGI) data set, available at <https://databank.worldbank.org/>, is used to assess governance at the national level. Web scraping techniques and the Python programming language assisted the study in extracting data and values for research variables from the World Bank website and project completion documents (Hovy, 2020; Mitchell, 2018). Figure 3.4 depicts the research steps undertaken to create the current study's data set, with these steps aggregating three different resources comprising project completion documents, the World Bank's procurement data set and the Worldwide Governance Indicator (WGI) data set.

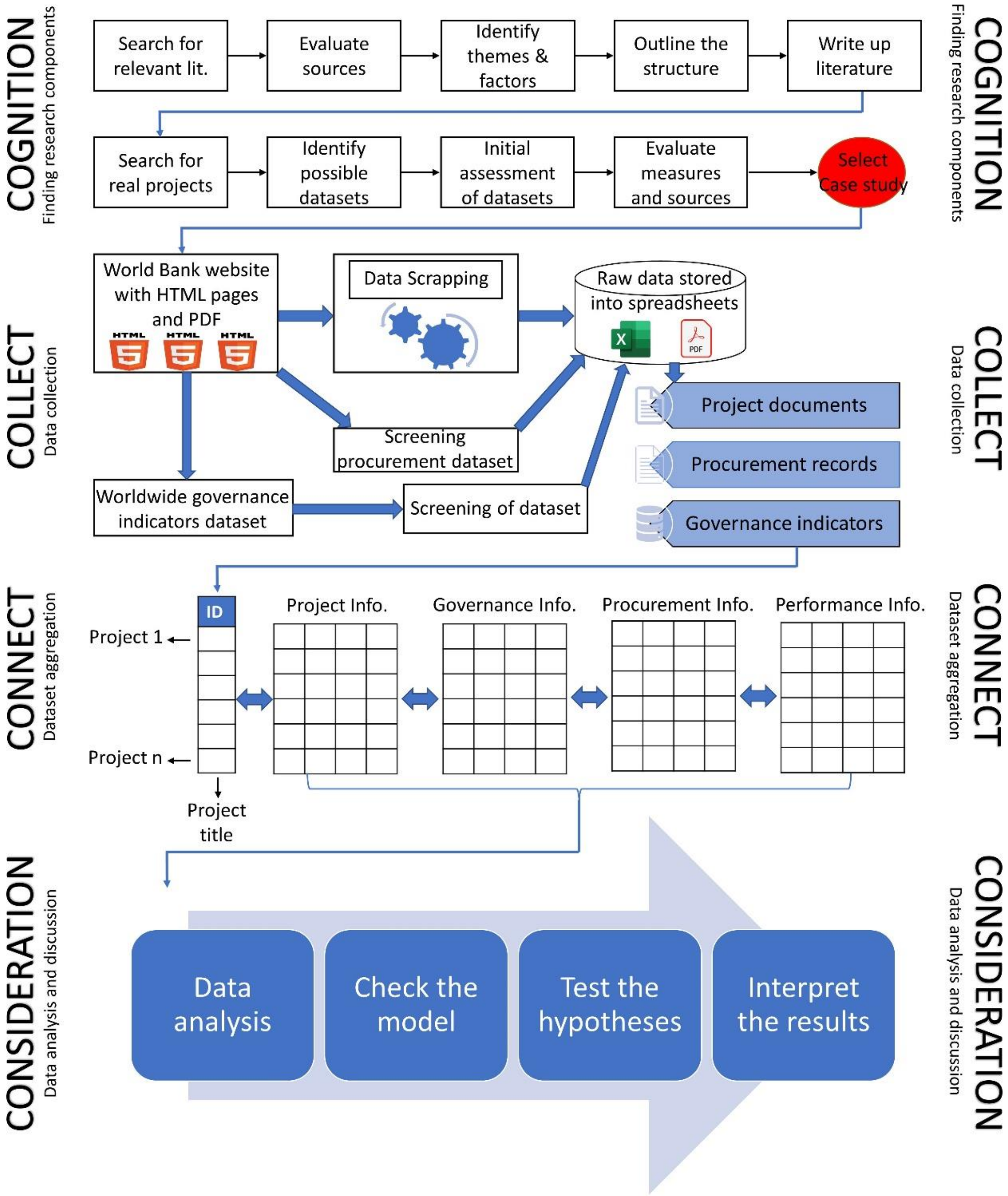


Fig. 3.4 Research coding process

Overall, the study's data set was aggregated by collecting data from more than 3,680 projects, drawn from projects during the period 2000–2020 and originally numbering approximately 7,000 projects. These projects were implemented in six world regions and in over 140 countries. Appendix III and Figure 3.5 provide statistical details of the countries and regions.

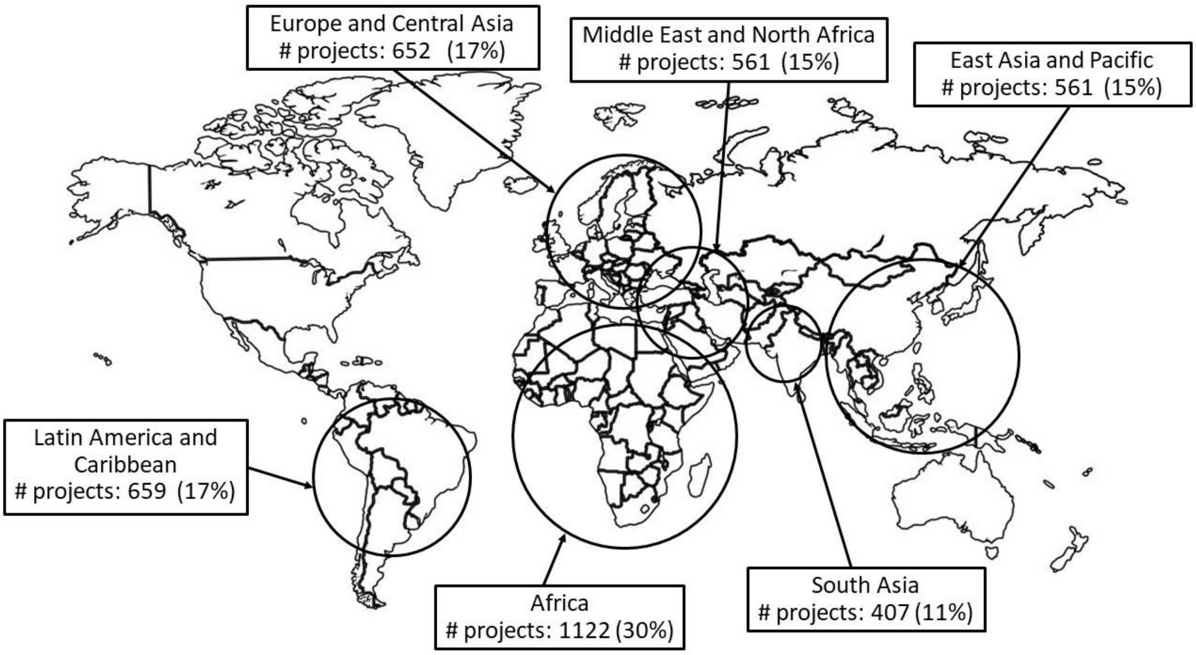


Fig. 3.5 Number of investigated projects across the six world's regions

3.3.3. Ethical consideration

This research mainly follows text analysis and classification methods based on secondary data from the World Bank. Since the data and information are obtained from the project completion reports, guidelines, and procedures provided by the World Bank and publicly accessed; Therefore, permission for further use and analysis is implied, and ethical consideration is not applicable.

3.4. Research variables

The study's theoretical framework comprises three main dimensions. Firstly, the governance variable (independent variable) consists of six governance indicators at the national level: "voice and accountability", "absence of violence", "government effectiveness", "regulatory quality", "rule of law" and "control of corruption". Additionally, three governance indicators at the project level are utilised: "monitoring and evaluation", "government engagement" and "sponsor (World Bank) effectiveness". These indicators, identified through a thorough literature review and endorsed by researchers, serve as foundational elements for the research (refer to Chapter 2).

Secondly, the complexity variable (moderation variable) comprises twelve complexity factors: "duration of the project (size)", "extension of time", "goal uncertainty", "size of budget (capital expenditure [CapEx])", "number of disciplines involved", "level of development outcomes", "capacity of countries", "supervisor support", "political instability", "number of contracts", "variety of procurement methods" and "diversity of suppliers". These complexity factors have also been derived from the existing literature and are acknowledged contributors to project complexity, as indicated in previous studies (refer to Appendix I).

Thirdly, the research-dependent variables pertaining to project outcomes include "on-time completion" and "achievement of project objectives". These variables are crucial for evaluating the impact of governance and complexity on the success of World Bank-funded projects. It is important to note that the availability of these variables is ensured by the data collected from the project reports, which were obtained through the World Bank. Thus, the data collection process directly supports the inclusion and analysis of these variables in the study.

By explicitly stating the origins of the variables through a comprehensive literature review and the subsequent development of a theoretical framework, followed by emphasising their availability in the collected dataset from World Bank-funded projects, the research establishes a robust foundation for investigating the relationship between governance, complexity, and project outcomes.

These variables are clarified in detail below.

3.4.1. Governance indicators (independent variable)

In the 1990s, scholars in the field of knowledge management concentrated on efficient governance's contribution to economic development. According to North (2018), some institutional prerequisites are needed for economic growth. In a notable report by World Bank researchers (although the report's outcomes are subject to dispute), it was stated that foreign aid could only be effective in countries where appropriate policies had been considered (Annisette, 2004; Easterly et al., 2004). For aid donors and the World Bank, the quality of governance has become a primary concern in relation to eligibility for aid, forming a mainstream item in the dialogue between the World Bank and its borrowers. The quality of governance is also used by the World Bank in determining eligibility for loans (Hout, 2007; Smets & Knack, 2018). In 2003, United States (US) President George W. Bush launched a major foreign aid initiative (US$15 billion), directing grants to countries with good governance (Thomas, 2012). This example clearly shows that governance is one of the critical elements in international relations' decisions by policy makers.

According to Kaufmann et al. (2011) and Thomas (2010), the following six widespread project construct aggregate indicators are measured through the Worldwide Governance

Indicators (WGIs). In the current study, these six indicators have been used to assess governance at the national level (see Figure 3.6).

1. Voice and accountability (*VA*) – Freedom of expression and association, and maintaining a free media are the extent to which a country's citizens' perceptions are measured concerning their government's election.

2. Political stability and absence of violence (*PV*) – The perceptions of possible government destabilisation or regime collapse by unconstitutional or violent means, such as political disorder, terrorism, etc., are measured through political stability and absence of violence (*PV*).

3. Government effectiveness (*GE*) – The quality of public services; the rate of their independence, despite political pressures; the quality of policies developed and their implementation; and the state's commitments are measured through government effectiveness (*GE*).

4. Regulatory quality (*RQ*) – The perceptions of the government's ability to develop and implement appropriate policies and regulations to allow private sector development is measured through regulatory quality (*RQ*)

5. Rule of law (*RL*) – The perceptions of the extent to which legal agencies respect social codes; the quality of contract enforcement regulations and law enforcement by police; and just verdicts by the courts, all geared to create a better society, are measured through rule of law (*RL*).

6. Control of corruption (*CC*) – The perceptions of the extent to which elected authorities prioritise their private gain vs. public gain, that is, corruption at all levels and its volume are measured through control of corruption (*CC*).

Over 30 underlying data sources constitute the formation of these six aggregate indicators. These data sources contain registered perceptions of governance generated from many surveys and expert assessments worldwide. The WGIs consist of a research data set enriched by many valid reports and briefings provided through enterprises, citizens and expert correspondents in industrial and developing countries. In this process, think tanks, non-governmental organisations (NGOs), international institutions and the private sector provide their input (Kaufmann et al., 2007). These six indicators are prevalent in measuring governance status in many countries.

At the project level, three governance indicators are used to assess project governance: firstly, the quality of monitoring and evaluation as an index of sound governance; secondly, government performance (engagement); and, thirdly, sponsor (World Bank) effectiveness.

1. Monitoring and evaluation (*M&E*) – Monitoring and evaluation (*M&E*) is at the centre of sound governance arrangements. It is vital for achieving evidence-based policy making; making capital expenditure (CaPeX) decisions; management; and accountability. A better quality of M&E assists the governance system and leads to effective project close-out.

2. Government performance (*GP*): This measure assesses the performance of governments in every single project, considering the extent to which the government ensured the quality of project preparation and implementation and complied with policies and agreements.

3. Sponsor (in this case, World Bank) effectiveness (*SE*): The sponsor effectiveness rating is based on the ratings of (i) sponsor performance in ensuring quality at entry and (ii) the quality of supervision. In this study, the term 'sponsor' is deliberately

employed to encapsulate the World Bank's multifaceted involvement in international development projects, reflecting not only its financial contributions but also its active role in guiding, overseeing, and providing comprehensive support to the projects it funds (Meenaghan, 1983).

All project-level governance indicators are evaluated using a six-point rating scale, which is implemented by the World Bank in their project reports. The rating scale ranges from 1–6, corresponding to: highly unsatisfactory, unsatisfactory, moderately unsatisfactory, moderately satisfactory, satisfactory and highly satisfactory. It is worth noting that the assessment of research variables is carried out by the World Bank's Independent Evaluation Group. In the present study, the evaluation group's findings regarding project performance rates, as included in the project completion reports, have been utilised.

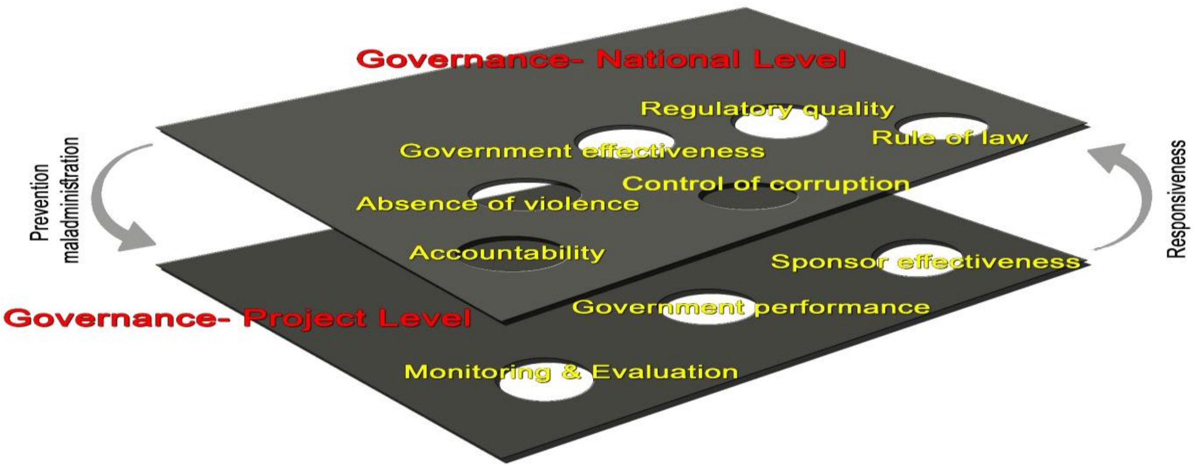


Fig. 3.6 Research governance indicators

3.4.2. Complexity (moderation variable)

The researchers Boardman and Sauser (2006) introduced a framework, subsequently extended by Bakhshi (2016). This framework consists of the following seven components:

“context”, “autonomy”, “belonging”, “connectivity”, “diversity”, “emergence” and “size”. The level of complexity in projects is measured through these components which, in research, are considered to be arbitrative variables. In the current research, the following 12 sub-factors are proxies for complexity: (1) duration of the project; (2) extension of project time; (3) goal uncertainty; (4) size of budget (CapEx); (5) number of disciplines involved; (6) level of development outcomes; (7) capacity of countries; (8) supervisor support and cooperation; (9) political instability; (10) number of contracts; (11) variety of procurement methods; and (12) diversity of suppliers (see Figure 3.7). To evaluate the complexity factors, diverse sources have been employed, including project completion reports provided by the World Bank's Independent Evaluation Group, the World Bank's procurement dataset, and the Worldwide Governance Indicators (WGIs). These sources have been instrumental in extracting the relevant figures for each individual complexity factor. For further details, please refer to Chapter 4, section 4.7.

(1) **Context:** The nature, scope and environment of a given organisation which is to accomplish the required plans are subject to the project context (Cicmil, 1997; Snowden, 2002). High uncertainty and inevitable changes in the socio-economic and political environments constitute project complexity (Chapman, 2016). This holds for the funding, management and governance of complex projects (Pitsis et al., 2018). Political instability and the level of development outcomes are context variables.

(2) **Autonomy:** Autonomy is embedded in departments, teams, sub-contractors and partners to serve a project’s purpose and promote the making of appropriate decisions. Since international development projects depend entirely on sponsors and local governments, these projects perform in conformance with the requirements; therefore, no variable was found to assess this index.

(3) **Belonging:** A sense of belonging enables the project actors to accept and contribute goal-directed behaviour that concerns other entities. This decision stems from necessity, solid beliefs and the desire to accomplish a task (Gorod et al., 2008). The capacity of countries and supervisor support are part of belonging.

(4) **Connectivity:** Connectivity comprises the harmony of all components to benefit the entire system in an appropriate manner (Baldwin & Sauser, 2009). This becomes apparent when harmony exists in formal and informal communications between the infrastructure of the project's constituents. In the current study, no variable represents connectivity.

(5) **Diversity:** System heterogeneity is inevitably a vital factor due to diversity with all that it means (Sauser et al., 2009b). Diversity causes fluctuations wherever unaccepted changes concerning the environment's elements prevail amid responsibility and adaptation. In this study, variety of procurement methods and diversity of suppliers are included in the diversity factor.

(6) **Emergence:** Any endeavour is subject to unexpected new properties and behaviours during its development, with these named "emergences" (Ireland et al., 2015; Sauser et al., 2009a). A project management system allows for these emergences to appear in the project and its sub-systems, subject to changes in their interactions (Daniel & Daniel, 2018). Extension of project time and goal uncertainty are variables of the emergence dimension.

(7) **Size:** The bigger the size and scope of a project (a vital factor), the bigger is its contribution to project complexity (Bakhshi et al., 2015). Megaprojects that require a specific management system comprise multiple stakeholders and are characterised by unique structural, political, technological and economic complexity (Flyvbjerg, 2014). In this study, duration of the

project, size of budget (CapEx), number of contracts and number of disciplines involved are used to assess the size of projects.

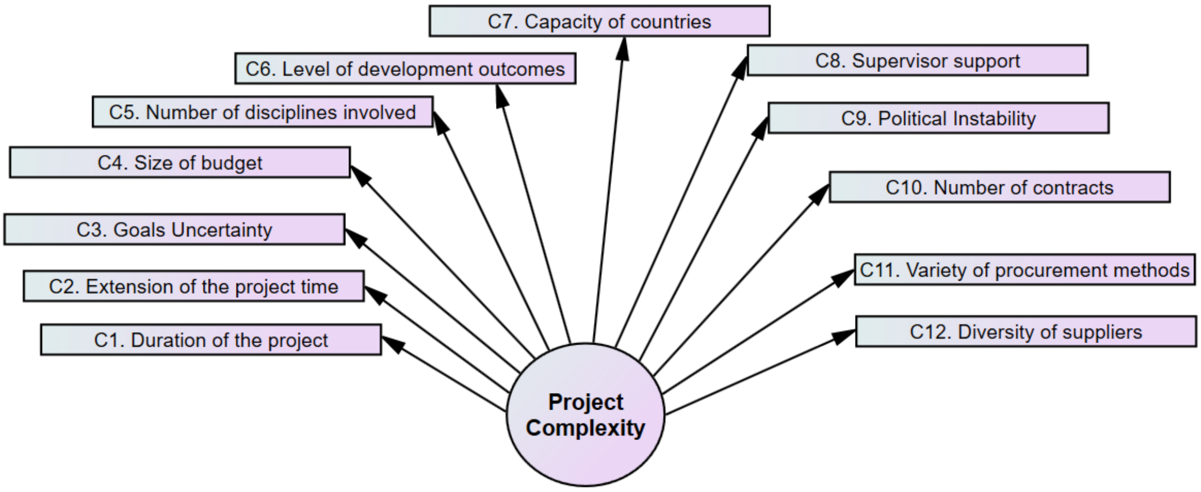


Fig. 3.7 Research project complexity variables

3.4.3. Project outcomes (dependent variable)

The project outcomes variable is a latent variable consisting of two sub-variables: on-time completion and project outcomes:

(1) **On-time completion:** this observed variable indicates if a specific project meets the planned completion time and is closed out on time.

(2) **Achievement of project objectives:** this observed variable indicates the extent to which the project's major relevant goals are achieved. In the World Bank, this variable is rated based on three separate criteria: (1) relevance of the project's objectives and design; (2) achievement of the project objectives (efficacy); and (3) efficiency.

Building on the study's original theoretical framework, the addition of all observed variables is now undertaken to extend the framework, as shown in Figure 3.8.

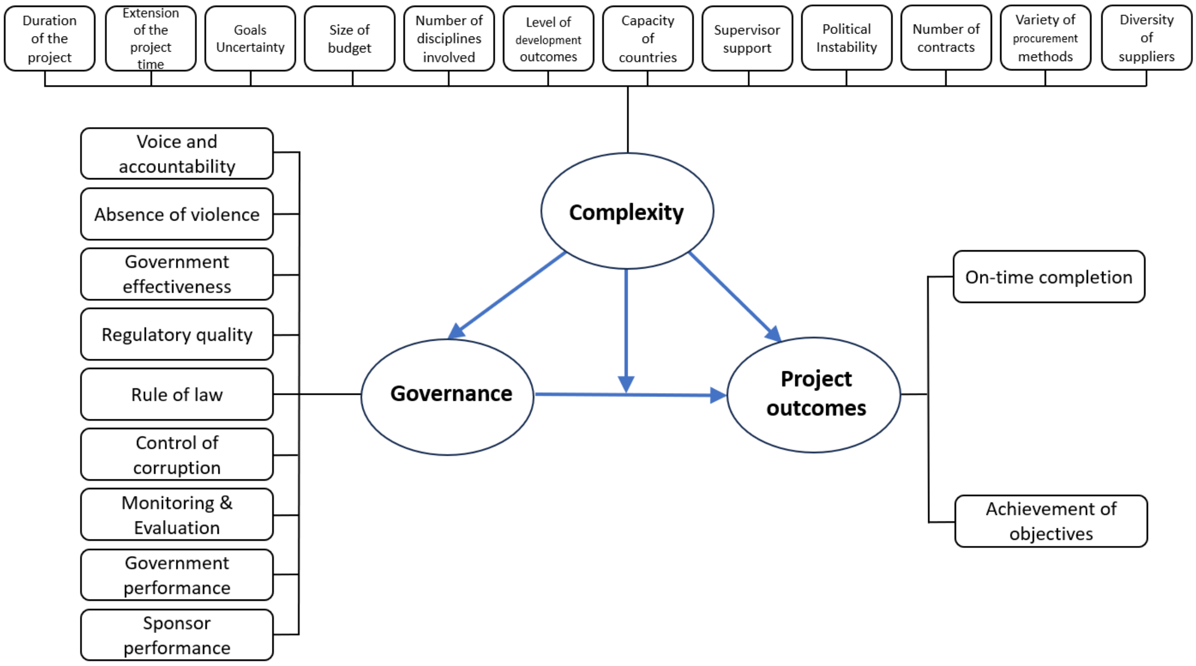


Fig. 3.8 Research theoretical framework

3.5. Introduction to main research methods

This study uses three main methods: (a) statistical analysis including structural equation modelling (SEM) and logistic regression; (b) social network analysis (SNA); and (c) natural language processing (NLP). The following subsections discuss these methods in detail.

3.5.1. Statistical analysis

3.5.1.1. Structural equation modelling (SEM)

Structural equation modelling (SEM) is a statistical procedure applied to assess complex theoretical models containing observed and unobserved variables (Mueller & Hancock, 2018). To understand the correlations between multiple variables derived from theory, confirmatory factor analysis (CFA) and path analysis (PA) in SEM are applied. Structural equation modelling (SEM) has been, and is, widely applied in social science studies and, specifically, in counselling research (Crockett, 2012). Crockett (2012) takes a step-by-step approach to explain SEM, suggesting that scholars might apply this measure: (1) to assess the factor structures of existing and new instruments; (2) to confirm or disconfirm theoretical constructs in their practical sense; and (3) to evaluate alternative models to determine an appropriated model for the collected data. As the application of SEM has become common practice in the field of social sciences (Civelek, 2018), sophisticated software packages, such as LISREL, AMOS, EQS, Mx, and MPlus have evolved. Many researchers apply these packages, allowing them to draw diagrams to conceptualise and visualise the statistical correlations between different theoretical variables (Crockett, 2012). As an illustration, the software package AMOS 26.0 was developed for this purpose.

The five sequential steps of SEM analysis are as follows: (1) model specification; (2) model identification; (3) model estimation; (4) model testing; and (5) model modification and are widely considered in the related literature (Crockett, 2012; Schumacker & Lomax, 2016). The study's proposed theoretical model is assessed and shown in Figure 3.4: as can be seen, the modifications and analysis are accurate and sound.

The following subsections introduce the steps in depth.

Step one: Model specification

Model specification is applied to devise a theoretical model based on the existing theory and available knowledge with the researcher specifying a model in which observed and latent variables are theoretically associated (Schumacker & Lomax, 2004). This allows certain conclusions to be drawn without data collection and analyses. To avoid specification error which occurs when the hypothesised model is not appropriate for the data and is not statistically acceptable, this step should be included in the theory (Schumacker & Lomax, 2016).

The objective of this step is to propose a model in which a sample's covariance matrix (S) is produced which fits the model's implied covariance matrix of ($\Sigma(\theta)$) (Bollen, 1989); that is, when the model is well-specified, S is sufficiently reproduced by ($\Sigma(\theta)$).

Anderson and Gerbing (1988) proposed a two-step approach through which a theory/model in social sciences can be developed. In this step, the measurement model is specified by identifying the observed, indicative variables (Anderson & Gerbing, 1988; Crockett, 2012), with the measurement model consisting of two latent concepts and two dependent variables (see Figure 3.4). The first latent concept, the governance arrangement, is estimated through six observed indicators: (1) voice and accountability; (2) political stability and absence of violence; (3) government effectiveness; (4) regulatory quality; (5) rule of law; and (6) control of corruption. The second latent concept is the complexity proxy, a mediating variable, estimated by 12 observed factors: (1) duration of the project; (2) extension of the project time; (3) goal uncertainty; (4) size of budget (CapEx); (5) number of disciplines involved; (6) level of development outcomes; (7) capacity of countries; (8) supervisor support and cooperation; (9) political instability; (10) number of contracts; (11) variety of procurement methods; and (12) diversity of suppliers. The accurate measurement of the latent variables specifies the measurement model.

Loehlin (2004) introduced the structural specifying model which includes the correlations between latent variables in a model. These correlations must be specified; according to this specification, a theoretical path diagram shows the asserted directional connections between model variables (Crockett, 2012). In comparing the set of equations through which the structural coefficients are explained, path diagrams are commonly applied to show which variables are observed or latent, the direction of associations therein and which variables are fixed or freely estimated (Bollen, 1989). In Anderson and Gerbing's (1988) study, the structural model includes two observed and two latent variables. The current study's variables and their correlations to each other are shown in Figure 3.4.

Step two: Model identification

Distinguishing the unknown information from the known information in the model is realised through the model identification step (Bollen, 1989; Kline, 2023). The unknown information includes free model parameters, such as correlations between variables to be estimated in the model; constrained model parameters, such as correlations that are known but equal to another parameter in the model; or fixed model parameters, such as parameters fixed to a specific value. To identify the model, according to Bollen (1989), the *t*-rule must be observed by researchers, ensuring that the number of parameters to be estimated is less than that of known parameters in the sample's variance–covariance matrix. The number of known parameters is calculated through the $k(k + 1)/2$ relationship, where k is the number of observed variables in the SEM model (Marsh & Hau, 2007).

The unknown parameters are to be estimated by the researcher based on the sample's data (Bollen, 1989). The other parameters of the model comprise factor loadings, variances, co-variances or correlations between exogenous and endogenous variables; factor loading between a latent variable and an observed variable fixed to 1 (often a 0 or 1) is considered as a known parameter. According to the *t*-rule, for a model to be identified, the number of free parameters must be less than the number of known parameters (Kline, 2023).

Step three: Model estimation

The SEM analysis model estimation is necessary as it is impossible to know the exact population parameters. The theoretical model parameters should be estimated by reducing the difference between ($\Sigma(\theta)$) and the population covariance matrix (Σ). This is an iterative process in which many calculations are applied to produce the best fitting model, the one with the closest S to $\Sigma(\theta)$. The difference between ($\Sigma(\theta)$) and S is expressed through a statistic named the chi-square (χ^2) which, when it is zero (0), indicates that the fit between the data and the theoretical model is perfect (Bollen, 1989; Schumacker & Lomax, 2016).

Many fitting functions can produce a value for χ^2 as close to zero (0) as possible (Schumacker & Lomax, 2016). Among these, maximum likelihood (ML) and generalised least squares (GLS) are the most frequently applied. Researchers of SEM usually apply ML as it is scale-free. That is, if one of the scales in the model were to be transformed, the whole estimation would become sensitive to the change; thus, the model estimation statistic remains as it is (Kline, 2023). A possible disadvantage of applying ML appears when the data are not continuous or normally distributed (Crockett, 2012). The normality assumption is a determining factor in choosing the appropriate fitting function. As ML and ordinary least squares (OLS) are sensitive to situations in which the normality assumption is not met in the observed data, leading to a non-accurate calculation of the χ^2 value, asymptotically distribution-free (ADF) estimators are applied (Schumacker & Lomax, 2004). Robust maximum likelihood (RML), introduced by Satorra and Bentler (1988), and weighted least squares (WLS), introduced by Browne (1974), are the two commonly applied fitting functions that are independent of the data distribution type (Schumacker & Lomax, 2016). According to Mueller (1997), due to its inability to produce a correct estimation of the χ^2 value with smaller samples, WLS is not suitable for the fitting function for a small sample.

Step four: Model testing

The model testing step is used to indicate how well the proposed theoretical model fits the sample's data (Hu & Bentler, 1999). In this step, researchers seek to determine whether ($\Sigma(\theta)$) and S are the same; if not, they then need to know the significance of their difference. The following commonly accepted two-step approach is involved in this process: (1) testing the measurement model and (2) testing the structural model (Anderson & Gerbing, 1988; Kline, 2023). In the first step, Anderson and Gerbing (1988) suggested testing whether the observed variables measured in the chosen latent concepts are in the expected direction. For this purpose, in the current study, confirmatory factor analysis (CFA) is run to illustrate that the chosen latent constructs (governance and complexity) are adequately measured by their associated observed variables.

In the second step, Anderson and Gerbing (1988) suggested a way to determine the extent to which a proposed structural model fits the sample's data. The chi-square test, root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR), Goodness-of-Fit Index (GFI) and Comparative Fit Index (CFI) are the fitness index used to decide the fit of the model to the sample's data. Each index has its weaknesses; therefore, Schumacker and Lomax (2016) suggested that researchers should apply more than one index to determine the fit of the proposed model to the sample's data.

1. Chi-square test

The chi-square test is the most commonly applied measure of fit, in determining the extent of the interrelationship between ($\Sigma(\theta)$) and S *(Schumacker & Lomax, 2016)*, losing its significance when these have similar values. This measure is sensitive to sample size; that is,

χ^2 produces insignificant results when more than 200 subjects are in a study. Thus, researchers need to be warned that they must check other model fit indexes to obtain consistent results.

2. Root mean square error of approximation (RMSEA)

In this step, the residuals are used to determine the differences between the S and Σ elements. In general, the accepted index values are within the 0.00 to 1.00 range, with RMSEA values lower than .05 indicating a proper model fit. Values between .05 and .08 are still regarded as acceptable when the values of other indexes are within the proper model fit values (Hu & Bentler, 1999).

3. Standardised root mean square residual (SRMR)

The standardised root mean square residual (SRMR) is based on the difference between the observed data and the theoretical correlation matrices. The SRMR value ranges within 0 and 1, where 0 is a perfect model fit, although values less than .08 are acceptable (Hu & Bentler, 1999). Unlike the chi-square test, the SRMR is an absolute fit index and is not sensitive to a large sample size.

4. Goodness-of-Fit Index (GFI)

The Goodness-of-Fit Index (GFI) is a variance and covariance measure in the sample's covariance matrix, predicted by the theoretical model. The GFI values are within the 0 and 1 range, with higher values indicating a better model fit (Kline, 2023). Schumacker and Lomax (2004) suggested that GFI values higher than .90 and .95 indicate a proper model fit.

5. Comparative Fit Index (CFI)

The comparison of a theoretical model with an alternative model is undertaken through the measure of fit using the Comparative Fit Index (CFI) (Hu & Bentler, 1999). The alternative model should be hypothesised to be free of correlations among its variables (a null model). The CFI values are within the 0 and 1 range, with values of .90 and .95 indicating a proper model fit.

The appropriateness of model testing is subject to some discussion, with the primary issue being whether it is necessary to test an alternative model when no theoretical foundation exists (Martens, 2005; McDonald & Ho, 2002). In the context of this argument, Martens (2005) proposed two fundamental perspectives: (1) testing the alternative model's hypothesis to better explain the data, so researchers can determine whether the hypothesised model is supported by the data, or whether the alternative model can explain the data with more precision and (2) the necessity to test the alternative model in SEM to eliminate confirmation bias when the multiple options for a model with better fit are of concern. Although these perspectives are appealing, researchers must be aware of the possible risk of producing better-fitting model(s) with no theoretical foundation. Researchers should search the related literature for at least one or two alternative models with a theoretical background to better test alternative theories (Martens, 2005).

Step five: Model modification

In the model modification step, SEM researchers may modify their model when the sample's data do not confirm the hypothesised model (Quintana & Maxwell, 1999). Steps involving either eliminating non-significant parameters from the theoretical model or adding new parameters absent in the initial model are applied in model modification (Crockett, 2012). Software packages, such as AMOS, contain modification indexes (MI) that provide possible changes in the chi-square statistics when a new path is added to, or eliminated from, the initially proposed model (Quintana & Maxwell, 1999).

Although model modification leads to improving a model to better fit the sample's data, the controversial aspect of this topic is unavoidable in the related literature, as the process is not driven by theory but by the sample's data (Crockett, 2012). Confirming the theory using by the sample's data is no longer efficient as this becomes an exploratory process which may decrease the generalisability of the results in the given population (Schumacker & Lomax, 2016). In model modification, it is suggested that, by adding or eliminating a new path in the model, the theoretical justification has priority as the modifications may not yield a general model but may become the sample's data within the model (Quintana & Maxwell, 1999).

3.5.1.2. Logistic regression

Marginal effects are applied by expressing the predicted probability of change/s in project outcomes due to a change in the complexity factor (e.g., how does one unit of project outcome change by adding or reducing one year in the project term?). The association strength between a complexity factor and a project outcome derived through logistic regression can be expressed in many ways (Norton et al., 2019). In this context, the typical approach is the odds ratio (OR). This ratio is the probability of whether or not an outcome might be achieved. This ratio is often applied to quantify the differences between two components (e.g., in this study, duration of project and governance indicators). Another approach is the risk ratio, calculated by dividing the probability of the outcome in the presence of the complexity factor by the probability of the project outcome being yielded in the absence of the complexity factor (Dreiseitl & Ohno-Machado, 2002). Another alternative is the marginal effect, calculated as the change in probability that the project outcome is yielded as the complexity factor changes by 1 unit when all explanatory variables remain constant. When the complexity factor is continuous (e.g., project duration), the change in probability that the project outcome is yielded is associated with a 1-unit change in the complexity factor, thus being named the “marginal effect”. The change is named an “incremental effect” for a discrete complexity factor (e.g., number of procurement methods) (Norton et al., 2019). In this study, the term “marginal effect” is the association strength measure in both instances.

3.5.2. Social network analysis (SNA)

Social Network Analysis (SNA) is a powerful set of research procedures used to decipher the structure of systems, with a primary focus on the interconnections between its components rather than the attributes of individual cases (Van der Hulst, 2009). Networks offer a unique perspective to understand the intricate web of connections in the governance indicators, shedding light on the density or sparsity of these connections (Borgatti et al., 2009). Furthermore, they provide insights into the flow of information, the degree of influence, and the nature of connections between governance indicators, all of which align with social network theories (Chung & Crawford, 2016). From a network perspective, the social environment can be expressed in patterns, referred to as the interrelationship structure between units or nodes (Duato et al., 2003). In the context of this study, SNA is employed to examine the relationship between diverse governance indicators and their impact on the success of international development projects.

In the current study, regions, countries, governance indicators, and their performance ratings constitute the nodes. The degree of connection is determined based on the correlation coefficients of both the centrality scores and rankings (Seok et al., 2021). The analysis reveals the following network measures for the degree of centrality: indegree and outdegree, betweenness and eigenvector (see Table 3.1). These centrality measures are instrumental in creating governance network indicators that highlight the most central indicators contributing to project outcomes.

Table 3.1

Definitions of degree centrality tools (Source: Everett and Borgatti (1999))

Measure	**Definition**
Indegree	The number of directional links to the actor from other actors (incoming links)
Outdegree	The number of directional links from the actor to other actors (outgoing links)
Betweenness	The extent to which an actor mediates or falls between any other two actors on the shortest path between those two actors; usually averaged across all possible pairs in the network.
Eigenvector	Based on asymmetric relationships, prestigious actors are the object, not the source of relationships. Similar to centrality, this is measured by considering the relationship orientation (e.g., indegree).

Gephi (an open-source network analysis and visualization software package) (Bastian et al., 2009) and UCINET (a software package for the analysis of social network data) (Borgatti et al., 2002) are applied to extract network and output data for the outdegree, indegree, betweenness and eigenvector centrality measures.

3.5.3. Natural language processing

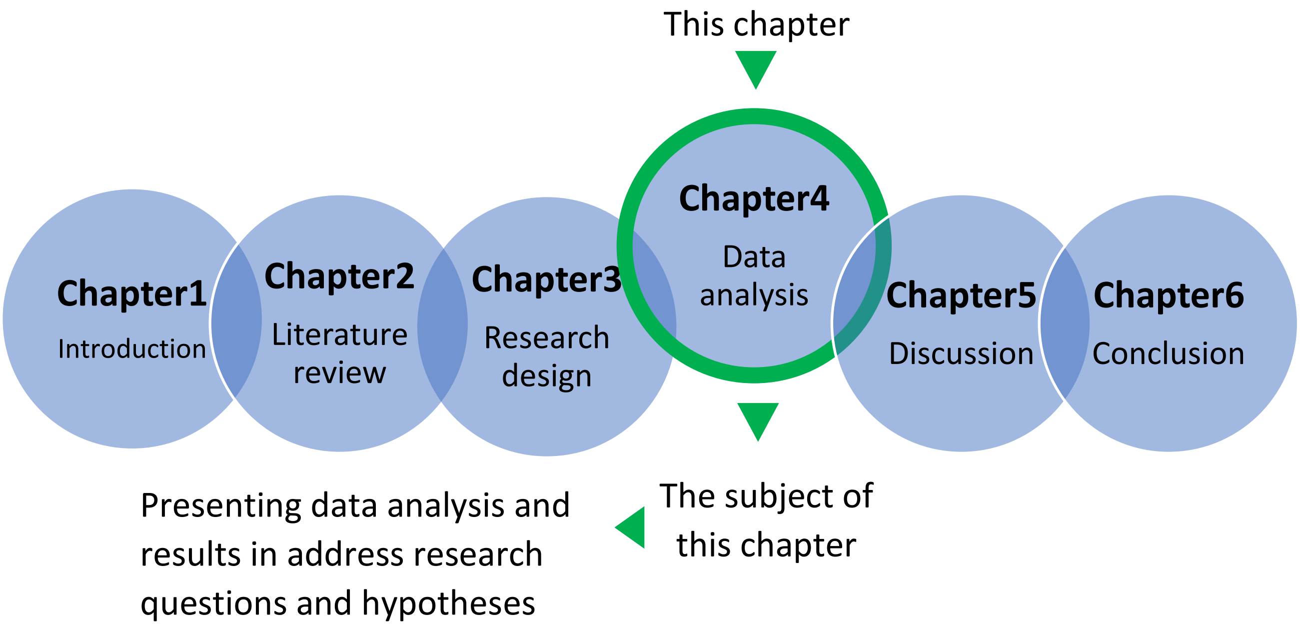
Natural language processing (NLP) is an area of research that explores how computers can be applied to understand and manipulate natural language text or speech for practical purposes. Researchers of NLP seek to learn how human beings understand and use language so appropriate tools and techniques to do the same can be developed for computer systems (Mitkov, 2022). NLP is a multidisciplinary field, drawing from diverse disciplines such as computer and information sciences, linguistics, mathematics, electrical and electronic engineering, artificial intelligence (AI), robotics, and psychology. It finds applications in a wide array of areas including machine translation, natural language text processing and summarisation, user interfaces, multilingual and cross-language information retrieval, speech recognition, AI, and expert systems. In the context of computer systems, Natural Language Processing (NLP) typically refers to the functionality of software or hardware components that analyse or synthesise spoken or written language (Chowdhary, 2020). The term "natural" is used to distinguish human speech and writing from more formal languages, such as mathematical or logical notations, or computer languages like Java, LISP, and Python. Natural language understanding (NLU), a subset of NLP, aims to enable a computer system that would comprehend natural language in the same way that a human being would. The top seven NLP techniques are: (1) sentiment analysis; (2) named entity recognition; (3) summarisation; (4) hierarchical mixture modelling (e.g., topic modelling); (5) text classification; (6) keyword extraction; and (7) lemmatisation and stemming.

Hierarchical mixture modelling has emerged as a robust methodology for finding patterns and structures in extensive data collections. The latest version of hierarchical mixture modelling is topic modelling in which the subject data comprise sizeable document collections. The mixture modelling algorithms find the underlying patterns of embedded words in these collections, which are named "topics". This modelling allows for effective clustering, searching, sorting, exploring, predicting and summarising of a large corpus of documents. These algorithms are applied to find patterns in images, music, audio and speech, genetic data, computer code, etc. Applications in computer vision are extensive, with researchers applying topic models of multiple images into scene-level classes, annotating images with words, and segmenting and labelling objects within images.

Researchers have recently extended statistical topic models for video analysis. These new topic modelling applications have developed statistical developments in hierarchical mixture modelling. The assumption in topic modelling is that the data are exchangeable, indicating that the order of documents and words in a collection are of no concern. This assumption is restrictive for many problems, and to counter these restrictions, better topic models are being developed and applied in extended spatial settings, time series settings and settings that depend on external covariates (Aletras & Stevenson, 2013).

Another notable statistical feature in topic modelling is its extension into Bayesian non-parametric methods. The original topic models are finite hierarchical mixtures (i.e., parametric mixture models). Recent advances in Bayesian non-parametric modelling, specifically, the Hierarchical Dirichlet Process (HDP) (Teh et al., 2004), have led to "infinite" topic models. In this modelling, the topics' number in the collection must be specified in advance, with the possibility of an increase (Blei, 2012). In this study, topic modelling is applied to identify and classify the key factors that influence international development project outcomes. The next chapter describes the research model, based on the data analysis, being run, along with testing of the research hypotheses.

Chapter 4



4.1. Introduction

In this chapter, the data accumulated through the application of cumulative tools to the statistical sample are summarised, coded and grouped in a multi-step process known as data analysis. This process provides the grounds for establishing correlations within the data to test the study's assumptions. For this purpose, the data are refined in their conceptual and empirical sense. Statistical techniques contribute to the induction and extension of these data. Data analysis is essential for assessing the accuracy and/or inaccuracy of assumptions in any study: it is the primary task in most studies where data are collected on the study's theme. In the current study, the collected data are assessed and analysed in descriptive analysis and statistical inference analysis formats in SPSS Statistics v.26 software. For this purpose, the following IBM® software, SPSS® Amos™ and SPSS Statistics v.26, are applied. To conduct the descriptive analysis, the indices of descriptive statistic variables are completely assessed. For the statistical inference analysis used to assess the study's hypotheses, correlations between the variables and extension of the obtained results from the statistical population, structural equation modelling (SEM) is applied.

4.2. Descriptive analysis

Classification of data, drawing of diagrams and computation of the mean, median, lowest and highest values, etc. are conducted through descriptive analysis, which discusses the description of each population member. From 2000 to 10 June 2020, the total number of completed projects is 6,725, with all projects reviewed and 3,683 completion reports issued. Public administration, with 894 projects, and information and communications technology (ICT), with 54 projects, are ranked as having the largest number of projects and the least number of projects, respectively. Of all the projects, 61% met their goal (see Fig. 4.1).

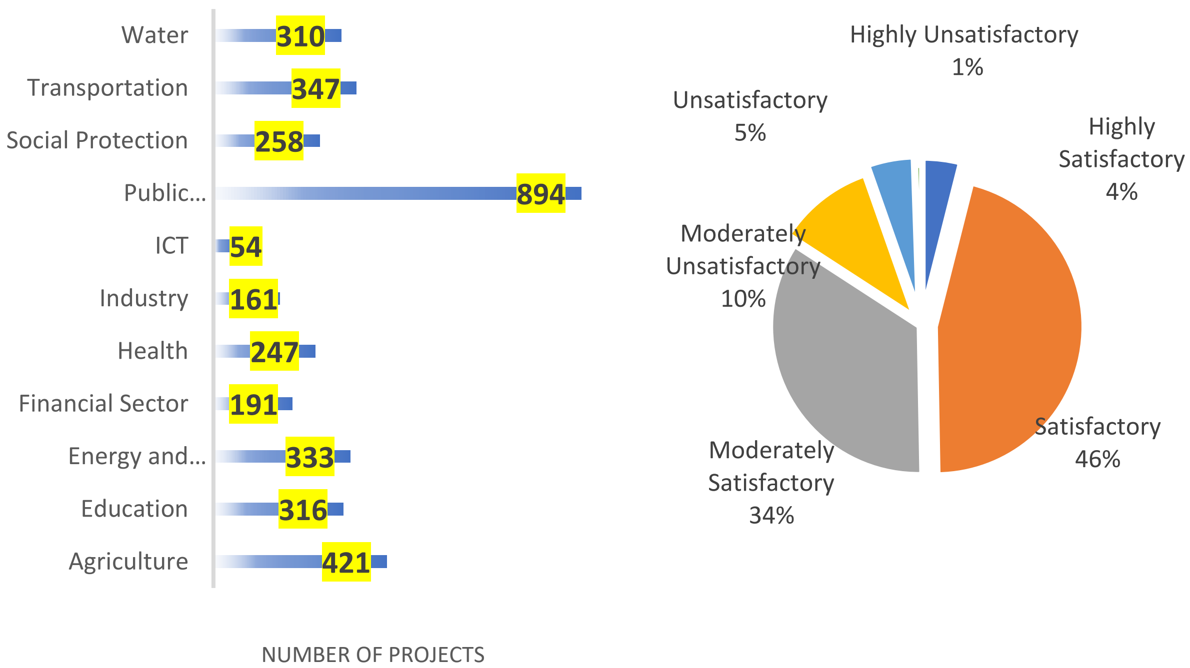


Fig. 4.1 Project outcome rate and distribution of project types

The descriptive statistics indices of the number of respondents, lowest and highest values, mean and standard deviations (SDs) are tabulated in Table 4.1. The data obtained from one group is used to describe the same in other groups.

Table 4.1
Descriptive statistics' indices of variables

Variable name	# of projects	Minimum	Maximum	Mean	Standard deviation
Voice and accountability (VA)	3535	0.47	90.38	37.54	20.25
Absence of violence (PV)	3521	0	97.14	30.67	20.03
Government effectiveness (GE)	3523	0	87.86	38.74	19.24
Regulatory quality (RQ)	3521	0.48	92.72	39.34	18.45
Rule of law (RL)	3535	0	89.47	35.63	17.67
Control of corruption (CC)	3534	0	91.83	35.11	18.85
Monitoring & Evaluation (ME)	766	1	9	5.17	1.37
Government performance (GP)	2414	0	9	5.54	1.80
Sponsor performance (SP)	2676	0	9	5.69	1.62
Duration of the project (DP)	3645	0	15	5.13	2.79
Extension of the project time (ET)	3633	-3	6	1.78	2.30
Goals Uncertainty (GU)	3503	-6	6	0.30	0.56
Size of budget (SB)	3658	70000	26861000000	169112210.60	693431762.20
Number of disciplines involved (NS)	3683	1	6	3.11	1.48
Level of development outcomes (DO)	2618	1	8	5.39	1.60
Capacity of countries (CC)	3683	1	3	1.68	0.53
Supervisor support (SS)	2606	0	9	5.92	1.62
Political Instability (PI)	3464	-2.73	1.35	-0.56	0.78
Number of contracts (NC)	3683	1	66	23.06	24.00
Variety of procurement methods (VP)	3683	1	12	3.30	2.75
Diversity of suppliers (DS)	3683	1	20	3.35	3.68
On-time completion (OC)	3637	0	1	0.40	0.49

Achievement of objectives (AO)	3683	1	9	4.32	0.93

The total data of a variable are divided into m observations. To compute the SD, the distances of all squared values from the mean $(X_i - \bar{X})^2$ are added, with the result divided by the number of observations minus 1: the outcome is then squared. These observations provide a glimpse into the characteristics and distribution of the variables analysed in the study.

4.3. Statistical inference analysis

A normal distribution of statistical variables is the prerequisite for running parametric tests which are usually based on the SD and the mean. Without normality in the distribution, any deduction from the results would be inaccurate.

4.3.1. Normality test

Normality tests are run to examine if the given data set is well moderated by a normal distribution. Kolmogorov–Smirnov (K-S); Lilliefors-corrected K-S; Shapiro–Wilk; Anderson–Darling; Cramer–von Mises; D'Agostino skewness; Anscombe–Glynn kurtosis; D'Agostino–Pearson omnibus; and Jarque–Bera tests constitute the set of normality tests (Ghasemi & Zahediasl, 2012). In this study, the K-S test is applied, being run through the SPSS Explore manual subject using the following procedure: Analyse → Descriptive statistics → Explore → Plots → Normality plots with tests. According to the SPSS Explore manual, an absolute value of the score is significant if it is above 1.96, 2.58 and 3.29 or below -1.96, -2.58 and -3.29 at a *p*-value of less than 0.05, 0.01 and 0.001, respectively. The skewness and kurtosis tests are run to determine the normality of the variables (see Table 4.2).

Table 4.2
Normality test results

Variable name	Skewness	Kurtosis
Voice and accountability (VA)	0.07	-0.868
Absence of violence (PV)	0.633	-0.064
Government effectiveness (GE)	-0.145	-0.854
Regulatory quality (RQ)	-0.035	-0.506
Rule of law (RL)	0.036	-0.437
Control of corruption (CC)	0.338	-0.263
Monitoring & Evaluation (ME)	-0.883	2.315
Government performance (GP)	-0.58	-0.06
Sponsor performance (SP)	-0.81	0.46
Duration of the project (DP)	-0.178	-0.691
Extension of the project time (ET)	1.184	1.216
Goals Uncertainty (GU)	1.44	4.544
Size of budget (SB)	23.188	751.074
Number of disciplines involved (NS)	-0.107	-1.393
Level of development outcomes (DO)	-0.16	-0.595
Capacity of countries (CC)	-0.159	-0.572
Supervisor support (SS)	-1.454	1.752
Political Instability (PI)	0.633	-0.064
Number of contracts (NC)	0.574	-1.201
Variety of procurement methods (VP)	0.323	-0.929
Diversity of suppliers (DS)	1.293	1.397
On-time completion (OC)	0.40	-1.84
Achievement of objectives (AO)	-0.781	0.491

As shown in Table 4.2, the skewness values range between -1.96 and 1.96, with the range for kurtosis being within -3 and 3 for all variables, except for variables *ET*, *GU*, *SB*, *CC* and *VP*, thus indicating that data normality is significant. Another normality test is run to delete all missing values (see Table 4.3), confirming that this research data set is well moderated by a normal distribution. In terms of kurtosis, most variables have kurtosis values close to 0, indicating a distribution similar to a normal distribution.

Table 4.3
Normality test results (after deletion of missing values)

Variable name	Skewness	Kurtosis
Voice and accountability (VA)	0.077	-0.83
Absence of violence (PV)	0.627	-0.035
Government effectiveness (GE)	-0.081	-0.9
Regulatory quality (RQ)	0.008	-0.566
Rule of law (RL)	0.063	-0.434
Control of corruption (CC)	0.310	-0.262
Monitoring & Evaluation (ME)	-0.883	2.315
Government performance (GP)	-0.58	-0.06
Sponsor performance (SP)	-0.81	0.46
Duration of the project (DP)	-0.102	-0.592
Extension of the project time (ET)	0.461	1.447
Goals Uncertainty (GU)	0.254	-1.237
Size of budget (SB)	0.059	-1.085
Number of disciplines involved (NS)	0.174	-0.007
Level of development outcomes (DO)	-0.107	-1.393
Capacity of countries (CC)	-0.16	-0.595
Supervisor support (SS)	-0.516	0.644
Political Instability (PI)	0.711	-0.974
Number of contracts (NC)	0.368	-0.877
Variety of procurement methods (VP)	1.351	1.61
Diversity of suppliers (DS)	0.404	-1.838
On-time completion (OC)	-0.899	0.753
Achievement of objectives (AO)	-0.516	0.644

4.3.2. Standardised coefficients of research variables

The merits and practicality of the indicators and the model are assessed. The stability of each latent variable in the AMOS model is determined by the factorial loads of each indicator (see Table 4.4). The standardised coefficients represent the strength and direction of the relationships between the latent variables in the model. They indicate how much the dependent variable changes per unit change in the independent variable, after controlling for the effects of other variables (Ghasemi & Zahediasl, 2012). For example, Variables such as "Government effectiveness (GE)," "Regulatory quality (RQ)," "Rule of law (RL)," "Control of corruption

(CC)," "Extension of the project time (ET)," and "Variety of procurement methods (VP)" have high standardised coefficients and critical ratios. This suggests that these variables have significant and strong relationships with the dependent variable in the model.

Table 4.4
Assessing standardised coefficients of structural model

Variable name	Standardised coefficient	Critical ratio
Voice and accountability (VA)	0.634	43.896
Absence of violence (PV)	0.583	38.963
Government effectiveness (GE)	0.872	76.306
Regulatory quality (RQ)	0.808	65.077
Rule of law (RL)	0.949	92.879
Control of corruption (CC)	0.896	-
Monitoring & Evaluation (ME)	0.07	-
Government performance (GP)	0.221	10.652
Sponsor performance (SP)	0.113	6.579
Duration of the project (DP)	0.768	-
Extension of the project time (ET)	0.831	52.504
Goals Uncertainty (GU)	0.524	30.79
Size of budget (SB)	-0.06	-3.459
Number of disciplines involved (NS)	-0.089	-5.149
Level of development outcomes (DO)	0.054	2.639
Capacity of countries (CC)	-0.012	-0.715
Supervisor support (SS)	-0.17	-8.345
Political Instability (PI)	-0.058	-3.255
Number of contracts (NC)	0.761	47.498
Variety of procurement methods (VP)	0.856	54.39
Diversity of suppliers (DS)	0.725	44.94

As shown in Table 4.4, almost all standard coefficients related to the parameters have a value above 0.4, revealing the efficiency of the model's stability measurement in relation to underlying latent variables. The critical ratio is a statistical measure that assesses the significance of the standardised coefficients. As observed, all values of CR are above $p < 0.05$ and have statistical significance, thus indicating the validity of the research tool.

4.4. Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) is run to assess the study's validity and to reveal the model with the best fit. According to Suhr (2006), CFA is a statistical technique adopted to verify the factor structure of a set of observed variables. It allows the researcher(s) to test the hypothesis of whether a relationship exists between observed variables and their underlying latent constructs. The researcher(s) apply knowledge of the theory, empirical research or both to postulate the relationship pattern *a priori* and then statistically test the hypothesis. In the current study, the scores for the model fit indices and validity of the three models are determined twice, once with, and once without, latent data. All these models are developed based on the theoretical research model. The validity of the three models is compared through the fit indices to enable the selection of one model.

4.4.1. Developing and testing models based on theoretical research framework

Model 1: The direct effect of complexity factors on governance functionality and their impact on project outcomes are assessed (the study's original theoretical framework). As observed in Tables 4.8 and 4.9, the indices of this model are a poor fit and need to be improved.

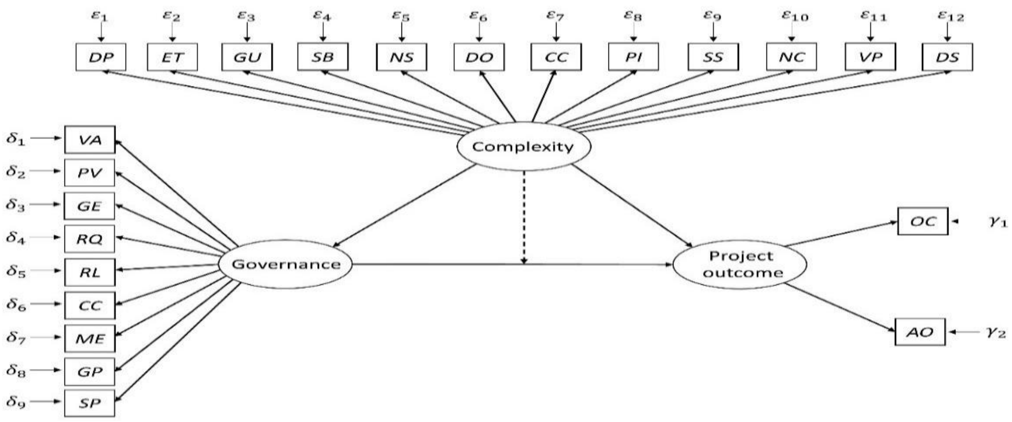


Fig. 4.2 Study's Model 1

Table 4.5
Factor loadings matrix (Model 1)

Variable	Complexity	Governance	Complexity x Governance	Outcome
Voice and accountability (VA)		0.576		
Absence of violence (PV)		0.58		
Government effectiveness (GE)		0.804		
Regulatory quality (RQ)		0.758		
Rule of law (RL)		0.815		
Control of corruption (CC)		0.801		
Sponsor performance (SP)		0.511		
Government performance (GP)		0.544		
Monitoring & Evaluation (ME)		0.138		
Diversity of suppliers (DS)	0.331			
Extension of the project time (ET)	0.812			
Goals Uncertainty (GU)	0.704			
Number of contracts (NC)	0.312			
Number of disciplines involved (NS)	-0.128			
Size of budget (SB)	-0.082			
Supervisor support (SS)	-0.422			
Duration of the project (DP)	0.731			
Variety of procurement methods (VP)	0.304			
Political Instability (PI)	-0.361			
Level of development outcomes (DO)	0.347			
Capacity of countries (CC)	-0.272			
Complexity x Governance			1	
On-time completion (OC)				0.933
Achievement of objectives (AO)				0.417

According to Shevlin & Miles (1998), in SEM, factor loadings with a value of 0.55 and above are reasonable and acceptable. It is commonly expected that a value of 0.7 or higher indicates that this factor extracts sufficient variance from the related variable. Factor loading is the correlation coefficient for a particular variable. As observed in Table 4.5, the factor loadings for Model 1 show low variance for many factors in the complexity latent variable and the monitoring and evaluation factor in governance. Based on these factor loadings and model fit figures, the original research model is unacceptable; thus, more sufficient models should be developed.

Model 2: The direct effect of complexity factors on governance functionality and their impact on project outcomes are assessed in this model. Due to the lower factor loading of the on-time completion variable, two dependent variables are separated. This separation allows the researcher to test the research hypotheses.

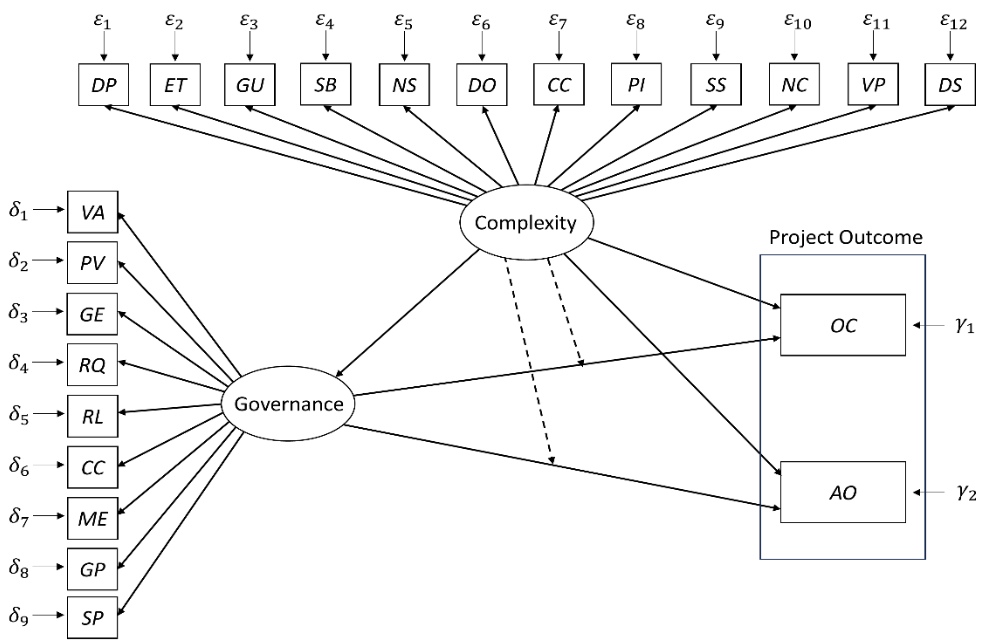


Fig. 4.3 Study's Model 2

Table 4.6
Factor loadings matrix (Model 2)

Variable	Complexity	Governance	Complexity x Governance	Outcome
Voice and accountability (VA)		0.443		
Absence of violence (PV)		0.464		
Government effectiveness (GE)		0.683		
Regulatory quality (RQ)		0.632		
Rule of law (RL)		0.668		
Control of corruption (CC)		0.663		
Sponsor performance (SP)		0.69		
Government performance (GP)		0.684		
Monitoring & Evaluation (ME)		0.219		
Diversity of suppliers (DS)	0.324			
Extension of the project time (ET)	0.789			
Goals Uncertainty (GU)	0.681			
Number of contracts (NC)	0.3			
Number of disciplines involved (NS)	-0.121			
Size of budget (SB)	-0.092			
Supervisor support (SS)	-0.487			
Duration of the project (DP)	0.717			
Variety of procurement methods (VP)	0.303			
Political Instability (PI)	-0.338			
Level of development outcomes (DO)	0.386			
Capacity of countries (CC)	-0.257			
Complexity x Governance			1	
On-time completion (OC)				1
Achievement of objectives (AO)				1

As observed in Table 4.6, most factor loadings of Model 2 are not acceptable; consequently, it is better to separate governance indicators into two levels to allow Model 3 to be devised.

Model 3: The direct effect of complexity on project outcomes and governance at two levels is assessed. In this assessment, the direct impact of governance at the national level on project governance is of concern. According to the factor loadings analysis (Table 4.7), the monitoring and evaluation variable does not strongly correlate with other variables (with a very low factor loading in the first component and a very high factor loading in the second), thus indicating that the monitoring and evaluation variable should be eliminated. Government performance and sponsor performance variables are not strong enough compared to the other variables; consequently, devising two different governance models, one at the national level and one at the project level, becomes necessary. As shown in Tables 4.8 and 4.9, none of the models fit the data, and all models have unacceptable fit indices.

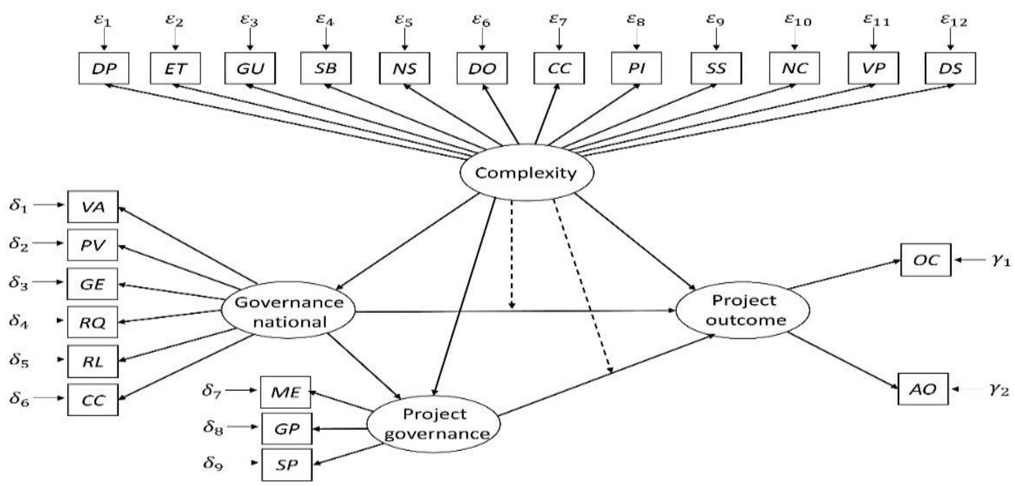


Fig. 4.4 Study's Model 3

Table 4.7
Factor loadings matrix (Model 3)

Variable	Complexity	Governance (national)	Governance (project)	Outcome
Voice and accountability (VA)		0.693		
Absence of violence (PV)		0.664		
Government effectiveness (GE)		0.895		
Regulatory quality (RQ)		0.859		
Rule of law (RL)		0.936		
Control of corruption (CC)		0.904		
Sponsor performance (SP)			0.905	
Government performance (GP)			0.837	
Monitoring & Evaluation (ME)			0.29	
Diversity of suppliers (DS)	0.273			
Extension of the project time (ET)	0.501			
Goals Uncertainty (GU)	0.434			
Number of contracts (NC)	0.182			
Number of disciplines involved (NS)	-0.063			
Size of budget (SB)	-0.126			
Supervisor support (SS)	-0.675			
Duration of the project (DP)	0.462			
Variety of procurement methods (VP)	0.218			
Political Instability (PI)	-0.468			
Level of development outcomes (DO)	0.604			
Capacity of countries (CC)	-0.402			
On-time completion (OC)				0.263
Achievement of objectives (AO)				0.979

Table 4.8
Model fit indices (missing values included)

Test name	Description	Acceptable values	Model 1	Model 2	Model 3
χ2/df	Relative Chi-Square	3> Good	80.324	80.461	23.364
NFI	Bentler-Bonett Normed Fit Index	>0.9	0.645	0.645	0.434
RFI	Relative Fit Index	>0.9	0.560	0.559	0.332
IFI	Incremental Fit Index	>0.9	0.648	0.648	0.511
TLI	Tucker-Lewis Fit Index	>0.9	0.563	0.562	0.481
CFI	Comparative Fit Index	>0.9	0.648	0.647	0.397
RMSEA	Root Mean Squared Error of Approximation	<0.1	0.147	0.147	0.150

Table 4.9
Model fit indices (missing values excluded)

Test name	Description	Acceptable values	Model 1	Model 2	Model 3
χ2/df	Relative Chi-Square	3> Good	28.899	46.451	18.611
RMR	Root Mean Squared Residual	0.1<	15.727	11.882	8.022
GFI	Goodness of Fit Index	>0.9	0.696	0.918	0.643
NFI	Bentler-Bonett Normed Fit Index	>0.9	0.653	0.922	0.767
RFI	Relative Fit Index	>0.9	0.608	0.891	0.612
IFI	Incremental Fit Index	>0.9	0.66	0.924	0.551
TLI	Tucker-Lewis Fit Index	>0.9	0.616	0.893	0.690
CFI	Comparative Fit Index	>0.9	0.66	0.924	0.711
RMSEA	Root Mean Squared Error of Approximation	<0.1	0.155	0.138	0.140

Model 3 has better factor loadings for both governance latent variables, while factor loadings for complexity still have low correlation coefficient values. The model fit figures are unacceptable which led the researcher to explore other models. After removing the three variables, namely, monitoring and evaluation, government performance and sponsor performance from the governance indicators list, more models are developed to find the model that is the best fit to address the research hypotheses.

The following four modified models are developed and assessed through the fit indices process.

4.4.2. Modified models

Model 4: After exploring the direct effect of complexity factors on governance functionality, interaction results are estimated, excluding the project governance indicators.

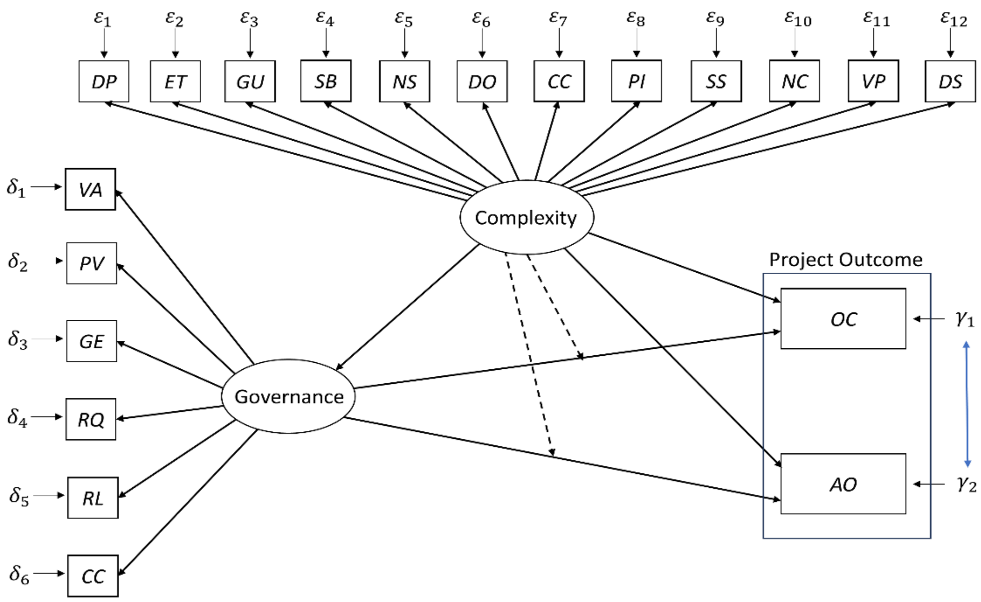


Fig. 4.5 Study's Model 4

Model 5: The direct effect of complexity factors on the governance function of the model is assessed, excluding the project governance indicators.

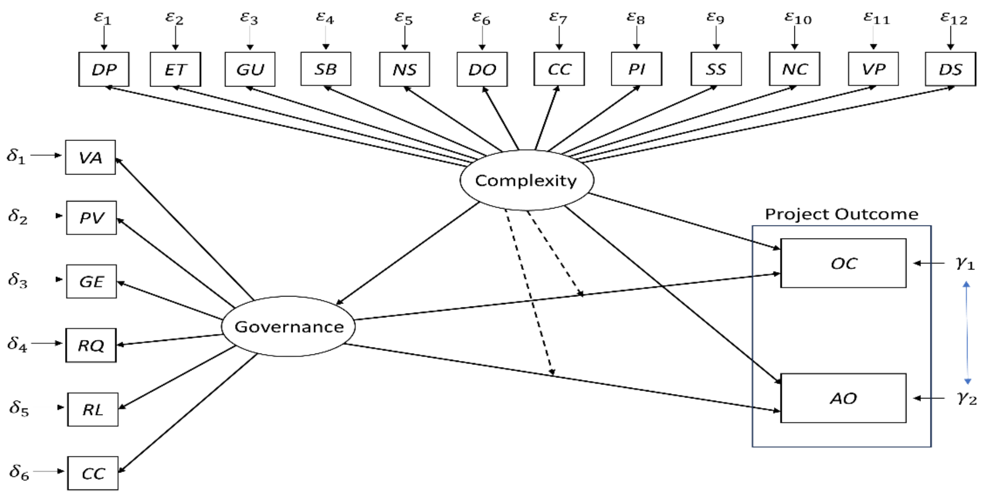


Fig. 4.6 Study's Model 5

Model 6: The direct effects of complexity factors on governance functionality and their impact on project outcomes are assessed. In this model, project outcomes are considered a latent variable, with project governance indicators excluded.

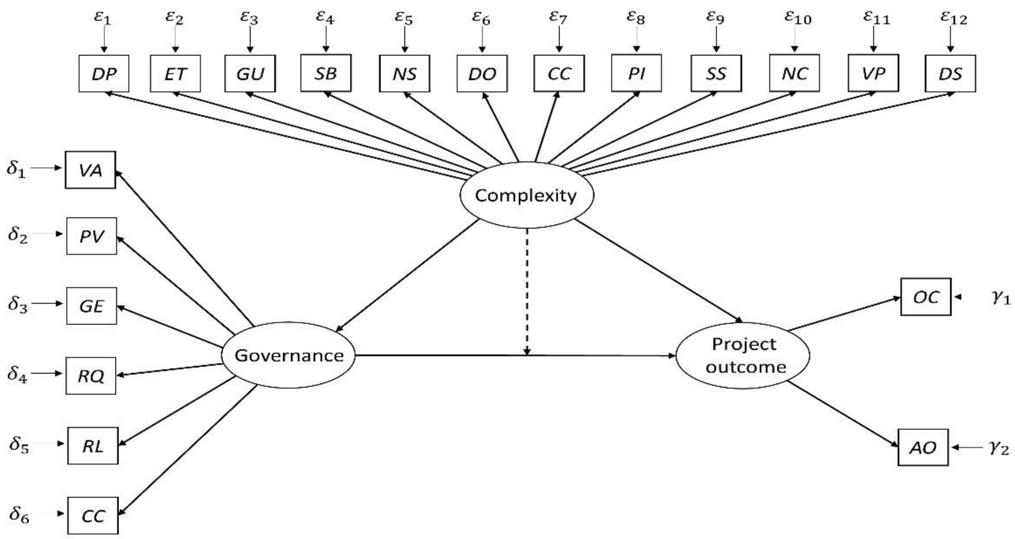


Fig. 4.7 Study's Model 6

Model 7: The model's complexity interaction and governance functionality are assessed, excluding the project governance indicators.

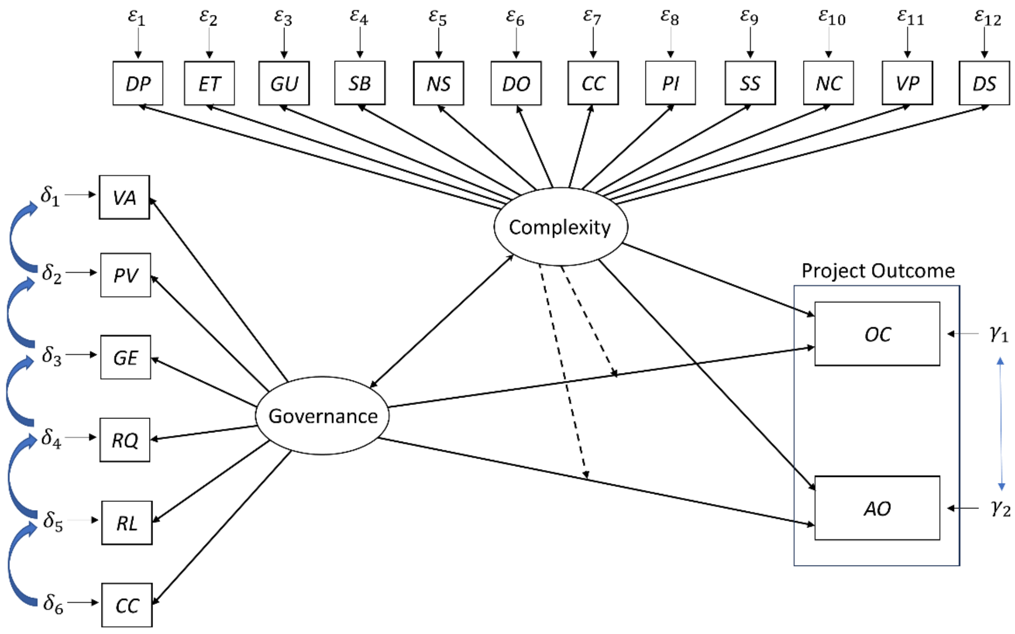


Fig. 4.8 Study's Model 7

Table 4.10
Model fit indices, with missed values

Test name	Description	Acceptable values	Model 4	Model 5	Model 6	Model 7
χ2/df	Relative Chi-Square	3> Good	57.467	103.658	88.221	88.696
NFI	Bentler-Bonett Normed Fit Index	>0.9	0.885	0.930	0.849	0.649
RFI	Relative Fit Index	>0.9	0.875	0.881	0.858	0.556
IFI	Incremental Fit Index	>0.9	0.931	0.973	0.851	0.651
TLI	Tucker-Lewis Fit Index	>0.9	0.877	0.917	0.927	0.558
CFI	Comparative Fit Index	>0.9	0.931	0.941	0.901	0.651
RMSEA	Root Mean Squared Error of Approximation	<0.1	0.124	0.094	0.104	0.154

Table 4.11
Model fit indices, with no values

Test name	Description	Acceptable values	Model 4	Model 5	Model 6	Model 7
$\chi 2/df$	Relative Chi-Square	3> Good	63.234	46.451	63.234	63.574
RMR	Root Mean Squared Residual	0.1<	14.125	11.882	14.125	14.182
GFI	Goodness of Fit Index	>0.9	0.696	0.918	0.696	0.696
NFI	Bentler-Bonett Normed Fit Index	>0.9	0.649	0.922	0.649	0.649
RFI	Relative Fit Index	>0.9	0.600	0.891	0.600	0.598
IFI	Incremental Fit Index	>0.9	0.652	0.924	0.652	0.653
TLI	Tucker-Lewis Fit Index	>0.9	0.604	0.893	0.604	0.602
CFI	Comparative Fit Index	>0.9	0.652	0.924	0.652	0.652
RMSEA	Root Mean Squared Error of Approximation	<0.1	0.161	0.138	0.161	0.162

Through comparing Tables 4.10 and 4.11, the study reveals that the models obtained through the latent data are a better fit with higher fit indices' scores.

A comparison of the seven proposed models reveals that Model 5 is the most promising, that is, the best for addressing the research hypotheses, while Model 7 is the least promising. A slight difference exists between the indices' scores for Models 4, 5 and 6.

The following two models and their results are applied:

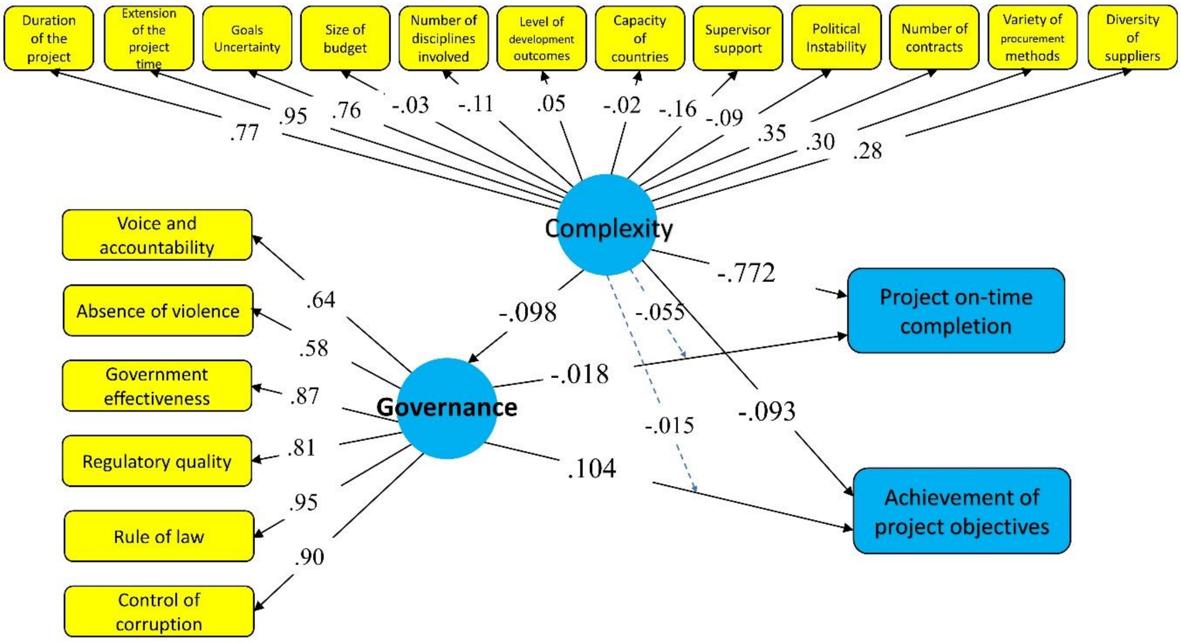


Fig. 4.9 Standardised coefficients for research model at national level

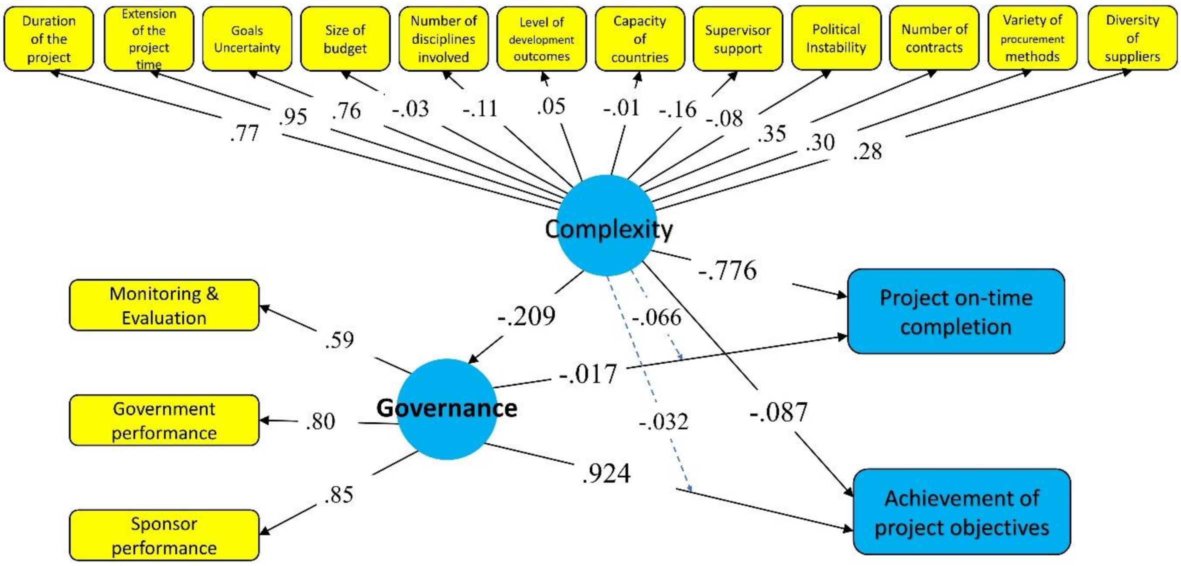


Fig. 4.10 Standardised coefficients for research model at project level

Based on factor analysis, with results shown in Table 4.12, seven variables are eliminated, with the following modified model applied:

Table 4.12
Factor loadings matrix (complexity variables)

Variable	Tailed	
	One	Two
Duration of the project (DP)	0.784	0.310
Extension of the project time (ET)	0.875	0.354
Goals Uncertainty (GU)	0.759	0.283
Size of budget (SB)	-0.064	-0.030
Number of disciplines involved (NS)	-0.144	-0.055
Level of development outcomes (DO)	0.243	0.111
Capacity of countries (CC)	-0.207	-0.114
Supervisor support (SS)	-0.314	-0.138
Political Instability (PI)	-0.299	-0.166
Number of contracts (NC)	0.338	0.080
Variety of procurement methods (VP)	0.616	0.078
Diversity of suppliers (DS)	0.631	0.082

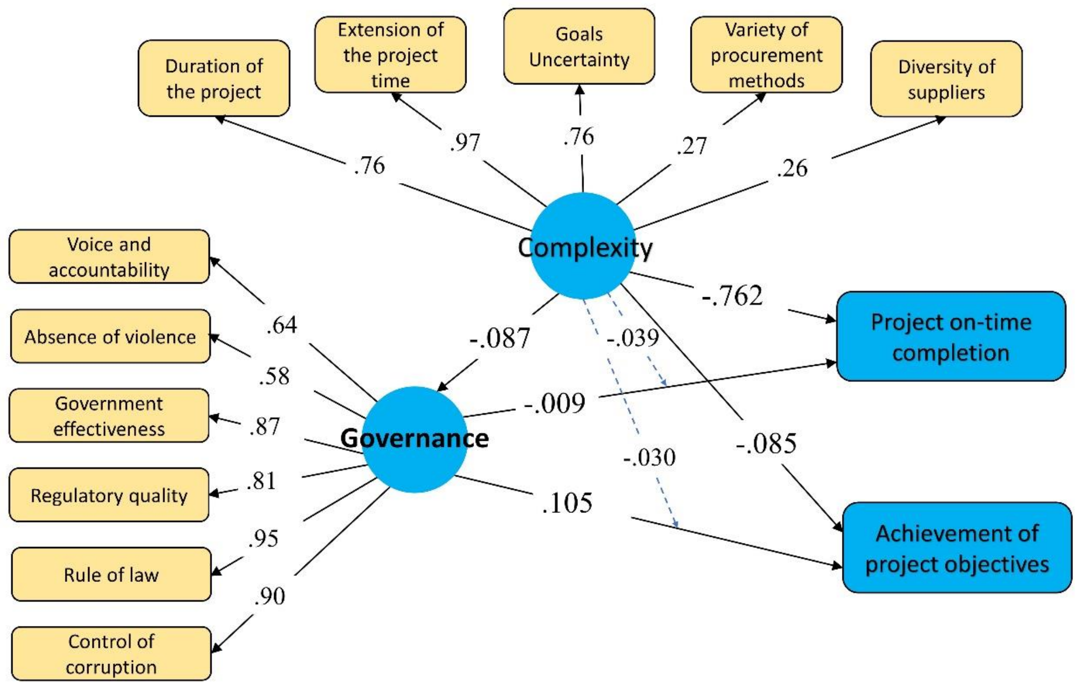


Fig. 4.11 Standardised coefficients for modified research model at national level

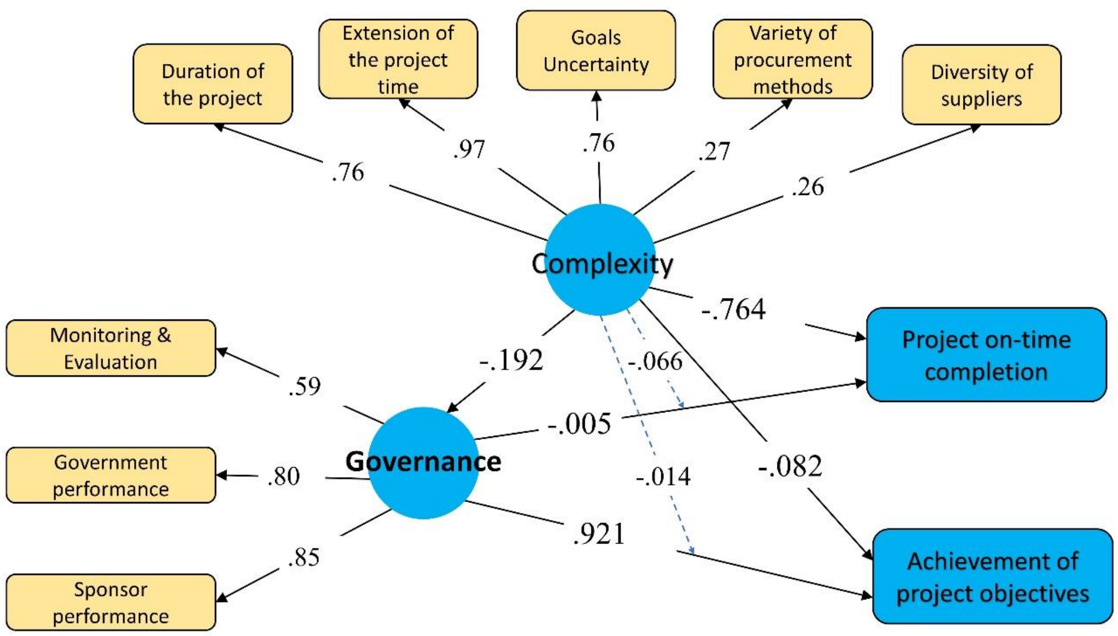


Fig. 4.12 Standardised coefficients for modified research model at project level

With the model's results, latent variable correlations are assessed and tabulated, as shown in Tables 4.13 and 4.14.

Table 4.13
Correlation coefficients of latent variables at national level

	Governance	Complexity	Achievement of objectives	On-time completion	Governance x complexity
-Governance	1				
-Complexity	-0.099*	1			
-Achievement of objectives	0.114*	-0.106*	1		
-On-time completion	0.058*	-0.730*	0.063*	1	
-Governance x complexity	0.007	-0.068*	-0.025	0.010	1

*p < .05.

Table 4.14
Correlation coefficients of latent variables at project level

	Governance	Complexity	Achievement of objectives	On-time completion	Governance x complexity
-Governance	1				
-Complexity	-0.187*	1			
-Achievement of objectives	0.784*	-0.106*	1		
-On-time completion	0.129*	-0.730*	0.063*	1	
-Governance x complexity	0.007	-0.039	-0.036	-0.011	1

*p < .05.

Table 4.15
Correlation coefficients of observed variables

	VA	PV	GE	RQ	RL	CC	ME	GP	SP	DP	ET	GU	SB	NS	DO	CC	SS	PI	NC	VP	DS	OC	AO
VA	1																						
PV	.46*	1																					
GE	.46*	.44*	1																				
RQ	.55*	.40*	.79*	1																			
RL	.60*	.56*	.82*	.75*	1																		
CC	.59*	.55*	.77*	.68*	.85*	1																	
ME	.03	.023	.06	.07	.021	.033	1																
GP	.02	.09*	.25*	.18*	.18*	.20*	.30*	1															
SP	.02	.05*	.11*	.09*	.07*	.09*	.52*	.68*	1														
DP	-.06*	-.06*	-.005	-.04*	-.02	-.06*	-.06	-.16*	-.22*	1													
ET	-.01	-.07*	-.07*	-.06*	-.07*	-.07*	-.05	-.15*	-.15*	.73*	1												
GU	-.03*	-.08*	-.10*	-.10*	-.10*	-.11*	-.04	-.12*	-.09*	.50*	.75*	1											
SB	.006	-.05*	.10*	.05*	.05*	.03*	.054	.08*	.04*	-.01	-.015	-.007	1										
NS	.03*	.04*	.012	.021	.04*	.05*	-.12*	.012	.018	-.11*	-.09*	-.13*	-.02	1									
DO	-.11*	-.16*	-.38*	-.28*	-.29*	-.31*	-.14	-.46*	-.35*	-.018	.04*	.06*	-.09*	.031	1								
CC	.34*	.20*	.60*	.58*	.43*	.37*	.009	.14*	.08*	.019	-.01	-.02	.08*	-.06*	-.22*	1							
SS	.012	.06*	.11*	.10*	.07*	.09*	.55*	.60*	.82*	-.18*	-.13*	-.09*	.04*	.023	-.30*	.07*	1						
PI	.46*	.79*	.52*	.49*	.59*	.58*	.027	.13*	.10*	-.05*	-.07*	-.10*	-.03*	.03*	-.23*	.32*	.10*	1					
NC	-.03	.007	-.05*	-.01	-.07*	-.10*	-.001	-.03	-.001	.37*	.27*	.14*	.012	.16*	.015	.05*	.012	-.01	1				
VP	-.001	.12*	-.08*	.01	-.06*	-.08*	-.03	-.10*	-.06*	.30*	.22*	.10*	-.09*	.05*	.07*	0.01	-.05*	.08*	.56*	1			
DS	-.12*	.05*	-.19*	-.13*	-.13*	-.16*	-.07	-.12*	-.07*	.25*	.21*	.13*	-.02	-.01	.10*	-.15*	-.03	.001	.44*	.51*	1		
OC	.014	.04*	.04*	.05*	.04*	.06*	.033	.12*	.13*	-.63*	-.73*	-.57*	.024	.10*	.003	.004	.10*	.03*	-.20*	-.19*	-.13*	1	
AO	.004	.05*	.13*	.10*	.09*	.11*	.50*	.73*	.76*	-.12*	-.08*	-.06*	.06*	.004	-.44*	.05*	.65*	.09*	.023	-.04*	-.06*	.06*	1

*. Correlation is significant at the 0.05 level.

4.5. Validity and reliability of the selected model

According to De Vaus (2002, p. 17), "data analysis is subject to reliable and valid measurements". Consistency in the research concept of gauging the accuracy of measurement is assessed by reliability. The study's validity is subject to the accuracy of measurements after assessing the extent to which measurements evaluate the intended concept. These measurements justify the validity and reliability of the study's fundamental criteria.

The lack of validated methods in confirmatory studies results in the deduction that the study's outcomes are not trustworthy. Before structural model tests are adopted and assessments are run in a study, the theoretical model must be up to par for reliability, convergent validity and discriminant validity. The concept of validation provides researchers, their associates and society with confidence in the study as they perceive that the adopted methods are promising with regard to scientific truth (Baz Chamas, 2017; Straub et al., 2004).

4.5.1. Reliability of the research model

Reliability is the extent to which a measuring procedure (i.e., an instrument) provides repetitious results in due time (Mohamad et al., 2015). A reliable instrument has less variability and is able to be applied in different situations, but as with any other procedure, this cannot be wholly true. As noted by Chakrabarty (2019), while some degree of chance error is universally present, the extent of this error can vary, being either high or low. Any two sets of measurements of the same characteristics of the same individuals are never considered as exact duplicates. Reliability is a critical criterion in correctly measuring data analysis. Stability, equivalence and internal consistency constitute types of reliability (Babin & Svensson, 2012).

Cronbach's alpha, composite reliability and average variance extracted (AVE) are applied to measure the reliability of the constructs (see Table 4.16). The theoretical model is considered reliable if Cronbach's alpha and composite reliability have values above 0.70 and if the value for average variance extracted (AVE) is 0.5 or higher (Shevlin & Miles, 1998). As shown in Table 4.16, these values for the construct are within the suggested acceptable ranges.

Table 4.16
Reliability of research model

Level	Latent variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
National	Complexity	0.719	0.867	0.798	0.586
	Governance	0.908	0.949	0.928	0.688
Project	Complexity	0.719	0.867	0.798	0.586
	Governance	0.695	0.729	0.752	0.535

4.5.2. Validity of the research model

Bagozzi (2022) defines validity as a collection of interrelated ideas that collectively encapsulate the essence of the subject phenomenon. A study's validity is embedded in the accuracy and correctness of its measurement instruments (Bryman & Cramer, 2004). Construct validity, criterion validity and content validity are three types of validity widely applied by researchers in evaluating instrument validity. Construct validity is one of the two convergent and discriminant forms widely applied in confirmatory studies.

According to McDanil and Gates (2018), convergent validity is the degree of association between different measurement instruments that are seeking to measure the same concept. To Bagozzi (2022), discriminant validity is the degree to which measures of different concepts are distinguished. There is a high correlation between the measures of the same concept indicating their convergent validity; there is a low correlation between measures designed for different concepts indicating their discriminant validity (Bryman & Cramer, 2004). Factor analysis is run so correlated variables can be reduced to a few factors through grouping, in this process, separating uncorrelated variables (Baz Chamas, 2017). Convergent validity is assessed through AMOS software which extracts all item factors and cross-loadings to their latent constructs are extracted (Barros et al., 2021), Table 4.17.

Table 4.17
Discriminant validity of the research model

Level	Latent variable	CR	AVE	MSV	MaxR(H)	Com.	Gov.	Com.*Gov.
National	Complexity	0.867	0.586	0.54	0.95	1	-0.09	-0.068
	Governance	0.949	0.688	0.54	0.89	-0.09	1	0.007
Project	Complexity	0.867	0.586	0.32	0.98	1	-0.18	-0.039
	Governance	0.729	0.535	0.30	0.91	-0.18	1	0.007

Notes: CR = composite reliability; AVE = average variance extracted; MSV = maximum shared variance; reliability = CR > 0.7; convergent validity = AVE > 0.5; discriminant validity = MSV < AVE.

Overall, the discriminant validity is supported as the MSV values are lower than the corresponding AVE values for all latent variables.

Additionally, the provided values for Composite Reliability (CR) and AVE meet the recommended thresholds for reliability (CR > 0.7) and convergent validity (AVE > 0.5), indicating that the measures are reliable and convergent within their respective latent variables.

4.6. Testing research hypotheses

After finalising the proposed model and assessing its validity and reliability, the study tests the relationships between latent and observed constructs and the established hypotheses.

4.6.1. Testing Hypothesis 1: Governance has a positive effect on project outcomes

- **H1a.** Governance has a positive effect on the achievement of project objectives

As shown on Tables 4.18 and 4.19, the path coefficient between governance at the national level and the achievement of project objectives is statistically significant with a value of 0.098 obtained. This includes the path coefficient's missed values with a 5.704 critical ratio at the national level. The critical ratio value explains the statistics formulated by dividing path estimation by its standard error. A value of ±1.96 or greater indicates two-sided significance at $\alpha = 0.05$ level (Garson, 2013). This trend also holds for the project level.

Table 4.18
Path coefficient of Hypothesis 1a (missed values included)

Path name	Path estimation	Critical ratio
Governance (national level) → achievement of objectives	0.098	5.704
Governance (project level) → achievement of objectives	0.934	46.06

By excluding the missed values at the national level, a value of 0.104 is obtained for the path coefficient with a critical ratio value of 6.031, with the same holding for the project level, at a value of 0.924 with a *p*-value of 57.384. This result is highly statistically significant and is applied in testing the hypothesis.

Table 4.19
Path coefficient of Hypothesis 1a (missed values excluded)

Path name	Path estimation	Critical ratio
Governance (national level) → achievement of objectives	0.104	6.031
Governance (project level) → achievement of objectives	0.924	57.384

This direct relationship with 95% certainty is statistically significant at national and project levels, indicating a positive and significant effect on the achievement of project objectives, thus indicating a valid hypothesis. The null Hypothesis 1a is rejected here in favour of the alternative Hypothesis 1a. This result indicates that the relationship of governance with the achievement of project objectives is positive and statistically significant.

- **H1b.** Governance has a positive effect on the project's on-time completion

As shown in Table 4.20, the path coefficient between governance and project on-time completion variables at the national level is -0.018 with a critical ratio value of -1.565, with the same holding for the project level, at -0.017 with a -1.419 critical ratio value.

Table 4.20
Path coefficient of Hypothesis 1b

Path name	Path estimation	Critical ratio
Governance (national level) → on-time completion	-0.018	-1.565
Governance (project level) → on-time completion	-0.017	-1.419

This direct relationship with 95% certainty is not statistically significant, indicating the slightly negative effect of governance on project on-time completion. This phenomenon is very weak and not distanced from its critical ratio; consequently, due to the high volume of samples, this makes a slight probable difference in significance. This phenomenon indicates neither a positive nor a negative effect regarding the significance of the relationship between governance and project on-time completion, thus making Hypothesis 1b non-valid. As a result, no solid evidence is found to confirm that governance at national and project levels leads to on-time project completion; therefore, the null Hypothesis 1b cannot be rejected here.

4.6.2. Testing Hypothesis 2: Complexity has a negative effect on project outcomes

- **H2a.** Complexity has a negative effect on the achievement of project objectives

As observed in the path analysis and results in Table 4.21, the path coefficients between complexity and the achievement of project objectives have critical ratio values of -0.093 and -5.425, respectively. These values indicate a negative relationship between complexity and project outcomes, even though it is statistically significant.

Table 4.21
Path coefficient of Hypothesis 2a

Path name	**Path estimation**	**Critical ratio**
Complexity → achievement of project objectives	-0.093	-5.425

This direct relationship with 95% certainty is statistically significant, indicating the negative effect of project complexity on the achievement of project objectives, thus making Hypothesis 2a valid, while not allowing the rejection of the null Hypothesis 2a. The results here indicate that project complexity negatively influences the achievement of project objectives.

- **H2b.** Complexity has a negative effect on the project's on-time completion

As observed in the path analysis and results in Table 4.22, the path coefficients between complexity and on-time completion have critical ratio values of -0.772 and -49.194, respectively. These values mean that a negative relationship exists between project complexity and on-time completion, although it is statistically significant.

Table 4.22
Path coefficient of Hypothesis 2b

Path name	**Path estimation**	**Critical ratio**
Complexity → project on-time completion	-0.772	-49.194

This direct relationship with 95% certainty is statistically significant, indicating the negative effect of project complexity on project on-time completion; thus, Hypothesis 2a is a valid hypothesis which does not allow for the rejection of Hypothesis 2b here.

4.6.3. Testing Hypothesis 3: Complexity has a negative effect on governance

The path analysis and results in Table 4.23 show that the path coefficients between complexity and governance at the national level have respective critical ratio values of -0.098 and -5.480. At the project level, these critical ratio values are -0.209 and -10.854, respectively. These values mean a negative relationship exists between complexity and governance, although it is statistically significant.

Table 4.23
Path coefficient of Hypothesis 3

Path name	**Path estimation**	**Critical ratio**
Complexity → governance (national level)	-0.098	-5.480
Complexity → governance (project level)	-0.209	-10.854

This direct relationship with 95% certainty is statistically significant, indicating the negative effect of project complexity on governance; thus, Hypothesis 3 is a valid hypothesis that does not allow the null Hypothesis 3 to be rejected at national and project levels.

4.6.4. Testing Hypothesis 4: Complexity negatively moderates the relationship between governance and project outcomes

Moderation analysis is one of the most common tools applied in structural equation modelling (SEM) (Aguinis et al., 2005). This analysis can be run on both latent and observed variables. In this study, the contribution of complexity (the latent variable) to the relationship between governance and project outcomes is assessed. The proposed model of latent moderation analysis comprises the unconstrained product indicator approach, multigroup, means, corrected means, factor scores and the latent moderated structural equation approach (Marsh et al., 2004). The latent product indicator approach, next to the matched pairs of indicators, is applied here to assess the moderation effects (Pieters et al., 2022).

- **H4a.** Complexity dampens the positive relationship between governance and achievement of project objectives

As deduced from the path analysis and results in Table 4.24, the path coefficients between complexity *x* governance and the achievement of project objectives at the national level have critical ratio values of -0.030 and -1.734, respectively. At the project level, the critical ratio values are -0.014 and -1.286, respectively, with no statistical significance.

Table 4.24
Path coefficient of Hypothesis 4a

Path name	Path estimation	Critical ratio
Governance x *complexity* → *AO (national level)*	-0.030	-1.734
Governance x *complexity* → *AO (project level)*	-0.014	-1.286

Note: AO = achievement of project objectives

This moderation relationship with 95% certainty is not statistically significant, thus making Hypothesis 4a non-valid and allowing the null Hypothesis 4a to be rejected.

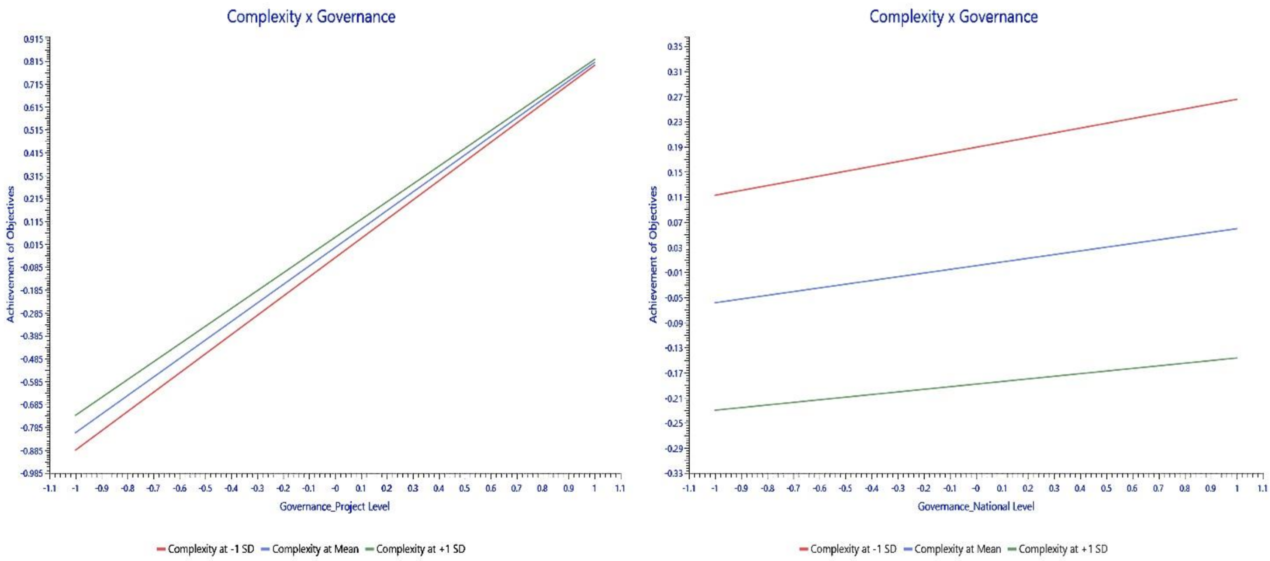


Fig. 4.13 Simple slope analysis: governance *x* complexity → achievement of project objectives (AO)

- **H4b.** Complexity dampens the positive relationship between governance and a project's on-time completion

As deduced from the path analysis and results in Table 4.25, the path coefficients between complexity *x* governance and on-time completion at the national level have critical ratio values of -0.039 and -3.342, respectively. At the project level, the respective critical ratio values are -0.066 and -5.319.

Table 4.25
Path coefficient of Hypothesis 4b

Path name	Path estimation	Critical ratio
Governance x complexity → OC (national level)	-0.039	-3.342
Governance x complexity → OC (project level)	-0.066	-5.319

Note: OC = (project) on-time completion

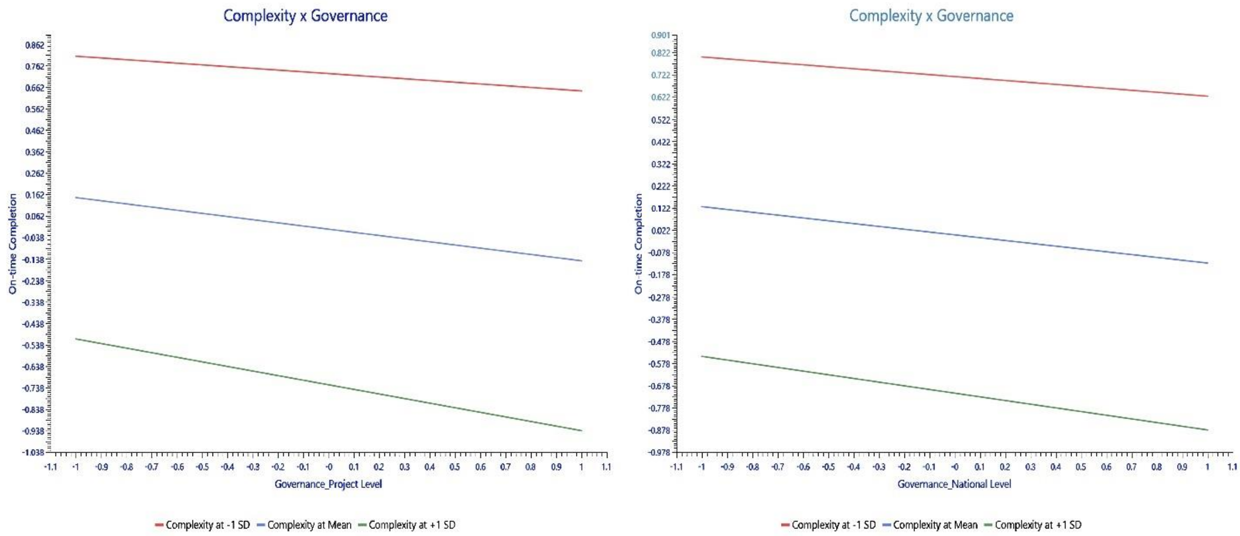


Fig. 4.14 Simple slope analysis: governance *x* complexity → project's on-time completion (OC)

This moderation relationship with 95% certainty is statistically significant, thus making Hypothesis 4b valid, while not allowing the null Hypothesis 4b to be rejected. As a result, complexity is found to negatively moderate the positive relationship between governance and on-time project completion.

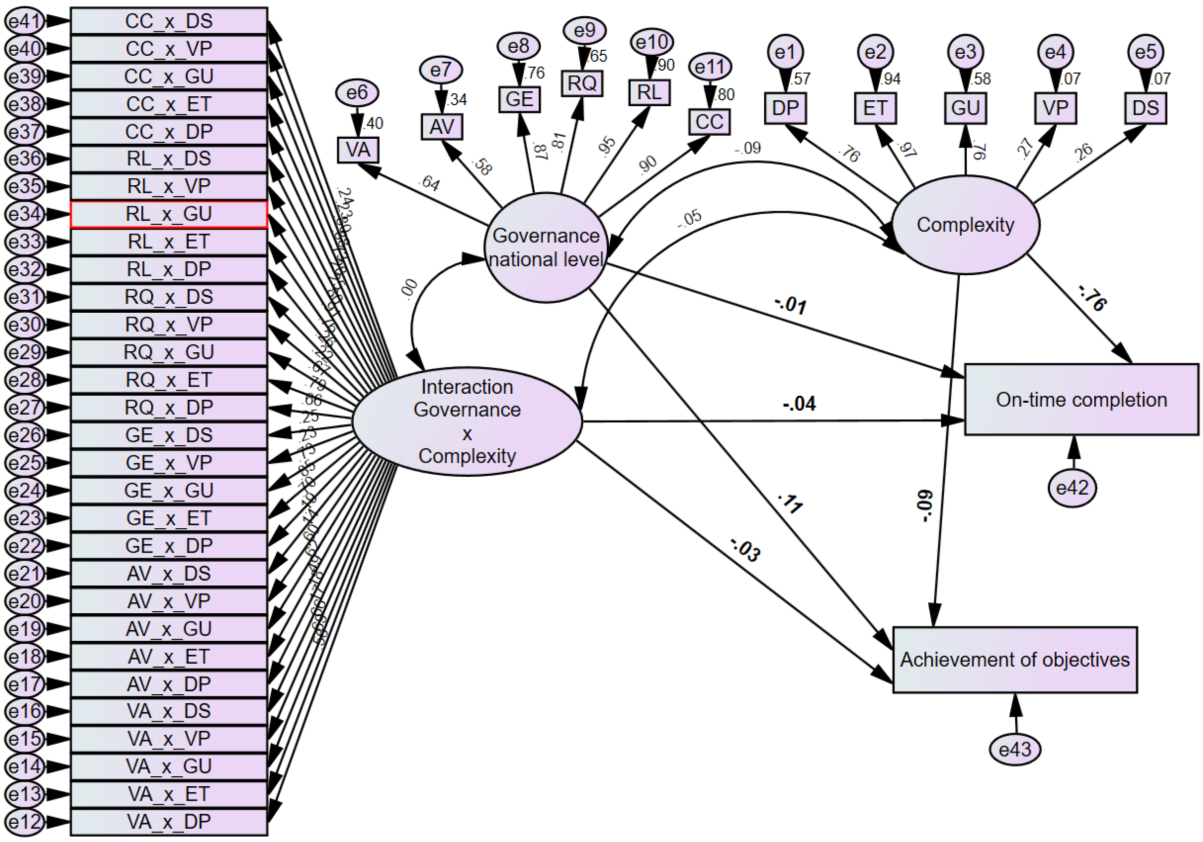


Fig. 4.15 Research model outcome (moderation analysis: national level)

As shown in Fig. 4.15 and Table 4.26, most model path coefficients are statistically significant except the relationship between governance and project on-time completion and the project objectives' achievement interaction relationship.

Table 4.26
Regression weights: research model at the national level (unstandardised estimates)

Path name			Estimate	S.E.	C.R.	P
Duration of the project	←	Complexity	1.000			
Extension of the project time	←	Complexity	1.281	.022	59.517	***

Path name			Estimate	S.E.	C.R.	P
Goals Uncertainty	←	Complexity	1.006	.021	47.856	***
Variety of procurement methods	←	Complexity	.360	.026	13.986	***
Diversity of suppliers	←	Complexity	.343	.026	13.328	***
Voice and accountability	←	Governance	1.000			
Regulatory quality	←	Governance	1.270	.031	40.719	***
Control of corruption	←	Governance	1.410	.032	43.958	***
Absence of violence	←	Governance	.918	.029	31.280	***
Government effectiveness	←	Governance	1.370	.032	43.068	***
Rule of law	←	Governance	1.497	.033	45.672	***
On-time completion	←	Complexity	-1.010	.021	-48.217	***
On-time completion	←	Governance	-.014	.018	-.788	.431
On-time completion	←	Interaction	-.071	.021	-3.342	***
Achievement of objectives	←	Governance	.165	.027	6.078	***
Achievement of objectives	←	Interaction	-.054	.031	-1.734	.083
Achievement of objectives	←	Complexity	-.114	.022	-5.073	***

Notes: SE = (approximate) standard error

CR is the parameter estimate divided by its standard error (SE) estimate. If the appropriate distributional assumptions are met, this statistic has a standard normal distribution subject to the null hypothesis, where the parameter has a population value of zero (e.g., if an estimate has a critical ratio value greater than 2.0, the estimate's absolute value is significantly different from zero at the 0.05 level).

Even without distributional assumptions, the critical ratios are interpreted as follows:

For any unconstrained parameter, according to the AMOS Manual, the square of its critical ratio is approximately the level of increase in the chi-square statistic if the analysis is repeated with that parameter fixed at zero.

The research model for moderation analysis at the project level is illustrated in Fig. 4.16, with the details tabulated in Table 4.27.

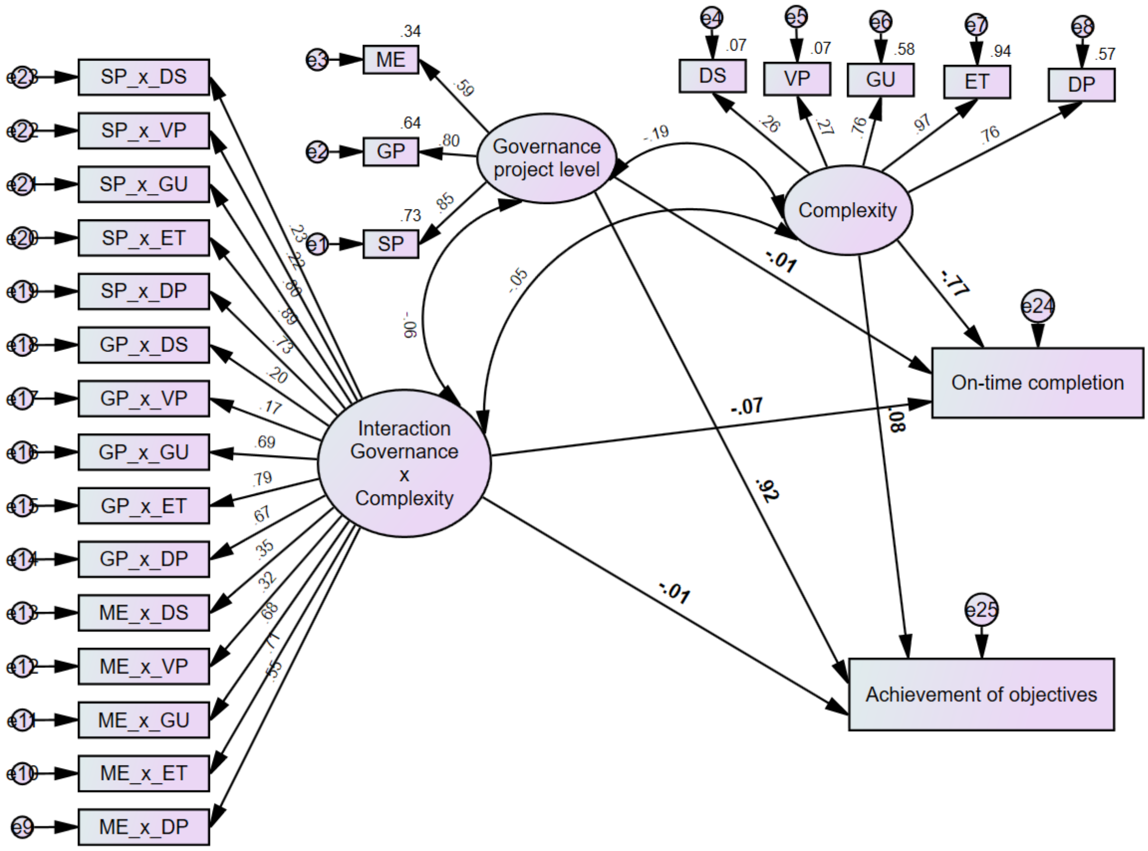


Fig. 4.16 Research model outcome (moderation analysis: project level)

As in the model at the national level, most model path coefficients are statistically significant at the project level, except for the relationship between governance and project on-time completion and the project objectives' achievement interaction relationship (see Table 4.28).

Table 4.27
Regression weights: research model at project level (unstandardised estimates)

Path name			Estimate	S.E.	C.R.	P
Sponsor performance	←	Governance	1.000			
Government performance	←	Governance	.943	.019	48.868	***
Monitoring & evaluation	←	Governance	.697	.039	17.982	***

Path name			Estimate	S.E.	C.R.	P
On-time completion	←	Complexity	-2.964	.223	-13.278	***
On-time completion	←	Governance	-.011	.014	-.763	.446
On-time completion	←	Interaction	-.141	.027	-5.319	***
Achievement of objectives	←	Governance	1.080	.019	57.374	***
Achievement of objectives	←	Complexity	-.312	.049	-6.426	***
Achievement of objectives	←	Interaction	-.030	.024	-1.286	.198
Diversity of suppliers	←	Complexity	1.000			
Variety of procurement methods	←	Complexity	1.051	.107	9.830	***
Extension of the project time	←	Complexity	3.752	.279	13.469	***
Goals Uncertainty	←	Complexity	2.939	.221	13.276	***
Duration of the project	←	Complexity	2.930	.221	13.280	***

4.6.5. Testing Hypothesis 5: Monitoring and evaluation (sound governance) positively impact upon project outcomes

- **H5a.** Monitoring and evaluation (M&E) have a positive effect on the achievement of project objectives.

As deduced from the path analysis and results in Table 4.28, the path coefficients between monitoring and evaluation (M&E) and the achievement of project objectives have critical ratio values of 0.509 and 19.563, respectively. These values indicate a positive statistically significant relationship between monitoring and evaluation (M&E) and the achievement of project objectives.

Table 4.28
Path coefficient of Hypothesis 5a

Path name	Path estimation	Critical ratio
Monitoring & evaluation → achievement of project objectives	0.509	20.031

This indirect relationship with 95% certainty is statistically significant, indicating a positive effect of monitoring and evaluation (M&E) on the achievement of project outcomes, thus making Hypothesis 5a valid, while not allowing the null Hypothesis 5a to be rejected.

- **H5b.** Monitoring and evaluation (M&E) have a positive effect on project's on-time completion

As deduced from the path analysis and results in Table 4.29, the path coefficients between monitoring and evaluation (M&E) and the project's on-time completion have critical ratio values of -0.025 and 0.156. Although not statistically significant, these values indicate a slight negative relationship between monitoring and evaluation (M&E) and the project's on-time completion.

Table 4.29
Path coefficient of Hypothesis 5b

Path name	Path estimation	Critical ratio
Monitoring & evaluation → on-time completion	-0.025	0.156

This indirect relationship with 95% certainty is statistically significant, indicating the negative effect of monitoring and evaluation (M&E) on the project's on-time completion, thus, making Hypothesis 5b non-valid and not allowing the null Hypothesis 5b to be rejected.

4.6.6. Testing Hypothesis 6: The positive relationship between governance and project outcomes is tighter in developed countries

- **H6a.** The positive relationship between governance and the achievement of project objectives is tighter in developed countries.

As deduced from the path analysis and results in Table 4.30, the path coefficients of research variables in least-developed, developing and developed countries have varying values. Surprisingly, the path coefficient between governance at the national level and the achievement of project objectives in least-developed countries is following an ascending trend in both developing and developed countries.

Table 4.30
Path coefficient of Hypothesis 6a

Path name	Least developed		Developing		Developed		Invariant
	Path estimation	Critical ratio	Path estimation	Critical ratio	Path estimation	Critical ratio	
Governance → AO (N)	0.085	0.155	0.034	0.414	-0.117	0.000	0.202
Complexity → AO (N)	-0.140	0.001	-0.226	0.000	-0.205	0.000	0.065
Gov. *x* Complexity → AO (N)	0.010	0.714	-0.024	0.214	-0.150	0.000	0.16
Governance → AO (P)	0.757	0.000	0.778	0.000	0.820	0.965	-0.063
Complexity → AO (P)	-0.013	0.960	0.040	0.098	0.083	0.985	-0.096
Gov. *x* Complexity → AO (P)	-0.074	0.223	-0.044	0.591	-0.170	0.980	0.096

Notes: N = national level; P = project level

This multigroup relationship with 95% certainty is statistically significant, indicating the positive effect of governance on the achievement of project outcomes in least-developed countries. Although not statistically significant, this relationship negatively affects developed countries by not allowing Hypothesis 6a to be rejected.

- **H6b.** The positive relationship between governance and on-time completion of projects is tighter in developed countries.

As deduced from the path analysis and results in Table 4.31, the path coefficients of research variables in least-developed, developing and developed countries have varying values. Although this relationship in least-developed and developing countries is negative, the path coefficients of governance at the project level and the project's on-time completion in developed countries are positive. Note that not all the figures are statistically significant.

Table 4.31
Path coefficient of Hypothesis 6b

Path name	Least developed		Developing		Developed		Invariant
	Path estimation	Critical ratio	Path estimation	Critical ratio	Path estimation	Critical ratio	
Governance → OC (N)	-0.068	0.000	-0.130	0.000	0.075	0.000	-0.143
Complexity → OC (N)	-0.712	0.000	-0.721	0.000	-0.657	0.000	-0.055
Gov. *x* Complexity → OC (N)	-0.047	-0.013	-0.025	-0.095	0.035	0.000	-0.082
Governance → OC (P)	-0.066	-0.171	-0.040	0.260	-0.075	0.960	0.009
Complexity → OC (P)	-0.661	0.000	-0.686	0.000	-0.070	0.666	-0.591
Gov. *x* Complexity → OC (P)	-0.033	-0.459	-0.048	0.110	-0.062	0.978	0.029

Notes: N = national level; P = project level

This multigroup relationship with 95% certainty is not statistically significant, thus making Hypothesis 6b non-valid and not allowing the null Hypothesis 6b to be rejected. The study finds that the positive relationship between governance and the project's on-time completion is NOT tight in developed countries.

4.7. The marginal effect of complexity factors on project outcomes

This section assesses the distinct relationship between every single complexity factor and project outcomes, and the association of complex factors and governance indicators is evaluated. This assessment is followed by the effect of complexity on the connection between governance and project outcome variables. In statistics and econometrics, the marginal effect of a variable refers to the effect of a small change in that variable on the predicted outcome or dependent variable, while holding all other variables constant (Bartus, 2005). Marginal effects are often used to interpret the coefficients of regression models and to investigate how changes in the values of the independent variables (complexity factors) impact the dependent variable (project outcome variables).

The following marginal effects are considered for the 12 project complexity factors:

4.7.1. The marginal effect of the duration of the project (DP)

A project's duration in different project types constitutes one of the complexity factors addressed by many researchers (Bakhshi, 2016). The marginal effect of the duration of the project (DP) is that it will significantly influence the overall cost and time of the international development project, as well as the quality of the outcomes. Therefore, the duration of the project should be carefully considered when planning and budgeting for a development project. The effect of this factor on project outcomes variables, including project on-time completion, and the achievement of project objectives are assessed. The effect of this factor on the governance indicators is assessed as well.

4.7.1.1. Assessing the effect of duration of the project (DP) on on-time completion

This section of the thesis discusses the effect of project duration on the on-time completion of projects. We used frequency diagrams and logistic regression models to analyse the relationship between these variables.

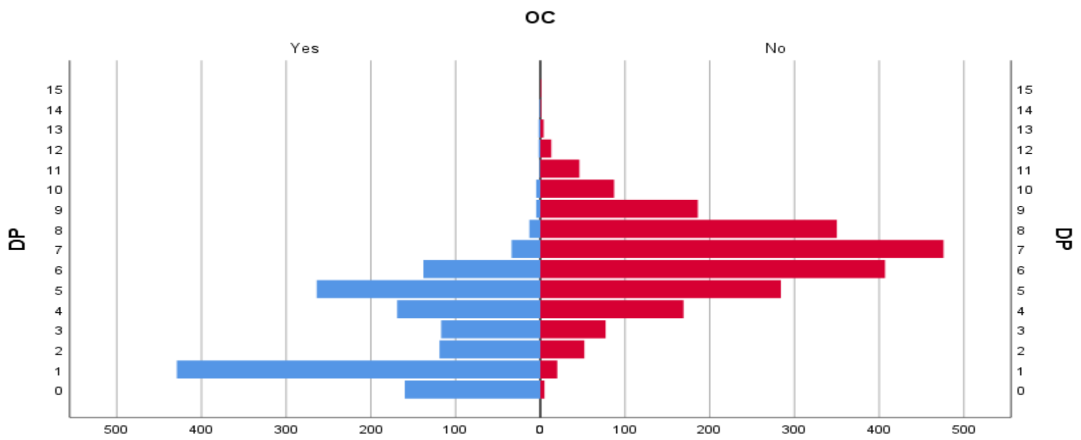


Fig. 4.17 The DP frequency diagram based on distinguishing on-time completion or non-completion of the project

Figure 4.17 shows that the frequency of projects being finished on time and according to the schedule is at its maximum between the second and fourth years of the project. The presence of an indirect association between the length of a project and the success rate of completion may be deduced from the fact that this issue suggests that projects with shorter timelines are more likely to be completed on time.

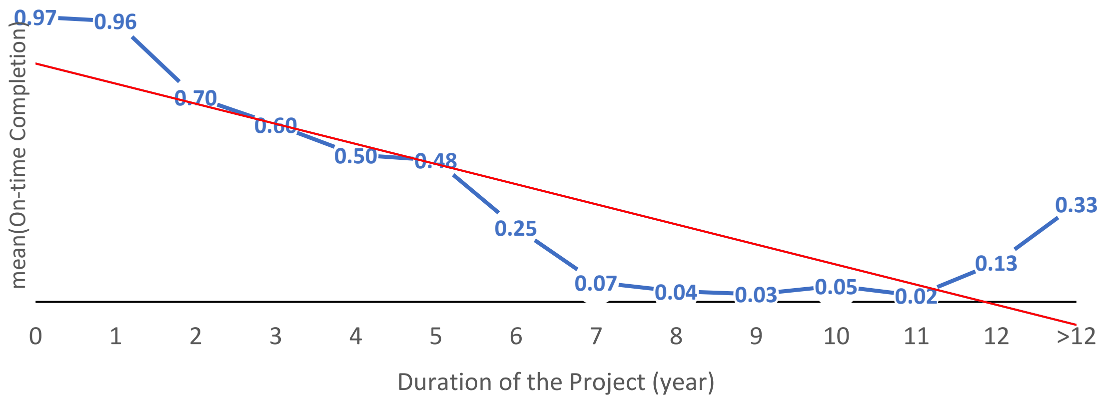


Fig. 4.18 The On-time completion average rate over the duration of projects

As seen in Figure (4.18), the completion deadline moves further out in the future whenever the project duration is made to last longer. As a result, short-term projects have a greater chance of being completed on schedule.

The Logistic Regression Model (LRM) can be used to predict the probability of on-time completion of the DP given a set of predictor variables. The LRM can then be used to calculate the probability of on-time completion and make decisions on allocating resources and governing the project to maximise the chances of on-time completion (Norton et al., 2019).

Table 4.32
The Logistic Regression Model (LRM) of on-time completion over the DP

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	-3.009	.1185	.049	644.878	<0.001
Duration of the project	-0.704	.0229	0.494	943.935	<0.001

According to the findings presented in Table 4.32, a one-unit increase in the DP variable would result in a twofold rise in the odds ratios associated with the NO category of the OC variable. Because the significance of this volume is less than <0.05, we can conclude that the association is statistically significant (P<0.001).

Proposition1: *The findings gathered and displayed in Figure (4.18), and the information calculated and displayed in Table 4.32 suggests that the probability of completing a project on time decreases proportionately with the project's duration. The project duration is negatively associated with the regression coefficient, such that for every unit increase in the project duration, the regression coefficient decreases by 0.704. This relationship is statistically significant, as indicated by the Wald statistic of 943.935 and a p-value of less than 0.001.*

4.7.1.2. Assessing DP effect on the achievement of project objectives

In this part, the effect of the duration of project trends on predetermined project goal achievements is assessed. As seen in Figure (4.19), an increase in DP results in a decrease in the frequency of projects that have achieved better outcomes. This suggests that short-term initiatives focusing on the long-term will likely accomplish their goals.

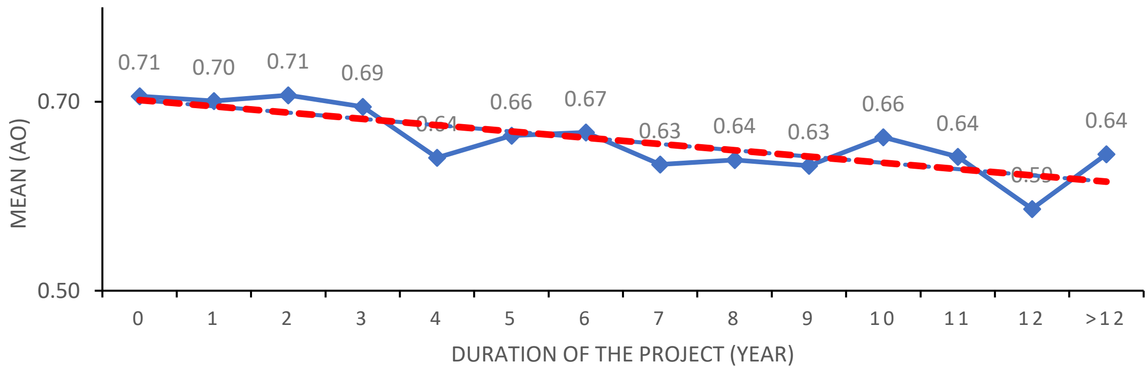


Fig. 4.19 The achievement of objectives average rate regarding the project time

According to the findings presented in Table 4.33, a one-unit rise in the DP variable would result in a seven percent drop in the likelihood of higher levels of project outcome. The link is statistically significant ($P<0.001$) since the importance of this volume is lower than 0.05.

Proposition2: *Table 4.33 shows that the intercepts for each of the six categories (HU, U, MU, MS, S, and HS) significantly affect the dependent variable, with the intercept for the HS category having the most considerable effect. Additionally, the duration of the project is negatively associated with the dependent variable. Figure (4.19), as well as the data in Table 4.33, show that the shorter the project's lifetime, the higher the possibility that its objectives will be met.*

Table 4.33
The Logistic Regression Model of achievement of project objectives concerning the DP

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1 (U)	-6.139	.3614	.002	288.565	<0.001
Intercept-2 (MU)	-3.318	.1159	.036	819.320	<0.001
Intercept-3 (MS)	-1.991	.0891	.137	498.786	<0.001
Intercept-4 (S)	-.212	.0781	.809	7.387	0.007
Intercept-5 (HS)	3.019	.1270	20.480	565.388	<0.001
Duration of the project	-.072	.0130	.931	30.397	<0.001

Note: the count of intercepts calculated based on the number of dependent variable categories. For instance, the achievement of project objectives is assessed via six categories: highly unsatisfactory (HU), unsatisfactory (U), moderately unsatisfactory (MU), moderately satisfactory (MS), satisfactory (S), and highly satisfactory (HS). Therefore, it is considered five intercepts here based on the following formula: Number of intercepts for a categorical variable= N (number of variable categories)-1

4.7.1.3. The effect of DP on the relationship between governance and on-time completion

The effect of the DP factor rate on the relationship between governance and on-time completion is discussed here. Figure (4.20) displays the relationship between governance and on-time completion as it relates to the project's duration. Even though there is an upward trend in the diagram, there is a slight variation in the correlation rates between time periods.

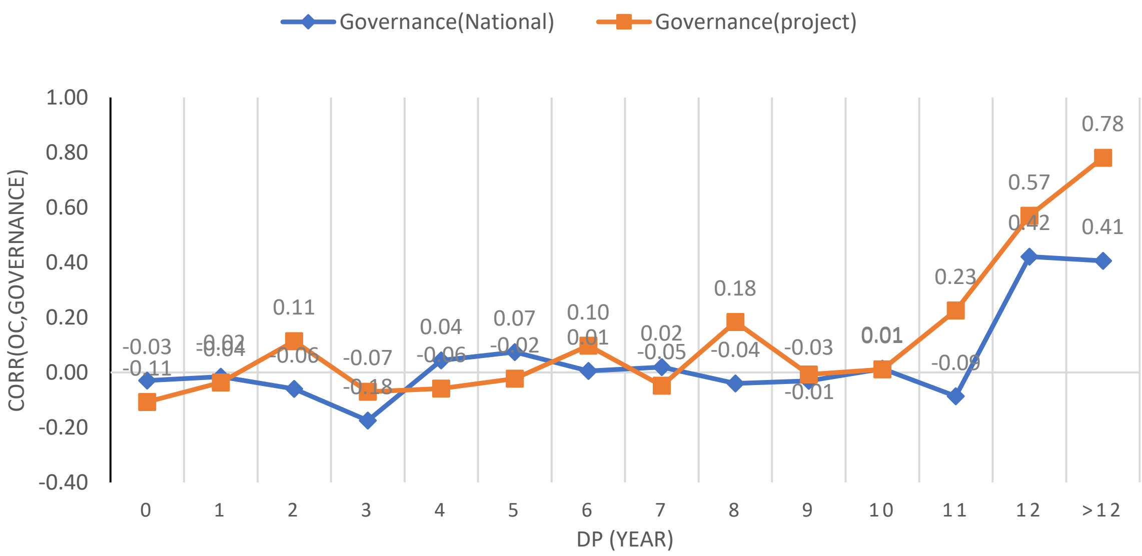


Fig. 4.20 The correlation of governance and on-time completion rate over the DP

This trend suggests that well-governed projects are more likely to be completed on time by various numerical periods. Ultimately, DP can help to strengthen the relationship between governance and on-time completion.

Table 4.34 displays the outcomes of the LRM and how the "voice and accountability" and "government effectiveness" variables affect the timely completion of short-term projects. Timely completion of mid-term projects is crucial, and the "voice and accountability" indicator is a key factor in this. The statistical relevance of the "sponsor performance" measure is demonstrated through long-term projects.

Table 4.34
The Logistic Regression Model of DP in the relationship between governance and on-time completion

Class.	Variable	Regression coefficient			Wald statistics	Significant
		β_0	Std. Error	e^{β_0}		
DP≤3	Intercept	1.275	0.228	3.579	31.304	0.001>
	VA	-0.012	0.007	0.988	2.867	0.090
	PV	0.011	0.006	1.011	3.087	0.079
	GE	-0.005	0.011	0.995	0.218	0.640
	RQ	0.017	0.009	1.017	3.267	0.071
	RL	0.010	0.013	1.010	0.678	0.410
	CC	-0.008	0.010	0.992	0.614	0.433
	GP	0.014	0.105	1.014	0.019	0.891
	SP	0.035	0.127	1.036	0.077	0.781
	ME	0.018	0.152	1.019	0.015	0.903
3<DP≤5	Intercept	-0.228	0.172	0.796	1.769	0.184
	VA	-0.011	0.005	0.989	5.324	0.021
	PV	0.001	0.004	1.001	0.089	0.766
	GE	0.021	0.008	1.021	7.833	0.005
	RQ	-0.005	0.007	0.995	0.624	0.430
	RL	0.009	0.010	1.009	0.912	0.340
	CC	-0.010	0.008	0.990	1.778	0.182
	GP	0.040	0.060	1.041	0.437	0.509
	SP	-0.090	0.069	0.914	1.704	0.192
	ME	0.009	0.098	1.009	0.009	0.926
5<DP≤7	Intercept	-1.645	0.229	0.193	51.766	0.001>
	VA	-0.016	0.005	0.984	9.110	0.003
	PV	-0.007	0.005	0.993	1.722	0.189
	GE	-0.001	0.009	0.999	0.026	0.873
	RQ	-0.004	0.008	0.996	0.186	0.666
	RL	0.018	0.012	1.018	2.321	0.128
	CC	0.009	0.009	1.009	0.856	0.355
	GP	0.050	0.080	1.051	0.390	0.532
	SP	0.088	0.089	1.092	0.994	0.319
	ME	-0.134	0.092	0.874	2.134	0.144
7<DP	Intercept	-2.980	0.549	0.051	29.414	0.001>
	VA	-0.023	0.013	0.977	3.050	0.081
	PV	-0.023	0.014	0.977	2.535	0.111
	GE	0.008	0.021	1.008	0.144	0.704
	RQ	0.025	0.020	1.025	1.622	0.203
	RL	-0.031	0.030	0.970	1.091	0.296
	CC	0.024	0.023	1.025	1.124	0.289
	GP	0.053	0.180	1.054	0.086	0.769
	SP	0.527	0.212	1.694	6.195	0.013
	ME	0.312	0.260	1.366	1.434	0.231

4.7.1.4. The effect of DP on the relationship between governance and achievement of objectives

The implementation of DP can positively affect the relationship between governance and the achievement of objectives, as it enables borrowing countries to understand their goals better and to develop and modify plans to achieve them more efficiently. Additionally, it can create a more collaborative environment between the World Bank, borrowing countries, and implementing agencies, allowing all parties to work together to achieve the desired results.

In this part, we evaluate the impact of the DP factor on the link between governance and goal attainment. Changes in project duration significantly influence the relationship between governance and the achievement of goals, as shown in Figure (4.21).

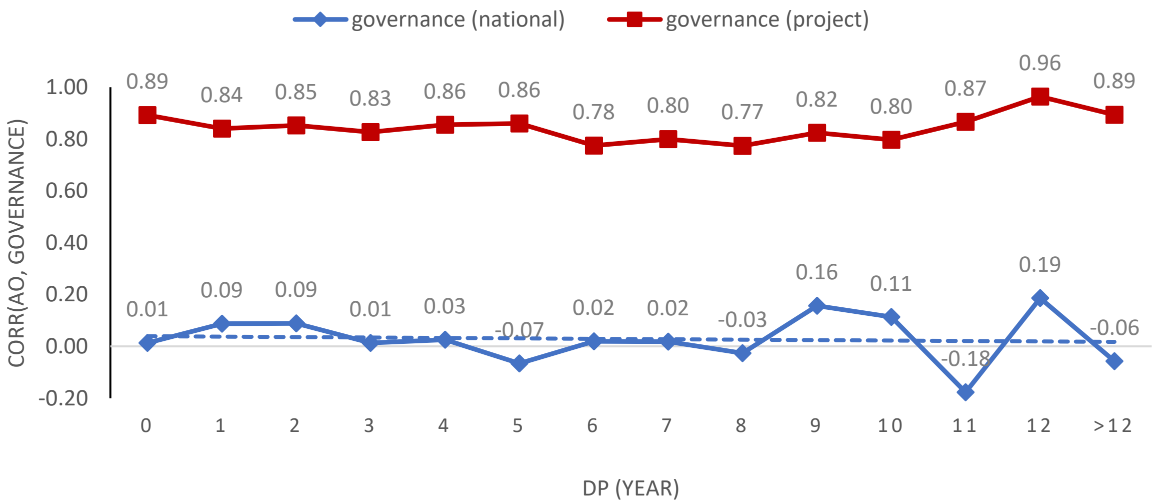


Fig. 4.21 The correlation of governance and the achievement of objectives rate over the DP

Results from LRM are summarised in Table 4.35, which shows that indicators for "government efficacy," "rule of law," "control of corruption," "government performance," "monitoring and evaluation," and "sponsor performance" all have a role in the successful completion of short-term projects. Objectives are more likely to be met halfway through a project if indicators for "voice and accountability," "government performance," "monitoring and evaluation," and "sponsor performance" are all present and functioning. Statistically significant relationships exist between the "government performance," "monitoring and evaluation," and "sponsor performance" measures in projects with a long duration.

Table 4.35
The Logistic Regression Model of DP in the relationship between governance and project outcome

Class.	Variable	Regression coefficient			Wald statistics	Significant
		β_0	Std. Error	e^{β_0}		
DP≤3	Intercept-1	-4.816	0.437	0.008	121.318	0.001>
	Intercept-2	-3.008	0.231	0.049	170.242	0.001>
	Intercept-3	-1.829	0.185	0.161	97.460	0.001>
	Intercept-4	-0.090	0.168	0.914	0.287	0.592
	Intercept-5	3.783	0.241	43.933	247.258	0.001>
	VA	-0.002	0.005	0.998	0.248	0.619
	PV	-0.004	0.004	0.996	0.983	0.321
	GE	0.041	0.008	1.042	28.211	0.001>
	RQ	-0.002	0.007	0.998	0.083	0.773
	RL	-0.045	0.009	0.956	25.435	0.001>
	CC	0.020	0.007	1.020	8.011	0.005
	GP	1.061	0.093	2.889	131.279	0.001>
	SP	1.195	0.106	3.302	126.764	0.001>
	ME	0.505	0.159	1.656	10.038	0.002
3<DP≤5	Intercept-1	-4.197	0.380	0.015	122.101	0.001>
	Intercept-2	-1.739	0.178	0.176	95.636	0.001>
	Intercept-3	-0.896	0.162	0.408	30.495	0.001>
	Intercept-4	0.388	0.159	1.474	5.931	0.015
	Intercept-5	3.620	0.224	37.332	261.676	0.001>
	VA	-0.015	0.005	0.985	11.056	0.001
	PV	0.001	0.004	1.001	0.080	0.777
	GE	0.007	0.007	1.007	1.005	0.316
	RQ	0.006	0.007	1.006	0.852	0.356
	RL	0.004	0.009	1.004	0.153	0.696
	CC	0.013	0.007	1.014	3.363	0.067
	GP	0.888	0.078	2.430	129.957	0.001>
	SP	1.218	0.096	3.381	161.155	0.001>
	ME	0.675	0.106	1.965	40.384	0.001>
5<DP≤7	Intercept-1	-5.572	0.594	0.004	88.096	0.001>
	Intercept-2	-2.708	0.198	0.067	187.189	0.001>
	Intercept-3	-1.372	0.160	0.253	73.544	0.001>
	Intercept-4	0.556	0.154	1.744	13.042	0.001>

	Intercept-5	3.581	0.218	35.899	269.334	0.001>
	VA	-0.013	0.004	0.987	12.773	0.001>
	PV	0.006	0.004	1.006	2.502	0.114
	GE	0.010	0.006	1.010	2.573	0.109
	RQ	0.006	0.006	1.006	1.055	0.304
	RL	-0.004	0.008	0.997	0.195	0.659
	CC	0.003	0.006	1.003	0.241	0.624
	GP	0.543	0.065	1.721	68.873	0.001>
	SP	1.236	0.080	3.443	241.526	0.001>
	ME	0.810	0.086	2.248	88.309	0.001>
7<DP	Intercept-1	-5.648	0.729	0.004	60.084	0.001>
	Intercept-2	-3.174	0.273	0.042	135.351	0.001>
	Intercept-3	-1.426	0.201	0.240	50.404	0.001>
	Intercept-4	0.735	0.194	2.085	14.337	0.001>
	Intercept-5	3.738	0.287	41.993	170.177	0.001>
	VA	-0.007	0.005	0.993	2.456	0.117
	PV	-0.004	0.004	0.996	0.802	0.370
	GE	0.012	0.008	1.012	2.436	0.119
	RQ	0.001	0.007	1.001	0.042	0.837
	RL	0.005	0.010	1.005	0.322	0.571
	CC	-0.002	0.008	0.998	0.089	0.766
	GP	0.693	0.082	2.000	71.999	0.001>
	SP	1.296	0.099	3.655	171.188	0.001>
	ME	0.610	0.101	1.840	36.290	0.001>

The logistic regression model of DP in the relationship between governance (independent variable) and project outcome (dependent variable) helps measure governance's impact on a project's success. The model predicts the likelihood of a successful project outcome based on the governance style and arrangements used. This helps identify areas of improvement in governance indicators and any potential risks that may lead to a failed project.

The results of the LRM show that five governance indicators contribute to addressing DP as a complexity factor. A balancing loop can be created between governance, the project's duration, and the project's outcome because governance positively influences DP and the project's outcome. In contrast, DP has a negative effect on the project's outcome, as shown in Figure (4.22). The relationship between governance and its indicators is defined as a reinforcing loop (Boateng et al., 2012).

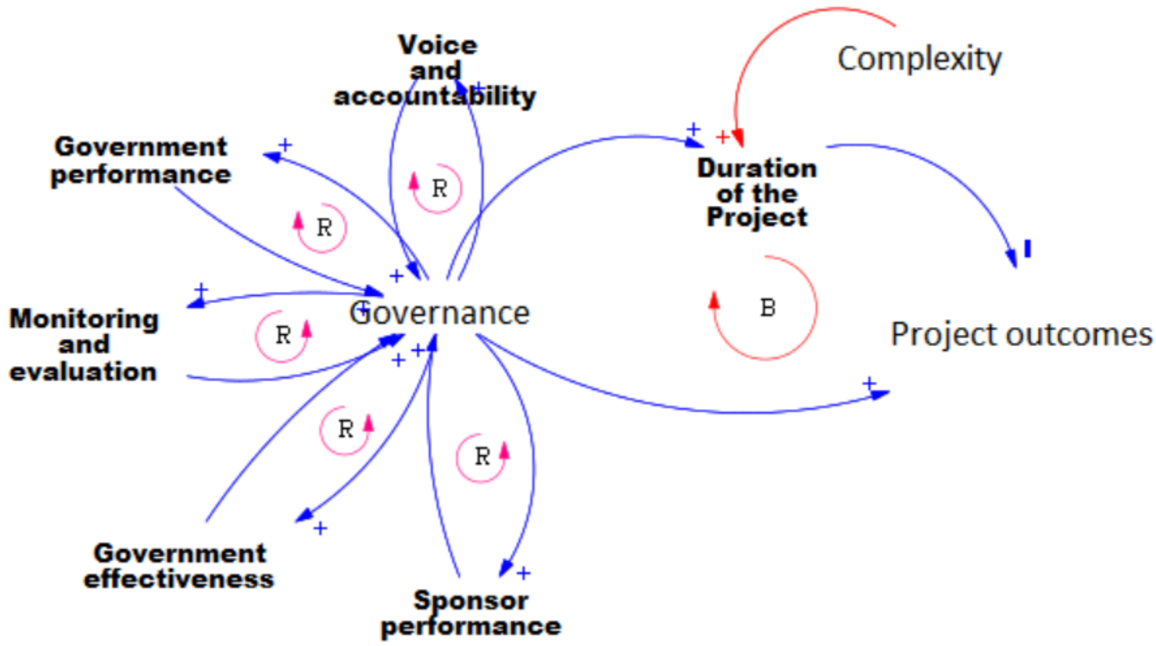


Fig. 4.22 Causal loop diagram of governance indicators to deal with the complexity of project duration

4.7.2. The marginal effect of Extension of Time /year (ET)

In project complexity, ET is one of the practical factors that can influence a project's predetermined schedule. The significance of international development projects in enhancing people's lives and the financial dependence of such projects on specific international entities can be severely affected if the project's completion goals are delayed due to a prolonged project period. This situation is considered a fundamental failure of the project. In this study, we are concerned with the level of Revised/Actual project time, and the initial planning time of the project is calculated and considered a complexity factor.

The Marginal effect of ET on project outcomes is discussed below:

4.7.2.1. Assessing the effect of ET on on-time completion

Since the ET variable levels are entirely separated, it cannot be analysed (Fig. 4.23). Complete separation occurs when a predictor variable or a combination of predictor variables (e.g., ET) perfectly predicts the outcome variable (e.g., OC) in logistic regression, resulting in a division of the data into distinct groups with no overlap. In other words, for a specific combination of predictor values, the outcome variable will always have the same value. This phenomenon, as defined by Albert and Anderson (1984), implies the existence of a vector α that accurately assigns all observations to their respective groups..

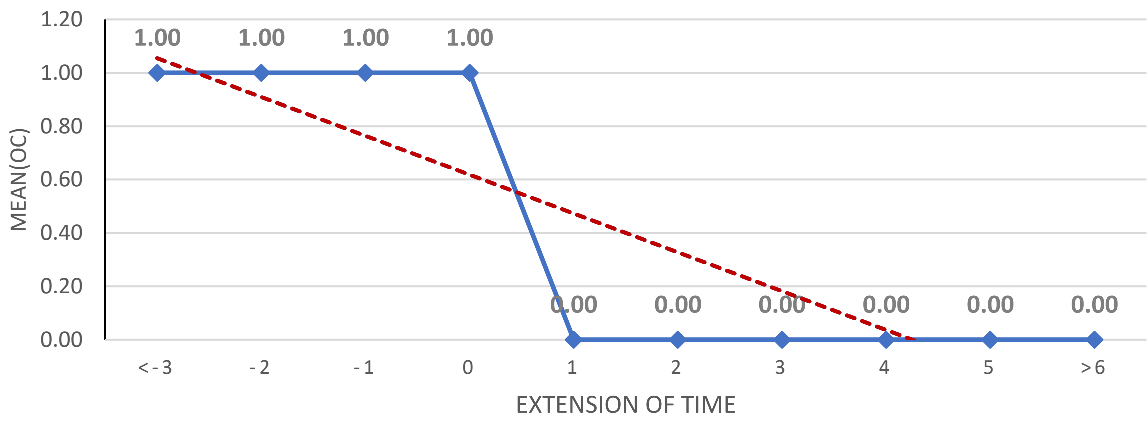


Fig. 4.23 The average on-time completion rate considering ET

<u>Proposition3</u>: *There is no relationship between the extension of project time and the rate of on-time completion. In other words, the project's completion time is not affected by the extension of the project's duration.*

4.7.2.2. Assessing the ET effect on the achievement of project objectives

As shown in Figure 4.24, an increase in ET results in a decrease in the frequency of projects that achieve a higher level of predetermined goals. Therefore, it can be inferred that low ET is likely to achieve more project objectives than high ET.

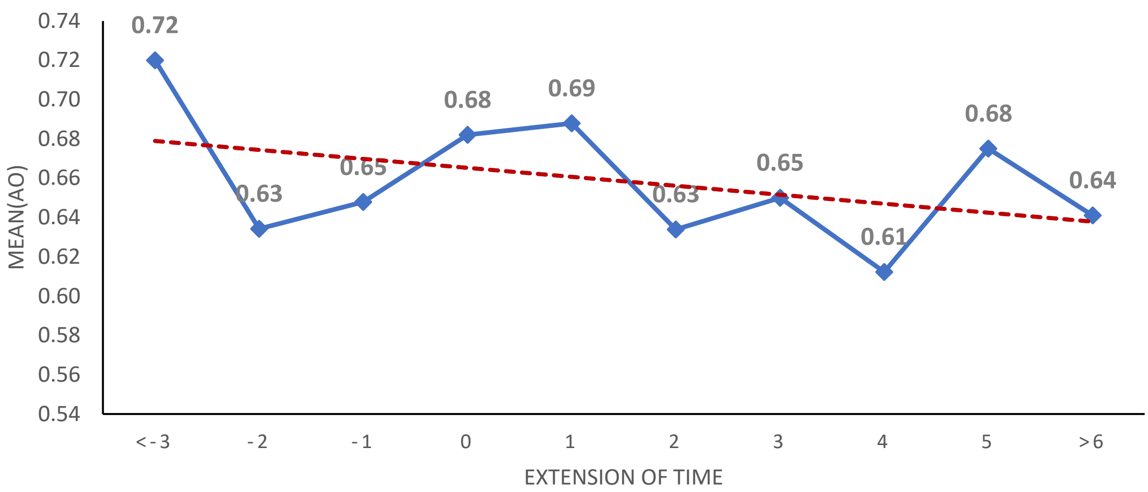


Fig. 4.24 Achievement of project objectives rate regarding the extension of project time

Table 4.36
The Logistic Regression Model of the achievement of project objectives concerning the ET

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.869	0.3556	0.003	272.287	<0.001
Intercept-2	-3.104	0.0988	0.045	986.460	<0.001
Intercept-3	-1.764	0.0632	0.171	779.277	<0.001
Intercept-4	0.004	0.0492	1.004	0.008	0.928
Intercept-5	3.253	0.1170	25.865	772.920	<0.001
Extension of the project time	-0.126	0.0215	0.882	34.360	<0.001

As observed in Table 4.36, an increase of 1 unit in the ET variable reduces the odds of achieving a higher level of project objectives by approximately 12%. The significance of this finding is <0.05, indicating a statistically significant relationship (P<0.001).

<u>Proposition4:</u> *The results presented in Figure 4.24 and the details provided in Table 4.36 suggest that lower ET is associated with a higher probability of achieving the project's goals.*

4.7.2.3. The effect of ET on the relationship between governance and on-time completion

Due to complete separation at ET variable levels, it cannot be analysed, Fig. (4.25).

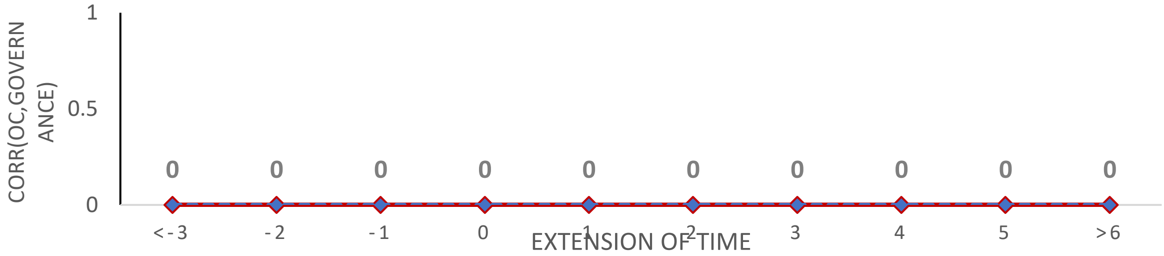


Fig. 4.25 The correlation of governance and on-time completion rate over the ET

4.7.2.4. The effect of ET on the relationship between governance and achievement of objectives

Based on the logistic regression model, it is found that for projects with low ET, the "Voice and Accountability," "Government Effectiveness," "Rule of Law," and "Control of Corruption" indicators contribute to the progress of project outcomes. For projects with medium ET, only the "Voice and Accountability" variable is significant in achieving project goals. However, for projects with high ET, none of these variables are statistically significant in predicting project outcomes.

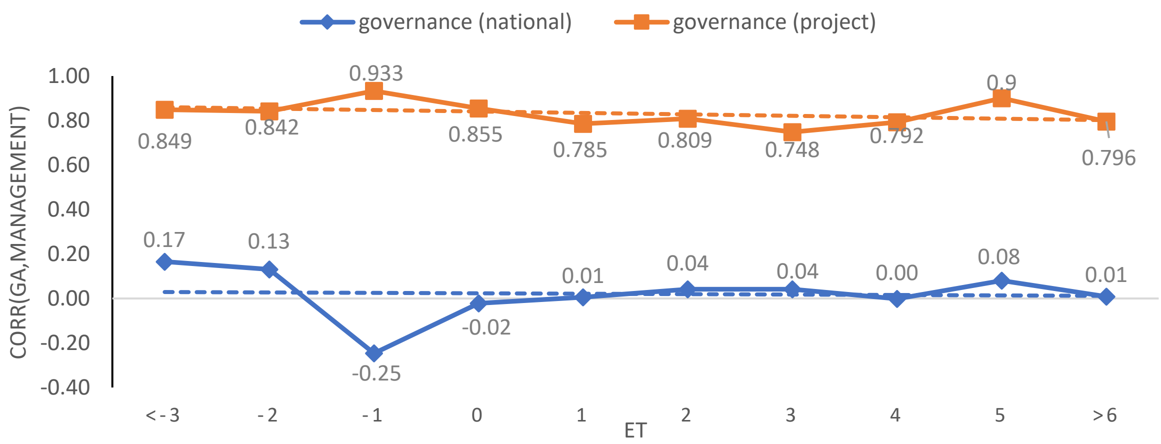


Fig. 4.26 The correlation of governance and achievement of project objectives over the ET

Based on the results of the logistic regression model, three governance indicators were found to contribute to addressing ET as a complexity factor. These indicators form a cyclical network of governance indicators, as shown in Figure 4.27. The network clearly demonstrates the importance of project-level governance indicators in dealing with complexity, rather than those at the national level.

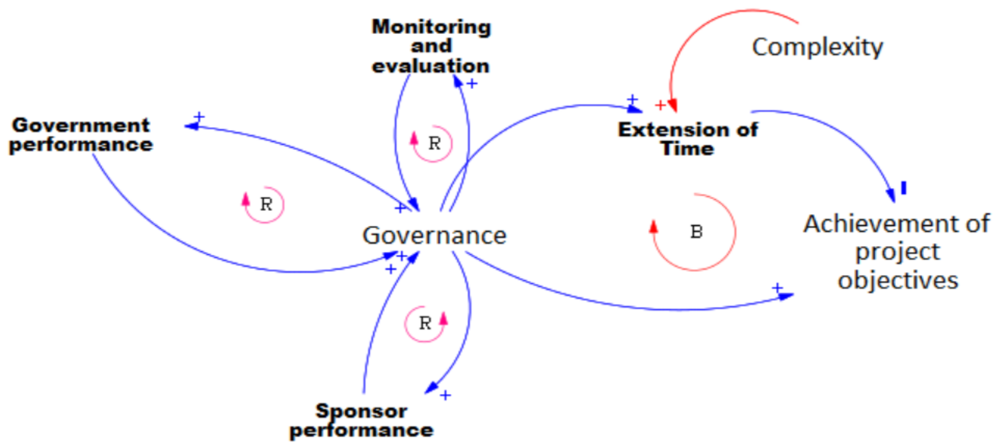


Fig. 4.27 Causal loop diagram of governance indicators to deal with complexity of time extension

4.7.3. The marginal effect of Goals Uncertainty (GU)

In traditional perspective on project definitions, the precedence of objectives and methods in project design is assumed (Turner & Cochrane, 1993). This assumption reinforces the belief that project design should be finalised as early as possible, based on the assumption that project objectives or goals can be clearly defined at the outset. However, this study acknowledges that complex projects pose challenges in establishing a performance time limit due to inherent uncertainty in the early stages. To quantify the level of uncertainty related to project goals, the study introduces an equation that calculates the goals uncertainty rate based on the deviation between real project time completion and planned project time, relative to the planned project time, as follow:

$$\boldsymbol{Goals\ uncertainty\ rate\ (time)} = \frac{\boldsymbol{Real\ project\ time\ completion\ \ - planned\ project\ time}}{\boldsymbol{planned\ project\ time}}$$

It is important to acknowledge that the equation's reliability and effectiveness are contingent upon several factors, including the validity of the Planned Project Time, the accuracy of the Real Project Time Completion, the generalizability of the findings, and the limitations associated with using time as the sole measure of goals uncertainty. This section of the study aims to evaluate the impact of goals uncertainty (specifically related to time) on project outcomes. It also examining the effect of goals uncertainty on the correlations between governance and project outcomes.

4.7.3.1. Assessing the effect of GU on on-time completion

As observed in Fig. (4.28), this variable cannot be analysed due to complete separation at "GU" variable levels.

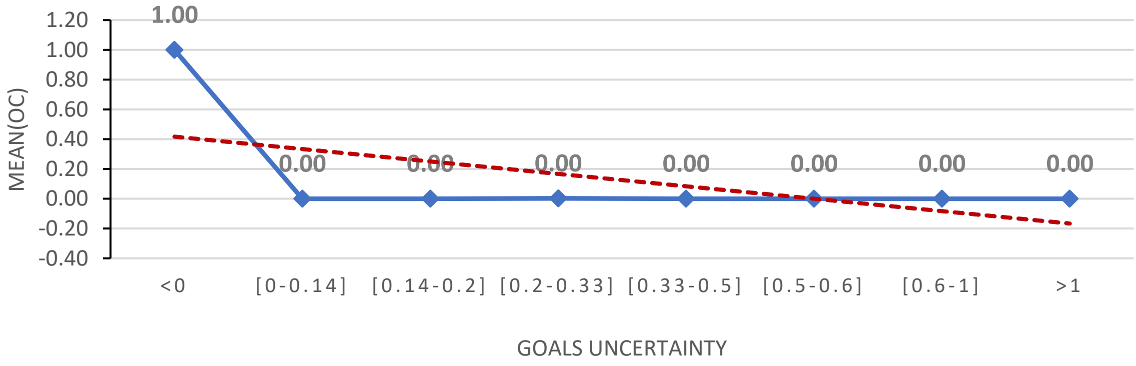


Fig. 4.28 The average on-time completion rate considering GU

Proposition5: *There is no relationship between GU and the on-time completion rate, implying that GU does not have an impact on the completion time of a project.*

4.7.3.2. Assessing the GU effect on the achievement of objectives

As observed in Fig. (4.29), an increase in GU results in a decrease in the frequency of projects that have successfully achieved their goals. This suggests that a lower GU is likely to result in better project outcomes compared to a higher GU.

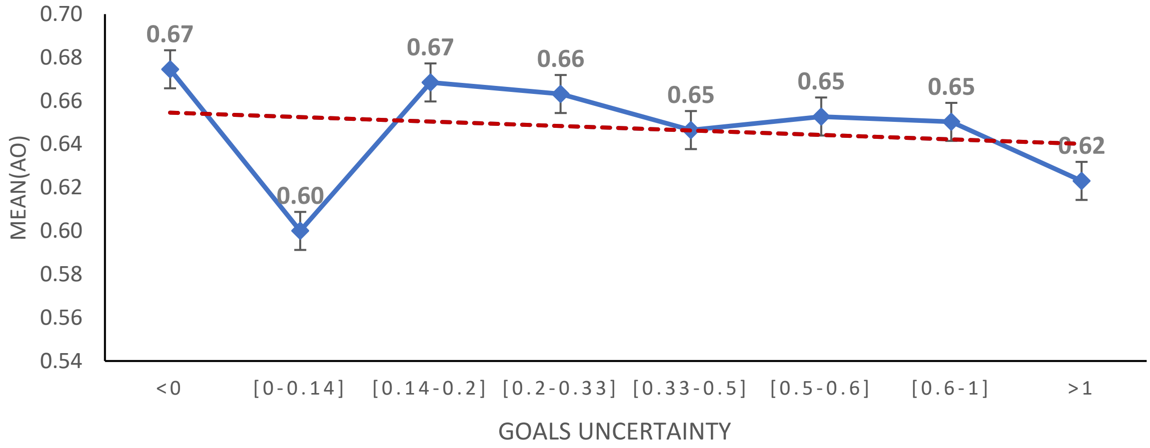


Fig. 4.29 Achievement of project objectives over the goals uncertainty

Table 4.37
The Logistic Regression Model of achievement of objectives over the GU

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.795	0.3549	0.003	266.563	<0.001
Intercept-2	-3.028	0.0961	0.048	993.044	<0.001
Intercept-3	-1.689	0.059	0.185	819.772	<0.001
Intercept-4	0.072	0.045	1.075	2.579	0.108
Intercept-5	3.312	0.1159	27.436	816.045	<0.001
Goals Uncertainty	-0.319	0.0658	0.727	23.452	<0.001

Table 4.37 shows that a one-unit increase in the GU variable reduces the odds of achieving higher objectives by 28%. This finding is statistically significant, with a significance level of

<0.05 (P<0.001), indicating a strong relationship between the GU variable and the achievement of project objectives.

<u>Proposition6:</u> *The results presented in Figure 4.29, and the data detailed in Table 4.37, suggest that a lower GU increases the likelihood of achieving project objectives.*

4.7.3.3. The effect of GU on the relationship between governance and on-time completion

Due to the complete separation in GU variable levels, this variable cannot be analysed, Fig. (4.30).

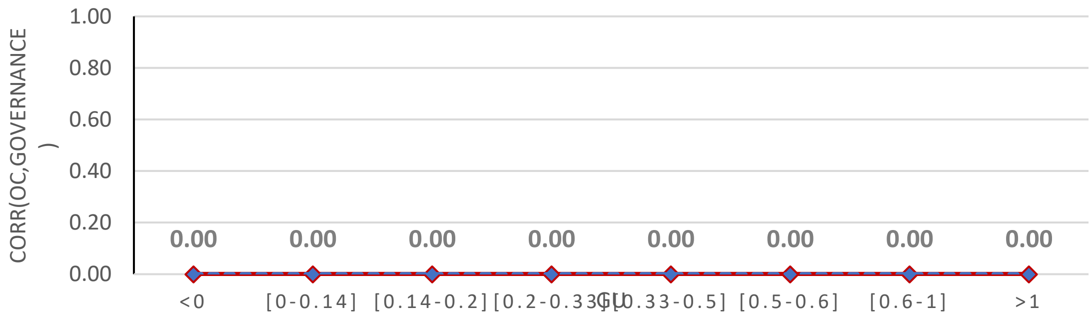


Fig. 4.30 The correlation of governance and on-time completion rate over the GU

4.7.3.4. The effect of GU on the relationship between governance and achievement of objectives

The logistic regression model (LRM) results demonstrate that a variety of governance indicators play a role in managing GU. Specifically, in projects with low GU, the "VA," "GE," "RI," "CC," "SP," "GP," and "ME" indicators contribute to achieving project goals. In medium GU projects, the "SP," "GP," and "ME" indicators show a significant connection. In high GU projects, the "VA," "SP," "GP," and "ME" indicators have statistical significance.

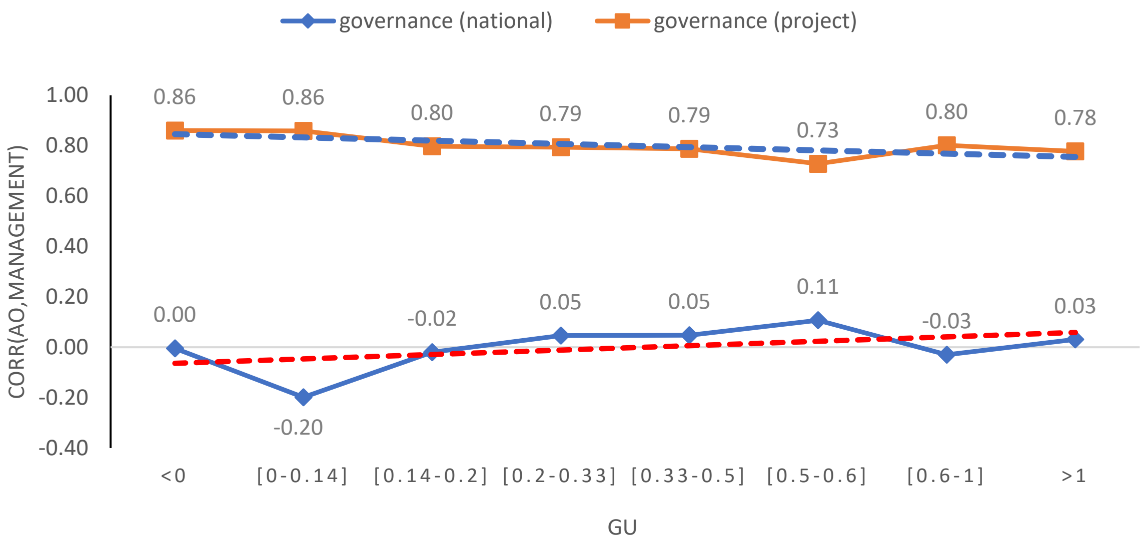


Fig. 4.31 The correlation of governance and achievement of objectives rate over the GU

The LRM results indicate the presence of different governance networks that are effective at different levels of GU. Specifically, the "SP," "GP," and "ME" indicators are effective at different GU levels, as revealed by the analysis. The relationship between governance and GU as a complexity factor is illustrated in Figure 4.32.

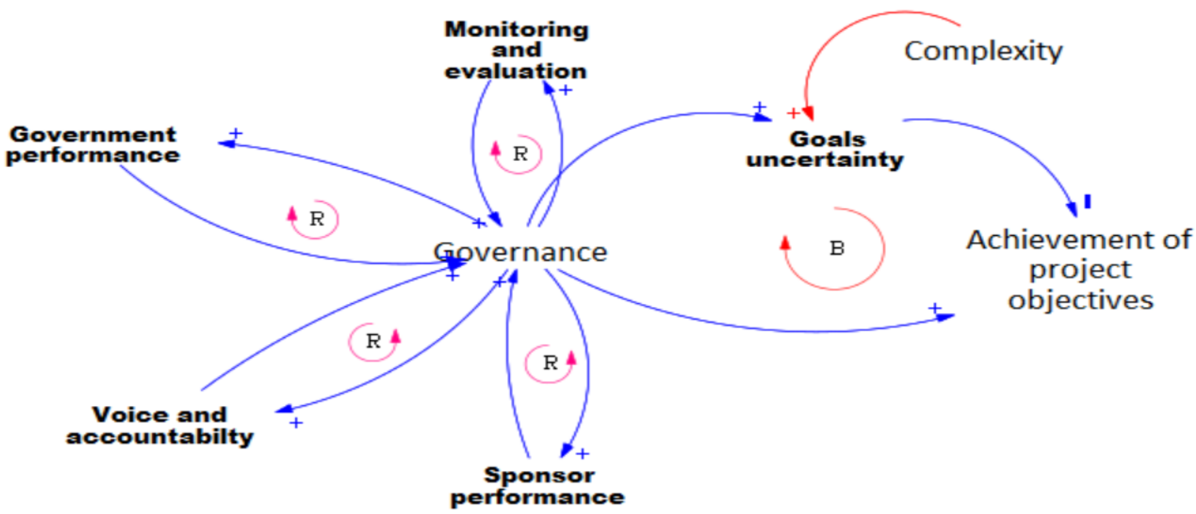


Fig. 4.32 Causal loop diagram of governance indicators to deal with complexity of GU

4.7.4. The marginal effect of Project Size on CAPEX (Budget)

In practice, budget constraints limit all international development (ID) projects. The budget size, particularly in terms of CAPEX, determines the project manager's competency to manage the project and the level of competencies required for projects of that size. As a country's economic capacities differ, decision-making on capital expenditures becomes critical for authorities with regard to project performance. Consequently, the level of budget size is a crucial factor associated with the complexity level of a project.

The following section discusses the marginal effect of project size on the budget and its impact on project outcomes.

4.7.4.1. Assessing the effect of size in the budget (SB) on on-time completion

Figure 4.33 illustrates the frequency of projects with respect to on-time completion rates across different budget sizes (SBs). It is observed that projects with a budget size of $10M-100M have the highest rate of delayed completion.

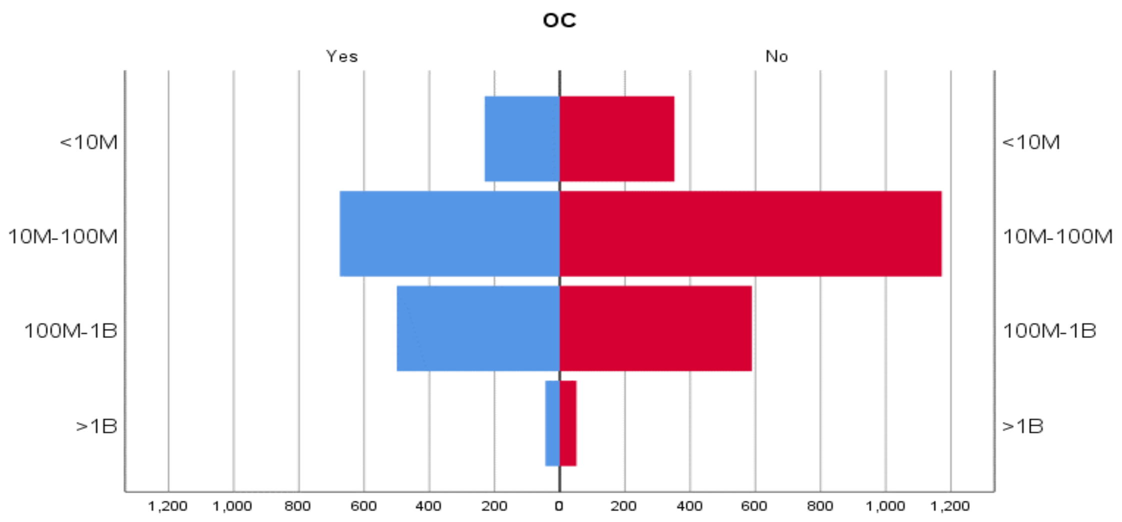


Fig. 4.33 Frequency of on-time completion with different SBs

Figure 4.34 indicates that, in terms of on-time completion, projects with higher budget sizes outperform their counterparts with lower budget sizes.

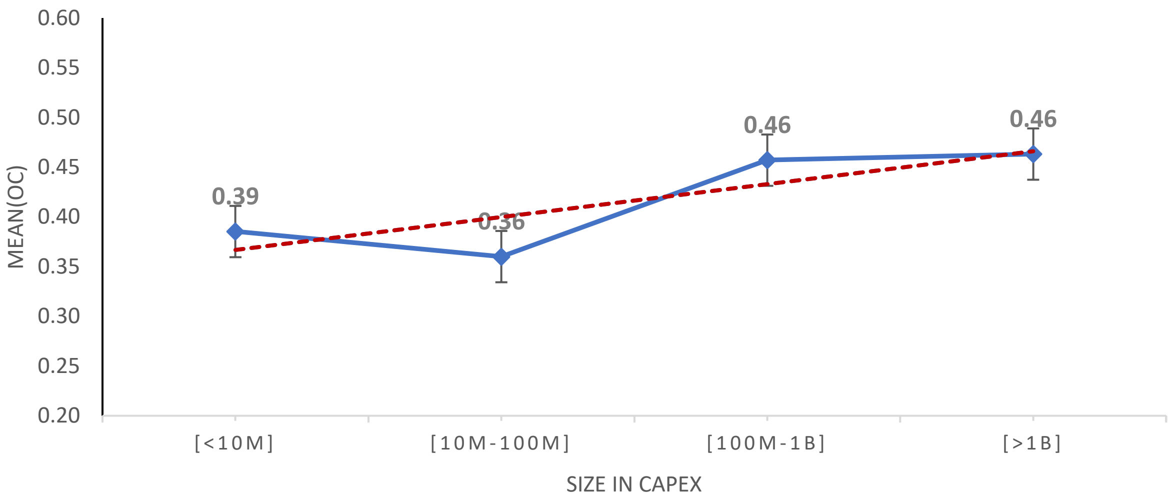


Fig. 4.34 The average on-time completion rate considering SB

Table 4.38
The Logistic Regression Model of on-time completion over the SB

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept	-0.414	0.0351	0.661	138.914	<0.001
Size in CAPEX	0.007	0.0053	1.007	1.805	0.179

Table 4.38 shows that a 100,000 unit increase in the SB variable results in a 0.7 increase in the odds of on-time completion. However, the significance level is greater than 0.05, making the relationship statistically non-significant (P=0.179).

Proposition7: *Based on the information provided, it can be concluded that there is no significant relationship between SB and the on-time completion rate.*

4.7.4.2. Assessing the size in budget (SB) effect on the achievement of objectives

Figures 4.35 and 4.36 indicate that mega projects, in terms of budget size, have a higher rate of achieving project objectives. Therefore, a higher degree of complexity (budget-wise) does not seem to have a negative impact on the achievement of project objectives.

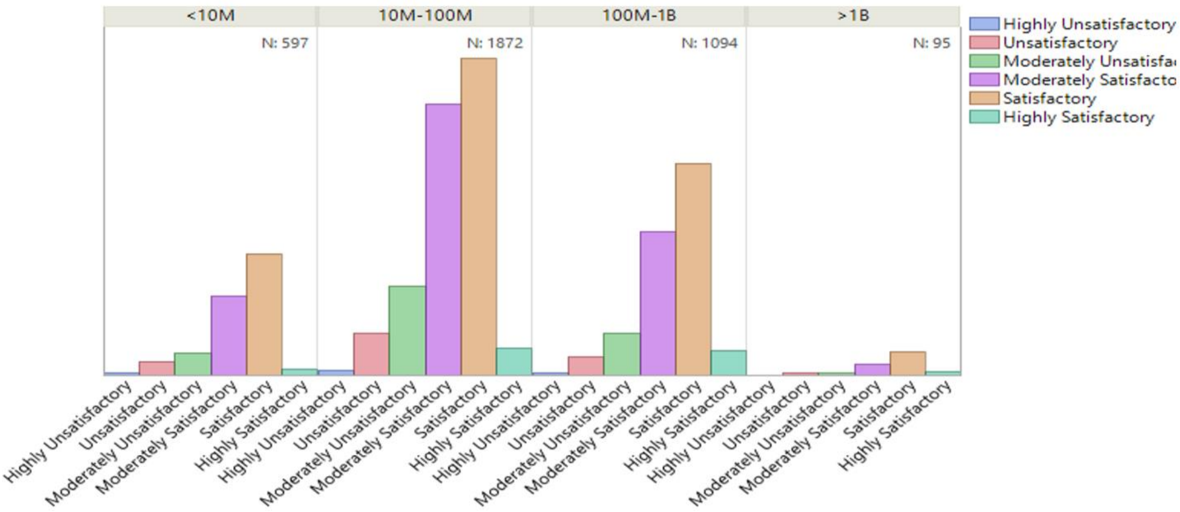


Fig. 4.35 Achievement of project objectives statistics regarding the size of CAPEX

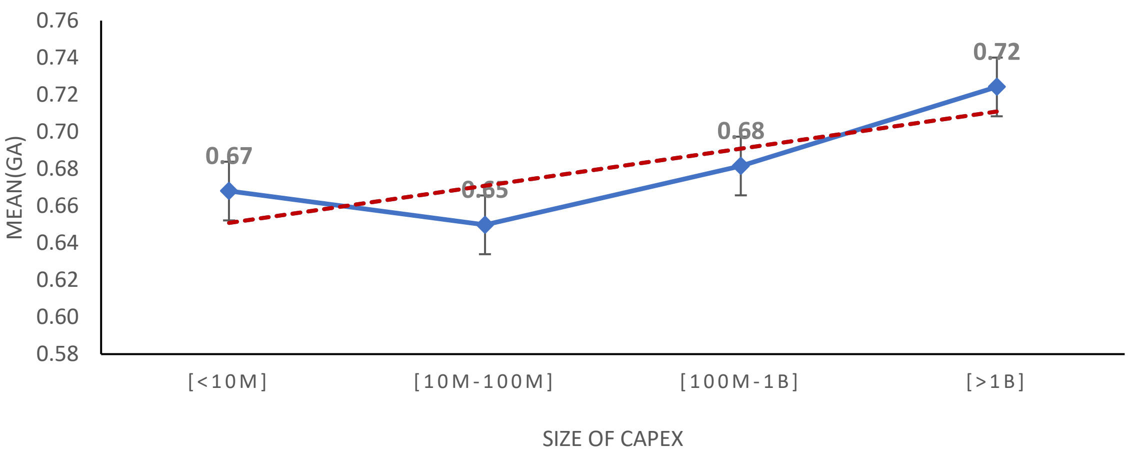


Fig. 4.36 Achievement of project objectives over the size of CAPEX

Table 4.39
The Logistic Regression Model of achievement of project objectives over the SB

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.28	0.2364	0.005	498.882	<0.001
Intercept-2	-2.842	0.0738	0.058	1482.948	<0.001
Intercept-3	-1.645	0.046	0.193	1277.967	<0.001
Intercept-4	0.042	0.0342	1.043	1.514	0.218
Intercept-5	3.253	0.0869	25.88	1401.315	<0.001
size of budget	0.021	0.0055	1.021	14.742	<0.001

Table 4.39 demonstrates that a 1000 unit increase in the SB variable increases the odds of achieving higher project objectives by 2.1%. This result is statistically significant, with a significance level of <0.05 (P<0.001).

Proposition 8 can be formulated as follows: *The results presented in Figure 4.36 and the data detailed in Table 4.39 indicate that a higher project budget does not have a negative impact on the rate of achieving project objectives.*

4.7.4.3. The effect of SB on the relationship between governance and on-time completion

While budget size does not seem to have a negative impact on project outcomes, it is still worth exploring its effect on the relationship between governance and project outcomes. This is the aim of the following section.

Figure 4.37 illustrates the correlation between governance and on-time completion of projects across different budget sizes. It is observed that there is a downward trend or descending correlation pattern at both analysis levels.

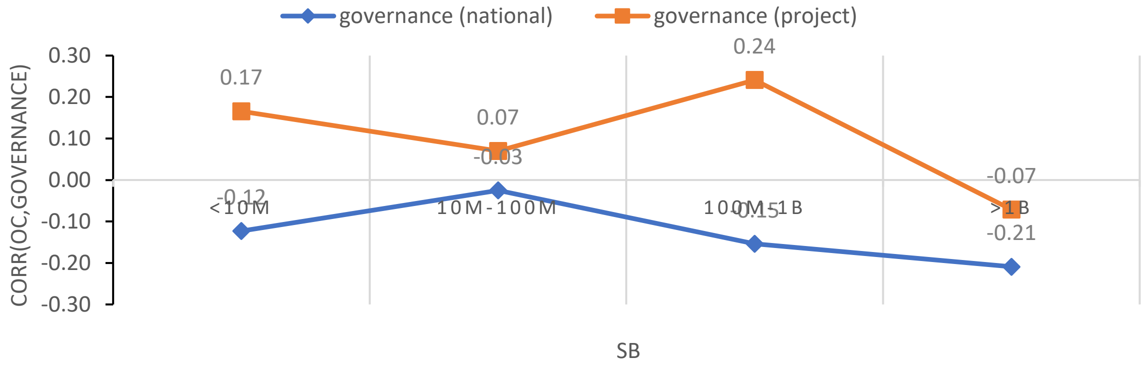


Fig. 4.37 The correlation of governance and on-time completion rate over the SB

The analysis shows that in projects with lower budget sizes, the "VA," "GE," and "SP" indicators contribute significantly to on-time completion. In medium budget projects, the "RQ," "RL," "CC," and "SP" indicators show a significant connection with project outcomes. In high budget projects, only the "ME" indicator demonstrates statistical significance.

It is worth noting that the detailed outcomes of the LRM have been excluded from the thesis due to the large volume of data analysis.

4.7.4.4. The effect of SB on the relationship between governance and achievement of objectives

The correlation between governance and the rate of achievement of project objectives considering different SBs accompanied by a stable trend is shown in Fig. (4.38).

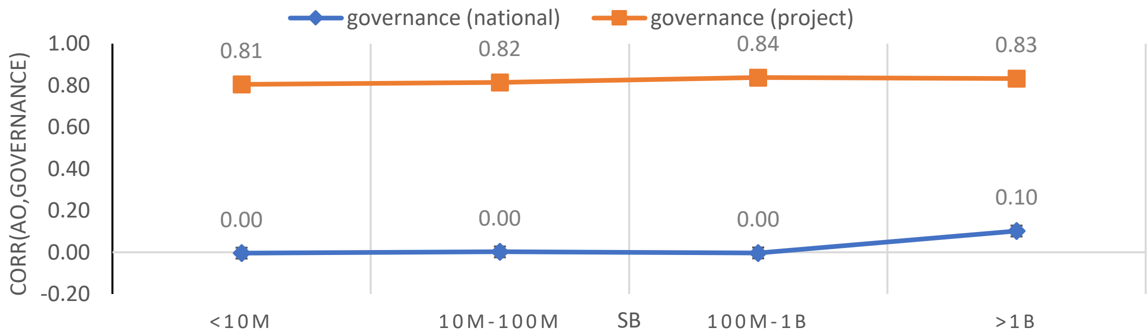


Fig. 4.38 The correlation of governance and the achievement of objectives over the SB

In projects with a budget size of less than $10 MSB, the "GP," "GE," and "SP" indicators contribute significantly to on-time completion. For projects with a budget size between $10M and $100M, the "VA," "PV," "CC," "GP," "ME," and "SP" indicators demonstrate a significant connection with project outcomes. In projects with a budget size between $100M and $1B, the "RQ," "RL," "SP," "GP," "GE," and "ME" indicators show a significant relationship. For projects with a budget size of more than $1B, the "CC," "GP," and "SP" indicators have a significant association with project outcomes.

Based on the LRM results, Figure 4.39 presents the most appropriate governance indicators' network to deal with complexity in SB projects.

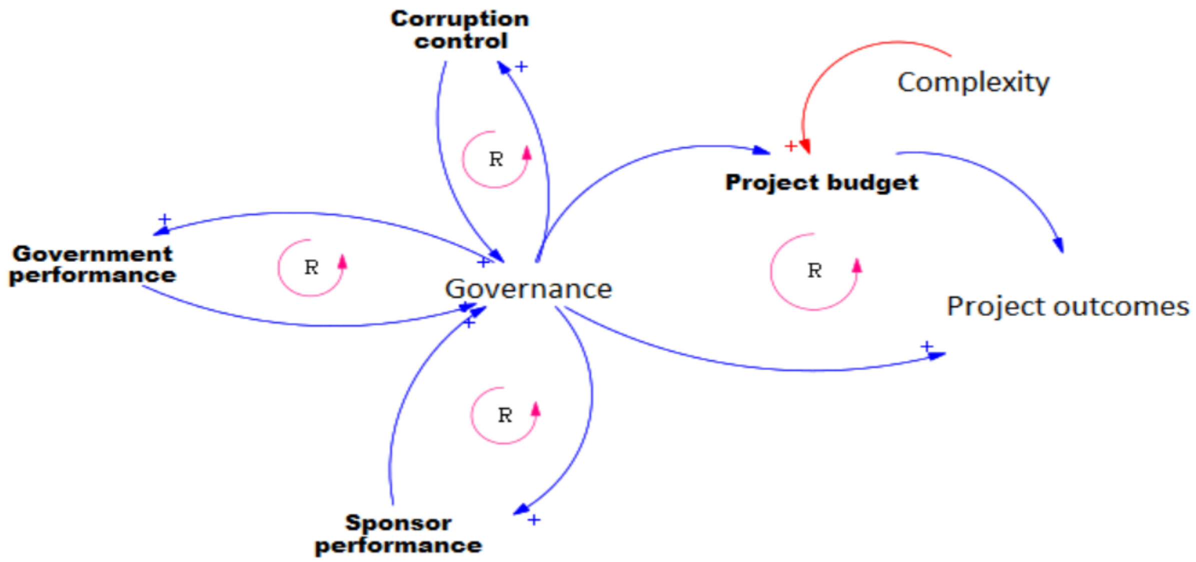


Fig. 4.39 Causal loop diagram of governance indicators to deal with complexity of size of project budget

4.7.5. The marginal effect of the number of disciplines involved (NS)

This section discusses the marginal effect of the number of disciplines involved (NS) in projects, which is considered another complexity factor by many scholars in the field. In our dataset, the NS and related themes in each international development project involve a maximum of six disciplines. The count of these disciplines and related themes varies depending on the context, such as health, water supply, housing construction, aviation, oil and gas, administration, renewable energy, roads, highways, among others. For further information, please refer to Section 4.8.

4.7.5.1. Assessing the effect of NS on on-time completion

Figure 4.40 presents the trend of on-time completion rates across different NSs. Despite the fact that involving more NSs in a project increases its complexity, there is no evidence to suggest that projects with higher NSs have a lower rate of on-time completion.

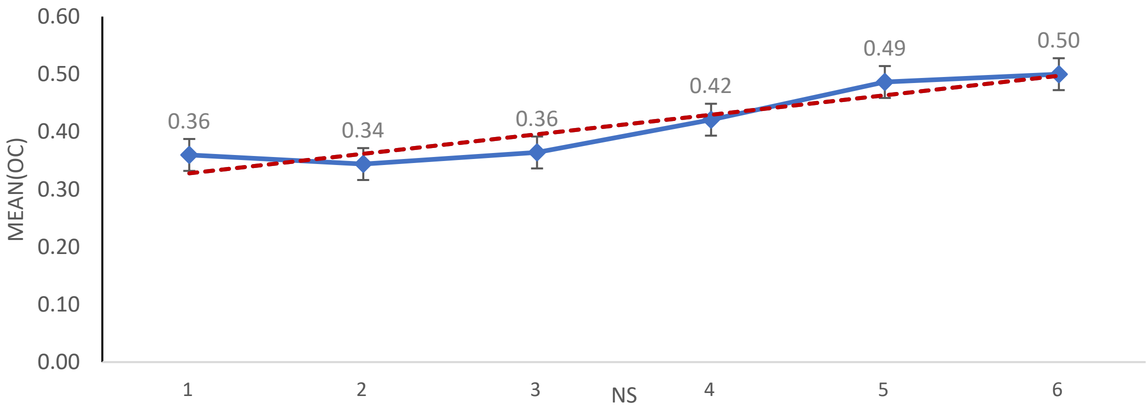


Fig. 4.40 The average on-time completion rate considering NS

Table 4.40
The Logistic Regression Model of on-time completion over the NS

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	-1.081	0.1039	0.339	108.155	<0.001
Number of disciplines involved	0.196	0.0291	1.216	45.419	<0.001

Table 4.40 demonstrates that a 1 unit increase in the NS variable increases the odds of on-time completion by 21%. This result is statistically significant, with a significance level of less than 0.05 (P<0.001).

Proposition9: *The involvement of NSs in a project does not necessarily affect the project's performance in terms of on-time completion.*

4.7.5.2. Assessing the NS effect on the achievement of objectives

Figure 4.41 displays the trend of achieving project objectives across different NSs. As observed, the curve remains stable with no significant fluctuations, and the average remained consistent in most cases.

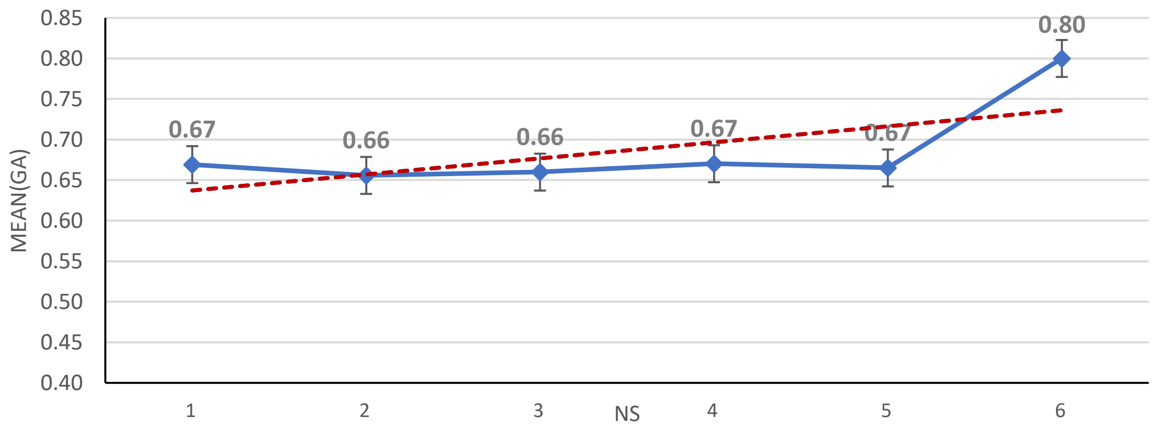


Fig. 4.41 Achievement of project objectives over the NS

Table 4.41
The Logistic Regression Model of achievement of project objectives over the NS

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.685	0.3635	0.003	244.606	<0.001
Intercept-2	-2.92	0.1244	0.054	550.382	<0.001

Intercept-3	-1.583	0.0994	0.205	253.382	<0.001
Intercept-4	0.165	0.0927	1.179	3.153	0.076
Intercept-5	3.388	0.1415	29.601	573.081	<0.001
NS	0.002	0.0259	1.002	0.004	0.95

As observed in Table 4.41, a 1 unit increase in the NS variable increases the odds of observing the higher achievement of objectives variable by 0.2%. The significance of this volume is >0.05, making the connection statistically non-significant (P=0.95).

Proposition10: *Based on the analysis of the data, there is no significant relationship between the number of disciplines involved in a project (NS) and the rate of achieving project objectives. Therefore, it can be concluded that the NS involved in a project does not have a significant impact on the achievement of project objectives.*

4.7.5.3. The effect of NS on the relationship between governance and on-time completion

Figure 4.42 presents the correlation between governance and on-time completion rates across different NS levels. It shows a reverse correlation between governance at the national level and project on-time completion.

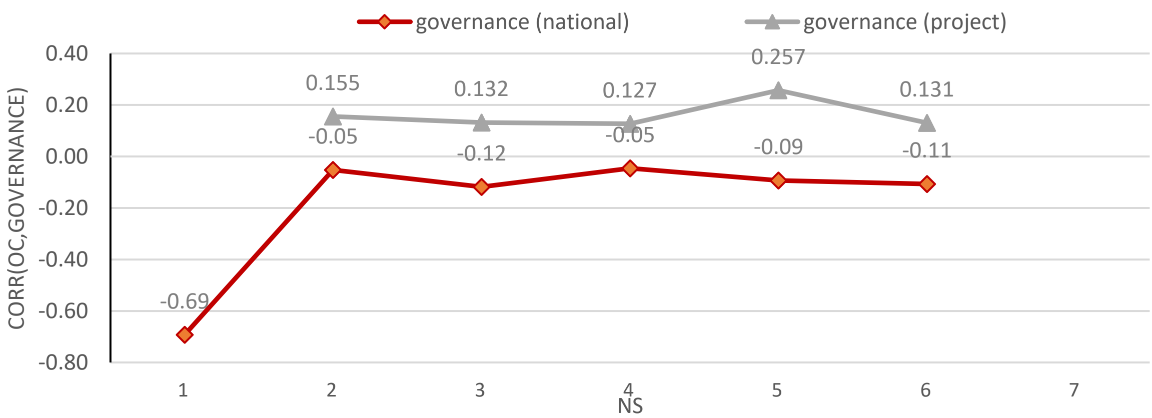


Fig. 4.42 The correlation of governance and on-time completion rate over the NS

Based on the LRM analysis, the governance indicators at the national level play a significant role in projects involving different levels of NS. In particular, the "VA," "PV," and "RQ" indicators are statistically significant in this regard.

4.7.5.4. The effect of NS on the relationship between governance and achievement of objectives

Figure 4.43 illustrates the correlation between governance and the achievement of project objectives rate across different NS levels. It indicates a sharp drop in governance at the national level for projects involving more than two NSs.

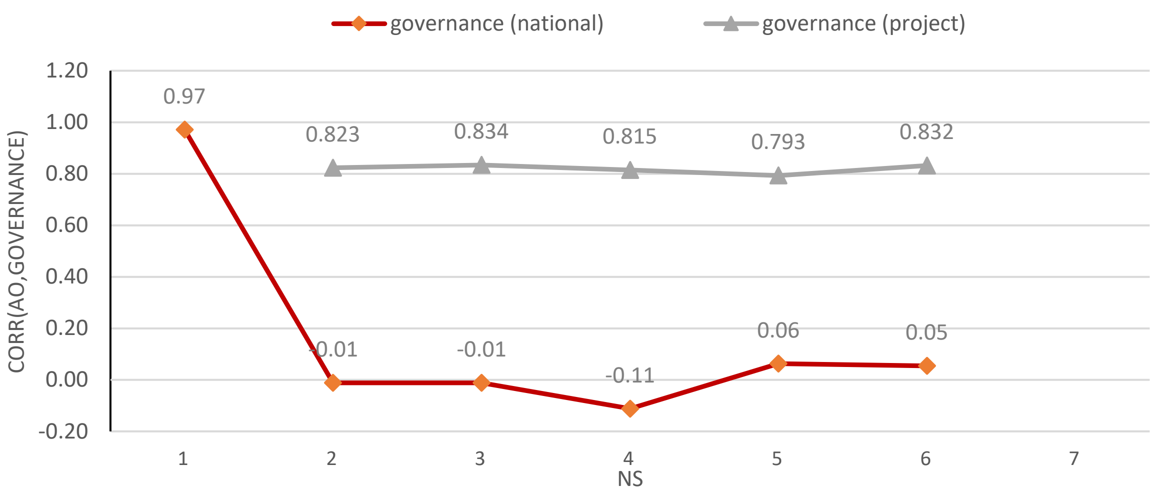


Fig. 4.43 The correlation of governance and the achievement of objectives over the NS

The LRM analysis indicates that several governance indicators are statistically significant in projects involving more than two NSs. These indicators include "VA," "GP," "SP," "GE," "RL," "CC," and "ME."

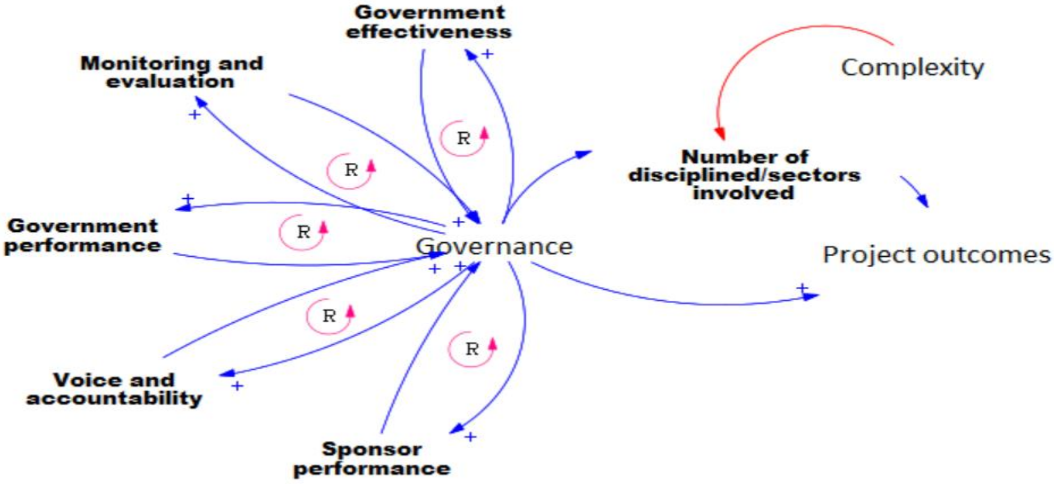


Fig. 4.44 Causal loop diagram of governance indicators to deal with the complexity involved in NSs

4.7.6. The marginal effect of level of development outcomes (DO)

This factor pertains to the risk that development outcomes (or expected outcomes) may not be sustained at the time of evaluation. This factor assesses the likelihood of project outcomes evolving over time, and a high level of risk represents greater complexity and uncertainty about the future of project outcomes.

4.7.6.1. Assessing the effect of DO on on-time completion

Figure 4.45 illustrates that projects with a medium DO risk have the highest frequency of being delivered past the due date, while projects with low DO risk have the lowest frequency of delayed delivery.

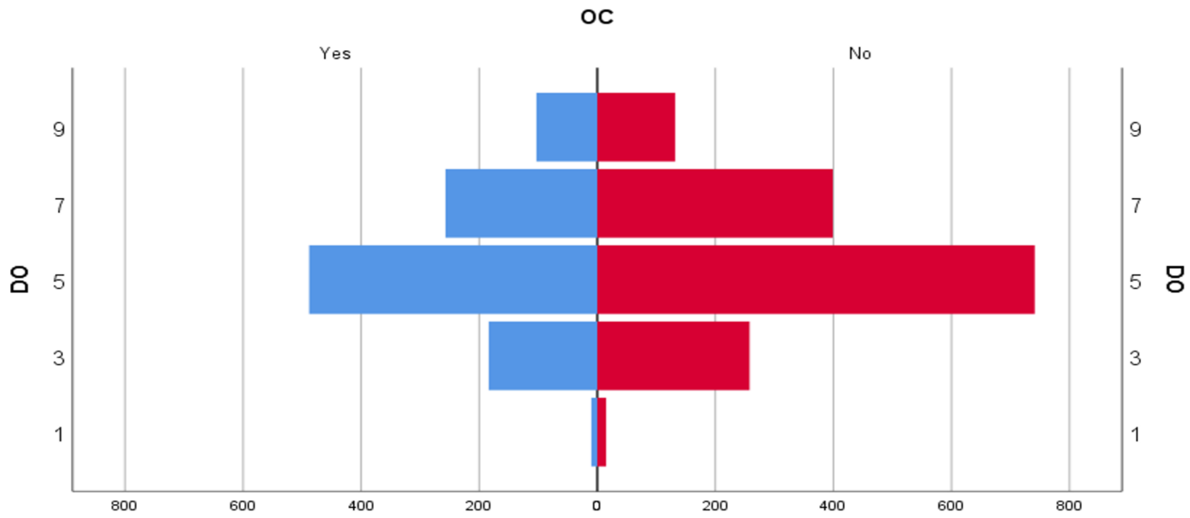


Fig. 4.45 Frequency of on-time completion and different DO levels

Figure 4.46 indicates a stable trend of on-time completion rates across different levels of outcomes development risk. The graph shows that the average rate of on-time completion remains relatively consistent across the diverse levels of outcomes development risk spectrum.

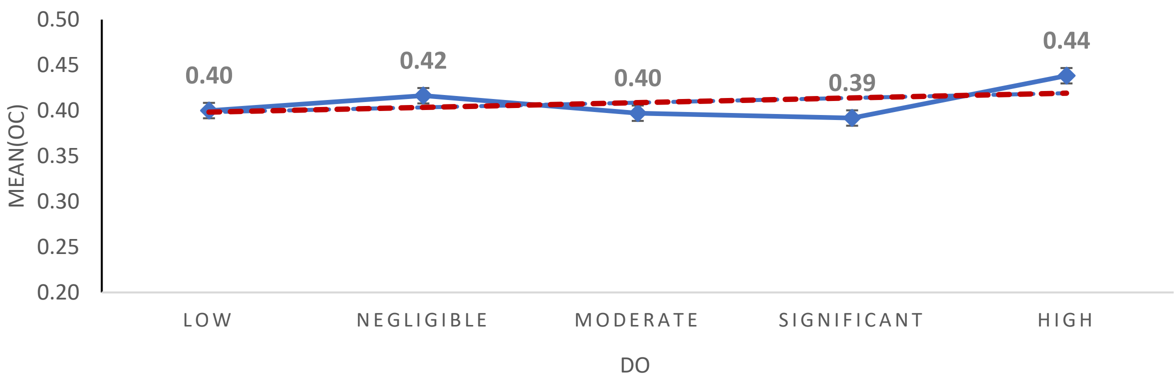


Fig. 4.46 The average on-time completion rate considering DO

As observed in Table 4.42, a 1 unit increase in the DO variable increases the YES odds in the OC variable by 0.2. The significance of this volume is >0.05, making the relationship statistically non-significant (P=0.935).

Table 4.42
The Logistic Regression Model of on-time completion over the DO

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	-0.462	0.1382	0.63	11.176	0.001
level of development outcomes	0.002	0.0241	1.002	0.007	0.935

Proposition11: *There exists no statistically significant relationship between the DO levels and the on-time completion rate.*

4.7.6.2. Assessing the effect of DO levels on the achievement of objectives

As observed in Fig. (4.47), projects with a medium DO risk have the highest frequency of achieving project objectives.

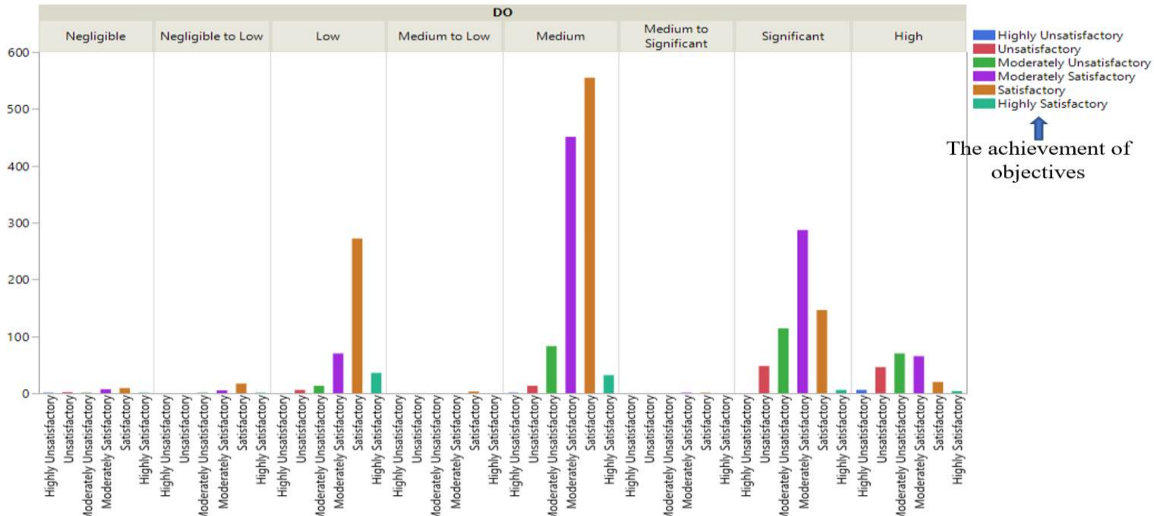


Fig. 4.47 Achievement of project objectives considering DO

Figure 4.48 displays the average rate of achieving project objectives across different levels of outcomes development risk. The graph shows a significant drop in the trend for projects with higher DO risk, indicating that projects with higher DO risk are less likely to achieve their objectives.

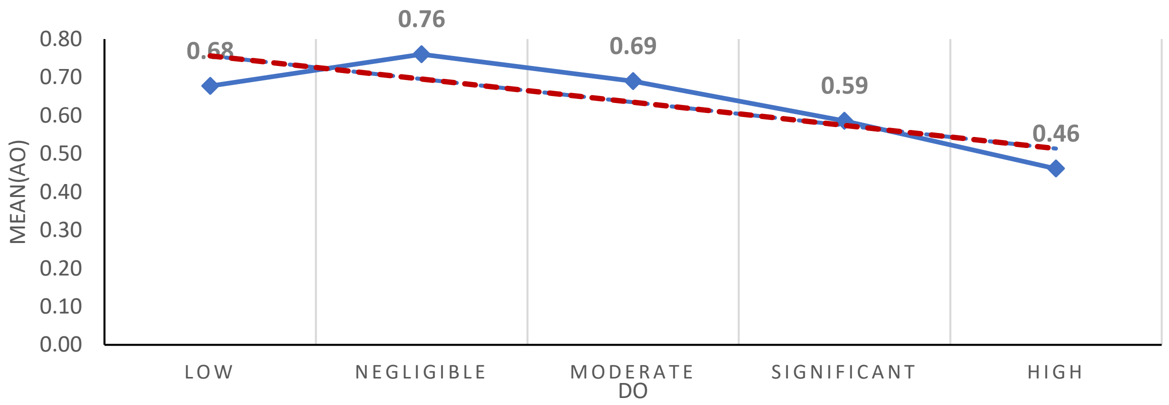


Fig. 4.48 The achievement of objectives average rate considering DO

As observed in Table 4.43, a 1 unit increase in the DO variable increase the odds of observing the higher achievement of project objectives variable by 44%. The significance of this volume is <0.05, making the connection statistically significant (P<0.001).

Table 4.43
The Logistic Regression Model of achievement of project objectives over the DO

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-9.305	0.3964	9.1E-05	551.157	<0.001
Intercept-2	-6.462	0.1962	0.002	1085.214	<0.001
Intercept-3	-4.966	0.1705	0.007	848.404	<0.001
Intercept-4	-2.88	0.1451	0.056	394.15	<0.001
Intercept-5	0.681	0.1627	1.976	17.518	<0.001

level of development outcomes	-0.567	0.0257	0.567	486.784	<0.001

<u>Proposition12</u>: *The achievement rate of project objectives is significantly influenced by the project's DO outcome levels. This proposition is supported by the results shown in Figures 4.47 and 4.48, which indicate that projects with a medium DO risk have the highest frequency of achieving project objectives, while there is a significant drop in the trend for projects with higher DO risk.*

4.7.6.3. The effect of DO on the relationship between governance and on-time completion

Figure 4.49 shows the correlation between governance and the rate of on-time completion across different levels of DO outcomes. The graph indicates a reverse correlation between governance at the national level and project on-time completion in most categories.

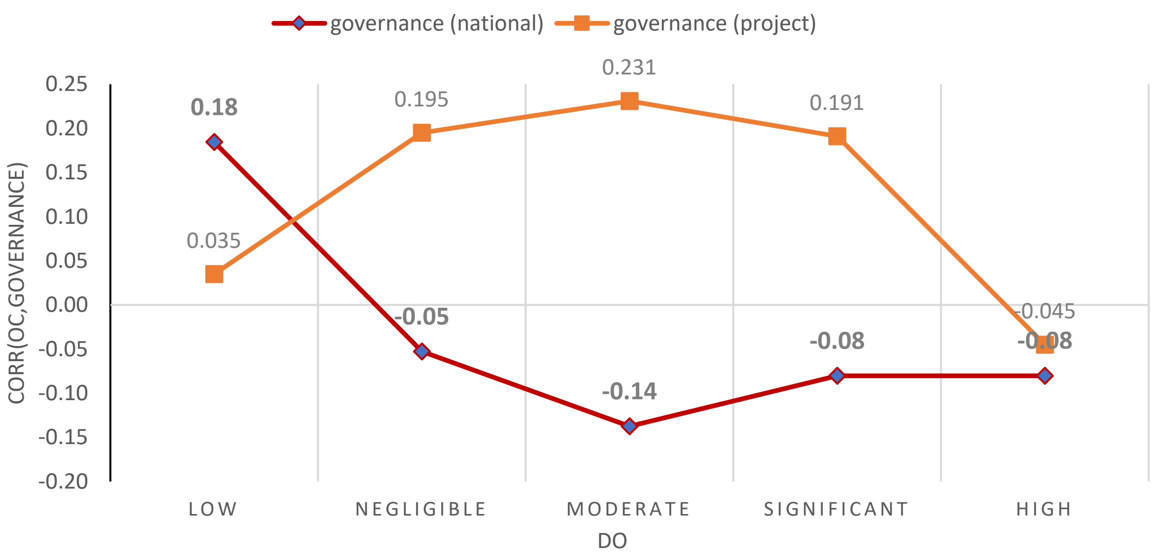


Fig. 4.49 The correlation of governance and on-time completion rate over the DO

Based on the LRM results, the GE indicator has a significant relationship in the low DO risk category. Additionally, the "SP" indicator has a significant impact on the on-time completion rate at the negligible, moderate, and significant risk levels. However, for the high-risk levels, none of the governance indicators have a significant influence on the rate of on-time completed projects.

4.7.6.4. The effect of DO on the relationship between governance and achievement of objectives

The correlation between governance and the project objective achievement rate considering different DO levels is shown in Fig. (4.50). There exists a reverse correlation between governance and achieving objectives at the national level in most categories.

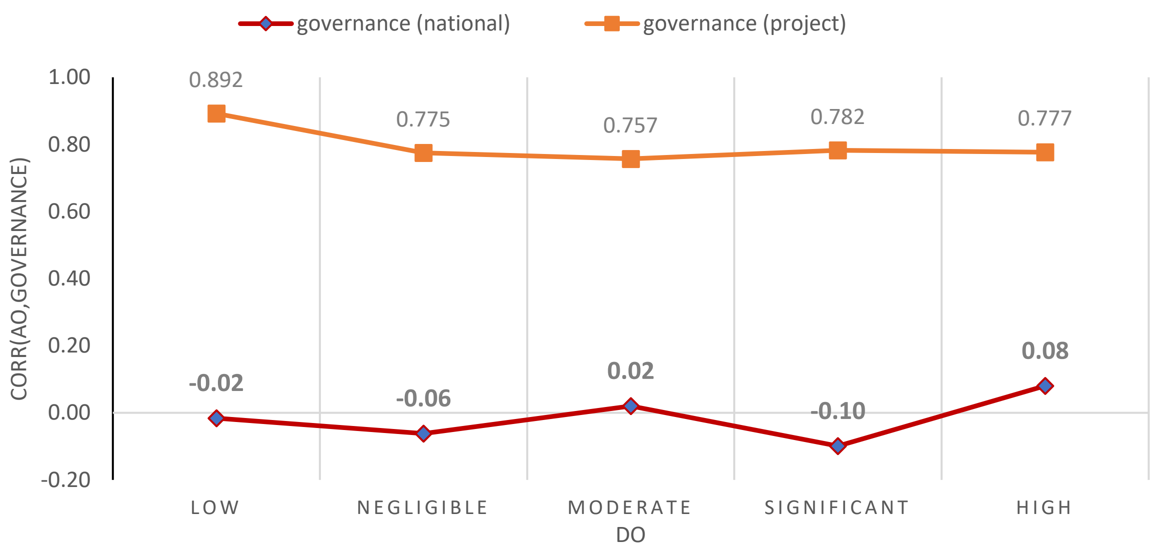


Fig. 4.50 The correlation between governance and the achievement of objectives over the DO

Based on the LRM results, the "GP" and "ME" indicators are associated with achieving project objectives in the low-risk category. For the negligible and moderate risk levels, the "VA," "PV," "RQ," "GP," and "SP" indicators have a significant connection. However, for the significant and high-risk levels of developing outcomes, only the "GP" and "SP" indicators have a statistically significant relationship.

Furthermore, the LRM results suggest the existence of a governance network with two indicators (project level) that have a significant influence on project outcomes in the high-risk category of developing outcomes, as shown in Fig. (4.51).

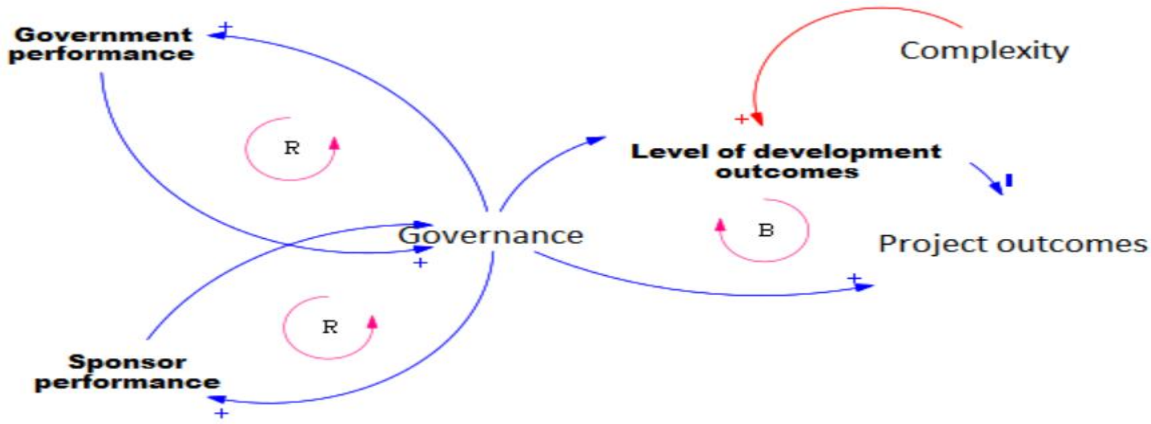


Fig. 4.51 Causal loop diagram of governance indicators to deal with development complexity levels

4.7.7. The marginal effect of capacity of countries (CC)

According to the literature (see Appendix I), a country's economic and social development level can affect the complexity of a project. Therefore, for the purpose of this study, countries have been classified based on their economic development level as developed, developing, and least developed. The World Bank's World Development Indicators database has been used for this classification, which categorizes countries based on their income group, geographic region, and operational lending categories.

4.7.7.1. Assessing the effect of the capacity of countries (CC) on on-time completion

The trend of project on-time completion regarding different CCs is shown in Fig. (4.52). Although CCs make projects more complex, there is no evidence confirming that projects in developed countries (high CC) have a lower rate of on-time completion.

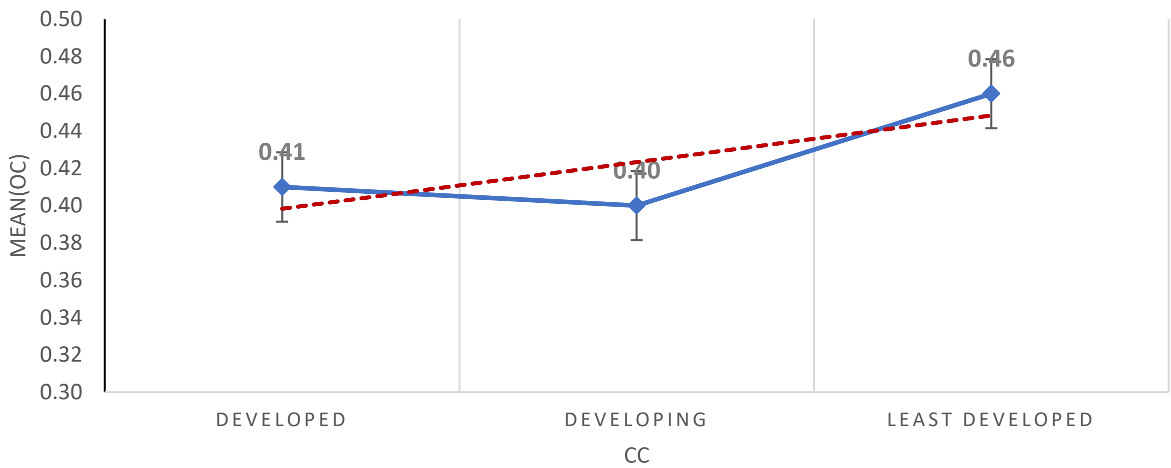


Fig. 4.52 The average on-time completion rate considering CC

As observed in Table 4.44, the significance rate for all variable categories is >0.05, indicating that the relationship is statistically non-significant (P=0.767 and P=0.519).

Table 4.44
The Logistic Regression Model of on-time completion over the CC

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	-0.416	0.0739	0.659	31.759	0
CC= Least Developed	0.068	0.2299	1.07	0.088	0.767
CC= Developing	-0.059	0.0908	0.943	0.416	0.519
CC= Developed	0	-	1	-	.

<u>Proposition 13</u> can be made that *there is no statistically significant relationship between the CC levels and the on-time completion rate.*

4.7.7.2. Assessing the capacity of countries (CC) effect on the achievement of objectives

The average rate of achieving objectives considering different CC levels is shown in Fig. (4.53). There exists a stable trend between projects with diverse CCs.

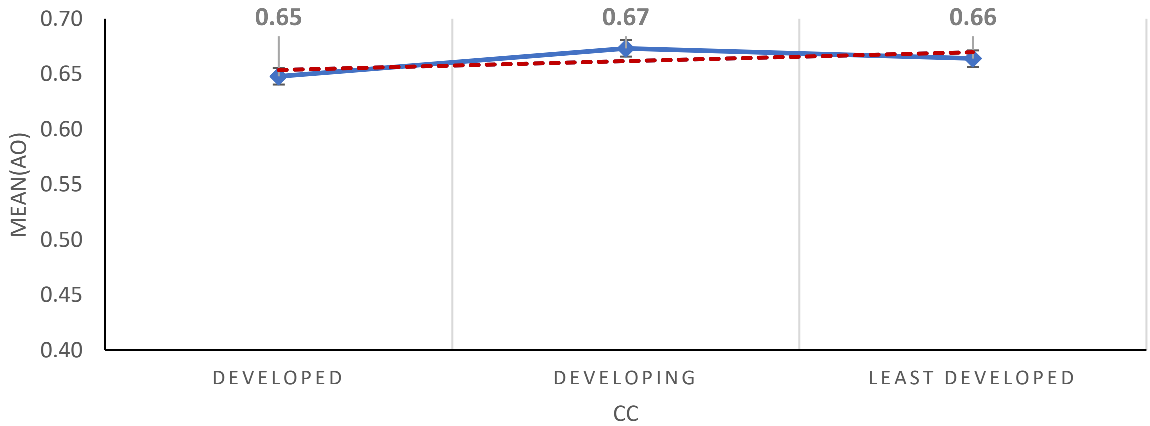


Fig. 4.53 The average of the achievement of objectives rate considering CC

Table 4.45
The Logistic Regression Model of achievement of project objectives over the CC

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.444	0.3577	0.004	231.66	<0.001
Intercept-2	-2.679	0.1059	0.069	639.582	<0.001
Intercept-3	-1.339	0.0748	0.262	320.22	<0.001
Intercept-4	0.423	0.0688	1.526	37.784	<0.001
Intercept-5	3.661	0.1295	38.892	798.759	<0.001
CC= Least Developed	0.317	0.2094	1.373	2.295	0.13
CC= Developing	0.393	0.082	1.481	22.95	<0.001
CC= Developed	0	.	1	.	.

As observed in the LRM analysis presented in Table 4.45, the odds of observing a higher achievement of project objectives increase by 48% when passing from least developed to developing countries. This increase is statistically significant, with a significance level of <0.05 (P<0.001).

<u>Proposition14</u>: *It can be concluded that developing countries have a better rate of achieving project objectives than least developed countries. However, this trend does not continue with developed countries.*

4.7.7.3. The effect of CC on the relationship between governance and on-time completion

The correlation between governance and the rate of on-time completion, considering different CC outcomes, is illustrated in Fig. (4.54). The figure shows a negative correlation between national-level governance and the rate of on-time completion for most CC categories.

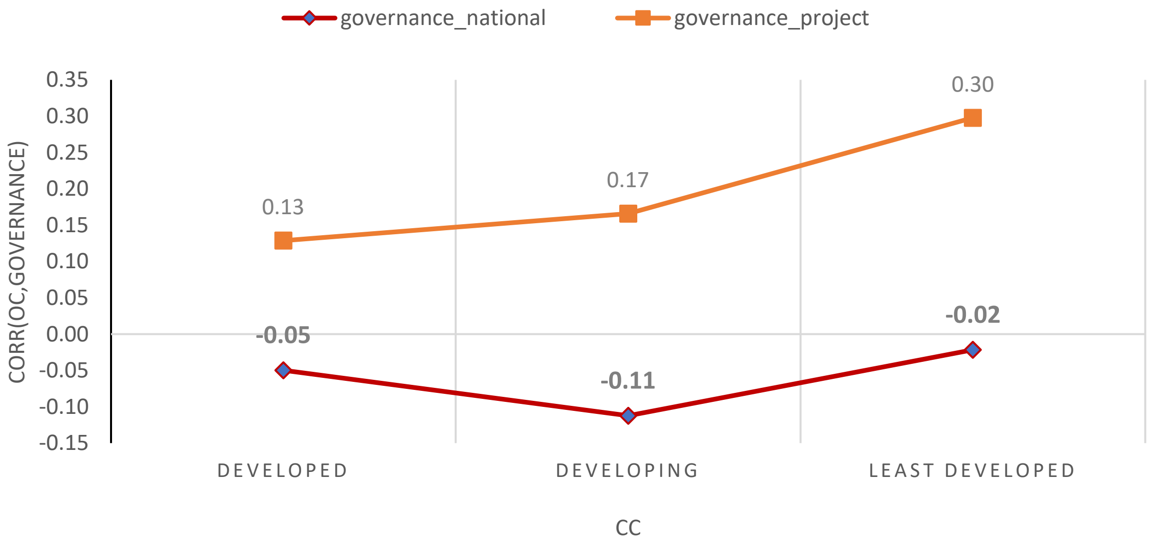


Fig. 4.54 The correlation of governance and on-time completion rate over the CC

Based on the LRM analysis, the indicators "VA," "RQ," "CC," and "SP" were found to be associated with delivering projects on-time for developing countries. However, none of the governance indicators were statistically significant at other levels.

4.7.7.4. The effect of CC on the relationship between governance and achievement of objectives

The correlation between governance and the project objective achievement rate considering different DO levels is shown in Fig. (4.55). There exists a stable correlation between governance and achieving objectives at the project level in most categories.

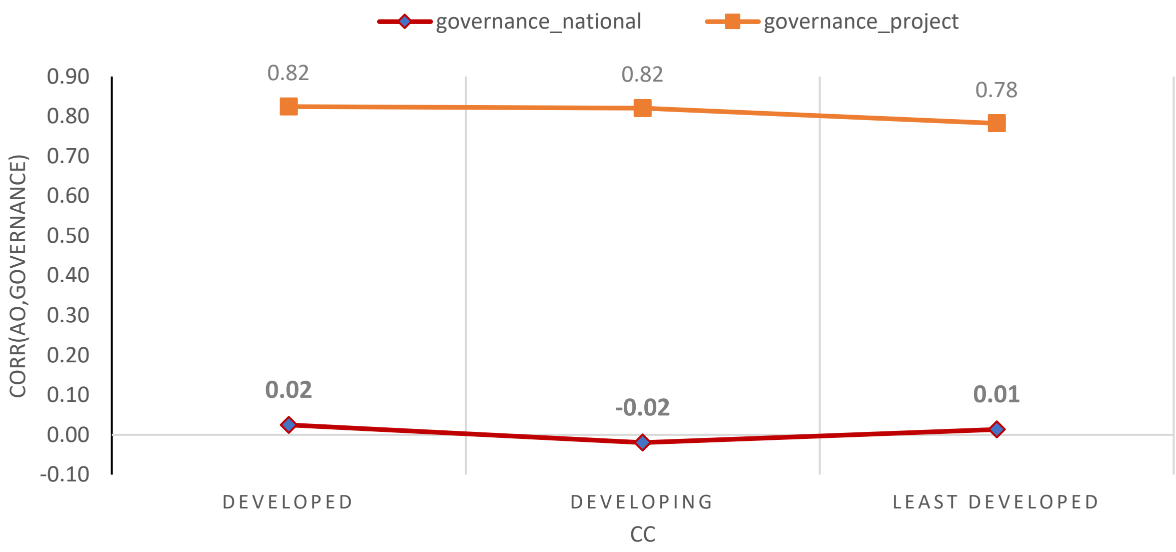


Fig. 4.55 The correlation of governance and the achievement of objectives over the CC

Based on the LRM analysis, the "GE," "RQ," "RL," "GP," "SP," and "ME" indicators were found to be significant in achieving project objectives in developed countries. For developing countries, the "VA," "RL," "RQ," "GP," "SP," and "ME" indicators were statistically significant. In least developed countries, the "RL," "CC," "GP," and "SP" indicators showed a significant relationship with achieving project objectives.

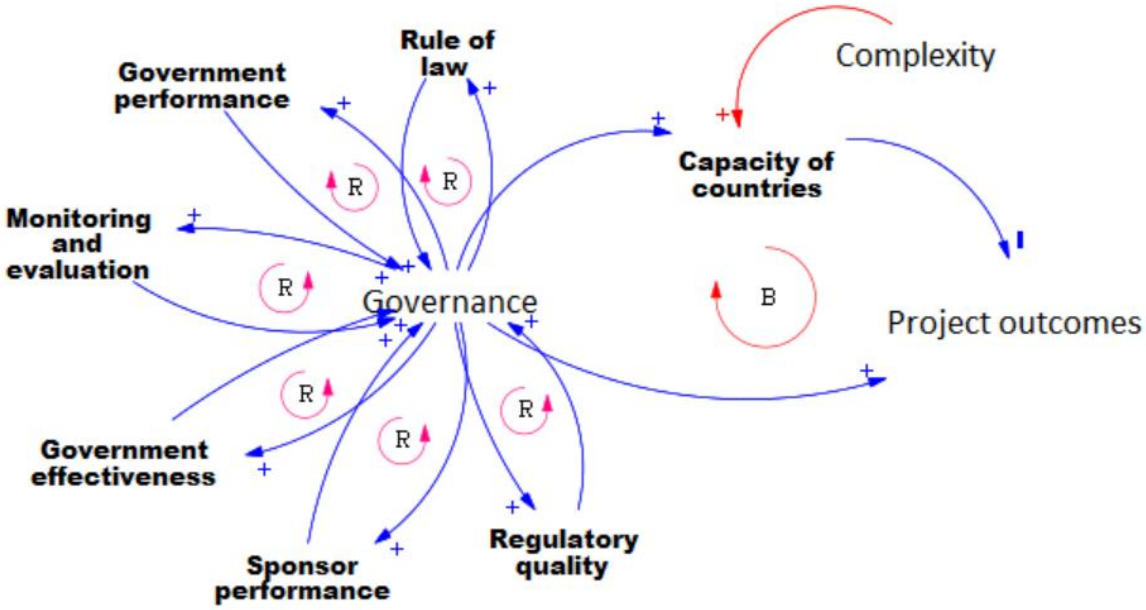


Fig. 4.56 Causal loop diagram of governance indicators to deal with the complexity of CCs

4.7.8. The marginal effect of supervisor support (SS)

Supervisor support refers to the extent to which supervisors, such as governments and the World Bank, value the contributions of their departments and are committed to achieving project objectives. This variable is evaluated by the Independent Evaluation Group (IEG) of the World Bank Group.

4.7.8.1. Assessing the effect of supervisor support (SS) on on-time completion

The trend of project on-time completion regarding different SSs is shown in Fig. (4.57). Apart from the HU category, there is an upward trend from projects with unsatisfactory performance to highly satisfactory outcomes.

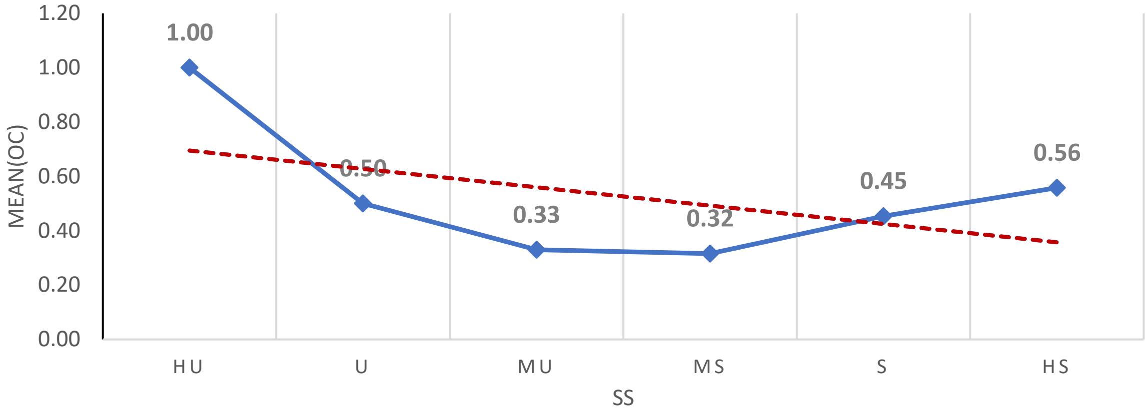


Fig. 4.57 The average on-time completion rate considering SS

Table 4.46 presents the Logistic Regression Model of on-time completion over the Supervisor Support (SS) variable. The table shows the regression coefficient for the intercept and supervisor support, along with their standard error, exponential value (e^(β_0)), Wald statistics, and significance. The intercept has a regression coefficient of -1.143 with a standard error of 0.1657, indicating that the probability of on-time completion decreases as supervisor support decreases. The supervisor support variable has a regression coefficient of 0.116 with a standard error of 0.0267, indicating that an increase in supervisor support leads to an increase in the probability of on-time completion. The significant value of both intercept and supervisor support coefficients is <0.001, making the relationship statistically significant.

Table 4.46
The Logistic Regression Model of on-time completion over the SS

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	-1.143	0.1657	0.319	47.607	<0.001
Supervisor support	0.116	0.0267	1.123	18.901	<0.001

<u>Proposition15</u>: *The LRM analysis confirms that better supervisor support leads to the project being delivered on time.*

4.7.8.2. Assessing the supervisor support (SS) effect on the achievement of objectives

The average rate of achieving objectives considering different SS levels is shown in Fig. (4.58). There exists a significant upward trend between projects with diverse SSs.

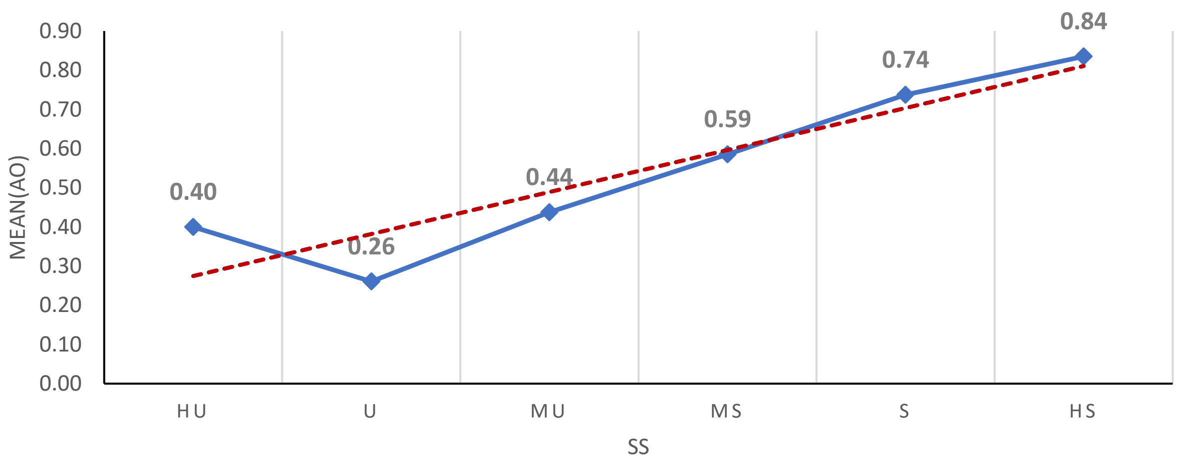


Fig. 4.58 The average of the achievement of objectives rate considering SS

As observed in Table 4.47, a 1 unit increase in the SS variable increase the odds of observing the higher achievement of project objectives variable by almost triple (2.8). The significance of this volume is <0.05, making the connection statistically significant (P<0.001).

Table 4.47
The Logistic Regression Model of achievement of project objectives over the CC

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-1.41	0.3726	0.244	14.313	<0.001
Intercept-2	1.891	0.1677	6.627	127.173	<0.001
Intercept-3	3.886	0.174	48.698	498.586	<0.001

Intercept-4	6.599	0.212	734.204	969.048	<0.001
Intercept-5	10.487	0.2646	35841.63	1570.208	<0.001
Supervisor support	1.049	0.033	2.856	1012.698	<0.001

Proposition16: *Better supervisor support led to the higher rate of project objectives achievement.*

4.7.8.3. The effect of SS on the relationship between governance and on-time completion

Figure 4.59 shows the correlation between governance and the rate of on-time completion across different levels of supervisor support. A positive, upward trend is observed between governance at the project level and project on-time completion. However, this trend is negative at the national level.

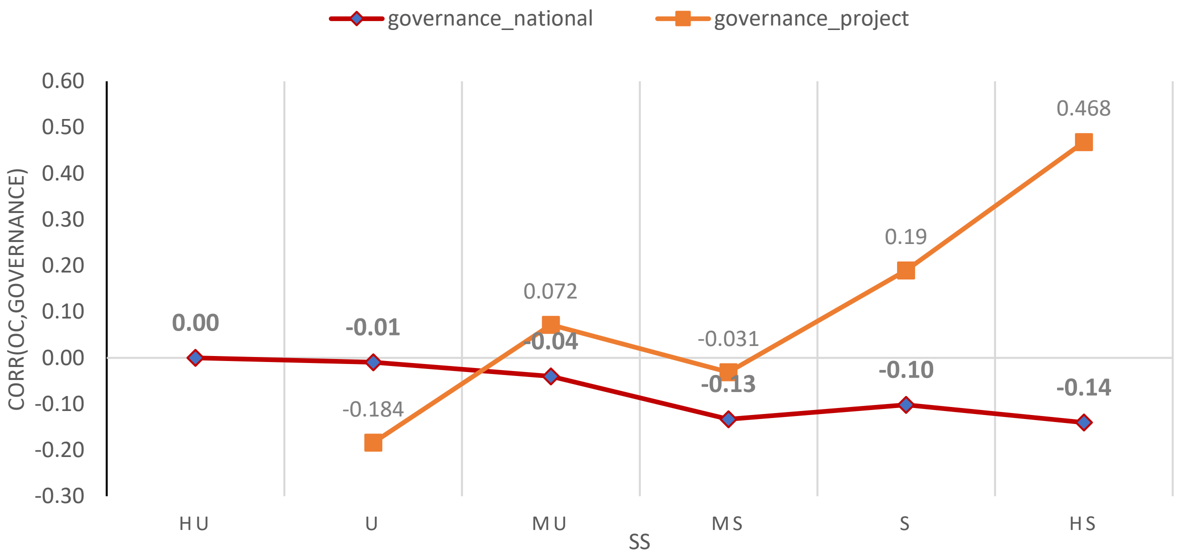


Fig. 4.59 The correlation of governance and on-time completion rate over the SS

Based on the LRM result, overall, the "GP," "SP," "PV," and "CC" indicators are involved in delivering projects on-time for different levels of supervisory support.

4.7.8.4. The effect of SS on the relationship between governance and achievement of objectives

The correlation between governance and the project objective achievement rate considering different SS levels is shown in Fig. (4.60). There exists a stable correlation between governance and achieving objectives in most categories at both project and national levels.

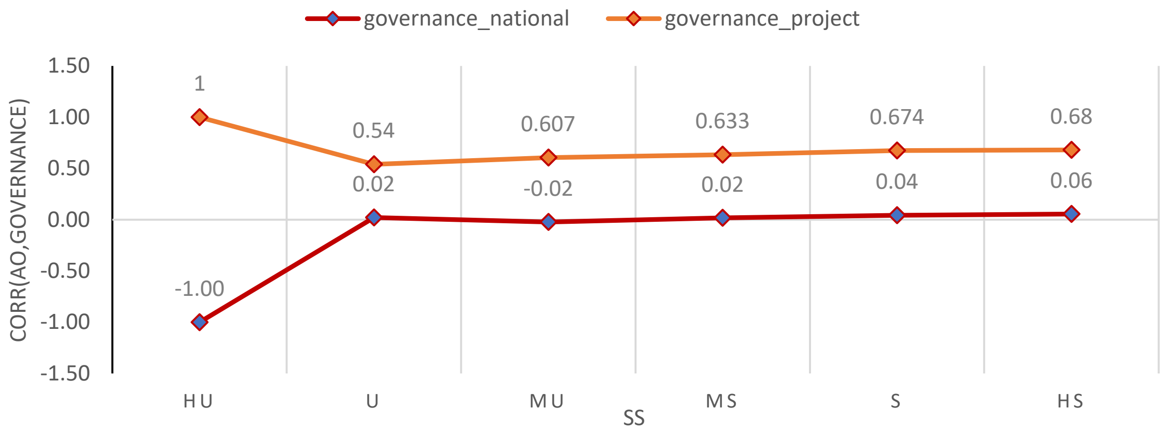


Fig. 4.60 The correlation of governance and the achievement of objectives over the SS

Based on the LRM result, the "GP" and "SP" indicators are involved in achieving project objectives for different levels of supervisory support. Additionally, "VA," "PV," and "GE" show a significant connection with supervisory support in other categories.

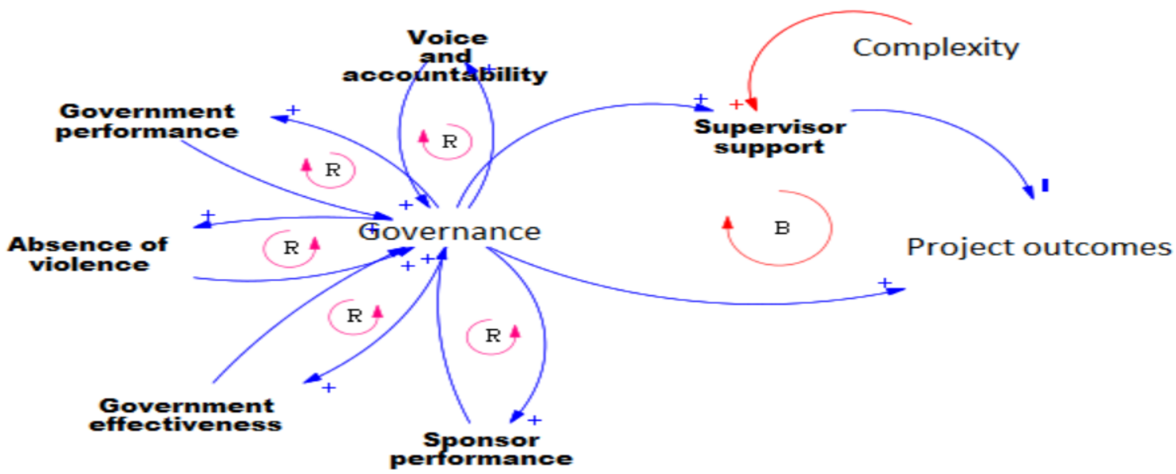


Fig. 4.61 Causal loop diagram of governance indicators to deal with the complexity of supervisor support

4.7.9. The marginal effect of political instability (PI)

Political stability is a critical factor in successfully delivering development projects in a country. The Political Instability Index assesses the risk of violent threats or changes in the central government, including domestic violence and terrorism. Based on the literature, political instability is frequently reported as one of the most significant complexity factors by scholars (see Appendix I).

4.7.9.1. Assessing the effect of political instability (PI) on on-time completion

The frequency of projects completed on time according to the political instability status, as observed in Fig. (4.62), shows a normal distribution of data. This means that countries with a mid-range political stability had the highest number of projects completed on time.

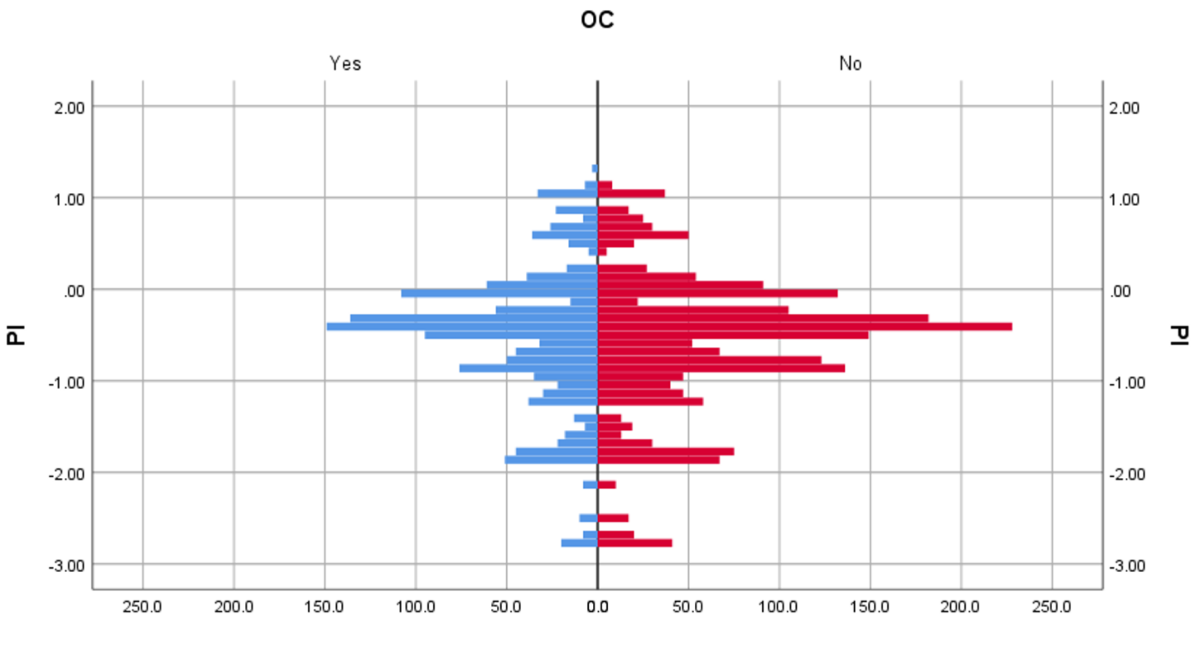


Fig. 4.62 Frequency of on-time completion with different level of political instability

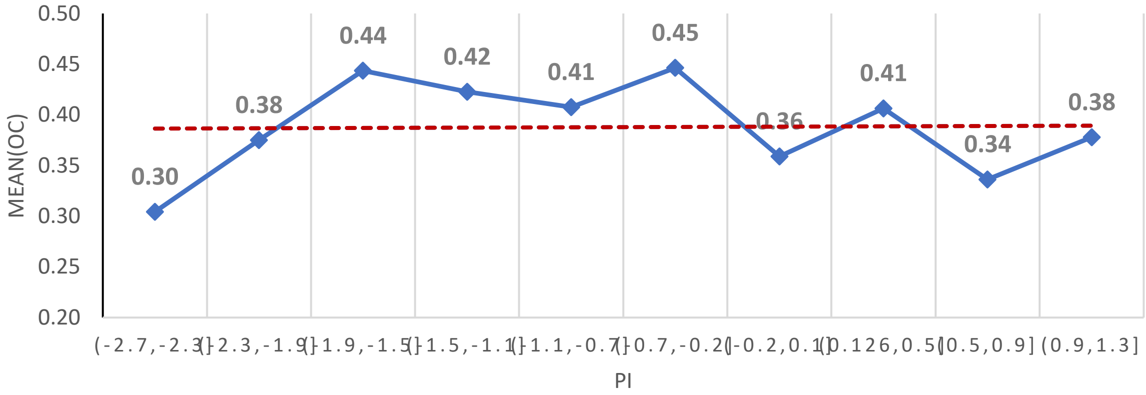


Fig. 4.63 The average on-time completion rate considering PI

The trend of project on-time completion based on different levels of political instability is presented in Fig. (4.63). It is observed that there is no clear correlation between political instability and on-time completion rate. Projects in countries with high political instability have a slightly lower rate of on-time completion, but the difference is not statistically significant.

Table 4.48
The Logistic Regression Model of on-time completion over the PI

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept	-0.398	0.052	0.671	58.806	<0.001
Political instability	0.093	0.0539	1.097	2.948	0.086

Based on the results from the logistic regression model presented in Table 4.48, there is no statistically significant relationship between political instability and the on-time completion rate. The significance level is above 0.05, indicating that the relationship is not statistically significant (P=0.086).

<u>Proposition17</u>: *There is no significant relationship between the level of political instability and the on-time completion rate of development projects.*

4.7.9.2. Assessing political instability (PI) effect on the achievement of objectives

The average rate of achieving objectives considering different PI levels is shown in Fig. (4.64). There exists a slight upward trend between projects with diverse PIs.

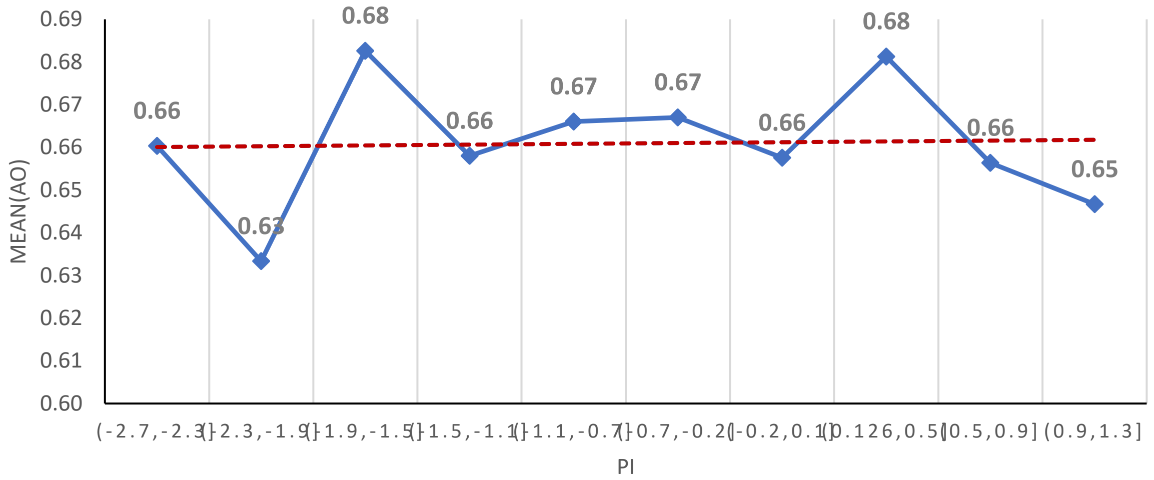


Fig. 4.64 The average of the achievement of objectives rate considering PI

As shown in Table 4.49, an increase of 1 unit in the PI variable is associated with a 19% increase in the odds of achieving project objectives. The significance of this finding is less than 0.05, indicating that the relationship is statistically significant (P<0.001).

Table 4.49
The Logistic Regression Model of achievement of project objectives over the PI

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.801	0.3556	0.003	266.081	<0.001
Intercept-2	-3.033	0.0984	0.048	949.283	<0.001
Intercept-3	-1.692	0.0623	0.184	737.157	<0.001
Intercept-4	0.062	0.0494	1.064	1.568	0.21

Intercept-5	3.29	0.1178	26.851	780.272	<0.001
Political instability	0.175	0.0489	1.191	12.846	<0.001

<u>Proposition18</u>: *Higher political stability led to the higher rate of project objectives achievement.*

4.7.9.3. The impact of PI on the relationship between governance and on-time completion

The correlation between governance and the rate of on-time completion considering different PI is shown in Fig. (4.65). There exists a positive upward correlation between governance at the national level and project on-time completion. This trend is stable at the project level.

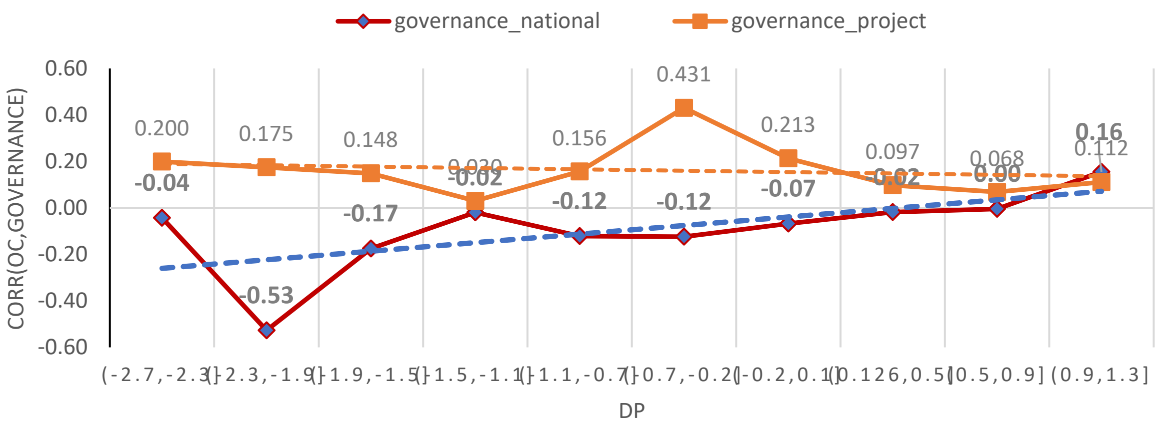


Fig. 4.65 The correlation of governance and on-time completion rate over the PI

According to the LRM analysis, overall, the "PV," "AV," "SP," and "ME" indicators are involved in delivering projects on-time for different levels of PI.

4.7.9.4. The impact of PI on the relationship between governance and achievement of objectives

Fig. (4.66) illustrates the correlation between governance and the achievement rate of project objectives considering different levels of political instability. There appears to be a consistent correlation between governance and the achievement of project objectives in most cases at both national and project levels.

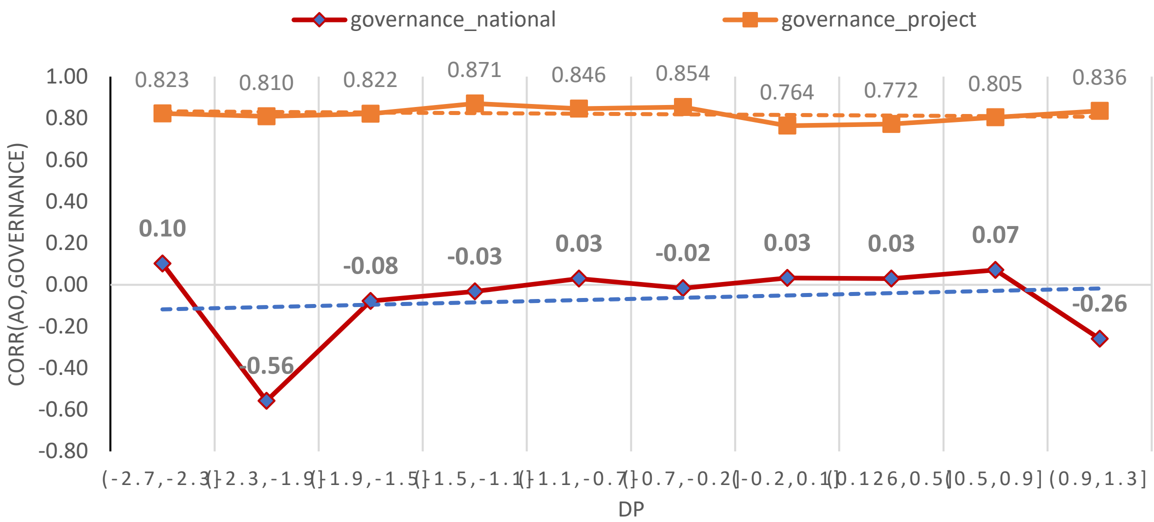


Fig. 4.66 The correlation of governance and the achievement of objectives over the PI

The LRM analysis indicates that the "GP," "SP," and "ME" indicators are involved in achieving project objectives for different levels of political instability. Additionally, the "RQ," "RL," "VA," and "GE" indicators are significantly connected to the PI in other categories. This result highlights the importance of good governance arrangements at the project level, which can help to achieve project objectives even in countries with high levels of political instability.

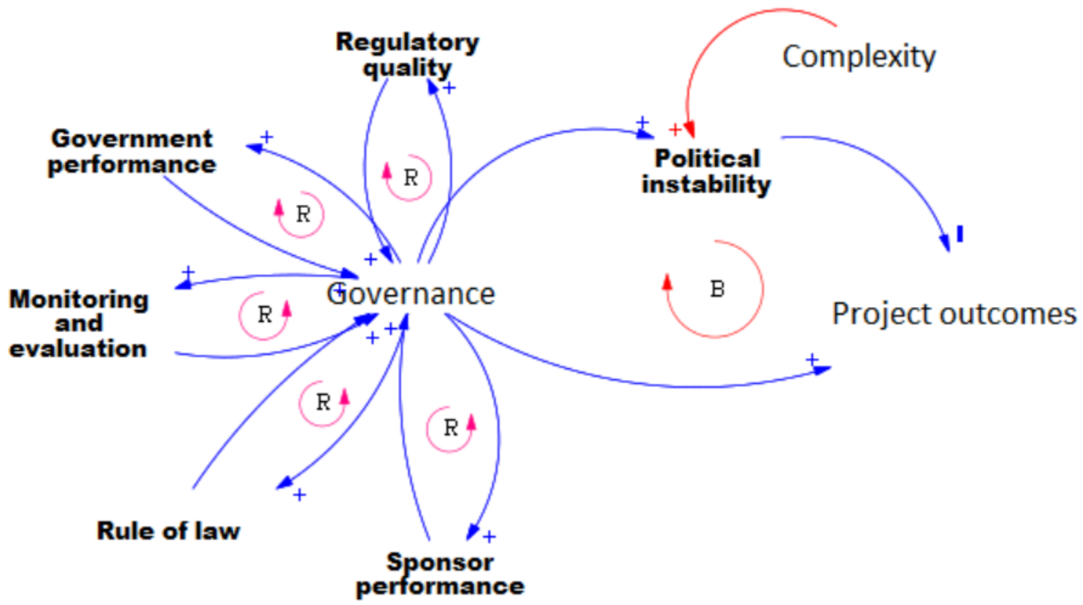


Fig. 4.67 Causal loop diagram of governance indicators to deal with the complexity of political instability

4.7.10. The marginal effect of number of contracts (NC)

The number of contracts linked to a project is a complexity factor that represents the diversity and size of a related project. This variable was taken from the procurement database and connected to the primary data set. The World Bank's data set shows that each project consists of a minimum of one and a maximum of forty-one contracts.

4.7.10.1. Assessing the effect of number of contracts (NC) on on-time completion

As shown in Figure (4.68), the frequency of projects completed on time is highest between the first and second categories of NC. This suggests that projects with a lower number of contracts are more likely to be completed on time, indicating an indirect relationship between NCs and the success rate of completion.

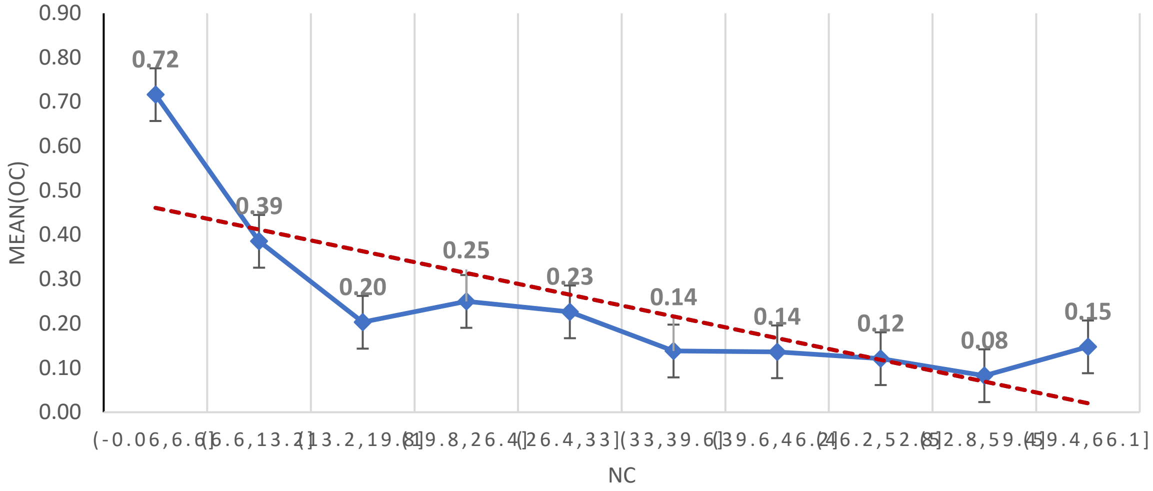


Fig. 4.68 The average on-time completion rate considering NC

As indicated in Table 4.50, a 1 unit increase in the NC variable would increase the NO odds ratios in the OC variable by 5%. The significance of this volume is <0.05, making the relationship statistically significant (P<0.001).

Table 4.50
The Logistic Regression Model of on-time completion over the NC

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept	0.481	0.0619	1.618	60.467	<0.001
Number of contracts	-0.043	0.0023	0.958	346.55	<0.001

Proposition19: *The results presented in Fig. (4.68) and the details in Table 4.50 suggest that as the number of contracts increases, the probability of on-time delivery decreases.*

4.7.10.2. Assessing number of contracts (NC) effect on the achievement of objectives

The impact of the NC trends on the predetermined project goal achievements is assessed here. As shown in Fig. (4.69), an increase in NC decreases the frequency of projects that have achieved their goals, indicating that a higher number of project contracts has a negative impact on attaining objectives.

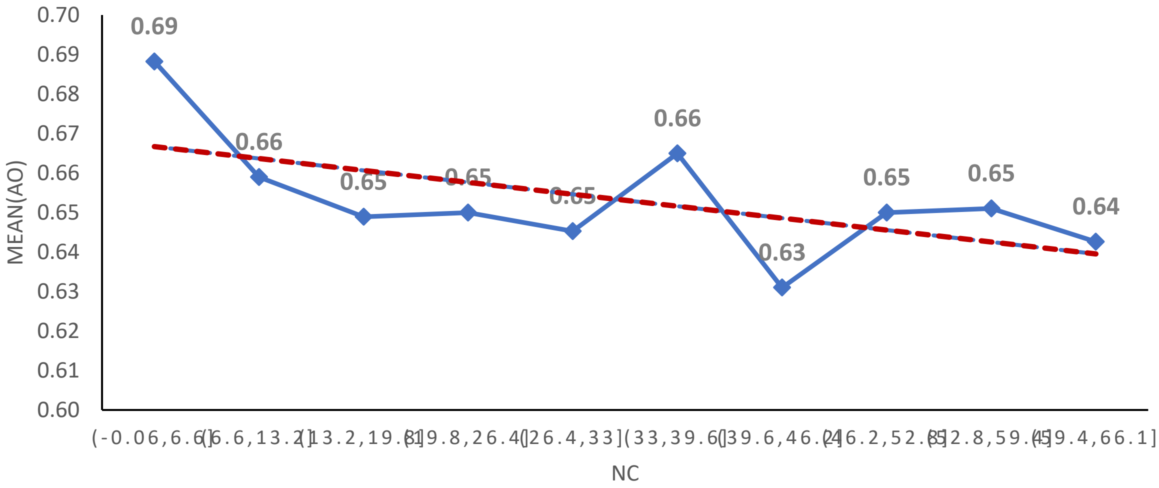


Fig. 4.69 The average of the achievement of objectives rate considering NC

As observed in Table 4.51, a 1 unit increase in the NC variable would decrease the odds at higher levels of project outcome by 1.5%. Because the significance of this volume is <0.05, the relationship is statistically significant (P=0.003).

Table 4.51
The Logistic Regression Model of achievement of project objectives over the NC

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.813	0.3566	0.003	265.651	<0.001
Intercept-2	-3.048	0.1024	0.047	885.976	<0.001
Intercept-3	-1.711	0.0689	0.181	616.29	<0.001
Intercept-4	0.042	0.0571	1.043	0.538	0.463
Intercept-5	3.272	0.1207	26.372	735.199	<0.001
Number of contracts	-0.005	0.0015	0.995	8.906	0.003

Proposition20: *The results shown in Fig. (4.69) and detailed in Table 4.51 indicate that there is a positive correlation between achieving project goals and the number of contracts. Specifically, the probability of achieving project goals is higher when there are fewer contracts, suggesting that projects with a lower number of contracts are more likely to achieve their predetermined goals.*

4.7.10.3. The impact of NC on the relationship between governance and on-time completion

The correlation between governance and the rate of on-time completion considering different NC is shown in Fig. (4.70). There exists a positive upward correlation between governance at the national and project level and on-time completion.

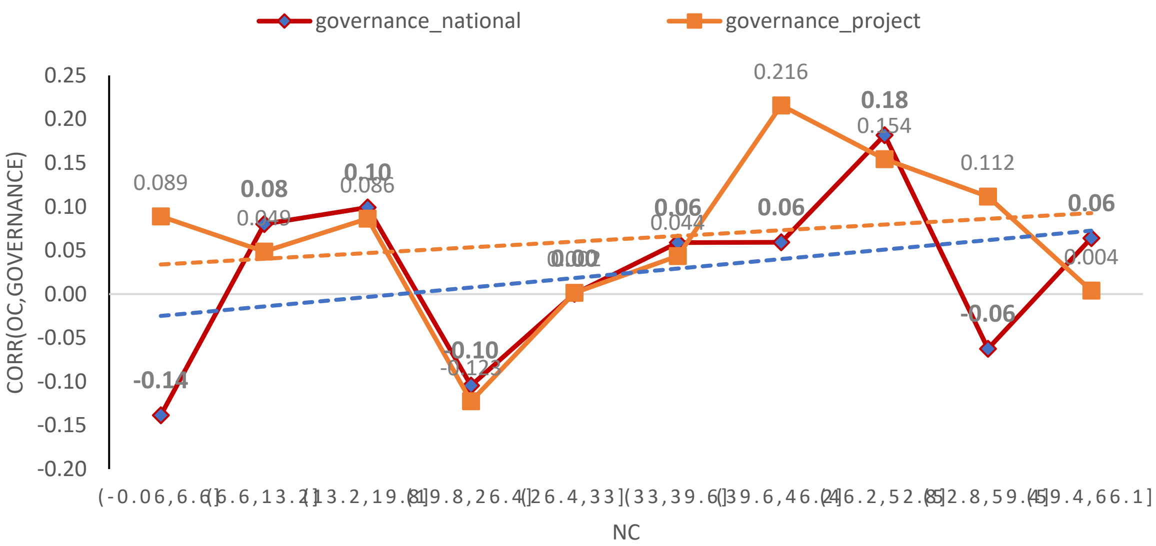


Fig. 4.70 The correlation of governance and on-time completion rate over the NC

Based on the LRM analysis, only the VA indicator is statistically significant in projects with more than 14 contracts. For 10 < NC ≤ 14, the VA and SP indicators are involved in on-time project completion. In projects with NC ≤ 10, the PV, AV, GE, RQ, SP, and GP indicators are significantly related to delivering projects on time.

4.7.10.4. The impact of NC on the relationship between governance and achievement of objectives

Fig. (4.71) shows the correlation between governance and the project objective achievement rate considering different NC. There exists a stable correlation between governance and achieving objectives most of the time at the project level. This trend is entirely changing at the national level.

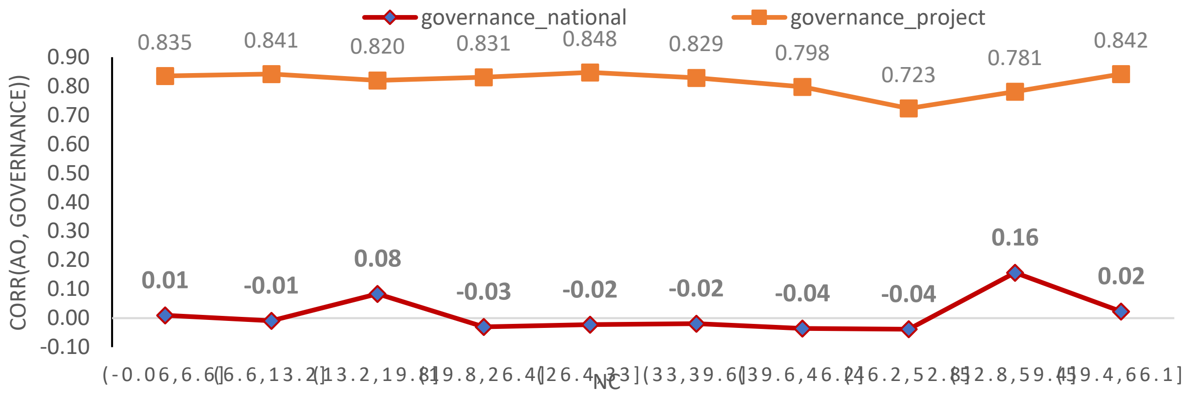


Fig. 4.71 The correlation of governance and the achievement of objectives over the NC

Based on the LRM analysis, overall, the "VA," "GP," "SP," and "ME" indicators are involved in achieving project objectives for different levels of NC. Moreover, the "RL" and "CC" are significantly connected to the NC in the first category.

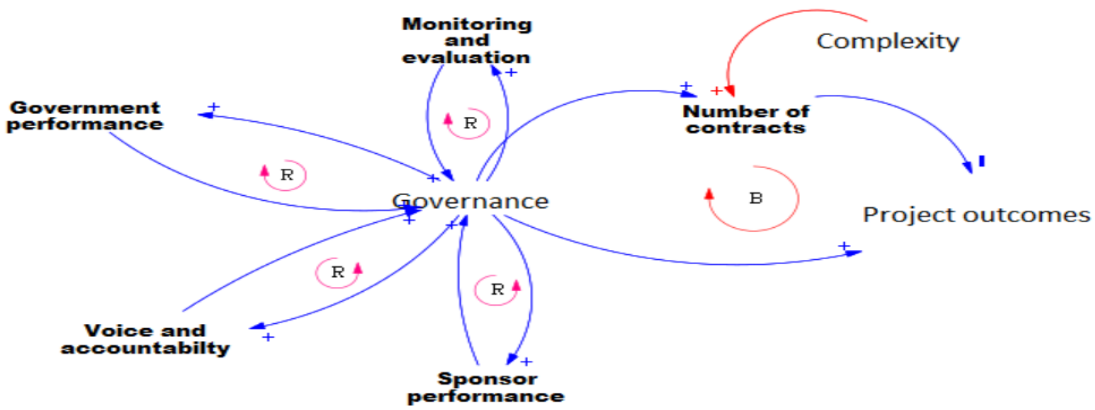


Fig. 4.72 Causal loop diagram of governance indicators to deal with the complexity of number of contracts

4.7.11. The marginal effect of variety of procurement methods (VP)

The World Bank uses a range of procurement methods to deliver projects, with 32 different methods available for different project types. However, the majority of projects (around 97%) are conducted using one of eleven procurement methods. These include International Competitive Bidding, National Competitive Bidding, Quality and Cost-Based Selection, Individual Consultant Selection, Single Source Selection, Direct Selection, Qualification Selection Consultant, Request for Bids, Shopping, Selection Based on Consultant's Qualification, and Quality Based Selection. This section examines the impact of the variety of procurement methods as a complexity factor on project outcomes.

4.7.11.1. Assessing the effect of procurement methods (VP) on on-time completion

As observed in Figure 4.73, the frequency of projects completed on time, according to the Variety of Procurement methods (VP), is highest in the first category. This suggests that projects with a lower number of VP are more likely to be completed on time. Therefore, there is an indirect relationship between the number of VP and the success rate of completion.

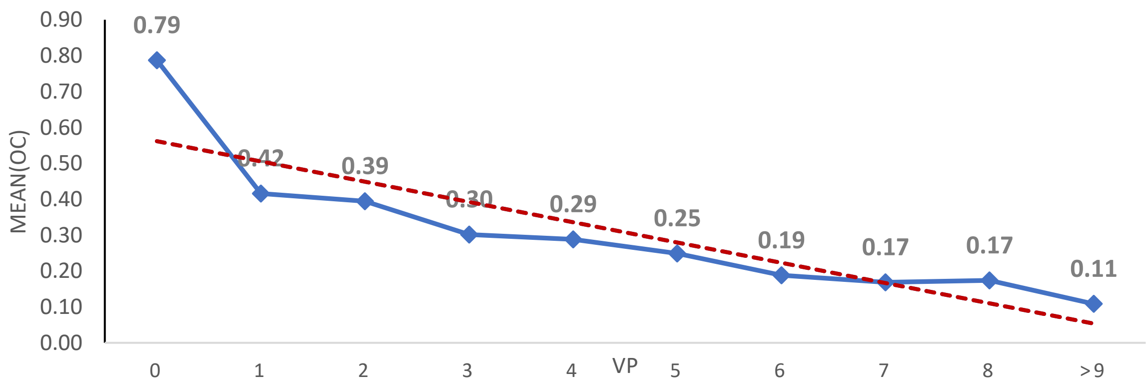


Fig. 4.73 The average of on-time completion rate considering VP

As indicated in Table 4.52, a 1 unit increase in the Variety of Procurement methods (VP) variable would increase the odds ratios of the NO variable in the OC variable by 34%. The significance of this value is less than 0.05, which makes the relationship statistically significant (P<0.001).

Table 4.52
The Logistic Regression Model of on-time completion over the VP

Variable	**Regression coefficient**			**Wald statistics**	**Significant**
	β_0	Std. Error	e^{β_0}		
Intercept	0.837	0.0737	2.309	128.913	<0.001
Variety of procurement	-0.411	0.0201	0.663	415.471	<0.001

<u>Proposition21:</u> *The greater the variety of procurement methods used, the lower the probability of on-time delivery.*

4.7.11.2. Assessing procurement methods (VP) effect on the achievement of objectives

The impact of the Variety of Procurement methods (VP) on predetermined project goal achievements is assessed here. As observed in Figure 4.74, an increase in VP decreases the frequency of projects that have achieved better outcomes, indicating that a higher number of project contracts negatively impacts attaining their goals.

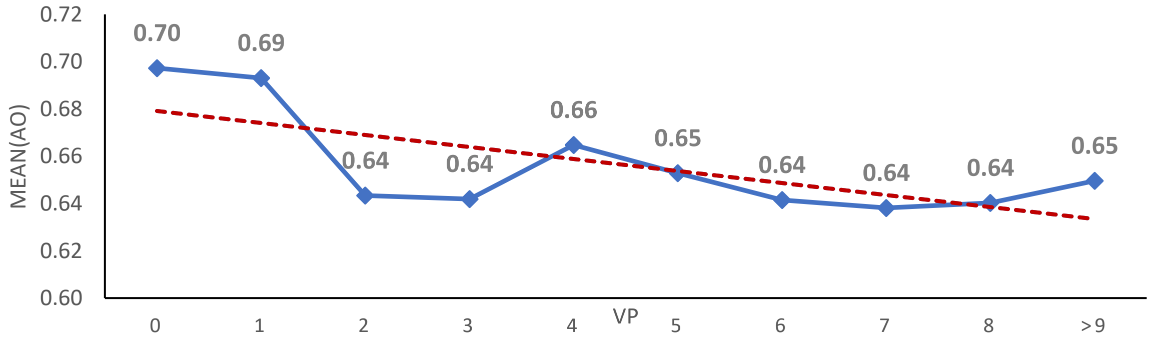


Fig. 4.74 The average of the achievement of objectives rate considering VP

As observed in Table 4.53, a 1 unit increase in the Variety of Procurement methods (VP) variable would decrease the odds at higher levels of project outcome by 8%. The significance of this value is less than 0.05, making the relationship statistically significant (P<0.001).

Table 4.53
The Logistic Regression Model of achievement of project objectives over the VP

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.989	0.3582	0.003	279.491	<0.001
Intercept-2	-3.223	0.1077	0.04	895.61	<0.001
Intercept-3	-1.883	0.0761	0.152	612.787	<0.001
Intercept-4	-0.116	0.0635	0.89	3.358	0.067
Intercept-5	3.13	0.1228	22.869	649.857	<0.001
Variety of procurement	-0.079	0.0137	0.924	32.88	<0.001

Proposition22: *The lower the variety of procurement methods used, the higher the probability of achieving project goals.*

4.7.11.3. The impact of VP on the relationship between governance and on-time completion

The correlation between governance and the rate of on-time completion considering different VP is shown in Figure 4.75. As it is evident, there is no significant pattern between the correlation of governance and project outcomes.

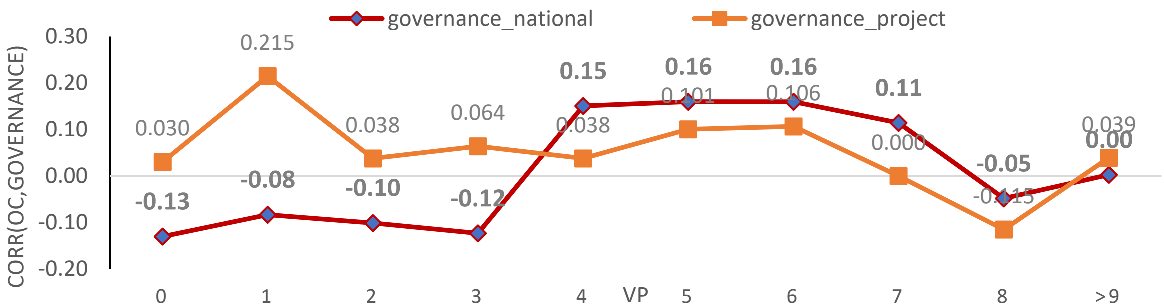


Fig. 4.75 The correlation of governance and on-time completion rate over the VP

Based on the Logistic Regression Model (LRM) results, the indicators of "PV," "AV," "GE," and "RQ" are significant in delivering projects on time, particularly for larger Variety of Procurement methods (VP).

4.7.11.4. The impact of VP on the relationship between governance and achievement of objectives

Figure 4.76 shows the correlation between governance and the project objective achievement rate considering different Variety of Procurement methods (VP). There is a consistent correlation between governance and achieving goals at the project level. This trend remains relatively stable at the national level; however, the figures are lower, and in some cases, approaching zero.

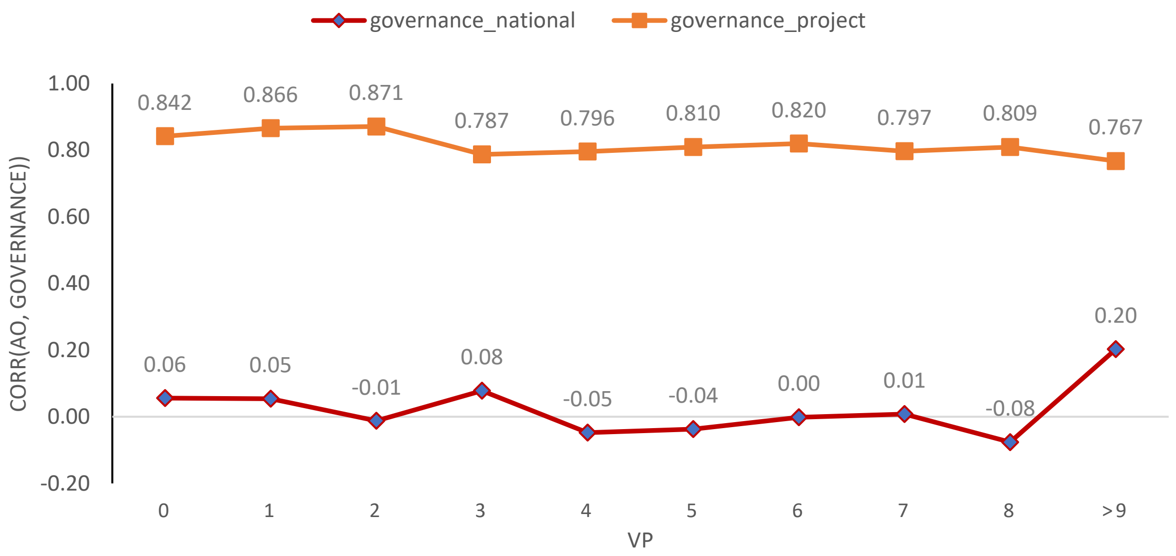


Fig. 4.76 The correlation of governance and the achievement of objectives over the VP

According to the LRM analysis, for VP=1, the governance indicators including "GE," "RL," and "CC" are significant in achieving project objectives. For 1<VP≤3, the significant indicators are "VA," "GE," "CC," "GP," "SP," and "ME." At 3<VP≤5, only "VA" and "ME"

are significant in achieving project objectives. Finally, for 5<VP, the significant indicators are "GP," "SP," and "ME" in achieving project objectives.

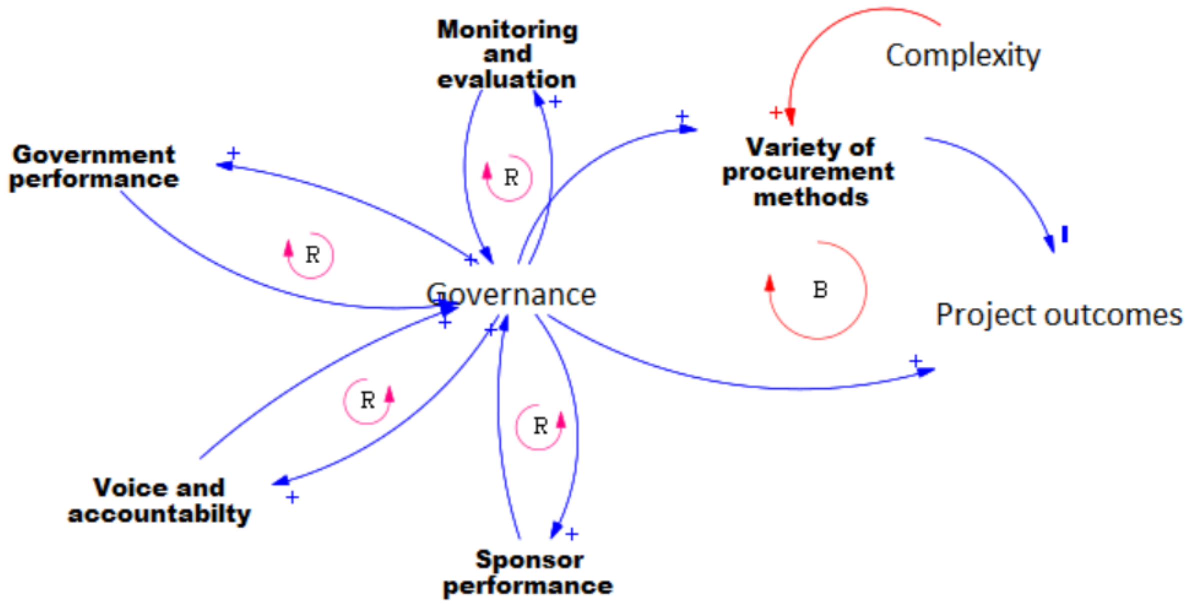


Fig. 4.77 Causal loop diagram of governance indicators to deal with the complexity of variety of procurement methods

4.7.12. The marginal effect of diversity of suppliers (DS)

All of the World Bank's projects utilise various sources of suppliers worldwide, which includes the procurement of products and materials, recruitment of implementing agencies and hiring of consulting companies. According to the World Bank's procurement database in 2021, China, the United States, India, France, the United Kingdom, and Germany are among the top supplying countries. It is worth noting that the rankings and values of the top suppliers are vary from year to year due to changes in procurement policies and global economic factors.

4.7.12.1. Assessing the diversity of suppliers (DS) on on-time completion

As observed in Figure 4.78, the frequency of projects completed on time according to the Number of Suppliers (DS) is highest in the first and second categories. This suggests that projects with a lower number of suppliers are more likely to be completed on time, indicating the existence of an indirect relationship between the DS and the success rate of completion.

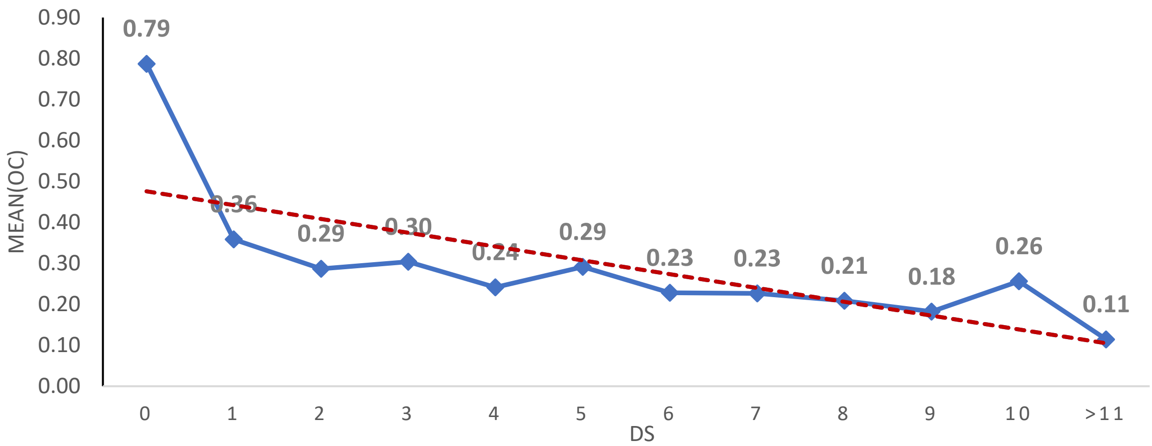


Fig. 4.78 The average of on-time completion rate considering DS

Table 4.54
The Logistic Regression Model of on-time completion over the DS

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept	0.368	0.0617	1.445	35.532	<0.001
Diversity of suppliers	-0.273	0.0169	0.761	259.782	<0.001

As indicated in Table 4.54, a 1 unit increase in the Number of Suppliers (DS) variable would increase the odds ratios of the NO variable in the OC variable by 24%. The significance of this value is less than 0.05, making the relationship statistically significant (P<0.001).

Proposition23: The results obtained in Figure 4.78 and the details tabulated in Table 4.54 suggest that the greater the diversity of suppliers, the lower the probability of on-time delivery.

4.7.12.2. Assessing diversity of suppliers (DS) effect on the achievement of objectives

The impact of the Number of Suppliers (DS) trends on predetermined project goal achievements is assessed here. As observed in Figure 4.79, an increase in DS decreases the frequency of projects that have achieved better outcomes.

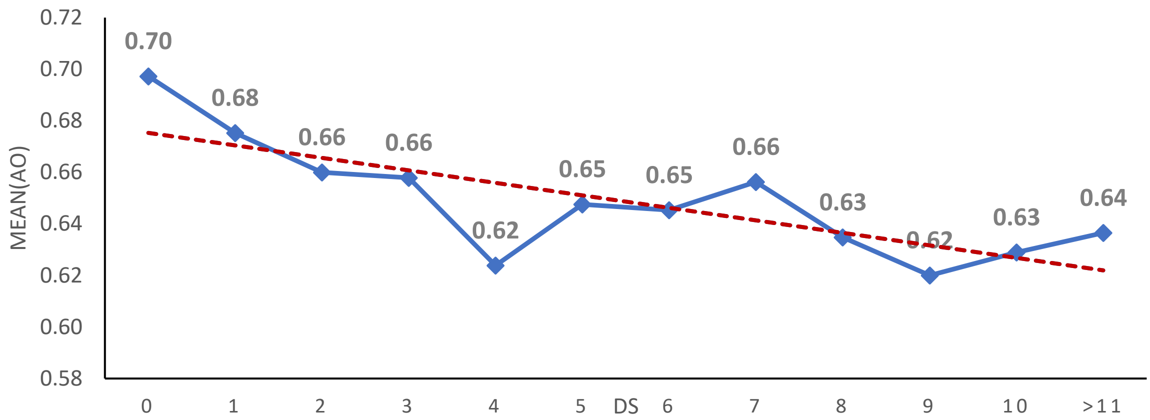


Fig. 4.79 The average of the achievement of objectives rate considering DS

As observed in Table 4.55 based on the Logistic Regression Model (LRM) analysis, a 1 unit increase in the Number of Suppliers (DS) variable would decrease the odds at higher levels of project outcome by 6%. The significance of this value is less than 0.05, making the relationship statistically significant ($P<0.001$).

Proposition24: *The results shown in Figure 4.79 and the details tabulated in Table 4.55 suggest that the lower the number of suppliers, the higher the probability of achieving project goals.*

Table 4.55
The Logistic Regression Model of achievement of project objectives over the DS

Variable	Regression coefficient			Wald statistics	Significant
	β_0	Std. Error	e^{β_0}		
Intercept-1	-5.901	0.3566	0.003	273.881	<0.001
Intercept-2	-3.136	0.1021	0.043	942.704	<0.001
Intercept-3	-1.796	0.0681	0.166	694.98	<0.001
Intercept-4	-0.033	0.055	0.968	0.358	0.55
Intercept-5	3.209	0.1194	24.753	722.334	<0.001
Diversity of suppliers	-0.054	0.0102	0.948	28.098	<0.001

4.7.12.3. The impact of DS on the relationship between governance and on-time completion

The correlation between governance and the rate of on-time completion considering different Number of Suppliers (DS) is shown in Figure 4.80. This graph demonstrates a significant amount of fluctuation in the correlation over the DS, both at the national and project levels.

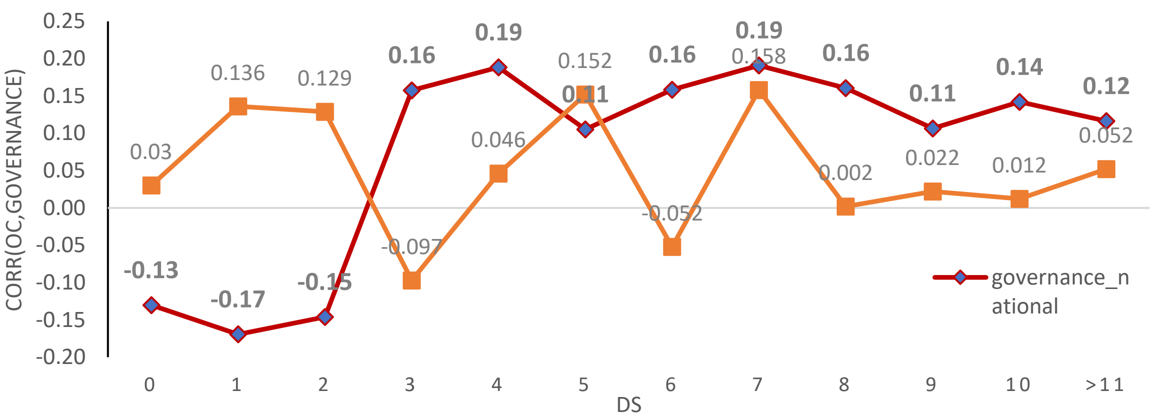


Fig. 4.80 The correlation of governance and on-time completion rate over the DS

Based on the LRM results, the "AV" indicator is the most significant governance indicator in delivering projects on time.

4.7.12.4. The impact of DS on the relationship between governance and achievement of objectives

Fig. (4.81) shows the correlation between governance and the project objective achievement rate considering different DS. There exists a stable correlation between governance and achieving objectives most of the time at the project level.

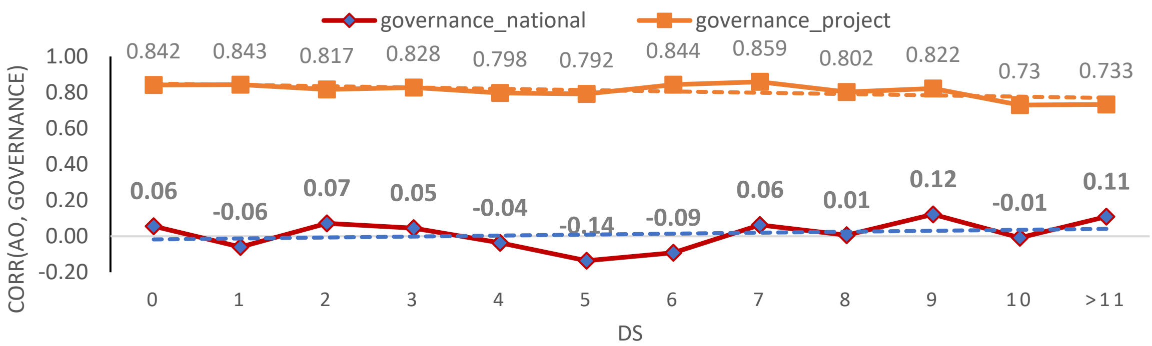


Fig. 4.81 The correlation of governance and the achievement of objectives over the VP

A logistic regression model has been conducted to analyse the status of governance indicators with different levels of diversity of suppliers involved in projects. As clearly observed from the LRM results, the indicators of "GP," "SP," and "ME" are statistically significant for high levels of Number of Suppliers (DS) in achieving project objectives.

The optimal governance network has been created in Figure 4.82. This figure showcases the governance indicators at the project level in managing a large number of suppliers.

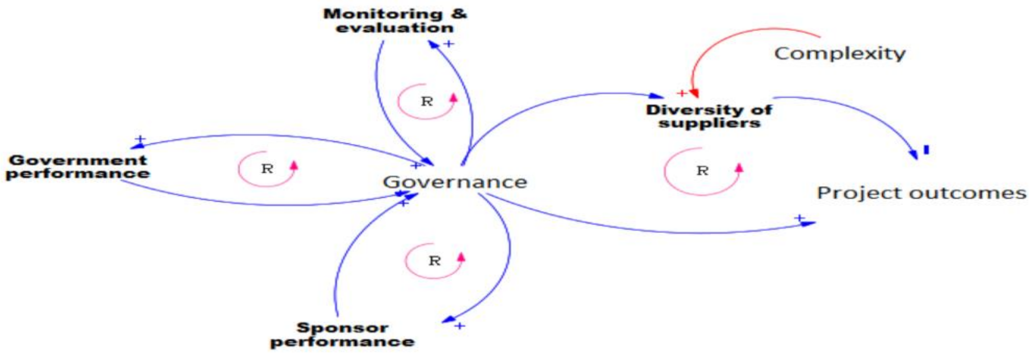


Fig. 4.82 Causal loop diagram of governance indicators to deal with the complexity of diversity of suppliers

4.8. Network analysis of dataset

Network analysis refers to a set of research procedures that are used to determine the structure of systems, with a focus on the correlations between their components rather than on the attributes of individual cases (Hanneman & Riddle, 2005). In this section, network analysis is used to determine the optimal governance network that achieves better project outcomes in dealing with complexities. Additionally, it aims to demonstrate the diversity and connectivity of disciplines involved in projects through the use of networks. The analysis also includes an assessment of project performance across different world regions using network analysis techniques. By employing this methodology, the study aims to gain insights into the interplay between governance networks and project performance, and identify the factors that contribute to successful project outcomes in international development. The findings of this analysis will inform policymakers and practitioners on best practices for effective project governance and highlight the importance of fostering collaboration and coordination among different actors in complex development projects.

4.8.1. Diversity of disciplines and themes involved in international development projects

The field of international development projects involves a diverse range of disciplines and themes, with over 74 sectors playing a role. These sectors span various areas, including health, agriculture, water supply, fisheries, construction, IT, aviation, and many others. As shown in Figure 4.83, central government projects have the highest degree centrality, with an outdegree count of 1345. Sub-national government, social protection, public administration, health, and agriculture sectors also exhibit significant degree centrality values of 609, 546, 513, 458, and 451, respectively.

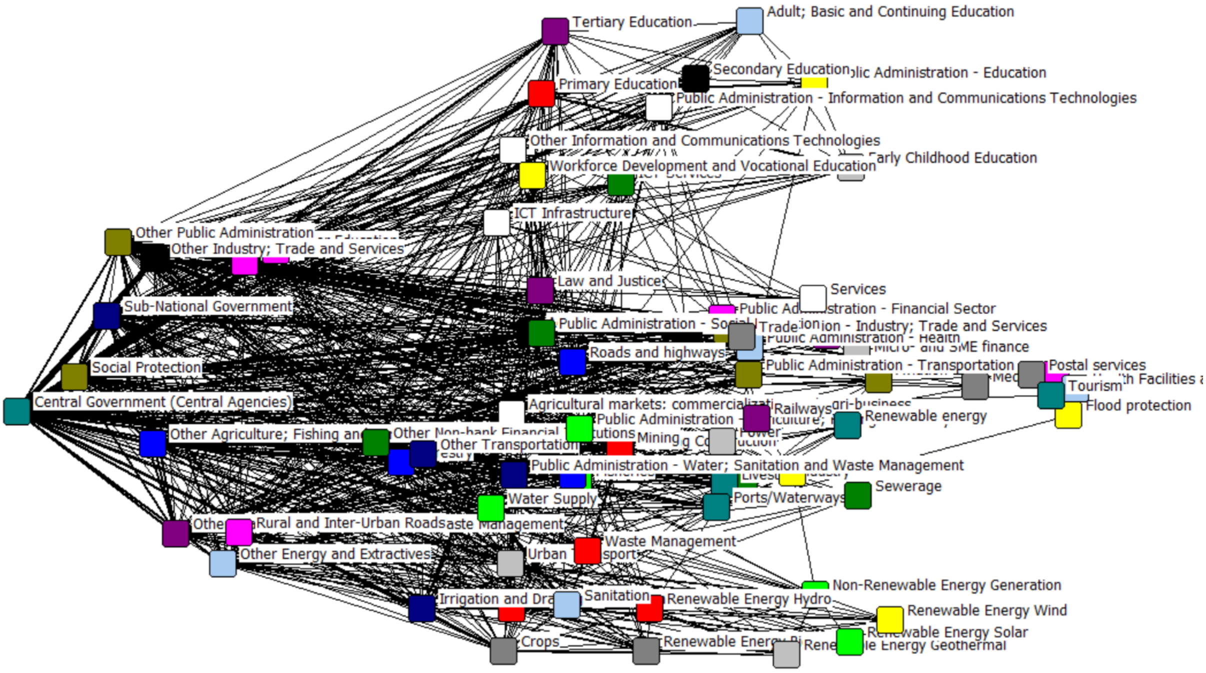


Fig. 4.83. Principal components of disciplines involved in international development projects

In addition to these findings, Figure 4.84 also depicts ego networks of international development sectors in different regions, highlighting the connectivity and interdependencies between these sectors.

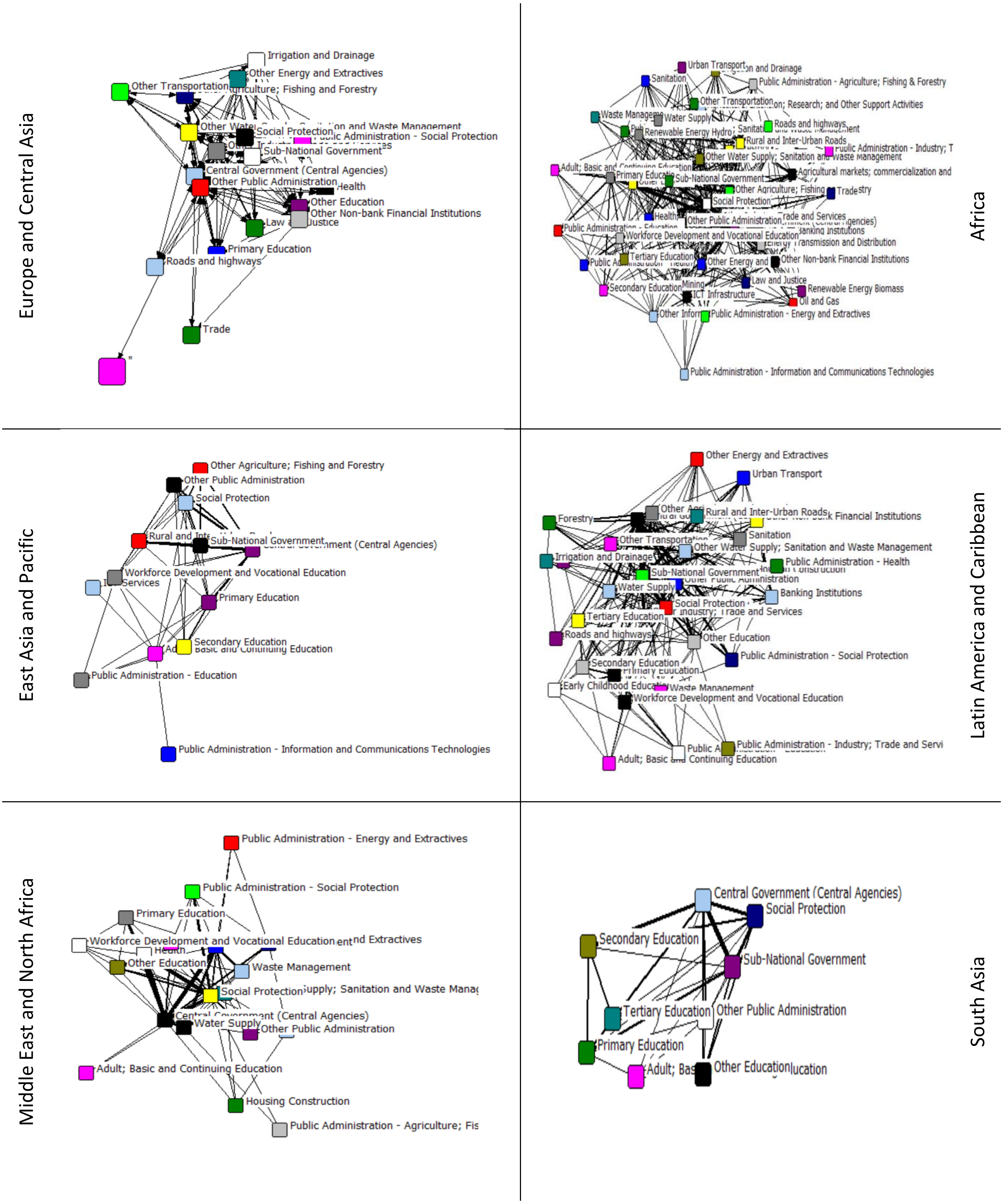


Fig. 4.84 Ego networks of international development sectors in different regions

By analysing these networks, we gain insights into the distribution of power and resources across different sectors. Furthermore, this analysis highlights the importance of collaboration and coordination among various actors in achieving successful project outcomes in international development. Figure 4.84 shows the ego networks of international development sectors in different regions.

Overall, the diversity of sectors involved in international development projects highlights the importance of multidisciplinary collaboration and coordination. Understanding the connections between these sectors is crucial for the success of development projects, and this analysis provides valuable insights for achieving positive outcomes in this field.

As per the procurement database of the World Bank, Public Admin projects have the highest number of contracts, followed by Transportation, Water Sanit Waste, Agriculture, Education, Health & Social, Energy & Extractives, Social Protection, Industry & Trade Ser, Financial Sector, and Info & Communication. The International Competitive Bidding method is widely adopted in the Health & Social, Energy & Extractives, Education, Transportation, Public Admin, and Social Protection industries. While this method is not as commonly used in the Financial Sector and Social Protection sectors, it still has the highest number of contracts. In Agriculture, Social Protection, and Water Sanit Waste projects, the National Competitive Bidding method is allocated the biggest share of contracts, with 25.3%, 24.8%, and 21.8% respectively. In Financial Sector and Info & Communication projects, 24.8% and 22.2% of contracts are allocated to Quality and Cost-Based Selection, respectively.

According to Table 4.56, which shows the performance of different sectors in projects and their correlations with governance, the correlations between M&E quality and goals achievement vary across sectors. Positive correlations are observed in several sectors, including

Agriculture, Education, Energy, Health, Social protection, Transportation, and Water. However, there are also sectors where the correlations are negative, such as Industry and Public administration. The correlations range from -0.31 to 0.76, indicating that the relationship between M&E quality and goals achievement is not straightforward and depends on the specific sector.

It is crucial to consider these correlations when designing and implementing development projects. Monitoring and evaluation are essential tools to assess project performance and identify areas that require improvement. Proper M&E practices can help to improve the quality of development projects and increase their likelihood of achieving their intended goals.

Table 4.56
Project performance in different sectors and their correlations with governance

	1	2	3	4	5	6	7	8	9	10	11
Number of projects	438	331	342	195	260	165	59	933	270	359	327
M&E (sound governance) quality	0.65	0.75	0.73	0.62	0.74	0.62	0.72	0.67	0.73	0.66	0.66
Correlation of M&E and on-time completion	-0.18	-0.03	-0.07	-0.17	0.12	0.13	-0.02	0.20	-0.08	-0.10	-0.23
Correlation of M&E and goals achievement	0.51	0.38	0.23	0.73	0.20	0.76	-0.31	0.52	0.47	0.58	0.57

(1) Agriculture (2) Education (3) Energy (4) Financial sector (5) Health (6) Industry (7) ICT (8) Public administration (9) Social protection (10) Transportation (11) Water

4.8.2. Overall project performance across the world regions

Table 4.57 presents the results of a social network analysis that examines the project performance centrality in different world regions. The table shows the degree centrality, weighted degree centrality, and relative markable for each region, as well as the performance categories, ranging from highly satisfactory to highly unsatisfactory.

The results of the analysis reveal significant differences in project performance across the different regions. Europe and Central Asia have the highest satisfactory project count, with a more satisfactory weighted degree centrality, followed by Latin America and the Caribbean and South Asia. On the other hand, the Middle East and North Africa performed the most poorly, with the highest degree of unsatisfactory projects. The analysis also shows that Africa has the lowest satisfactory weighted degree centrality, indicating weaker collaboration and coordination among actors in the network and lower project performance. Figure 4.85 also shows projects performance in different world regions.

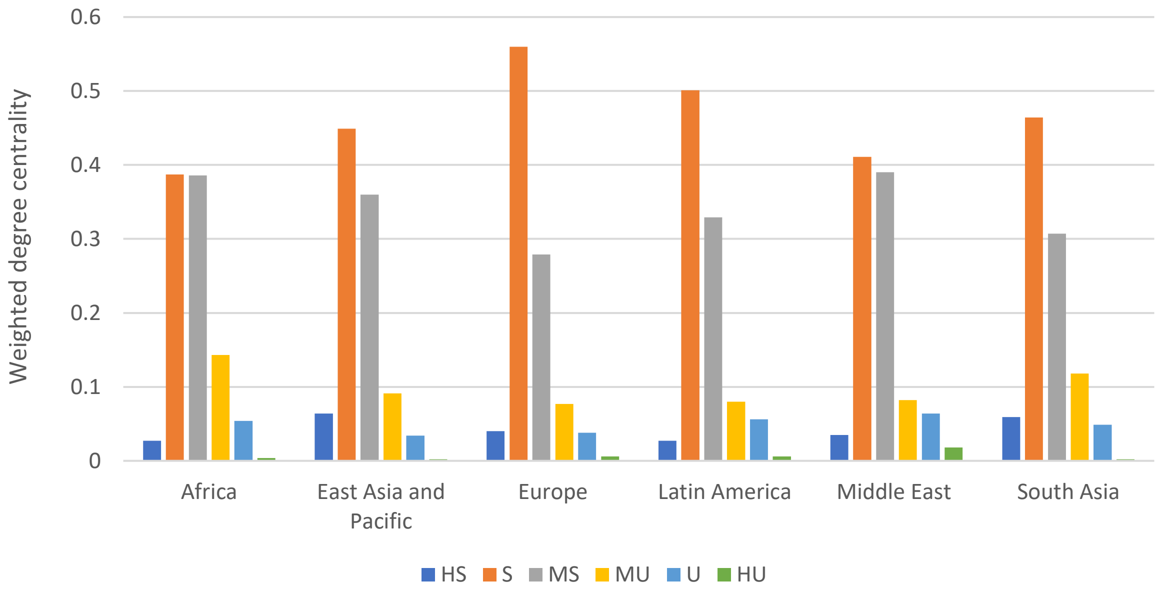


Fig. 4.85 Projects performance in different world regions

Looking closer at each region's project performance, we can observe that Africa had the highest number of moderately unsatisfactory projects (MU), with a weighted degree centrality of 0.143. This is followed by unsatisfactory projects (U), with a weighted degree centrality of 0.054. Conversely, East Asia and the Pacific had the highest number of highly satisfactory projects (HS), with a weighted degree centrality of 0.064. Europe and Central Asia also had a high number of highly satisfactory projects, with a weighted degree centrality of 0.04.

Table 4.57
Project performance centrality in different world regions

Region (degree)	Performance	Degree centrality	Weighted degree centrality	Relative markable
Africa (1122)	HS	30	0.027	30
	S	434	0.387	7
	MS	433	0.386	8
	MU	160	0.143	13
	U	60	0.054	23
	HU	4	0.004	34
East Asia and Pacific (561)	HS	36	0.064	19
	S	252	0.449	4
	MS	202	0.360	9
	MU	51	0.091	15
	U	19	0.034	28
	HU	1	0.002	35
Europe and Central Asia (652)	HS	26	0.040	25
	S	365	0.560	1
	MS	182	0.279	12
	MU	50	0.077	18
	U	25	0.038	26
	HU	4	0.006	32
Latin America and Caribbean (659)	HS	18	0.027	29
	S	330	0.501	2
	MS	217	0.329	10
	MU	53	0.080	17
	U	37	0.056	22
	HU	4	0.006	33
Middle East and North Africa (282)	HS	10	0.035	27
	S	116	0.411	5
	MS	110	0.390	6
	MU	23	0.082	16
	U	18	0.064	20
	HU	5	0.018	31
South Asia (407)	HS	24	0.059	21
	S	189	0.464	3
	MS	125	0.307	11
	MU	48	0.118	14
	U	20	0.049	24
	HU	1	0.002	36

HS- Highly Satisfactory S- Satisfactory MS- Moderately Satisfactory MU- Moderately Unsatisfactory U- Unsatisfactory HU- Highly Unsatisfactory

Overall, the results of the social network analysis suggest that project performance varies across different world regions, with some regions having a stronger network structure and better collaboration among actors than others. The analysis also highlights the importance of collaboration and coordination among different actors in achieving successful project outcomes. By understanding these dynamics, development practitioners and policymakers can better plan and execute development projects that lead to positive changes for communities.

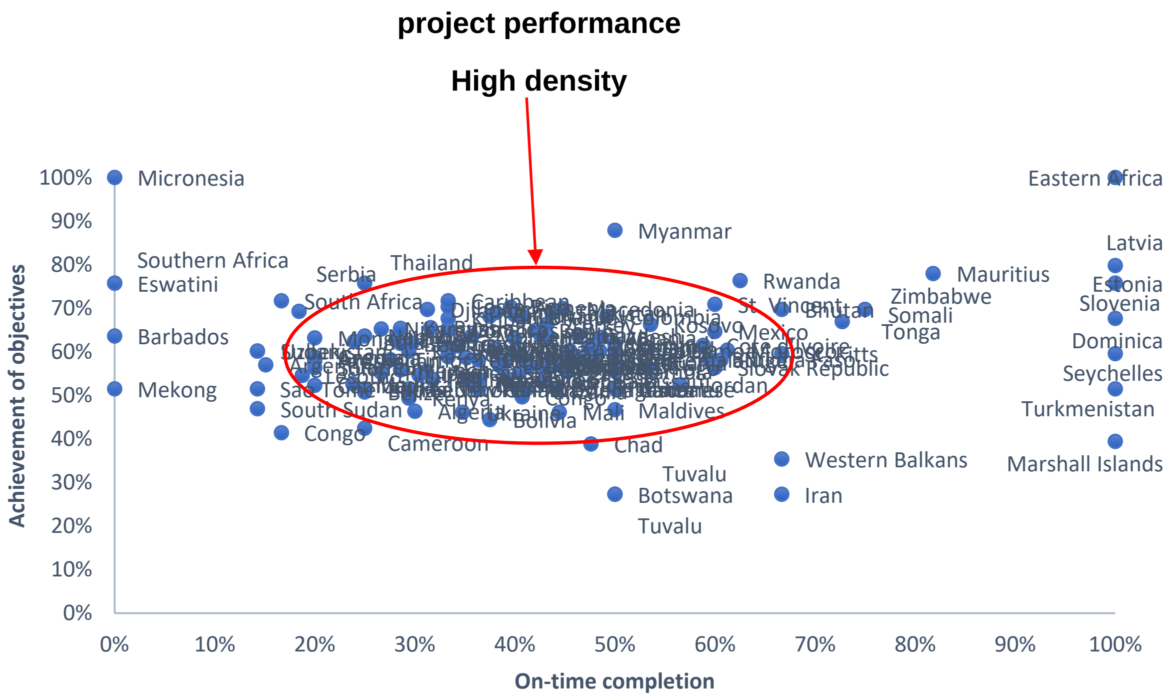


Fig. 4.86 Countries development project performance

The World Bank procurement database 2021 reveals the top borrowing and supplying countries for development projects. Vietnam, Congo Democrat, Uganda, Madagascar, Ethiopia, Bangladesh, Kyrgyz Republic, Uzbekistan, and Somalia are among the top borrowing countries. Meanwhile, the United States, China, India, France, the United Kingdom, and Germany are the top supplying countries.

Figure 4.79 records the density of project performance among countries and shows that several countries have a high level of on-time project completion. Specifically, projects in Eastern Africa, Latvia, Estonia, Dominica, Seychelles, Turkmenistan, and the Marshall Islands have been completed on time. It is worth noting that the Federated States of Micronesia had only one project, which started in 2014 and ended in 2019 with a highly satisfactory performance rating.

4.8.3. The optimal governance networks in dealing with complexity

This sub-section constructs the formulation of optimal governance networks tailored to navigate the intricate landscape of project complexity. Building upon the insights derived from the Logistic Regression Modelling (LRM) analysis presented in the previous section, these networks spotlight pivotal governance indicators essential for timely project delivery and successful achievement of objectives within the challenging framework of complexity. Furthermore, the relationships between governance indicators are analysed and presented.

The following steps have been taken to analyse governance networks. Firstly, a binary matrix, derived from the LRM, was created for all complexity factors discussed in the previous sections. A binary matrix is the most straightforward and widely-used type of matrix. In this matrix, a 'one' is recorded in a cell if a tie exists, and a 'zero' is recorded if there is no tie (Hanneman & Riddle, 2005). Table 4.58 displays a binary matrix that illustrates the governance indicators involved in delivering projects on time, considering a high level of complexity.

Table 4.58
The binary matrix of governance indicators in delivering projects on time

	CC	GE	GP	ME	PV	RL	RQ	SP	VA
CC	-	0	1	0	0	0	0	4	0
GE	0	-	2	0	0	0	4	4	0
GP	0	0	-	0	0	0	0	3	0
ME	0	0	0	-	0	0	0	1	0
PV	0	4	3	0	-	0	5	4	0
RL	1	0	0	0	0	-	0	2	0
RQ	2	0	2	0	0	1	-	6	0
SP	0	0	0	0	0	0	0	-	0
VA	1	6	2	1	5	2	6	11	-

Based on the binary matrix (Table 4.58), multiple centrality measures have been calculated, as shown in Table 4.59. Both "VA" and "SP" have recorded the highest degree centrality, with "VA" having the highest eigenvector. This points towards the governance indicators at the national level, highlighting the crucial role of national indicators in delivering projects on time, rather than project governance indicators. For more information, please refer to Figure 4.87.

Table 4.59
Governance indicators centrality measures (towards on-time completion)

	1	2	3	4	5	6
	Outdegree	Indegree	Outclose	Inclose	Betweenness	Eigenvector
CC	5.00	4.00	20.00	16.00	1.00	0.027
GE	10.00	10.00	16.00	20.00	0.00	0.078
GP	3.00	10.00	22.00	13.00	0.00	0.017
ME	1.00	1.00	22.00	22.00	0.00	0.007
PV	16.00	5.00	14.00	22.00	0.00	0.172
RL	3.00	3.00	19.00	18.00	0.00	0.014
RQ	11.00	15.00	16.00	18.00	4.00	0.047

SP	0.00	35.00	24.00	8.00	0.00	0.022
VA	34.00	0.00	8.00	24.00	0.00	0.980

In Table 4.59, the social network analysis results indicate that "VA" has the highest outdegree (34) and eigenvector (0.980), while "SP" has the highest indegree (35). These results suggest that "VA" is a highly influential governance indicator, while "SP" is heavily influenced by other indicators. The table also shows that "RQ" has the highest betweenness (4), indicating its potential role as a bridge between other governance indicators. The relatively high values for outclose and inclose centrality measures for various indicators demonstrate the overall interconnectedness of the governance indicators in ensuring on-time project completion.

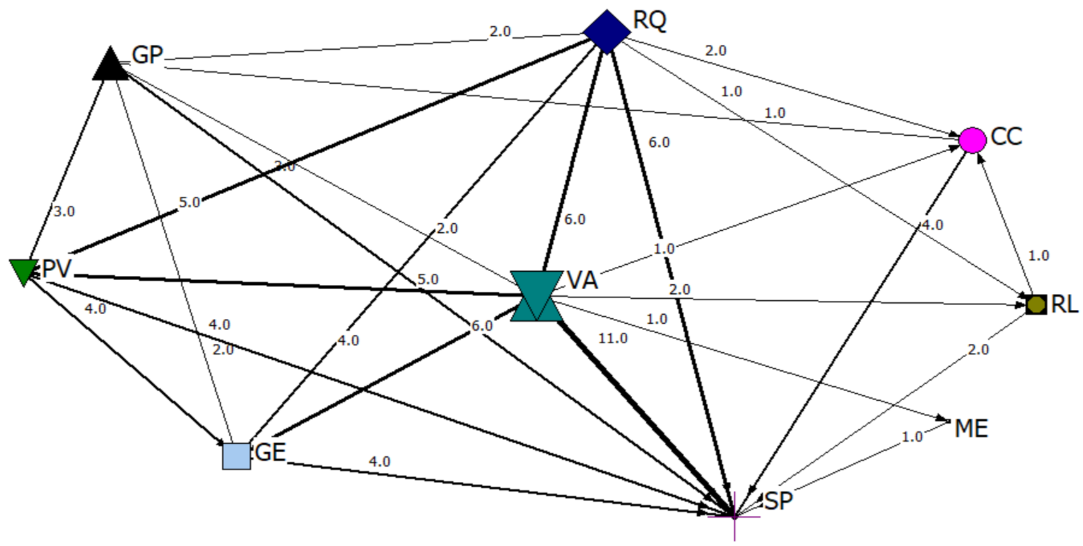


Fig. 4.87 Governance indicators network for dealing with complexities and accomplishing on-time completion (link weights)

Table 4.60 presents a binary matrix illustrating the governance indicators involved in achieving a project's objectives, taking into account a high level of complexity. The indicators "GP," "ME," and "SP" demonstrate the strongest connections with other indicators.

Table 4.60
The binary matrix of governance indicators in achieving project objectives

	CC	GE	GP	ME	PV	RL	RQ	SP	VA
CC	-	0	10	7	0	0	0	10	0
GE	7	-	12	8	0	7	2	12	0
GP	0	0	-	33	0	0	0	45	0
ME	7	8	33	-	1	8	4	32	17
PV	1	2	4	1	-	0	0	4	0
RL	8	0	10	8	0	-	0	10	0
RQ	1	0	5	4	0	3	-	5	0
SP	0	0	0	32	0	0	0	-	0
VA	4	4	18	17	3	3	2	18	-

As observed in Table 4.61 and Figure 4.88, the role of project governance indicators, including "GP," "ME," and "SP," in achieving project objectives is undeniable. All three indicators belong to the governance at the project level. Notably, "GE" serves as a bridge between other indicators in the governance network (Betweenness=2).

Table 4.61
Governance indicators centrality measures (towards achieving project objectives)

	1	2	3	4	5	6
	Outdegree	Indegree	Outclose	Inclose	Betweenness	Eigenvector
CC	27.000	21.00	18.00	14.00	0.00	0.00
GE	48.00	6.00	12.00	20.00	2.00	0.00
GP	78.00	59.00	20.00	12.00	0.00	0.00
ME	0.00	110.00	24.00	8.00	0.00	1.00
PV	12.00	3.00	12.00	22.00	0.00	0.00
RL	36.00	13.00	16.00	17.00	0.00	0.00
RQ	18.00	4.00	14.00	19.00	0.00	0.00
SP	32.00	104.00	22.00	10.00	0.00	0.00
VA	69.00	0.00	8.00	24.00	0.00	0.00

In Table 4.61, the social network analysis results show that "ME" has the highest indegree (110), indicating its significant influence from other governance indicators in achieving project objectives. "GP" has the highest outdegree (78), which suggests that it strongly influences other indicators. Furthermore, "GE" has a betweenness centrality of 2, acting as a bridge between other indicators in the governance network. The relatively high values for outclose and inclose centrality measures for various indicators demonstrate the overall interconnectedness of the governance indicators in ensuring the achievement of project objectives.

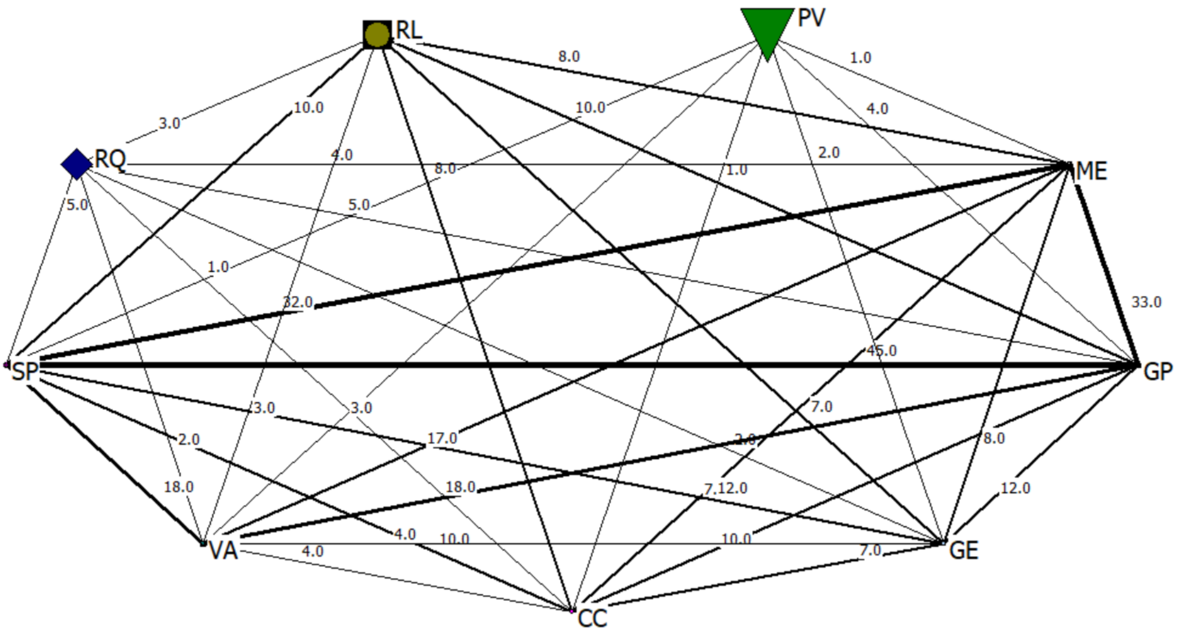


Fig. 4.88 Governance indicators network for dealing with complexities and accomplishing project objectives (link weights)

4.9. Identifying key factors affecting project outcomes using NLP

This study analysed 3,683 project completion documents to identify critical factors influencing project outcomes. Due to the vast collection of documents, the topic modelling method, a hierarchical mixture modelling approach, was employed. Natural Language Processing (NLP) techniques, such as topic modelling, enable the analysis of large volumes of text data by identifying patterns, extracting meaningful information, and classifying documents into categories. In this case, the method helped to identify and group factors affecting project performance.

Before undertaking the topic modelling, a literature review was conducted, from which factors influencing project performance were collected and tabulated in Table 4.62. All factors were then classified into fifteen primary topic categories.

Table 4.62
Key factors affecting project outcomes from literature

Factors	Associates' keywords	Reference
Political	inconsistency, instability, revolution, import restriction	Kwak (2002); Banihashemi et al. (2017)
Legal	changes in laws, currency conversion, lack of appropriate regulatory systems, role of local courts in arbitration	Kwak (2002); Banihashemi et al. (2017)
Cultural	differing socio-cultural backgrounds and thought process of actors, anchoring changes in the organization's culture	Kwak (2002); Khan et al. (2013)
Technical	use of technology and standards incompatible with project	Kwak (2002); Banihashemi et al. (2017)
Managerial/organisational	project management styles, lack of appropriate processes and resources, implementation approach, flexible project planning, degree and consistency of local leadership, trust, empowering leadership	Khan et al. (2013); Kwak (2002); Struyk (2007); Vickland and Nieuwenhuijs (2005); Khang and Moe (2008); Diallo and Thuillier (2005); Zwikael and Globerson (2007); Yamin and Sim (2016)
Economic	changes in economic conditions, competition, regulatory changes	Kwak (2002); Banihashemi et al. (2017)
Environmental	pollution—noise, air, water, visual, unsustainable use of natural resources, local environment, natural disasters	Kwak (2002); Struyk (2007)

Social	ethnic hostility, religious fragmentation, resistance of beneficiaries to new social values	Kwak (2002); Banihashemi et al. (2017)
Corruption	political participation in investment decision making, lack of regulatory institutions, transparency	Kwak (2002); Banihashemi et al. (2017)
Governance	systems of control, relationships, processes, monitoring, evaluation, roles of governance institutions and steering groups, roles and responsibilities	Ika et al. (2012); (Müller et al., 2016); Bekker and Steyn (2008); Almahmoud et al. (2012)
Financial	budget, fund disbursement,	Ika (2015)
Collaboration/Partnership	selecting the right project team, networking and team building, number of implementing actors, alignment of actors, communication	Khan et al. (2013); Struyk (2007); (Vickland & Nieuwenhuijs, 2005); Diallo and Thuillier (2005); Ika et al. (2012); (Turner & Müller, 2005)
Safety and security	wars, coups, acts of terrorism, uncontrollable circumstances, security of stakeholders,	Kwak (2002); Kwak and Anbari (2004)
Human resource	capabilities, knowledge, competencies, extensive training,	Zwikael and Globerson (2007)
Procedural	supply chain, tendering, interventions	Seo et al. (2014); Bayiley and Teklu (2016)

Recent advances in Bayesian non-parametric modelling, specifically the hierarchical Dirichlet process (HDP) (Teh et al., 2004), have led to the development of "infinite" topic models. In this approach, the number of topics in the collection must be specified in advance (Table 4.62), with the possibility of increasing it (Blei et al., 2010; Blei, 2012). In this section of the study, topic modelling is employed to identify and classify the key factors affecting international development project outcomes. All keywords extracted from the project completion documents have been tabulated in Appendix four, with the most frequent keywords displayed in Figure 4.89. Additionally, some crucial factors have been identified through manual coding and content analysis, as shown in Table 4.63. By combining topic modelling and manual analysis techniques, this study offers a comprehensive understanding of the factors that play a significant role in shaping project outcomes.

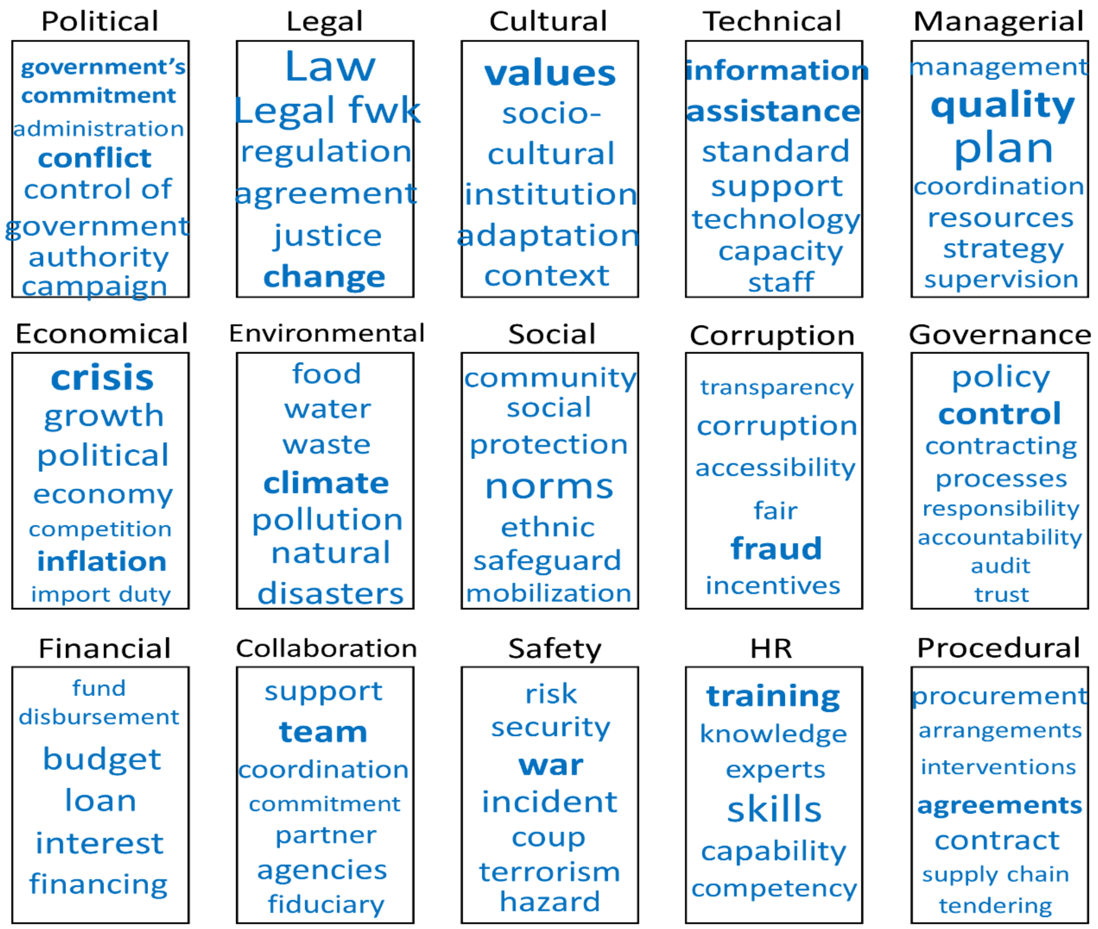


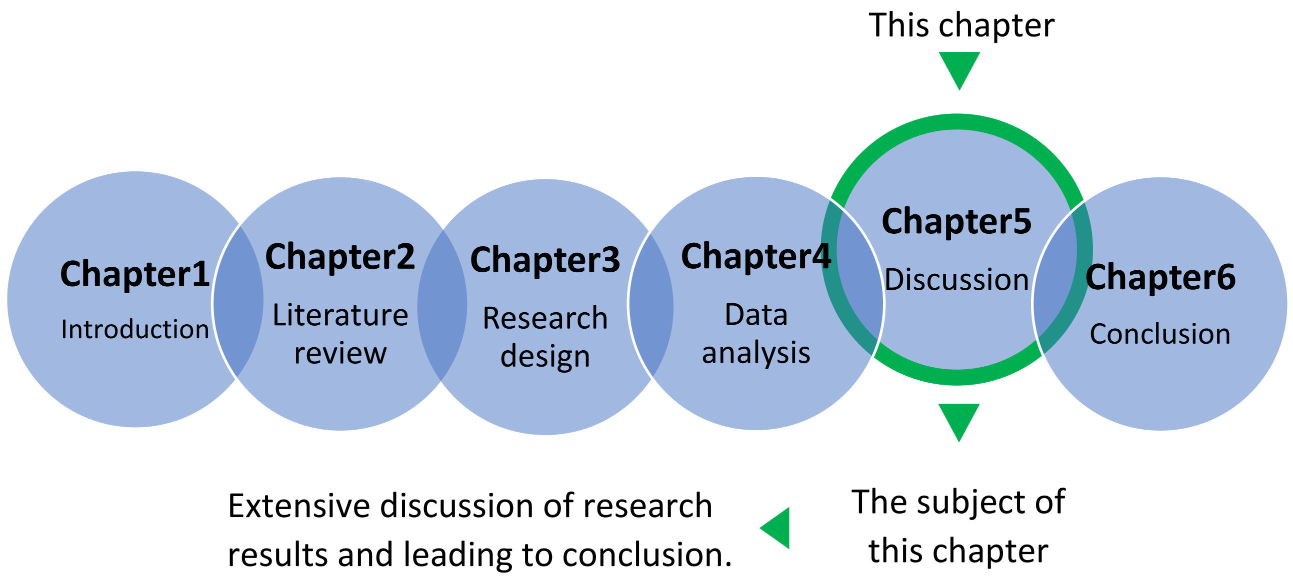
Fig 4.89 Top key factors affecting project outcomes

Fig. 4.89 captures the intricate tapestry of factors influencing international development projects, clustered into 15 key categories. Political dynamics, technical prowess, and managerial acumen stand out, each playing a crucial role in different project phases. Financial considerations, collaborative efforts, procedural integrity, and legal compliance emerge as vital components. Cultural nuances, economic forces, environmental impacts, and social dimensions weave into the project fabric. The perpetual battle against corruption, governance structures, safety measures, and human resource development shape the narrative. This figure is a short guide, highlighting the key factors for successful international development projects. More details will be explained in the next chapter.

Table 4.63
Major factors affecting implementation and outcome classified based on different performances (Manual coding)

Low performance	Moderate performance	High performance
Political changes	Changes in administration	Ineffective financial management
Inadequate counterpart operational funding	Long delay between Bank and the National Assembly approval	Slow initial procurement affected disbursement
Bureaucratic administrative procedures	capacity and lack of leadership	The country’s civil war
The commitment of the Steering Committee	Budget resources	Limited Procurement and FM capacity of the PAU
Institutional capacity	Slow disbursement	Political crisis
Dual role of the Project Manager	Insecurity, instability and uncertainty about holding of elections	Quality of M&E
Weak project coordination	Insufficient implementation capacity	Difficulties with contracts to NGOs
Inconsistencies in implementation modalities	High governance and fiduciary risk	Turn-over of experts
Adequacy of Government’s commitment	Weak capacity of the main actors	The capacity of HR to deliver services
Quality of M&E	Chronic HR related issues	Changes to project leadership
Large number of vested interests	Low capacity of project financial and procurement management	The centralisation of the project management structure
Generally dysfunctional implementation arrangements	Institutional weaknesses	Strong Government commitment
Weak capacity of implementing agencies	Turnover of and coordination of handover between Bank	Project steering guidance and oversight
Dysfunctional procurement management	Reform program of the government	Lack of solid institutional arrangements and funding mechanisms
Weak overall donor coordination	Changes within the Ministries	Public accessibility of information
Working with the Bank’s complex procedures	Frequent turnover of key staff and human resource constraints	Streamlined Procedures for adjustment operations
Political Environment	Executing Agency Implementation Capacity	Stakeholder involvement and/or participatory processes
Project Staffing	Decentralized structure to report progress	Suspension of disbursement
dialogue between the Bank team and the project team members became more and more strained	Political and security context	Financial autonomy

Chapter 5



5.1. Introduction

This chapter provides a detailed discussion of the findings presented in the previous chapter, which explored the impact of governance on the outcomes of international development projects and the moderating effect of complexity on this relationship. As outlined in the previous chapter, the study found that governance, both at the national and project levels, has a positive impact on achieving project objectives, but no evidence was found for a similar influence on on-time project completion. Additionally, the study identified 12 complexity factors that moderate the relationship between governance and project outcomes, with most proxies negatively moderating this influence.

The purpose of this chapter is to delve deeper into these findings and provide a more detailed discussion of the factors that influence the relationship between governance and project outcomes in the context of complex international development projects. Specifically, this chapter examines the nuances of the relationship between governance and project outcomes, exploring the circumstances under which governance indicators are most effective in ensuring that projects achieve their intended objectives. Additionally, this chapter examines the moderating effect of complexity on this relationship, exploring how different complexity factors can impact the effectiveness of governance mechanisms in achieving project outcomes.

To achieve these aims, this chapter draws upon a range of relevant literature and provides a detailed discussion of the findings presented in the previous chapter. Through this discussion, this chapter provides a more nuanced understanding of the relationship between governance, complexity, and project outcomes, highlighting the factors that can enhance or inhibit the effectiveness of governance mechanisms in achieving project objectives.

Overall, this chapter contributes to the ongoing debate around how to design effective governance mechanisms for international development projects. By providing a more detailed discussion of the findings presented in the previous chapter, this chapter informs future research in this area and provides valuable insights for practitioners and policymakers involved in international development.

5.2. A discussion of research methodology: Lessons learned from the study

This thesis presents an application of data science in the context of project management. The research methodology used in this study adopts a multi-method approach that encompasses both qualitative and quantitative methods to evaluate the success and impact of governance on project outcomes at a global level. The study utilises data from the World Bank and analyses it by applying a conceptual model that validates and tests existing correlations and relationships between governance indicators, complexity factors, and project outcomes. The study aims to analyse the impact of governance on international development projects, while taking into account the moderating role of project complexity.

To conduct this study, an innovative five-stage approach was followed, including background understanding, data collection, data exploration, statistical analysis, and network analysis (see Figure 5.1). The data for this study primarily consisted of secondary sources covering a 20-year period. These sources included international development project completion reports, guidelines, and procedures obtained from the World Bank website. Natural language processing (NLP) techniques were used to analyse the reports of 3,683 projects, identifying the main themes and features of project performances. Statistical tools, such as structural equation modelling (SEM) and logistic regression modelling (LRM), were then used to evaluate the influence of governance on project outcomes and the role of complexity in moderating the relationship between governance and project outcomes. Lastly, network analysis techniques were used to identify the governance networks for dealing with complexity and achieving project outcomes.

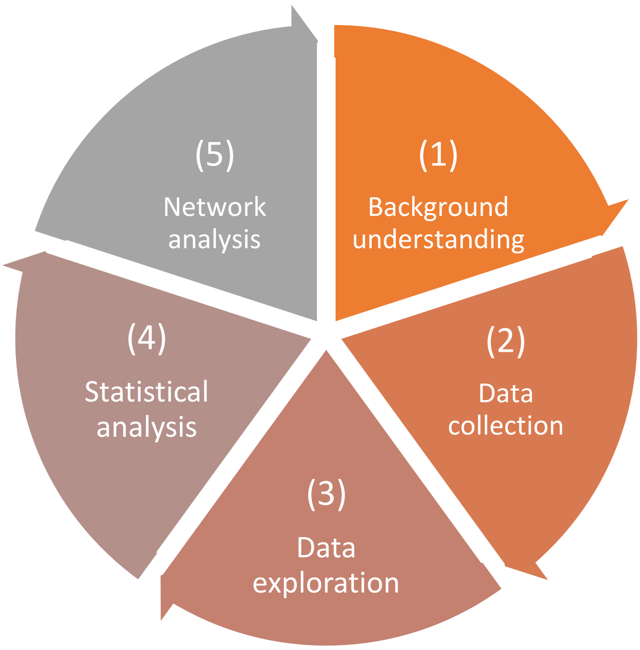


Fig 5.1 Research process

The World Bank's Independent Evaluation Group is responsible for assessing project outcomes, and the current study uses the evaluation group's results of overall project performance rates to compare and assess project outcomes. Additionally, the World Bank procurement data set is used to analyse the status of contracts and suppliers in different projects, and the Worldwide Governance Indicator (WGI) data set is used to assess governance at the national level.

It is worth noting that the data used in this study primarily comprises secondary sources, which may have limitations in terms of accuracy and completeness (Sørensen et al., 1996). Additionally, the study focuses solely on projects sponsored by the World Bank, which may limit the generalisability of the findings to other international development projects (Smith et al., 2008). Nonetheless, the study provides valuable insights into the impact of governance on project outcomes, and the methodology used in this study can serve as a framework for future research in this field. In addition, the study analyses data from 3,683 projects funded by the World Bank over a 20-year period, providing a large sample size that enhances the statistical power of the study.

The advantage of using statistical analysis is that it provides a rigorous and systematic approach to data analysis (Mandel, 2012). The structural equation modelling (SEM) technique enables the evaluation of complex relationships between multiple variables and the assessment of the moderating effects of project complexity. However, using SEM may oversimplify or generalise complex phenomena. The SEM technique assumes that the relationships between variables are linear and causal, which may not always be the case in real-world scenarios (Schumacker & Lomax, 2016). To address SEM's limitations, logistic regression models are used to understand the marginal effect of complexity factors and examine the governance indicators based on different complexity degrees and project outcomes.

As a result of the vast amount of project reports, content analysis techniques, such as natural language processing (NLP), were employed to identify the factors that affect project outcomes and create an aggregate integrated dataset. The benefit of using content analysis is that it enables the identification of patterns and themes in large datasets (Stemler, 2001). The NLP technique allows for the automated analysis of text data, saving time and reducing human error. Furthermore, content analysis can capture the qualitative and contextual aspects of the data (Chowdhary, 2020).

Overall, the research methodology has various strengths, including comprehensive data collection, high sample size, and multi-method analysis. However, it also has some limitations, such as reliance on secondary data and potential biases in data collection. By acknowledging these limitations, the study can more accurately interpret its findings and make more nuanced conclusions about the impact of governance and complexity on project outcomes.

5.3. The influence of governance on project outcomes

Governance refers to the processes involved in controlling project behaviour and ensuring that a project's status aligns with its objectives. It can be seen as a continuous monitoring measure that regulates the project to ensure that it stays on the right track (Ireland, 2016). Another significant contribution of governance is defining relationships, principles, rights and rules for different participants and stakeholders (Müller, 2016a). The quality of governance is also used by the World Bank to determine eligibility for loans (International Development Association, 2004). This clearly indicates that governance is a critical element in the decision-making process of policymakers in international relations.

This study investigates the impact of governance at two levels: national and project level. Six widely recognised project construct aggregate indicators, as introduced by Kaufmann et al. (2010), have been used to measure governance at the national level. These indicators include voice and accountability (VA), absence of violence (PV), government effectiveness (GE), regulatory quality (RQ), rule of law (RL), and control of corruption (CC). At the project level, three governance indicators are used to assess project governance: quality of monitoring and evaluation (ME) as an index of sound governance, government performance (engagement), and sponsor (World Bank) effectiveness (SP).

Before conducting the main research model using structural equation modelling, the correlation between governance and project outcome variables, including the achievement of objectives and on-time completion, was assessed. The analysis demonstrated that governance at both the national and project levels has a positive relationship with the achievement of objectives and on-time completion. However, the strength of the relationships varies depending on the level of governance. Governance at the project level has a stronger relationship with the achievement of objectives compared to governance at the national level. On the other hand, both national and project-level governance have a weak relationship with on-time completion. Here are further details of the correlation analysis:

National Level:

Governance and Achievement of Objectives: The correlation coefficient is 0.114, which is statistically significant at $p < .05$. This indicates a weak positive relationship between governance at the national level and the achievement of objectives. According to the empirical data, as governance improves, the achievement of objectives tends to increase slightly.

Governance and On-time Completion: The correlation coefficient is 0.058, which is also statistically significant at $p < .05$. This suggests a weak positive relationship between governance at the national level and on-time completion. As governance improves, on-time completion tends to increase slightly.

Achievement of Objectives and On-time Completion: The correlation coefficient is 0.063, which is statistically significant at $p < .05$. This indicates a weak positive relationship between the achievement of objectives and on-time completion.

Project Level:

Governance and Achievement of Objectives: The correlation coefficient is 0.784, which is statistically significant at $p < .05$. This indicates a strong positive relationship between governance at the project level and the achievement of objectives. As governance at the project level improves, the achievement of objectives tends to increase substantially.

Governance and On-time Completion: The correlation coefficient is 0.129, which is statistically significant at $p < .05$. This suggests a weak positive relationship between governance at the project level and on-time completion. As governance at the project level improves, on-time completion tends to increase slightly.

Achievement of Objectives and On-time Completion: The correlation coefficient is 0.063, which is statistically significant at $p < .05$. This indicates a weak positive relationship between the achievement of objectives and on-time completion.

In general, the correlation analysis indicates that all independent variables exhibit positive associations with the dependent variables of achievement of objectives (AO) and on-time completion (OC). Nevertheless, the strength of these relationships varies. The majority of independent variables at the national level demonstrate weak associations with OC and AO. However, governance indicators at the project level exhibit diverse correlations. Specifically, monitoring and evaluation (ME) displays a moderate association with AO, while government engagement (GP) and sponsor effectiveness (SP) reveal strong associations with AO. It is noteworthy that correlation only indicates an association between two variables and nothing further. Any assessment of cause and effect must rely on the investigator's knowledge and biological plausibility (Gogtay & Thatte, 2017). Subsequently, the relationship between independent and dependent variables was examined using structural equation modelling.

Based on the hypothesis testing in the previous chapter, the analysis demonstrated that the path coefficients between governance at both the national and project levels and the achievement of project objectives were statistically significant. This suggests that effective governance has a slight positive but significant influence on the attainment of project objectives (Joslin & Müller, 2016). The critical ratios exceeded the threshold of ±1.96, further supporting the validity of Hypothesis 1a. Consequently, the null hypothesis was rejected in favour of the alternative hypothesis. However, on the other hand, the path coefficient between governance and project on-time completion variables at the national level is -0.018, with a critical ratio value of -1.565. At the project level, the path coefficient is -0.017 with a critical ratio value of -1.419. These critical ratios do not meet the threshold of ±1.96, indicating that the relationship is not statistically significant at the 95% confidence level.

This lack of statistical significance suggests that there is no strong evidence to support a positive or negative effect of governance on project on-time completion. Consequently, Hypothesis 1b cannot be considered valid, and the null Hypothesis 1b cannot be rejected.

Overall, the study reveals a modest positive impact of governance on the attainment of project objectives. However, it does not provide substantial evidence to conclude that governance significantly influences the timely completion of projects. This indicates that, while good governance practices may contribute to achieving project objectives, other factors such as Trust (Brixi et al., 2015; Munns, 1995); Leadership (Swink, 2003); Communication (Kania et al., 2022); Scheduling techniques (Ahmed, 2018); and Complexity (Brahm & Tarziján, 2015; Kerzner, 2022) may be more influential in determining whether a project is completed on time.

After testing governance-related hypotheses, logistic regression models were used to explore the specific aspects of governance indicators that have the greatest impact on project outcomes. The aim of this is to provide additional insights into the role of governance indicators and help to identify the best governance arrangements and networks for the success of international development projects. The results of the regression analysis indicate that 'Absence of Violence (PV)', 'Regulatory Quality (RQ)', and 'Control of Corruption (CC)' have a positive impact on both 'Project Objectives' and 'On-time Completion'. On the other hand, 'Voice and Accountability (VA)' and 'Rule of Law (RL)' appear to have a neutral influence on both outcomes. Regarding 'Government Effectiveness (GE)', there is a positive relationship with 'Project Objectives', but it does not directly affect 'On-time Completion'. Furthermore, 'Monitoring & Evaluation (ME)' positively influences 'Project Objectives', but it does not have an impact on 'On-time Completion'. Conversely, both 'Government Performance [engagement] (GP)' and 'Sponsor Performance (SP)' have a positive influence on both dependent variables.

The following discussion points based on the research results are obtained:

The Relationship between Governance and Project Outcomes: The study confirms the significance of governance in attaining project objectives. This is crucial, as project objectives essentially serve as indicators of project success, encompassing the anticipated benefits a project is expected to deliver (Joslin & Müller, 2016). However, the absence of a substantial relationship between governance and timely completion is intriguing. It suggests that while governance can ensure a project fulfills its intended objectives, it does not necessarily guarantee adherence to the initially proposed timeframe (Ika & Saint-Macary, 2012).

Differing Impacts of Governance at National and Project Levels: It is worth noting that project-level governance exhibits a stronger association with objective achievement compared to governance at the national level. This implies that day-to-day, on-the-ground governance practices within a project exert a more direct influence on the attainment of project goals (Musawir et al., 2017). Conversely, the influence of national governance may be more indirect and less predictable.

Influence of Specific Aspects of Governance Indicators: The logistic regression models yield intriguing results, indicating the importance of 'Absence of Violence (PV)', 'Regulatory Quality (RQ)', and 'Control of Corruption (CC)' in both project outcome variables at the national level. This underscores the indispensability of a stable, well-regulated, and corruption-free environment for project success. Additionally, it is noteworthy that 'Government Performance [engagement] (GP)' and 'Sponsor Performance (SP)' exert influence on both dependent variables at the project level. This highlights the significance of active collaboration and effectiveness of the parties involved in achieving success in international development projects. This finding aligns with the principles of Agency theory, which further validates the significance of strong collaborative efforts between project actors (Ahola et al., 2014).

5.4. The impact of complexity on project outcomes

In this study, complexity is defined as an "intricate arrangement of the varied interrelated parts in which the elements can change and evolve constantly, with an effect on the project objectives" (Bakhshi et al., 2016, p. 1203). As mentioned in the theoretical background of this study in Chapter one, there are seven main complexity drivers that represent the complexity proxies, including "context," "autonomy," "belonging," "connectivity," "diversity," "emergence," and "size." In the current study, a subset of twelve complexity factors derived from the complexity drivers is used to assess the degree of complexity in international development projects. The relationship of these factors as independent variables, as well as moderation variables, is assessed in this study. The factors include: (1) project duration; (2) extension of project time; (3) goal uncertainty; (4) budget size (CapEx); (5) number of disciplines involved; (6) level of development outcomes; (7) capacity of countries; (8) supervisor support and cooperation; (9) political instability; (10) number of contracts; (11) variety of procurement methods; and (12) diversity of suppliers. This section discusses the results of the impact of complexity on project outcomes.

As revealed by the correlation analysis, complexity demonstrates a negative correlation with both the variables of achieving objectives and on-time completion. It is noteworthy that the correlation between complexity and on-time completion is -0.730, whereas the correlation between complexity and the achievement of objectives is -0.106. It is worth highlighting that among all the complexity factors, Duration of the Project (DP), Extension of Project Time

(ET), and Goal Uncertainty (GU) demonstrate significant negative correlations with on-time completion, with values of -0.63*, -0.73*, and -0.57*, respectively. Conversely, Supervisor Support (SS) exhibits a significant positive correlation of 0.65* with the achievement of objectives.

Regarding hypothesis testing, the path analysis suggests a statistically significant negative relationship between project complexity and the achievement of project objectives. The path coefficient value of -0.093 and a critical ratio of -5.425 both indicate that as project complexity increases, the achievement of project objectives decreases. Given the critical ratio of -5.425 (which exceeds the threshold of ±1.96), this relationship is statistically significant at the 95% confidence level. This means that the research findings reject the null hypothesis (H0) related to Hypothesis H2a. Similarly, the results show a statistically significant negative relationship between project complexity and on-time completion. With a path coefficient of -0.772 and a critical ratio of -49.194, the data suggests that the likelihood of project on-time completion decreases as project complexity increases. This relationship is highly statistically significant given the large critical ratio (-49.194). Therefore, the data rejects the null Hypothesis H2b. However, the path coefficients indicate the size of the effect, with the path coefficient for on-time completion (-0.772) suggesting a larger effect size than the achievement of project objectives (-0.093). This could imply that complexity has a greater impact on the timeliness of a project rather than on the achievement of its objectives.

The results for both hypotheses show that the higher level of complexity has detrimental effects on project outcomes, both in terms of achieving objectives and completing on time. This is an important finding as it suggests that the World Bank and governments need to consider complexity in their planning and execution strategies. When managing complex projects, special attention and resources might be needed to ensure objectives are met and timelines are adhered to (den Heyer & Johnson, 2020).

Although complexity has been found to have a negative impact on project outcomes, the marginal effects of individual complexity factors vary. According to the results of logistic regression models, twenty-four propositions have been yielded (for more information, see Chapter 4). The findings derived from the logistic regression analysis reveal insightful observations regarding various factors influencing project complexity and their relationship with the attainment of project objectives and timely completion. Several factors, such as project duration, extension of project time (ET), project budget, supervisor support, political stability, number of contracts, variety of procurement methods, and the number of suppliers, exhibit a significant correlation with the outcome variables, thereby providing valuable insights into the field of project management. In the following paragraphs, we thoroughly examine and discuss the key formulated propositions that emerge from the regression analysis.

The data findings indicate that as project duration increases, the likelihood of completing the project on time decreases (Proposition 1). This aligns with common challenges in project management, where longer projects tend to face more unforeseen circumstances or changes that could cause delays (Zwikael & Gilchrist, 2021). Furthermore, the study results suggest that shorter project durations are associated with a higher probability of achieving objectives (Proposition 2). This finding can be attributed to improved focus, efficient resource utilisation, and a reduced likelihood of scope creep in shorter projects. These findings also underscore the importance of agile project management in international development projects (Ika et al., 2020; Picciotto, 2020).

Regarding the extension of project time (ET), the results indicate that projects with shorter ET have a greater chance of achieving their objectives (Proposition 4), highlighting the significance of effective time management and its impact on successful project outcomes (Solís-Carcaño et al., 2015).

One surprising outcome of the study is the absence of a significant relationship between the number of disciplines involved in a project (NS) and the rate of achieving project objectives (Proposition 10). This suggests that multidisciplinarity does not inherently compromise the quality or achievement of project objectives. A similar trend has also been observed regarding the size of the budget (Proposition 8). The data indicates that a higher project budget does not have a negative impact on the rate of achieving project objectives. These findings challenge the assumption that the number of disciplines involved in a project (NS) and the size of the budget (SB), which are both part of the project Size dimension, contribute to negative project outcomes as complexity factors according to the literature (Azim, 2010; Vidal et al., 2011b).

The study also reveals the impact of risk levels of development outcomes. Interestingly, projects with a moderate risk of development outcome (DO) demonstrate the highest frequency of achieving project objectives (Proposition 12). This indicates that while a certain level of risk is expected and can be effectively managed, projects with higher risk levels may require additional resources and strategies to ensure objective attainment (Kliem & Ludin, 2019).

Another intriguing finding is the positive correlation between the level of development of a country and the achievement of project objectives (Proposition 14). This emphasises the crucial role of infrastructural, technological, and managerial factors that distinguish different levels of development in contributing to the success of international development projects (Shenhar et al., 2007).

Supervisor support emerges as a significant factor for both on-time delivery (Proposition 15) and achievement of project objectives (Proposition 16), underscoring the essential role of effective leadership in project management. This finding aligns with the importance of top management support identified in other studies, such as the work of Kilby (2000), Crawford (2005), and Buntaine and Parks (2013).

Lastly, the analysis presents an interesting relationship between the number of contracts, variety of procurement methods, number of suppliers, and project outcomes. An increase in the number of contracts results in a decreased probability of on-time delivery (Proposition 19) but interestingly leads to a higher likelihood of achieving project objectives (Proposition 20). Similarly, a greater variety of procurement methods and a higher number of suppliers are associated with a lower likelihood of on-time delivery (Propositions 21 & 23) but facilitate the achievement of project objectives (Propositions 22 & 24). These findings support the significance of the diversity aspect of complexity, which significantly affects project outcomes (Bakhshi, 2016).

5.5. The moderation role of complexity on the relationship between governance and project outcomes

The study findings confirm that complexity has no significant moderating effect on the relationship between governance and the achievement of project objectives (Hypothesis 4a). However, complexity does have a significant moderating effect on the positive relationship between governance and on-time completion (Hypothesis 4b), indicating that higher complexity levels hinder the timely completion of projects despite effective governance.

The path coefficients between complexity and governance, as well as their impact on the achievement of project objectives at the national and project levels, were analysed. The critical ratio values for the path coefficients at both levels were -0.030 and -0.014, respectively. These values indicate that the relationship between complexity and the achievement of project objectives is not statistically significant, meaning that complexity does not significantly weaken the positive relationship between governance and project objectives. Therefore, Hypothesis 4a is not supported, and the null hypothesis (no relationship) cannot be rejected.

In contrast, the analysis also assessed the path coefficients between complexity and governance, and their influence on on-time completion at the national and project levels. The critical ratio values for these path coefficients were -0.039 and -0.066 at the national and project levels, respectively. These values indicate a statistically significant relationship, suggesting that complexity does indeed negatively moderate the positive relationship between governance and on-time completion. Thus, Hypothesis 4b is supported, and the null hypothesis (no relationship) can be rejected.

The results confirm that effective governance arrangements have the potential to mitigate project complexity and guide them towards successful goal attainment. Therefore, regardless of the varying degrees of complexity, good governance plays a crucial role in enabling development projects to achieve their objectives (Pitsis et al., 2014; Qiu et al., 2019).

5.6. The impact of monitoring and evaluation system on project outcomes

Monitoring and evaluation (M&E) lies at the centre of robust governance arrangements. It is vital for achieving evidence-based policy making, making capital expenditure (CaPeX) decisions, management, and accountability. A higher quality of M&E assists the governance system and leads to effective project close-out. A critical instrument for enhancing development project outcomes is a strong monitoring and evaluation (M&E) system (Raimondo, 2016). This research sheds light on the significant role M&E plays in international development projects, particularly in relation to the achievement of project objectives.

The study's findings were insightful and underscored the substantial role of M&E in realising project objectives. There was a statistically significant positive relationship between M&E and the achievement of project objectives, supporting that M&E systems directly contribute to successfully attaining project goals (path coefficient value of 0.509 and a critical ratio of 20.031). In other words, higher quality in the effectiveness of Monitoring and Evaluation (M&E) systems leads to a more successful achievement of project objectives (Hypothesis 5a).

However, the research did not find a significant relationship between M&E and the project's on-time completion (with path coefficient of -0.025 and a critical ratio of 0.156). Although the coefficient was slightly negative, it wasn't statistically significant, implying that the effect of M&E on on-time completion remains inconclusive (Hypothesis 5b). This highlights the complexities surrounding project timelines in international development projects. These could be influenced by various external factors beyond the scope of M&E, such as policy changes, environmental conditions, and socio-political factors, amongst others (see section 4.9 for key factors affecting the project outcome).

Overall, the strengths of the World Bank's M&E system lie in its transparency, external validation, knowledge sharing, connection to financial decision-making, and use in setting performance targets (Raimondo, 2016; Thambura et al., 2023). However, to enhance its effectiveness, attention should be paid to improving the quality and usage of evaluations, building evaluation capacity, and promoting the use of regular performance information for dealing with complexities. After reading almost forty project completion reports and conducting manual coding for content analysis, some strengths and weaknesses of the monitoring and evaluation system have been identified, as follows:

Evaluations are conducted externally, in a fully transparent process: The external conduct of evaluations helps maintain an objective viewpoint, minimising the risk of bias that can sometimes come from internal evaluations. The transparency of the process aids in building trust and credibility among all stakeholders.

All M&E information is reported publicly and available for best practices: Public reporting is fundamental to accountability, transparency, and learning. Making the M&E findings accessible to the public enables the exchange of knowledge, promotes best practices, and enhances cooperation among different entities.

The M&E system is closely linked to the information needs of the Finance Departments, especially for the budget process: This connection supports better financial planning, ensuring that resources are allocated effectively and efficiently. The finance department can make informed decisions on budgetary allocations based on the M&E results.

Performance information is used to set performance targets for implementing agencies: Setting performance targets based on data helps in holding agencies accountable, fostering a culture of performance-based management.

The Finance Departments use evaluation findings to impose management changes on implementing agencies: This shows that the M&E system is not only about monitoring but also about facilitating improvements. Such changes can increase the effectiveness of agencies and ultimately improve project outcomes.

Evaluation conducted as a collaborative endeavour between key stakeholders: Collaboration fosters a common understanding of challenges and opportunities, promoting buy-in from all parties and aligning their efforts towards shared objectives.

Unevenness exists in the quality of evaluations conducted; this is probably caused by cost and time constraints imposed by the financial sponsor: This can be addressed by having standard evaluation guidelines in place, which can ensure some level of uniformity and quality even within resource constraints. Training and capacity building among evaluators can also help and reduce complexity (Kacou et al., 2022).

Governments are probably not spending enough on evaluations: Adequate funding is crucial to ensure thorough and effective evaluations. Advocacy efforts can be geared towards highlighting the long-term benefits of well-funded evaluations, which can in turn lead to better project outcomes and public services.

There is a low level of utilisation because of low ownership of evaluation findings: To enhance ownership, involving all stakeholders in the M&E process can be beneficial. Participatory M&E methods can help improve buy-in and utilisation of evaluation findings.

There is an apparent absence of incentives for implementing agencies to conduct their own evaluations: Incentive mechanisms could be introduced to encourage agencies to conduct their own evaluations. This can range from recognition of good practices to linking evaluation performance with certain benefits.

Insufficient availability of advanced evaluation training: Strengthening capacity building programmes and offering advanced evaluation training can enhance the quality of evaluations conducted. Partnerships with academic institutions and development partners can be explored to provide such trainings.

Insufficient attention to regular performance information: The importance of regular performance tracking needs to be stressed more in the system. Regular monitoring can provide timely information for decision-making and corrections in the implementation process. It could be promoted through enhanced awareness and capacity building initiatives.

These findings are important for the World Bank and other stakeholders in international development, emphasising the need to invest in robust M&E systems to enhance the achievement of project objectives. They underscore that while M&E can significantly contribute to goal achievement, further research is needed to uncover how M&E systems can be optimised to also positively influence the timely completion of projects.

5.7. World regional performance discussion

In terms of contract count and financial volume, the distribution of international development projects varies across different geographical regions, according to the World Bank. Among the six geographical regions, Africa ranks at the top in terms of contract count and financial volume. The Middle East and North Africa (MENA) has had the least financial volume. Although South Asia (SA) had 12% of the contract count, this region placed second region after Africa in terms of financial volume. South Asia followed by East Asia and Pacific (EAP), Europe and Central Asia (ECA), and Latin American and Caribbean (LCR), respectively.

The analysis of project outcome performance in different countries reveals varying levels of success in achieving project objectives. Countries like Rwanda, China, India, Russia, Egypt, and Turkey stand out as high performers, demonstrating a strong focus on project success.

Ghana, Kazakhstan, Brazil, Senegal, and Mexico perform moderately well, while Mali, Burkina Faso, and the Democratic Republic of the Congo face challenges in achieving desired project outcomes (See Appendix III). This comparison provides valuable insights into the project implementation landscape across different regions, enabling a better understanding of the factors contributing to project success or limitations.

In Africa, a total of 766 projects were examined, accounting for approximately 21% of the dataset. The region demonstrated a diverse range of project outcomes. Notable examples include Rwanda, with an impressive project outcome rate of 76%. This suggests a strong commitment to achieving project objectives and successful implementation. Burkina Faso also exhibited a relatively higher project outcome rate of 58%, indicating a positive track record in project execution. Ghana performed well with a project outcome rate of 57%, further highlighting its success in delivering impactful development projects. Rwanda, with a high M&E quality rate of 76%, achieved a remarkable project outcome rate of 73%. Similarly, Senegal, with an M&E quality rate of 78%, showcased a project outcome rate of 59%. These examples indicate that effective monitoring and evaluation practices contribute to successful project implementation in the region.

Moving on to the Middle East and North Africa (MENA) region, the study encompassed 328 projects, representing around 9% of the dataset. Egypt emerged as a standout performer with a favourable project outcome rate of 63%. This indicates successful project implementation within the country. Afghanistan, despite its unique challenges, demonstrated a respectable project outcome rate of 55%, suggesting a positive track record in achieving project objectives in a challenging environment. Tunisia, with an M&E quality rate of 60%, achieved a project outcome rate of 57%. Jordan, with an M&E quality rate of 52%, showcased a project outcome rate of 53%. These findings suggest that improved M&E practices positively influence project outcomes in the MENA region.

Within South Asia, a total of 525 projects were examined, accounting for approximately 14% of the dataset. India, with its vast portfolio of development projects, exhibited a remarkable project outcome rate of 62%. This highlights the country's strong focus on achieving project objectives and successful implementation. Pakistan, on the other hand, showed a moderate project outcome rate of 58%, indicating an average success rate in project execution within the region. Bangladesh stands out with a high M&E quality rate of 64% and a corresponding project outcome rate of 67%. This indicates a strong connection between effective monitoring and evaluation and successful project implementation. Other countries in the region, such as Nepal and Sri Lanka, also exhibited positive relationships between M&E quality and project outcomes.

The East Asia and Pacific (EAP) region encompassed 825 projects, representing around 22% of the dataset. China stood out with a high project outcome rate of 69%, showcasing effective project implementation and a strong commitment to achieving project goals. Indonesia, another significant player in the region, exhibited a moderate project outcome rate of 61%, suggesting an average success rate in project implementation. Vietnam displayed a significant correlation between M&E quality and project outcomes. With an M&E quality rate of 76%, Vietnam achieved an impressive project outcome rate of 67%.

Moving to Europe and Central Asia (ECA), the study covered 644 projects, accounting for approximately 17% of the dataset. Poland demonstrated a high project outcome rate of 58%, indicating effective project execution and a positive track record. Kazakhstan exhibited a project outcome rate of 60%, further emphasising a favourable project success rate in the region. Turkey, known for its substantial development projects, showcased a higher project outcome rate of 66%, indicating successful project implementation. Russia also demonstrated a notable project outcome rate of 66%, reflecting a relatively high success rate in achieving project objectives. In ECA, countries like Armenia and Romania showcased a positive relationship between M&E quality and project outcomes. Armenia, with an M&E quality rate of 80%, achieved a project outcome rate of 66%. Similarly, Romania, with an M&E quality rate of 76%, showcased a project outcome rate of 63%.

Within the Latin American and Caribbean (LCR) region, a total of 665 projects were examined, representing around 18% of the dataset. Brazil exhibited a moderate project outcome rate of 54%, indicating an average performance in project implementation. Mexico, on the other hand, showcased relatively better project outcomes with a rate of 65%, highlighting a positive track record in project execution. Colombia demonstrated a project outcome rate of 68%, further suggesting effective project implementation and a high success rate. Colombia, with an M&E quality rate of 68%, achieved a remarkable project outcome rate of 68%. Jamaica, with an M&E quality rate of 71%, showcased a project outcome rate of 71%. These findings suggest that improved M&E practices positively influence project outcomes in the LCR region.

Comparing project performance with political stability indices reveals intriguing patterns. Countries with higher political stability indices, such as Poland, Georgia, and Turkey, generally exhibited better project outcomes and on-time completion rates. This suggests that political stability provides a conducive environment for successful project implementation. In contrast, countries with lower political stability indices, like Mali and Yemen, faced more significant challenges in achieving project objectives.

These results shed light on the project outcome performance in different world regions. The findings highlight both successful and moderate performances, reflecting the complexities and variations inherent in international development projects (Ika et al., 2020). Understanding the impact of political stability and governance on project outcomes is vital for policymakers, project managers, and development practitioners. By acknowledging the role of political stability and implementing effective governance mechanisms, countries can enhance their project performance and achieve more successful outcomes. Further research could explore additional factors influencing project performance, such as economic conditions, cultural contexts, and project management practices, to gain a more comprehensive understanding of international development project dynamics.

5.8. Key factors affecting the project outcomes

This study analysed 3,683 project completion documents to identify key factors influencing project outcomes. Given the extensive collection of documents, a hierarchical mixture modelling approach was employed using topic modelling methodology. Additionally, more than 100 reports were thoroughly read and manually coded to gain familiarity with the structure of the completion reports. This process led to the identification of the following key factors (for more details, refer to Table 4.48):

Political and Administrative Challenges: Frequent political changes, bureaucratic procedures, and inconsistencies in implementation modalities indicate a volatile and complex environment. These conditions may disrupt the smooth execution of development projects and introduce unexpected barriers, thereby increasing the level of complexity.

Insufficient Organisational Capacity: Weak project coordination, inadequate funding, and insufficient capacity of implementing agencies indicate a lack of resources and capabilities to effectively manage and implement the project. This deficiency can lead to inefficient resource utilisation and ineffective project outcomes.

Issues with Monitoring & Evaluation: The dual role of the project manager, quality of monitoring and evaluation (M&E), and generally dysfunctional implementation arrangements suggest problems in project oversight, reporting, and evaluation. This can result in a lack of accountability and transparency, leading to underperforming projects.

Administrative Delays and Political Insecurity: Changes in administration, prolonged approval processes, and instability caused by elections can cause project delays, introducing uncertainty and inefficiencies.

Capacity and Leadership Gaps: There is still a lack of capacity and leadership, along with persistent human resources issues and weak capacity of the supervision. These factors impact the smooth execution and management of projects.

Administrative and Financial Issues: Ineffective financial management, slow initial procurement, and difficulties with contracts for non-governmental organizations (NGOs) suggest areas that require improvement, even in high-performing projects.

Human resources issues: The ability to attract, retain, and develop skilled staff, as well as maintain stable leadership and management, appears to be crucial for the success of development projects. Several factors related to human resources have been found to impact project outcomes as follow:

Adequacy of Government's commitment suggests HR-related issues in terms of the government staff's dedication to the project.

The dual role of the Project Manager may indicate an HR problem, where one individual is burdened with tasks that could be better handled by multiple people, resulting in inefficiency or errors.

The presence of a large number of vested interests may imply challenges in managing the interests of various stakeholders, which can become an HR issue if not effectively addressed.

Capacity and lack of leadership can indicate HR issues, such as a shortage of necessary skills or qualified leaders to drive the project forward.

Chronic HR-related issues explicitly refer to ongoing human resources problems, encompassing aspects like hiring, retention, training, and skill gaps.

Frequent turnover of key staff and constraints in human resources highlight challenges in maintaining a stable and capable workforce, which is crucial for ensuring project continuity and success.

Despite encountering these challenges, international development projects appear to benefit from several positive factors such as:

***Organisational Capacity*: ** While there are still issues with limited procurement and centralisation of the project management structure, the capacity of facilities to deliver services and provide project steering guidance appears strong, contributing to the project's success.

***Positive Influences*: ** Several factors such as stakeholder involvement, financial autonomy, public accessibility of information, and streamlined procedures for adjustment operations appear to have a positive impact on project outcomes. The commitment of the steering committee and the government's reform program indicate potential for improvement if the addressed issues are resolved.

This analysis reveals that managing political-administrative factors, enhancing organisational capacity, and strengthening project management and monitoring can significantly influence the performance of development projects. Future projects could learn from these insights and implement strategies to mitigate negative factors while leveraging the positive ones.

In addition to manually coding project reports, qualitative data has been collected through text analysis using Natural Language Processing. All keywords extracted from the project reports have been categorised into 15 main categories. For more detailed information, please refer to Appendix IV. The following provides a brief explanation of some key factors:

1. Political Factors: It is evident that politics and government-related factors significantly influence project outcomes, from the design to the post-completion phase. These factors include instability, political interference, and the commitment of the government. The frequent occurrence of terms like 'national' and 'local' throughout all phases suggests the significance of both national and local political contexts. Notably, the implementation phase appears to be particularly influenced by the government's commitment. Other keywords in this category include national policy, local policy, government's commitment, political instability, legislation, political interference, political leadership, political relations, policy enforcement, diplomatic relations, public opinion, ministry, president, campaign, authority, and bureaucratic processes.

2. Technical Factors: The design and implementation phases show a high frequency of keywords such as 'technical', 'data', and 'information', indicating the importance of technical aspects, data handling, and information management during these stages. However, the weight of these factors appears to decrease significantly in the post-completion phase. Other keywords in this category include technical expertise, data management, information technology, technical infrastructure, technical support, technological advancements, software and hardware, technology transfer, data analysis, technical feasibility, technology literacy, technical standards, technical quality, and technical capacity.

3. Managerial/Organisational Factors: Keywords such as 'processes', 'resources', 'management', 'quality', 'plan', and 'strategy' are frequently found in all project phases, highlighting the significance of project management skills, strategic planning, and resource management throughout the project lifecycle. Other keywords in this category include project management, strategic planning, resource allocation, decision-making processes, managerial skills, organisational structure, change management, quality management, risk management, performance metrics, leadership, project monitoring, stakeholder management, communication, consultant, supervision, and time management.

4. Financial Factors: The data emphasises the importance of financial management, particularly 'budget', 'fund disbursement', 'financing', and 'financial', during the design and implementation stages. These keywords seem to decrease in importance in the post-completion phase. Other key factors in this category include budgeting, fund disbursement, financial management, economic viability, cost estimation, financial planning, cost control, cost-benefit analysis, financial risk, financial reporting, investment, return on investment, money, interest, loan, expenditure, and financial sustainability.

5. Collaboration/Partnership Factors: The significant occurrence of 'team', 'partner', 'collaboration', 'coordination', 'support', and 'commitment' suggests the importance of teamwork and collaboration. The high weightage of 'government' and 'bank' could indicate their crucial roles as stakeholders or financiers. Other keywords in this category include teamwork, stakeholder engagement, partnership development, inter-agency coordination, public-private partnership, cooperation, shared goals, mutual trust, conflict resolution, negotiation, knowledge sharing, collaboration tools, agencies, government, stakeholders, and partner commitment.

6. Procedural Factors: The presence of 'arrangements', 'procedure', 'process', 'agreements', 'contract', and 'procurement' in all phases suggests that established procedures and contractual agreements are vital for smooth project execution. Other keywords in this category include contract management, procurement processes, administrative procedures, workflow optimisation, standard operating procedures, process documentation, process transparency, quality assurance, milestone planning, scheduling, approval processes, compliance checks, interventions, supply chain, tendering, bureaucracy, and project handover.

7. Legal Factors: Legal aspects such as 'Law', 'legal and regulatory framework', and 'regulation' are present in all project phases, but their significance seems to decrease post-completion, emphasising the role of legal considerations primarily in the design and implementation stages. Other keywords in this category include compliance with local laws, regulatory requirements, contractual obligations, legal jurisdiction, intellectual property rights, legal disputes, privacy laws, labour laws, environmental regulations, ethical standards, legal risk, legal advice, legal amendments, legal covenant, and legal documentation.

8. Cultural Factors: Cultural factors appear to have less significance based on their lower weights across all phases. However, maintaining cultural sensitivity may still be important in project design and implementation. Other keywords in this category include cultural sensitivity, cultural diversity, language proficiency, local customs and traditions, cross-cultural communication, cultural training, respect for cultural heritage, cultural adaptation, social norms, community engagement, cultural integration, cultural values, and cultural conflicts.

9. Economic Factors: Factors such as 'economic conditions', 'political economy', 'economic growth', and 'economy' demonstrate their influence on all phases. However, their presence in the post-completion phase seems to drop. Other keywords in this category include economic conditions, currency, import duty, import restriction, economic recession, market trends, trade regulations, inflation rate, currency exchange rate, economic risk, economic development, employment rate, poverty level, GDP, economic stability, and socioeconomic factors.

10. Environmental Factors: Elements such as 'water', 'climate', 'waste', and 'food' appear to be more crucial in the design and implementation phases, indicating the importance of considering environmental impacts and resources during these stages. Other keywords in this category include environmental impact, resource management, waste management, environmental regulations, climate change adaptation, sustainable practices, conservation efforts, environmental risk, pollution, air, carbon footprint, renewable energy, emission, biodiversity, ecosystem services, and water management.

11. Social Factors: Factors such as 'ethnic', 'norms', 'social protection', 'community', and 'social' seem to be crucial during the design and implementation phases, pointing to the importance of understanding and integrating into the local social context. Other keywords in this category include community engagement, social safeguard, social values, social protection, gender equality, human rights, public health, education level, poverty alleviation, social inclusion, social justice, social cohesion, social impact, social capital, and social infrastructure.

12. Corruption Factors: 'Transparency' and 'corruption' are evident across all project phases, but their weights seem to decrease in the post-completion phase. Other keywords in this category include anti-corruption measures, bribery, fraud detection, ethical standards, corruption risk, integrity management, accountability, whistleblowing, due diligence, forensic auditing, conflict of interest, and ethical governance.

13. Governance Factors: 'Control', 'relationship', 'roles and responsibilities', 'governance', 'Policy', 'accountability', and 'meeting' seem crucial across all phases, underscoring the importance of clear roles, responsibilities, and transparency in project governance. Other keywords in this category include role clarity, responsibility assignment, policy compliance, leadership effectiveness, governance structure, accountability, decision-making processes, meeting, audit, trust, stakeholder relations, board effectiveness, strategic direction, operational oversight, corporate culture, and governance risk.

14. Safety and Security Factors: While 'security' shows a presence in all stages, its importance seems to decrease in the post-completion phase. This suggests a need for security measures during the project's active phases. Other keywords in this category include physical security, data security, health and safety regulations, risk assessment, emergency preparedness, disaster recovery, workplace safety, crisis management, security policy, personal safety, security training, cyber security, and safety audits.

15. Human Resource Factors: 'Knowledge', 'staff', 'skills', 'training', and 'human resource' consistently appear in all project phases, emphasizing the importance of human resources and capacity development throughout the project. Other keywords in this category include staff recruitment, skill development, training programs, staff retention, capacity building, performance evaluation, employee motivation, team building, talent management, staff wellbeing, competency, experts, qualifications, recruitment, human resource planning, labor relations, and succession planning.

To provide more detail in the governance category, it is interesting to consider the importance of system of controls and processes in achieving better project performance (Müller, 2016b). Here are additional details regarding the key governance factors mentioned in the project completion reports:

Control: The weight of 'Control' increases from low to moderate to high-performance projects during the design and implementation phases (Appendix IV). This suggests that well-controlled project design and execution could be critical for achieving high performance (Laine et al., 2020). The role of the control system as a governance pillar in project performance is widely acknowledged by scholars, as seen in studies on control and collaboration (Sundaramurthy & Lewis, 2003); control in dealing with risk (Tang et al., 2020; Zwikael & Smyrk, 2015); control and sustainability (Kivilä et al., 2017); and relational governance (Manu et al., 2011).

One of the interesting concepts introduced in the Viable System Model (Beer, 1984) is Requisite Variety, which highlights its implications for the control of complex systems. The concept of requisite variety was initially proposed by Ross Ashby in 1958. It is based on the idea that, in order to manage the diverse behaviours within organisations, control systems need to be established. Control can effectively reduce variety only if such systems exist. This principle can be summarised as 'the greater the range of actions available to a control system, the greater the range of disturbances it can compensate for'. Ashby formulated this principle as "variety can destroy variety," emphasising that for a system to be stable, the number of states in its control mechanism must be greater than or equal to the number of states in the system being controlled. Ashby referred to this principle as the Law of Requisite Variety. In information theory terms, the Requisite Variety condition can be viewed as a simple statement of a necessary dynamic equilibrium condition (Ashby & Goldstein, 2011). In the next section, the research findings will be used to propose and discuss a Viable System Model for the governance system of the World Bank.

Policy: The weight of 'Policy' follows a similar pattern to 'Control'. However, its importance seems to be especially pronounced in the design phase (Appendix IV). This may indicate that a well-crafted policy is instrumental in setting a strong foundation for the project (Giacchino & Kakabadse, 2003).

Roles and Responsibilities: This factor is more prominent in the design and implementation phases of moderate and high-performance projects compared to low-performance projects. This observation suggests that the establishment of clear roles and responsibilities is crucial for achieving improved outcomes in international development projects. Scholars in the field of project and portfolio management have also highlighted the significance of key actors' dynamics and the presence of clear responsibilities among them (Blomquist & Müller, 2006; De Schepper et al., 2014).

Participatory Processes: 'Participatory Processes' are most heavily weighted in the design phase of high-performance projects, suggesting that engaging various stakeholders in the planning process could contribute to success.

Contracting Processes: The importance of 'Contracting Processes' increases from low to moderate performance projects during the design and implementation phases but doesn't follow the same pattern with high-performance projects. This could imply that while good contracting practices are essential, they may not be the key differentiator for the highest performing projects. Past studies have recommended the use of performance-based contracting in public procurement (Ambaw & Telgen, 2017; Regan et al., 2015). The procurement practices of the World Bank are discussed in Chapter One and are also considered as a complexity factor.

Trust: The factor 'Trust' shows an increasing trend from low to high-performance projects, especially during the implementation phase. This indicates that building trust could be crucial for project success. Trust has been extensively studied in the literature as a key element of governance, receiving significant attention from scholars (Müller, Turner, et al., 2014; Wang et al., 2019; Wu et al., 2020). Its importance is widely acknowledged in project management research.

In summary, while all governance factors play a role in project outcomes, 'Control', 'Policy', 'Roles and Responsibilities', 'Participatory Processes', and 'Trust' appear to be particularly important, especially during the design and implementation phases of a project.

5.9. Managerial implications of the research outcomes: a viable governance model to encounter complexity

After conducting an extensive assessment of the World Bank project cycle and reviewing the research findings on the impact of governance on project outcomes, it is imperative to propose a governance model to address complexity. This subsection discusses a governance model for the World Bank, drawing on the viable system theory, which has garnered significant attention among scholars in the literature (refer to Chapter 2). A Viable system can stand alone because it is self-sufficient and able to be self-sustaining. The viable System Model (VSM) interprets the system viability concerning its environment and arrangements with a focus on understanding the system's purpose. Internalizing the complexity, variety, responsiveness, cohesion, and recursive concepts, when cohesively applying all the pre-specified functions is another capability of VSM (Beer, 1984; Devine, 2005; Hoverstadt, 2020).

The count of potential states or configurations of a system constitutes the concept of variety in VSM. The level of complexity of a system is measured through this variety; thus, the higher variety, the higher the complexity level in a system. This phenomenon is named the Requisite Variety (RV) of the system (Ashby, 1958). According to RV, both the internal and external verities of a system must be in harmony, and the system as a whole must be empowered to manage the RV. This can assist the system deal with complexity and make resiliency and adaptability. The implication of requisite variety introduced by Ashby (1958), and the further work of Snowden (2002) in acknowledging four states of the system, made the authors recognize these four essential concepts: Known. Knowable, Complex, and Chaos, following this, the Simple, Complicated, Complex, and Chaos are recognised. The complexity proxies and framework proposed in this study can be applied in assessing the complexity level of international development projects and then applying appropriate governance arrangements.

The World Bank Group comprises of five institutions that provide financial and technical assistance to developing countries for a variety of development projects. The governance system in the World Bank is designed to facilitate effective management and implementation of these projects. The key components of the World Bank's governance system for international development projects include:

Board of Governors: The highest decision-making body, consisting of representatives from each member country. The Board of Governors typically convenes annually to discuss the overall strategic direction and policies of the World Bank Group.

Board of Executive Directors: Comprising 25 Executive Directors, this board is responsible for the general operations of the World Bank. They approve loans, credits, grants, and guarantees, as well as the institution's policies and budget. The board convenes regularly to review and discuss the projects and programs of the World Bank.

President: The President of the World Bank Group is responsible for managing the overall operations of the institution. The President is appointed by the Board of Executive Directors and represents the World Bank at the international level.

Senior Management Team: The Senior Management Team oversees the day-to-day operations of the World Bank Group. It includes the President, Managing Directors, Vice Presidents, and other high-level executives.

Country Offices: The World Bank maintains country offices in numerous developing countries, headed by Country Directors. These offices collaborate closely with the respective governments and other stakeholders to identify, prepare, and implement development projects.

Project Implementation Units: These units are typically established within the borrowing country's government or other implementing agencies. They are tasked with executing the projects, ensuring adherence to agreed plans and objectives.

According to the VSM principle, a system's operation is subject to the five primary and sufficient subsystems: System ONE mostly referred to as Implementation functions, System TWO, Coordination, System THREE, Control, System FOUR, Intelligence, and System FIVE Policy. The operations of these five subsystems and their interactions are crucial for a system's viability.

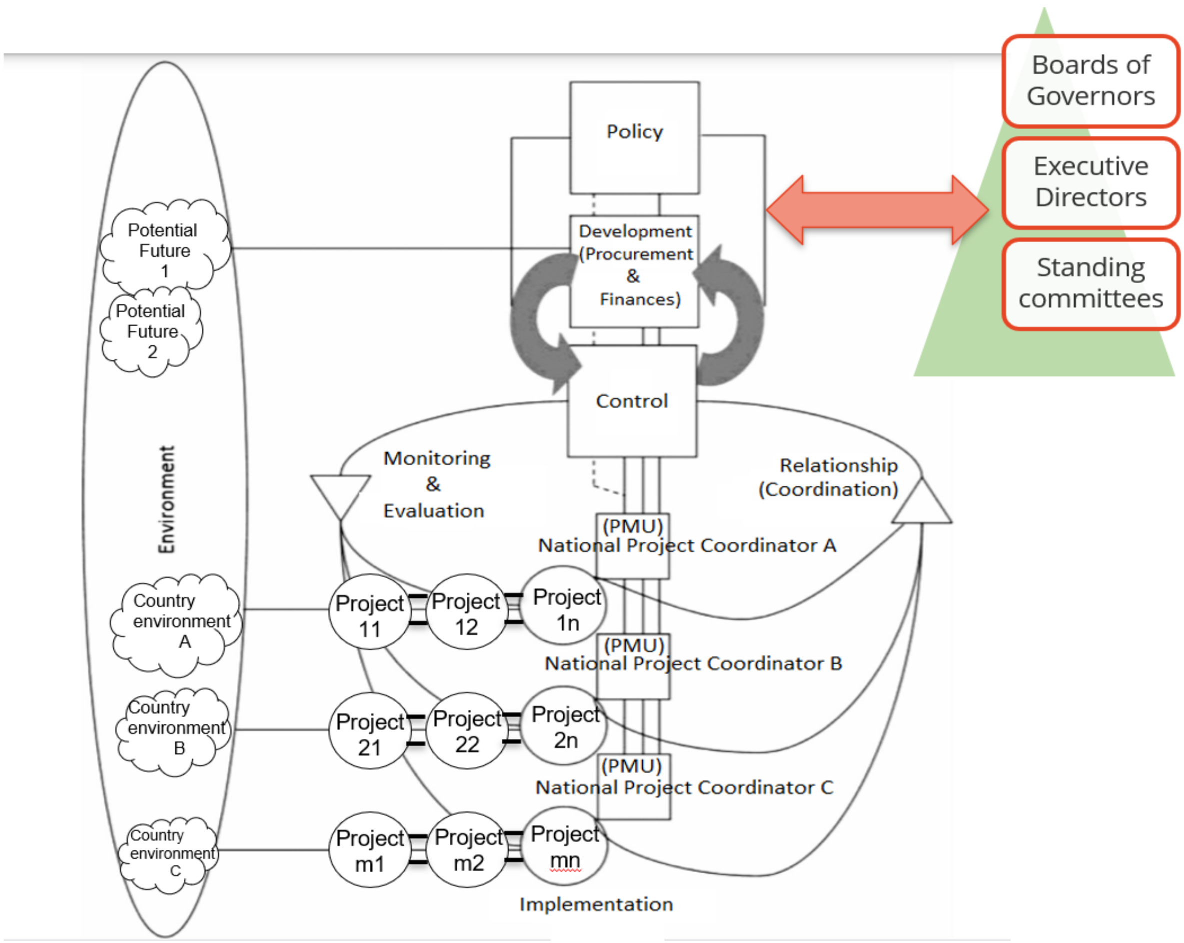


Fig. 5.2 Viable governance model proposed by author (Source: Authors' own creation)

System 5 identifies the system, and its purpose and formulates the appropriate policies therein; it is responsible for managing and controlling the entire system (Devine, 2005; Espejo & Gill, 1997). The board of governors, executive directors, and standing committees are the key actors in managing and controlling the World bank projects. System 4 first recognizes the internal and external opportunities and threats in the system's environment and, next, supplies the information to Systems 3 and 5. The information gathered by System 4 supports the system in planning and developing the RV necessary for the proper response to its environment. System 4 distributes the system's data into its environment, which, to a certain extent, contributes to enabling the system to shape and influence some elements therein; thus, controlling the RV (Beer, 1989; Espejo & Gill, 1997). The DEBACCS framework is applied in system 4 for evaluating the system complexity and assists RV to take necessary actions (for more information see Chapter 1).

The authoritative line between the higher-level system(s) and the operating project management units (in square boxes in System 1) therein constitutes System 3. This system allocates resources next to serving the accounting and distribution activities. This relationship is shown through arrows entering and exiting the project management units at the national level and the control function.

System 2 facilitates and maintains the synergies in the relationships among the management units in System 1. These interdependencies are promoted by observing and implementing the internal rules and procedures to internalize the organisation's routines (Devine, 2005). Coordination prevents a direct disturbance in activities and reduces the possibility of redundancy in their functionality. Upon achieving a highly-coordinated operation, the need for additional formal control by the system's management diminishes in Systems 5, 4, 3, and 2 or the meta systems becomes evident (Espejo & Gill, 1997). The contribution of national project coordinators is critical provide complex features of projects to the system's control section.

The delivery of the international development projects output (goods and services), which is defined by the system's purpose, is subject to System 1, consisting of the two: the management unit (Sponsor and governments) and the implementing unit components. The relationship between these two components is shown by two arrows (lines of formal authority) which connect them Fig, (5.2), (Leonard, 2009). The national project management units are shown in Fig. (5.2) in circles, and their respective management units are shown in squares. The operating units are linked to the control function through System 3 on the left side. This link, due to its not being subject to the formal authority structure, allows System 2 to collect information directly from the implementing agencies and feed them into System 3, the inward arrow.

System 2 broadcasts the relevant information from System 3 to the operating units in every single country, instead of going through the specific sub-management function at the next lower level below System 3, the outward arrow. System 2 supplements the formal control mechanism by gathering and comparing the information on the actual performance of the operating units vs. that of the objective. Its relationship with the implementing agencies is established as a formal/informal structure with clearly defined purposes (Devine, 2005; Espejo & Gill, 1997). System 3 is a periodic *Reality check* on the information that System 3 receives from System 1. Governance arrangements should be changed according to the information provided by system 3. For instance, if there is sufficient supplier availability in the selected country, it should be advised to apply specific procurement methods to avoid more complexity if the corruption rate is high in the selected country.

Next to their direct link to the national project management unit, each implementing unit is linked to its environmental elements. The gathered intelligence from the environment due to the interactions of these units with the environment is fed into the system through System 3. The activities of the management unit are coordinated by System 2 and controlled by System 3, shown by entering and exiting arrows. The implementing units constitute a network shown by the double-curved lines, indicating their vitality in the system through their synergistic collaboration. Moreover, the level of monitoring and evaluation should be adapted according to the selected country's environment.

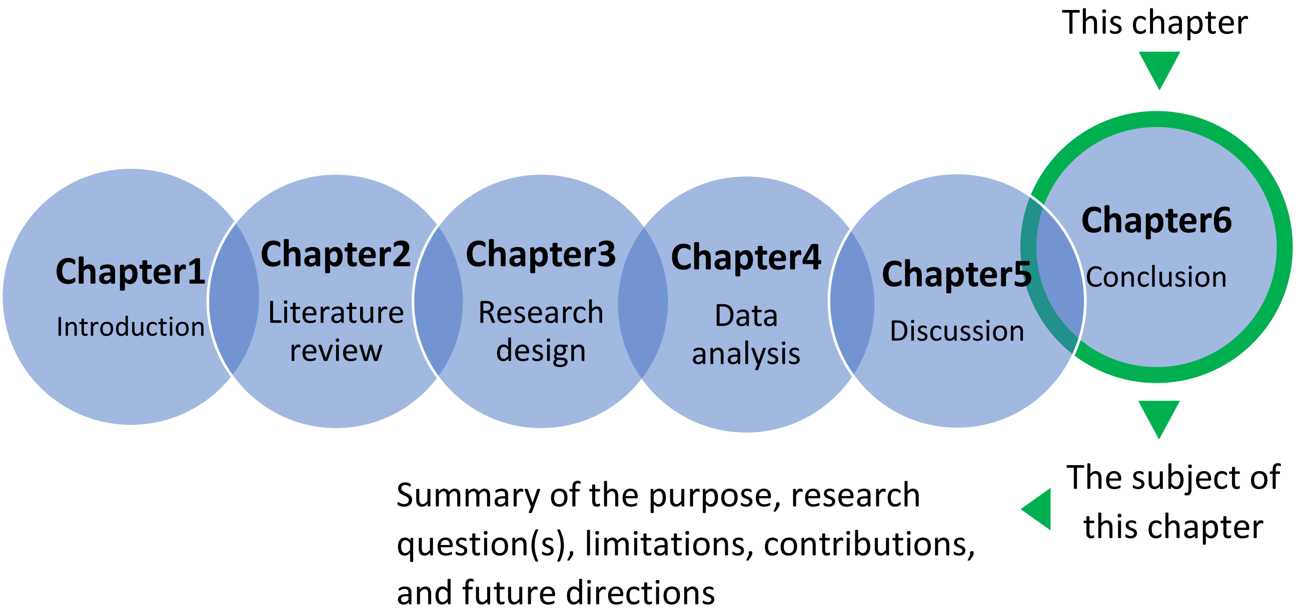
According to the Law of Requisite Variety, a system must maintain a level of internal variety equivalent to the variety in its environment to maintain stability and deal with complexity. The VSM accounts for this by ensuring that the subsystems effectively manage internal and external complexities, enabling the World Bank governance system to adapt to changing circumstances, and respond to diverse challenges.

VSM is a recursive model, which means that the same five subsystems can be applied at different levels of the organisation. This allows for a more robust governance system capable of addressing complexities at various levels, from the highest (World Bank) to the lowest (country level). This hierarchical structure facilitates effective communication, coordination, and decision-making across the organisation.

A system consisting of policymaking, intelligence, control/monitoring and evaluation, coordination, and implementation functions linkable to the system's environment is conceptualised through the VSM framework. Being equipped with these functions, together with other VSM properties of recursive systems and cohesion, allows this framework to be applied in a system's problems diagnosis beginning from the meta-systems level (World bank) and ending in the lowest or final sub-systems (Country level). More investigation is needed in this regard which is an interesting area of research for future endeavours.

The forthcoming chapter will explore the summary of research outcomes and present the conclusions. It will discuss the findings of the research, highlighting their contribution to the existing body of knowledge. Moreover, this chapter will examine the managerial implications of the research outcomes, as well as their relevance to theory and practice. Lastly, the research limitations will be acknowledged and addressed.

Chapter 6



6.1. Introduction

The landscape of international development projects has grown remarkably intricate, characterised by an array of stakeholders, external influences, and interconnected relationships that exert influence on project outcomes. In this context, governance plays a critical role in ensuring that projects achieve their intended objectives while remaining within the boundaries of established principles, relationships, rights, and rules. Nonetheless, the precise relationship between governance and project outcomes, especially in the realm of complex development projects, remains relatively unexplored.

This study aims to address this gap in knowledge by exploring the impact of governance on the outcomes of international development projects, and the role of complexity in moderating this relationship. The research question that guides this study is: how does governance affect international development project outcomes, and to what extent is this relationship moderated by project complexity?

To answer this question, a multi-method approach was used, drawing upon the records of over 7,000 projects and 250,000 contracts from the World Bank over the past 20 years. The resulting dataset included 3,683 projects, which were analysed to assess the impact of governance on project outcomes, as well as the moderating effect of complexity on this relationship.

The study found that governance, both at the national and project levels, has a small positive impact on achieving project objectives, but no evidence was found for a similar influence on on-time project completion. Furthermore, the study identified 12 complexity factors that moderate the relationship between governance and project outcomes, with most proxies negatively moderating this influence. However, the study also revealed the existence of positive relationships between some variables.

To test the relationship between complexity factors and project outcomes, as well as their effects on governance status, a Logistic Regression Model was used. The results indicated that all complexity factors had marginal effects on governance and project outcomes, with varying levels of probability. These findings contribute to a better understanding of the influence of governance on project outcomes in the context of different complexity factors and have important implications for governments, local authorities, financial institutions, and the UN when establishing governance mechanisms.

Overall, this study provides valuable insights into the relationship between governance and project outcomes in the context of complex international development projects. The findings of this study have important implications for practitioners and policymakers involved in international development and will contribute to the ongoing debate around how to ensure that international development projects are successful in achieving their intended objectives.

6.2. Addressing research questions

This study was undertaken to answer seven main questions, and the core findings can be summarised as follows:

1. How does governance affect international development project outcomes?

The study provides a comprehensive understanding of the relationship between governance and international development project outcomes. It showcases that governance significantly affects project outcomes, but the impact varies depending on the governance level (national or project) and the specific aspect of governance under consideration.

Project-level governance appears to have a stronger correlation with the achievement of project objectives compared to national-level governance. This suggests that the practices and policies within a project's operational environment have more immediate and direct effects on the success of the project. These could include aspects such as effective monitoring and evaluation, government engagement, and sponsor performance. However, national-level governance, while less influential on an individual project's outcome, still plays a role in shaping the broader context within which these projects operate.

While governance influences the achievement of project objectives, the study found no significant relationship between governance and on-time completion of projects. This indicates that although good governance can facilitate the realisation of project goals, it does not necessarily ensure adherence to proposed timeframes. Other factors such as government' commitments, political and administrative challenges, communication, leadership, complexity, and trust seem to have a more critical role in influencing a project's timely completion (see Section 5.8).

In terms of specific governance indicators, the study highlights the importance of certain aspects such as Absence of Violence, Regulatory Quality, and Control of Corruption at the national level, and Monitoring & Evaluation, Government Performance, and Sponsor Performance at the project level (see Table 6.1). These findings underscore the significance of a stable, well-regulated, and corruption-free environment as well as effective collaboration between project actors for international development project success.

2. To what extent is the relationship between governance and international development project outcomes moderated by project complexity?

In view of the findings presented in Chapter 4, we can ascertain the extent to which the relationship between governance and international development project outcomes is moderated by project complexity.

It is evident that the influence of governance on project outcomes is not uniform but instead varies in the presence of project complexity. The interaction of governance and project complexity significantly impacts some project outcomes while leaving others largely unaffected.

Specifically, project complexity does not significantly moderate the relationship between governance and the achievement of project objectives. This suggests that the positive impact of good governance practices on achieving project objectives remains relatively consistent regardless of the level of project complexity.

Conversely, when considering the project's on-time completion, the relationship between governance and this outcome is substantially moderated by project complexity. The higher the project complexity, the more it mitigates the positive impact of governance on the on-time completion of projects. Hence, for highly complex projects, even with excellent governance, the likelihood of on-time completion is reduced.

Notably, project complexity has a direct impact on multiple other factors of project performance, demonstrating its pervasive influence on project outcomes (see question 3). Likewise, governance influences various factors such as regulatory quality and control of corruption, indicating its comprehensive role in shaping project outcomes.

While complexity does not significantly alter the influence of governance on project objective achievement, it has a notable moderating effect on the relationship between governance and on-time project completion. Therefore, while good governance remains a vital aspect for project success, the handling of project complexity also plays a critical role, particularly in the context of project timing. The nuanced role of complexity in international development projects underscores the importance of tailored project management strategies to navigate the intricate interplay of governance and complexity for project success.

3. How does project complexity affect international development project outcomes?

Based on the research findings presented, it becomes evident that project complexity has a significant impact on outcomes of international development projects. The study defines complexity as an intricate arrangement of interrelated parts that can evolve and change, thereby affecting project objectives. Several complexity factors were examined, including project duration, extension of project time, goal uncertainty, budget size, number of disciplines involved, level of development outcomes, capacity of countries, supervisor support and cooperation, political instability, number of contracts, variety of procurement methods, and diversity of suppliers.

The correlation analysis revealed a negative correlation between complexity and both the achievement of objectives and on-time completion variables. Notably, the duration of the project, extension of project time, and goal uncertainty demonstrated significant negative correlations with on-time completion. Conversely, supervisor support exhibited a significant positive correlation with the achievement of objectives.

The path analysis confirmed a statistically significant negative relationship between project complexity and the achievement of project objectives, as well as on-time completion. As project complexity increased, the likelihood of achieving project objectives and completing projects on time decreased. The effect size was larger for on-time completion, indicating that complexity has a greater impact on project timeliness compared to objective achievement.

The results highlight the need for special attention and resources in managing complex projects to ensure that objectives are met and timelines are adhered to. The findings also underscore the importance of considering complexity in planning and execution strategies by the World Bank and governments involved in international development projects.

While complexity overall has a detrimental effect on project outcomes, the marginal effects of individual complexity factors vary. Factors such as project duration, extension of project time, project budget, supervisor support, political stability, number of contracts, variety of procurement methods, and the number of suppliers demonstrated significant correlations with project outcomes. These findings provide valuable insights into the field of project management and emphasise the importance of effective time management, agile project management, and leadership support in complex projects.

The research also challenges certain assumptions regarding complexity factors. The number of disciplines involved in a project and the size of the budget were found to not have a negative impact on the achievement of project objectives, contrary to previous literature. Additionally, the analysis revealed intriguing relationships between risk levels of development outcomes, the level of development of a country, and project outcomes.

4. Does governance improve the performance of international development projects?

The research findings robustly support the assertion that governance plays a pivotal role in enhancing the performance of international development projects, specifically in the context of achieving project objectives. By implementing governance mechanisms, projects benefit from crucial monitoring and control measures that effectively regulate project behaviours and ensure alignment with stated objectives. However, it is important to note that the research did not yield substantial evidence indicating a direct improvement in on-time completion rates resulting from governance practices alone. While the importance of good governance cannot be undermined, it is evident that a comprehensive approach encompassing multiple factors is necessary to achieve successful project completion (for further elaboration, refer to the detailed findings in Chapter 4).

Table 6.1
Impact of governance and complexity on project outcomes

No.	Research variable	Type of Impact		
		Project objectives	On-time completion	Moderation role
1.	***Governance (national level)***	+	N	N/A
1.1.	Voice and accountability (VA)	N	N	N/A
1.2.	Absence of violence (PV)	+	+	N/A
1.3.	Government effectiveness (GE)	+	N	N/A
1.4.	Regulatory quality (RQ)	+	+	N/A
1.5.	Rule of law (RL)	N	N	N/A
1.6.	Control of corruption (CC)	+	+	N/A
2.	***Governance (project level)***	+	N	N/A
2.1.	Monitoring & Evaluation (ME)	+	N	N/A
2.2.	Government performance [engagement] (GP)	+	+	N/A
2.3.	Sponsor performance (SP)	+	+	N/A
3.	***Complexity***	-	-	-
3.1.	Duration of the project (DP)	-	-	-
3.2.	Extension of the project time (ET)	N	-	N
3.3.	Goals Uncertainty (GU)	N	-	N
3.4.	Size of budget (SB)	N	+	N
3.5.	Number of disciplines involved (NS)	+	N	N
3.6.	Level of development outcomes (DO)	N	-	-
3.7.	Capacity of countries (CC)	N	N	N
3.8.	Supervisor support (SS)	-	-	N
3.9.	Political Instability (PI)	N	-	-
3.10.	Number of contracts (NC)	-	-	-
3.11.	Variety of procurement methods (VP)	-	-	-
3.12.	Diversity of suppliers (DS)	-	-	-

+ positive impact, - negative impact, ***N***. Neutral, ***N/A***. Not applicable

5. How does monitoring and evaluation as sound governance impact international development project outcomes?

Monitoring and Evaluation (M&E) systems serve as a vital pillar of sound governance, significantly contributing to the achievement of project objectives in international development. According to the research conducted, there is a statistically significant positive relationship between the quality of M&E systems and the attainment of project objectives, underlining M&E's role in enhancing project outcomes.

However, the influence of M&E on project timelines remains inconclusive, with the research not finding a significant correlation between these two factors. This suggests the existence of external variables, including policy shifts and socio-political changes, that could impact project completion times, reflecting the intricate dynamics of international development projects.

The World Bank's M&E system, with its strengths in transparency, external validation, and performance target setting, serves as an exemplar of the benefits of a well-executed M&E system. Yet, areas such as the quality and usage of evaluations, capacity building, and regular performance tracking require further attention to improve the effectiveness of M&E.

The study identified potential improvements, including standard evaluation guidelines, more participatory M&E methods, and increased attention to regular performance information. These improvements could enhance stakeholder engagement, evaluation quality, and real-time decision-making capabilities.

6. Which governing factors have influenced international development project outcomes?

Political and administrative challenges emerge as significant factors affecting project outcomes. Frequent political changes, bureaucratic procedures, and inconsistencies in implementation modalities contribute to a volatile and complex environment, disrupting the smooth execution of development projects. Insufficient organisational capacity, including weak project coordination and inadequate funding, further hinder effective project management and implementation, leading to inefficient resource utilisation and ineffective outcomes.

Monitoring and evaluation issues also play a crucial role. Dual roles of project managers, poor quality of monitoring and evaluation, and dysfunctional implementation arrangements result in a lack of accountability and transparency, leading to underperforming projects. Administrative delays and political insecurity, such as changes in administration and prolonged approval processes, introduce uncertainties and inefficiencies.

Capacity and leadership gaps, including the lack of skilled staff and weak supervision, impact project execution and management. Ineffective financial management, slow procurement processes, and difficulties with contracts for non-governmental organisations highlight areas that require improvement, even in high-performing projects. Additionally, human resources issues, such as attracting and retaining skilled staff, maintaining stable leadership, and addressing chronic HR-related problems, are crucial for project continuity and success.

Despite these challenges, international development projects can benefit from positive factors such as organisational capacity and stakeholder involvement. Strengthening political-administrative management, enhancing organisational capacity, and improving project management and monitoring are essential for achieving successful project outcomes.

The analysis of project reports also revealed 15 main categories of factors that influence project outcomes. These include political, technical, managerial/organisational, financial, collaboration/partnership, procedural, legal, cultural, economic, environmental, social, corruption, governance, safety and security, and human resource factors. Each category highlights specific aspects that are crucial during different project phases, emphasising the multifaceted nature of project governance (see Appendix IV).

Within the governance category, several key factors stand out. Control, policy, roles and responsibilities, participatory processes, and trust play significant roles in project success. Well-controlled project design and execution, along with clear roles and responsibilities, contribute to high-performance projects. Engaging stakeholders through participatory processes and building trust are also important during the planning and implementation phases.

7. Is governance more effective in projects implemented by developed countries than in projects by developing or least developed countries?

Regarding the achievement of project objectives, the findings indicate that governance has a significant positive impact in least-developed countries. However, this relationship is not statistically significant in developed countries, suggesting that governance may be less effective in these contexts.

In terms of on-time project completion, the study found a positive relationship between governance and on-time completion in developed countries. However, this relationship was not statistically significant, indicating that governance does not have a significantly greater impact on on-time completion in developed countries compared to other contexts.

Overall, the findings suggest that the effectiveness of governance in projects varies across different contexts. While governance appears to be more effective in achieving project objectives in least-developed countries, its influence on this outcome is less pronounced in developed countries. Similarly, while there is a positive relationship between governance and on-time completion in developed countries, this relationship is not statistically significant.

These results highlight the complex nature of governance and the need to consider other factors that may contribute to project outcomes in different contexts. Further research is required to explore these contextual factors and identify strategies for enhancing the effectiveness of governance in international development projects across all contexts.

In conclusion, the study does not provide clear evidence that governance is more effective in projects implemented by developed countries compared to projects implemented by developing or least developed countries. The effectiveness of governance appears to vary depending on the specific context and other influencing factors.

6.3. The dynamics of governance indicators and complexity

This subsection highlights the dynamics of interrelationships between governance indicators and complexity factors. Using logistic regression models from Chapter 4, we modelled the probability of a discrete governance outcome given a complexity variable (see Section 4.7 for more details). Consequently, an analysis of the relationship matrix between governance indicators and complexity factors is presented in Table 6.2.

A matrix-based analysis reveals a complex interplay between various governance indicators and complexity factors at both national and project levels. Each governance indicator interacts differently with various project complexity factors, and this should be considered when implementing projects and designing governance strategies. The strong relationships represent areas where improving governance could have a more significant impact on project complexity, while the weak ones are areas where improvement may not necessarily result in substantial navigates to complexity. A clear understanding of these relationships is pivotal in tailoring effective governance strategies, ensuring the successful execution of projects and the overall development of a nation.

Table 6.2
Governance indicators and complexity factors relationship matrix (● Strong ○ Medium Δ Weak)

Level	Governance indicator	Complexity factor											
		Duration of the project	Extension of the time	Goals Uncertainty	Size of budget	Number of disciplines	Development outcomes	Capacity of countries	Supervisor support	Political Instability	Number of contracts	Procurement methods	Diversity of suppliers
National	1. Voice and accountability	○	Δ	○	Δ	○	Δ	○	Δ	○	●	●	○
	2. Absence of violence				Δ	Δ	Δ		○	Δ	Δ	○	Δ
	3. Government effectiveness	Δ	Δ	Δ	○	Δ		Δ	Δ	Δ	Δ	○	Δ
	4. Regulatory quality				Δ	Δ		●		Δ	Δ	Δ	
	5. Rule of law	Δ	Δ	Δ	Δ	Δ		○		○	Δ	○	Δ
	6. Control of corruption	Δ	Δ	Δ	○	Δ	Δ	●	Δ		Δ	Δ	Δ
Project	7. Monitoring & Evaluation	○	○	●	○	●	Δ	○		●	○	○	○
	8. Government engagement	○	○	●	○	○	○	●	●	○	●	○	○
	9. Sponsor performance	●	○	●	●	●	●	●	●	●	●	○	●

Of considerable note is the pronounced influence of the "Sponsor Performance" indicator at the project level, which exhibits a strong relationship with most complexity factors, excluding the duration of the project and diversity of suppliers where the relationship is medium. This suggests that the performance of the sponsor is a significant factor affecting the project's complexity across multiple dimensions, including time management, goal uncertainty, budget size, disciplinary range, development outcomes, country capacity, supervisor support, political instability, contract volume, and procurement methods.

On the national level, the "Control of Corruption" and "Voice and Accountability" indicators show a strong relationship with crucial complexity factors. Specifically, the Control of Corruption strongly affects the capacity of countries, while Voice and Accountability significantly impacts the development outcomes and procurement methods.

Simultaneously, the governance indicator of "Regulatory Quality" has a strong relationship only with the number of disciplines, suggesting its influence is more specific rather than general. Similarly, the Absence of Violence, while crucial, appears to have a lesser impact on most project complexity factors, underlining that not all governance indicators significantly affect project complexity.

It is important to highlight that the indicators showing a medium or weak relationship with complexity factors are not to be overlooked. While their influence might be less pronounced, they contribute to the overall governance framework and can influence project and national dynamics in subtler ways.

The interrelationships outlined in the matrix underscore the necessity of an integrated approach to governance, one that acknowledges the unique influence of different governance indicators. It highlights the paramount importance of sponsor performance on project complexity and reminds us that effective governance is not just about managing corruption or ensuring regulatory quality but also about enhancing voice and accountability. As such, to successfully navigate the complex landscape of project execution and national development, it is indispensable to have a comprehensive understanding of the dynamics of all these variables.

6.4. Addressing research hypotheses

This research explored the impact of governance and complexity on international development project outcomes. The findings provide several important insights into these relationships, some of which support the initial hypotheses, while others refute them (see Table 6.3).

Table 6.3
Research hypotheses outcome

H	Description	Path coefficient 95%CI (N, P)	Critical ratio (N, P)	Outcome
1	a. Governance has a positive effect on the achievement of project objectives.	.104, .924	6.03, 57.3	Supported
	b. Governance has a positive effect on the project's on-time completion.	-.018, -.017	-1.56, -1.41	Not supported
2	a. Complexity has a negative effect on the achievement of project objectives.	-.093	-5.425	Supported
	b. Complexity has a negative effect on the project's on-time completion.	-.772	-49.194	Supported
3	Complexity has a negative effect on governance.	-.098, -.209	-5.48, -10.8	Supported
4	a. Complexity dampens the positive relationship between governance and achievement of project objectives.	-.03, -.014	-1.73, -1.28	Not supported
	b. Complexity dampens the positive relationship between governance and a project's on-time completion.	-.039, -.066	-3.34, -5.31	Supported
5	a. Monitoring and evaluation (M&E) have a positive effect on the achievement of project objectives.	.509	20.031	Supported
	b. Monitoring and evaluation (M&E) have a positive effect on project's on-time completion.	-.025	.156	Not supported
6	a. The positive relationship between governance and the achievement of project objectives is tighter in developed countries.	0.82	.965	Not supported

	b. The positive relationship between governance and on-time completion of projects is tighter in developed countries.	-.075	.960	Not supported

H= Hypothesis, N= National level, P= Project level, M&E= Monitoring & evaluation

The study's primary hypothesis (H1) posited that governance positively affects the achievement of project objectives, which was well supported by the data (.104, .924; 6.03, 57.3). However, the second part of this hypothesis, which suggested that governance positively affects the project's on-time completion, was not supported (-.018, -.017; -1.56, -1.41). This suggests that while governance plays a significant role in aligning the project with its objectives, it does not necessarily ensure timely delivery.

The second hypothesis (H2), which stated that project complexity has a negative impact on both the achievement of project objectives and on-time completion, was supported. The path coefficients and critical ratios were consistent with the proposed negative relationships, indicating that as project complexity increases, there is a decrease in the likelihood of achieving project objectives (-.093; -5.425) and of project completion on time (-.772; -49.194).

In Hypothesis 3, the data supported the assertion that complexity has a negative effect on governance (-.098, -.209; -5.48, -10.8), highlighting the increased governance challenges in complex projects.

Hypothesis 4 explored the moderating effect of complexity on the relationship between governance and project outcomes. It was found that complexity does not significantly dampen the positive relationship between governance and the achievement of project objectives (-.03, -.014; -1.73, -1.28), which contradicts the proposed hypothesis. However, complexity was found to indeed dampen the positive relationship between governance and a project's on-time completion (-.039, -.066; -3.34, -5.31).

The fifth hypothesis (H5) suggested that M&E have a positive effect on project outcomes. The data supported the idea that M&E positively influences the achievement of project objectives (.509; 20.031), while no significant effect was found for on-time project completion (-.025; .156), contradicting the latter part of the hypothesis.

The final hypothesis (H6) proposed a stronger positive relationship between governance and project outcomes in developed countries. However, the data did not support this hypothesis for either the achievement of project objectives (0.82; .965) or the on-time completion of projects (-.075; .960).

Overall, the research offers several compelling insights into the dynamics of project management. While governance and M&E were found to be pivotal for the achievement of project objectives, these factors did not guarantee on-time completion. Moreover, project complexity was associated with both the underachievement of project objectives and delayed completion, as well as presenting a challenge to governance. The research underscores the importance of complexity navigation and underlines the critical role of M&E for achieving project objectives.

6.5. Contributions to the body of knowledge

The findings of this study make significant contributions to both project complexity and governance in terms of knowledge. Some of these contributions are elaborated as follows:

This study introduces the DEBACCS Framework, a comprehensive model designed to understand and evaluate the complexity within a system, particularly in the context of projects. The DEBACCS acronym stands for seven key criteria: Diversity, Emergence, Belonging, Autonomy, Connectivity, Context, and Size. These criteria represent the various dimensions essential for gauging a project's complexity.

The name 'DEBACCS' is metaphorically akin to the intricate weaving of a complex fabric or the interrelated components of a sack. This analogy is apt, as complexity in this framework is conceptualized as a collection of elements that, while distinct, form recognisable and interconnected patterns. Just as a sack holds and unifies diverse items, the DEBACCS framework encapsulates the multifaceted aspects of complexity in a cohesive manner.

By providing a structured approach to measure complexity, the DEBACCS Framework lays a robust foundation for this research. It offers a nuanced lens through which the complexity inherent in projects can be systematically analysed and understood. Next, I explain each of these dimensions in detail to fully comprehend how they contribute to the complexity of a project.

Context: The context of a project is related to the nature, scope, and environment of the organization where the project's needs and expectations are met. Project complexity is often associated with high uncertainty and changes in socioeconomic and political environments, as well as the politics involved in funding, managing, and governing complex project relations. In this study, the project context was measured through political instability in each country and the level of risk to development outcomes.

Autonomy: Autonomy refers to the ability of constituent departments, teams, or partners to make independent choices in order to fulfill the project's purpose. In the context of international development projects, autonomy is limited due to dependence on sponsors and local governments. Therefore, no variable was found to assess this criterion.

Belonging: Belonging refers to the ability to accept and contribute goal-directed actions with respect to another entity. In complex projects, constituent teams, departments, subcontractors, and partners choose to belong to the project not only based on cost-benefit considerations but also to contribute to the project's supra purpose. The capacity of countries and supervisor support are considered as part of belonging in international development projects.

Connectivity: Connectivity is defined as the capacity to form connections that benefit the entire system. In complex projects, connectivity is reflected in the formal and informal communication infrastructure established among project constituents. Due to a lack of data, no variable representing connectivity was included in the current study.

Diversity: Diversity refers to the differentiation and requisite variety that creates system heterogeneity and enables the system to adapt and co-evolve with a rapidly changing environment. In this study, the variety of procurement methods and the diversity of suppliers were included in the diversity dimension.

Emergence: Emergence refers to the appearance of new properties and behaviours during the development or evolution of a project. Project emergence occurs when management systems fail to produce an accurate model of the production systems, as the production subsystems and their interactions change and evolve over time. The extension of project time and goal uncertainty are variables considered in the emergence dimension of the current study.

Size: The size and scope of a project are significant factors contributing to its complexity. Large projects, often referred to as megaprojects, involve multiple stakeholders and have a notable impact on communities. They are characterised by significant structural, political, technological, and economic complexity, as well as an extended execution timeframe, making them challenging to manage using conventional practices. In this study, the duration of the project, size of the budget (CapEx), number of contracts, and number of disciplines involved were used to assess the size of projects.

The DEBACCS Framework can be applied to any type of project and provides a universal index of complexity, regardless of unrelated and nonsensical factors. It is important to note that unfamiliarity and lack of knowledge are not considered part of complexity, despite being mistakenly used as such by many scholars.

By incorporating the DEBACCS Framework into project complexity, this study contributes valuable insights and a structured approach to understanding and assessing the complexity of projects. It offers a comprehensive set of criteria that encompass various aspects of complexity, allowing researchers and practitioners to evaluate and compare the complexity levels of different projects. Furthermore, the framework enhances our understanding of the factors that contribute to complexity, enabling more effective project management strategies and decision-making processes.

Considering the logistic regression models used in this study, four approaches can be proposed to address complexity in international development projects. In cases of low complexity and inadequate governance, the World Bank needs to take a more directive approach and increase control to enhance project performance. In situations characterised by good governance and low complexity, the World Bank's role as a project sponsor should acknowledge the government's commitment and guide them towards project success.

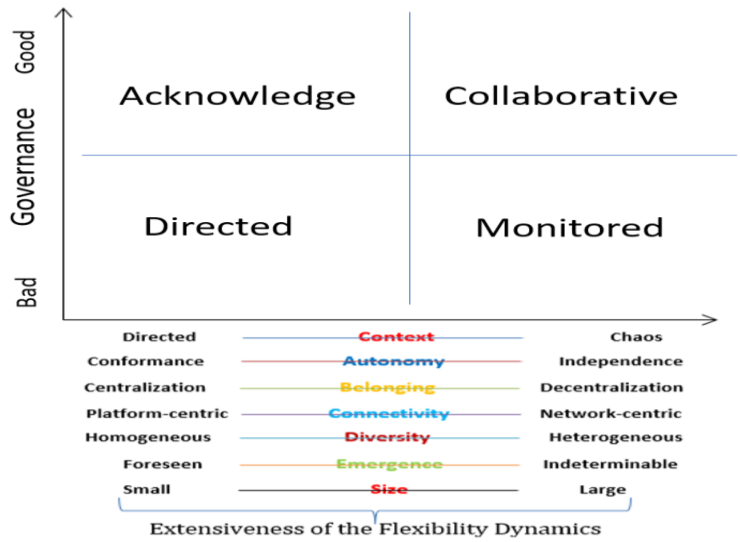


Fig. 6.1 Four management approaches for dealing with complex development projects

In scenarios of high complexity and good governance, close collaboration between the World Bank and governments is essential to increase project performance. The study reveals that complexity does not significantly impede the relationship between governance and project outcomes. Lastly, when facing complex projects in a country with a poor governance system, the World Bank can improve project outcomes by implementing a more robust monitoring and evaluation system and promptly responding to any changes. For more detailed information, please refer to Figure 6.1. It is important to note that further investigation is required to provide a more comprehensive understanding of these analyses.

Overall, this study's contributions to the body of knowledge in project complexity and governance are significant, providing a robust framework for assessing complexity and advancing our understanding of the intricacies involved in managing complex projects. To delve further into the specific contributions made to the project governance body of knowledge, I encourage you to refer to Chapter 5 for detailed information.

6.6. Limitations of the study

Despite the extensive use of various data resources and the generation of a rich pool of findings, this study is subject to several research limitations, which include the following:

Firstly, it is important to acknowledge that the data utilised in this study primarily consists of secondary sources. This reliance on secondary data may introduce limitations in terms of accuracy, completeness, contextual fit, and data availability. While secondary data has its limitations, it also offers advantages such as cost-effectiveness, wide coverage, and historical depth.

Secondly, the study focuses exclusively on projects sponsored by the World Bank, potentially constraining the generalizability of the findings to other international development projects. However, it is worth noting that the substantial size of the research dataset and the significant contribution of the World Bank to international development projects enable us to make reasonably broad statements based on the current research findings.

Another research limitation lies in the potential biases associated with data collection, both in aggregating the dataset and in the evaluation outcomes provided by the World Bank.

Lastly, it is important to recognise that the identification of complexity factors in this study is contingent upon the availability of data. This could serve as a constraint on the research. Future studies could address this limitation by focusing on specific theories and assessing relevant variables through case studies.

By acknowledging and addressing these limitations, future research can build upon these findings to further enrich our understanding in governance and complexity field.

6.7. Future research directions

Based on the findings and limitations of this study, several avenues for future research warrant exploration as follow:

First, the relationship between governance and project outcomes in different countries is assessed in this study which raises the question, how come certain governance arrangements have worked for some sectors, but not others. For example, research results confirm that the correlation between governance and project outcomes is -0.31 in ICT projects while this figure is 0.73 and 0.51 for financial Sector and agricultural projects, respectively.

Second, although this study highlighted the contribution of monitoring and evaluation as a sound governance system in achieving the project outcomes, more studies are required regarding the mediation role of monitoring and evaluation in delivering international aid. Moreover, exploring the features of a good sound governance system will be worthwhile for future research.

Third, the results here represent the recognition of different governance networks for their efforts to address project complexity. It would be interesting to connect these networks with government types in different countries and reveal the optimal level of governance in achieving project outcomes. Moreover, the results of this study can be applied in developing machine-learning techniques for a smart governance system. Results contribute to the understanding of the influence of governance, when establishing governance mechanisms, on project outcomes when affected by different complexity factors and will be of interest to countries, local governments, the UN, and financial institutions alike. The spectrum of outcomes identified in this study will be of interest to academics and practitioners alike wishing to further assess the drivers behind the results here described.

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Appendix I. Project complexity factors extracting from systematic literature review.

Dimension	Project complexity factors (provenance of complexity)
Context	Unusual type of design process
	Demand of creativity
	Scope for development
	Institutional configuration
	Significant on public agenda
	Degree of project flexibility (in scope, process, organization…)
	HSSE issues
	Decision making process challenges
	Repetition of similar type of projects
	Internal politics Issue (ambiguity, hidden information)
	Environment complexity (networked environment)
	Cultural configuration
	Form of contract
	Overlapping office hours
	Stability project environment
	Experience with parties involved
	Project drive
	Commercial newness of the project (new partners, teams etc.)
	Conflict between stakeholders
	Level of competition between stakeholders
	Lack of support (top management, users, staff members etc.)
	Organizational degree of innovation
	New laws and regulations
	Local laws and regulations
	Level of competition
	Environment of changing technology, economy and nature
	Functional role
	Degree of obtaining information
	Interaction between the technology system and external environment
	Organizational risks
	Neighbouring environment (including the site access/location)
	Geological condition/difficulty of location
	External politics issue
	Union power
Belonging	Quality requirements
	Cost restraints (cost and financing)
	Specific requirements/standards
	Capability (knowledge, experience, education, training etc.)
	Technical capability of team
	Unknown/poorly defined requirements
	Bespoke software or hardware
	Trust in stakeholders
	Team transparency, empathy (the personal and intangible matter that improves cooperation)
	Project Manager competencies
	Technological degree of innovation
	Risk of highly difficult technology
	Technological newness of the project
	Highly customized products
	Responsibility & Accountability
	Requirements capture

Appendix I (continued). Project complexity factors extracting from systematic literature review.

Dimension	Project complexity factors (provenance of complexity)
Autonomy	Availability of people, material and of any resources due to sharing
	Level of interrelation of between phases
	Team/partner cooperation and communication
	Levels of management are involved in project decision-making
	The amount of overlap and interactions
	Dynamic and evolving team structure
	Dependencies with the environment
	Interdependencies between sites, departments and companies
	Interdependencies of objectives/interests
	Process interdependence
	Stakeholders interrelation/interdependencies
	Interdependencies between actors
	Specifications interdependence
	Interdependence between components of the product
	Technological process dependencies
	Resource and raw material interdependence
	Dependencies between schedules
	Interdependencies of information systems
	Number of governmental people who involved in projects
	Combined transportation
Connectivity	Interconnectivity and feedback loops in the task and project networks
	Face to face relationship between project team members
	Number of interfaces in the project organization
	Relations with permanent organizations
	Capacity of transferring information
	Level of processing information
	Goals/interests alignment
Emergence	Dynamics of the task activities
	Uncertainties of scope
	Uncertainty & clarity of objectives or goals
	Uncertainty in technical methods
	Information uncertainty
	Clients with unrealistic goals
	Market uncertainty

Appendix I (continued). Project complexity factors extracting from systematic literature review.

Dimension	Project complexity factors (provenance of complexity)
Diversity	Variety of financial resources
	Variety of organizational skills needed
	Variety of the project management methods and tools applied
	Variety of resources to be manipulated
	Diversity of tasks
	Diversity of inputs and/or outputs
	Variety of the interests of the stakeholders
	Diversity of staff (experience, social span ...)
	Variety of the stakeholders status
	Cultural variety
	Number of different languages
	Multiple time zones
	Variety of hierarchical levels within the organization
	Variety of organizational interdependencies
	Variety of technological dependencies
	Variety of the technologies used during the project
	Variety of technological skills needed
	Multiple participating countries/location
	Geographic location of the stakeholders
	Variety of information systems to be combined
	Variety of the product components
	Client transparency, empathy (the personal and intangible matter that improves cooperation)
	Multiple suppliers, contractors, vendors, etc.
Size	Number of decisions to be made
	Duration of the project
	Number of deliverables/disciplines
	Number and quantity of resources
	Number of activities
	Largeness of capital investment
	Number of the project management methods and tools applied
	Number of different occupational specializations
	Number of inputs and/or outputs
	Largeness of scope (number of components etc.)
	Size in CAPEX (Capital expenditures)
	Number of stakeholders
	Number of companies/projects sharing their resources
	Number of formal units & departments involved
	Number of objectives
	Number of investors
	Staff quantity
	Number of structures/groups/teams to be coordinated
	Number of hierarchical levels
	Number of information systems

+5 ● Strong +3 ○ Medium +1 △ Weak

Appendix II. Relationship between research themes and principal theories contributing to project governance

Research Theme/keyword	Freq.	Agency theory	Transaction cost theory	Institutional theory	Contingency theory	Stakeholder theory	Stewardship theory	Principal-agent theory	Systems theory	Network theory	Resource dependence theory
Collaboration	7	△1	△1		△1	△1		△1	△2		
Contract	16	○4	●7	○3				△2			
Procurement	6	△2	△1	△2						△1	
Organisation	41	●6	●9	●5	●12	△2	○4		△1	△1	△1
Social network analysis	10	△2	△1	△2	△2					●5	
Infrastructure	10	△2	△1	△2		○3	△1				△1
Public-private partnership	19		○4	●8		○3		○3		△1	
Network	16	△2	○3	△2						●9	
Governmentality	6	△2		△1		△2		△1			
Strategy	11	△1	○3	△1		△2	△1		△1	△1	△1
Uncertainty	5	△1	△2		△1				△1		
Control	7	●5	△1				△1				
Innovation	10	△2	△2	△2		△2			△1	△1	
Complexity	11	△1	△1	○3		△1	△1		○3		△1
Trust	11	○3	△2	△1	△1		△2	△2			
ERP	6		△2	△2	△1				△1		
Decision making	5		△1	△1		△1		△1	△1		
Quality	7	△1	△1	△1	△1	△1	△1	△1			
Project owner	5	△1	△1	△1				△2			
Portfolio management	7	○3			△2			△1	△1		
Information technology	9	○3	△2		△1	△1		△1	△1		
Project success	31	●6	●5	●5	●5	○4	○3	△1	△1		△1
Relational norms	10	△2	○3	△2	△1			△1	△1		
Agile	12	○3	△1		△2	△1	△2	○3			
Public projects	15	△2	△2	△2	△1	○3		○3		△2	

+5 ● Strong +3 ○ Medium +1 △ Weak

Appendix II (continued). Relationship between research themes and principal theories contributing to project governance

Research Theme/keyword	Freq.	Agency theory	Transaction cost theory	Institutional theory	Contingency theory	Stakeholder theory	Stewardship theory	Principal-agent theory	Systems theory	Network theory	Resource dependence theory
Governance framework	12	△2	△2	△2		△2	△1	△1		△1	△1
Knowledge	11	△1	○3	△1	○4				△1	△1	
Risk	17	○3	○3	△1		△2	△1	○3	△2		△2
Stakeholders	12	△2		○4		○4		△1			△1
Sustainability	6	△1	△1			△1	△1	△1			△1
Organizational enablers	6	△1	△1	△1	△2		△1				
Construction	13	△2	△2	○3		△1	△2			△2	△1
Performance	16	●5	●4	△1	△1	△2	△1	△1	△1		
PMO	9	△2	△2	△2	△1					△2	
Project context	5	△1	△1	△1	△2						
Benefits management	12	△1	△1	○4	△2	△1	△1	△2			
Megaproject	17	△1	○3	●5		△2	△1	○3		△1	△1
Projectification	7	△2	△1	△1	△2		△1				
Public administration	5	△1	△1	△1		△1				△1	
Benefits realization	5	△1	△1	△1		△1	△1				
multilevel project governing	5	△1	△1			△1	△1				△1
Institutional logics	7										
Ethics	7	○3 △1	△	△3 △2		△1	△1 △2				△1
Complex projects	5								○4	△1	
Leadership	7	○3					○3			△1	
Corporate governance	5	△1	△1			△1	△1				△1
Team	6	○3					△2 △1				
Mechanisms	7	△1	△2	△1	△1	△1		△1			
Accountability	5	○3								△2	
Communication	5	△1				△1		△2	△1		
Competence	5			△1	○4						
Behaviour	7	△1	△1	△1	△2			○3		△1	

Appendix III.
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
1	Argentine Republic	241	187	32	21	1	76	53	8	15%		1	8	22	22		57%
2	Arab Republic of Egypt	194	158	21	14	1	52	32	9	28%	1	3		7	19	2	63%
3	Republic of Kazakhstan	75	44	13	15	3	30	17	5	29%		1	1	6	9		60%
4	Republic of Poland	70	62	1	6	1	31	19	9	47%		1	1	9	8		58%
5	Republic of Belarus	40	20	17	2	1	16	7	2	29%				4	3		62%
6	Kingdom of Thailand	179	164	2	12	1	30	4	1	25%				1	2	1	76%
7	Republic of Bulgaria	57	47	0	10	0	29	20	8	40%		1	1	8	10		60%
8	Georgia	115	87	20	6	2	63	32	11	34%		1	2	12	17		61%
9	Republic of Mali	163	122	30	6	5	60	18	8	44%		3	2	9	4		46%
10	Republic of Turkey	260	210	31	12	7	67	44	19	43%	1	2	2	7	29	3	66%
11	Afghanistan	198	126	50	16	6	102	61	19	31%		7	4	24	24	2	55%
12	Republic of India	838	627	113	74	24	212	121	29	24%		3	12	44	52	10	62%
13	Bangladesh	398	294	73	19	12	102	60	26	43%	1	2	6	15	30	6	64%
14	Burkina Faso	171	125	34	10	2	68	32	19	59%			7	10	14	1	58%
15	Jamaica	105	90	11	2	2	28	21	7	33%				9	12		65%
16	Republic of Albania	128	94	23	8	3	59	37	18	49%		2	2	10	22	1	63%
17	Republic of Azerbaijan	83	61	10	12		48	30	6	20%		3	3	8	15	1	58%
18	Republic of Botswana	35	31	2	2		5	2	1	50%		1		1			27%
19	Republic of Maldives	41	24	12	3	2	18	10	5	50%		1	4	1	4		47%
20	Republic of Panama	88	73	3	10	2	26	11	4	36%		1	1	6	3		52%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
21	Romania	127	103	10	12	2	45	37	13	35%		2	7	8	18	2	59%
22	China	585	461	88	27	9	218	147	56	38%		3	6	39	80	19	69%
23	Myanmar	72	40	22	9	1	7	2	1	50%					1	1	88%
24	Turkmenistan	10	6		4		4	1	1	100%				1			52%
25	Barbados	14	14				2	2	0	0%				1	1		64%
26	Belize	23	17	3	2	1	9	4	1	25%	1			1	2		51%
27	Republic of Ethiopia	234	169	49	11	5	96	55	20	36%	1	1	8	19	25	1	58%
28	Republic of Chad	96	74	16	3	3	29	21	10	48%		5	7	3	6		39%
29	Republic of Kenya	281	209	49	18	5	67	34	10	29%		5	4	14	11		49%
30	American Samoa	45	28	15		2	17	11	5	45%			1	5	5		60%
31	Republic of Guinea	124	95	24	3	2	35	22	7	32%			3	14	5		54%
32	Republic of Haiti	125	84	33	4	4	43	25	9	36%		1	5	10	9		53%
33	Tanzania	288	234	32	13	9	96	52	21	40%		1	13	24	14		51%
34	Tuvalu	17	4	13			4	2	1	50%			2				27%
35	Ukraine	111	68	18	19	6	50	23	8	35%	1	5	2	6	9		46%
36	Republic of Zimbabwe	67	48	8	9	2	10	4	3	75%				1	3		70%
37	Republic of Yemen	232	207	14	10	1	87	28	8	29%		3	3	11	8	3	56%
38	Republic of Vanuatu	21	12	8	1		8	4	2	50%		1		1	2		52%
39	Republic of Uzbekistan	73	31	29	8	5	26	14	2	14%			1	7	6		60%
40	Republic of Kiribati	26	13	10	2	1	13	9	3	33%				4	4	1	68%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome: HU	U	MU	MS	S	HS	Outcome Rate
41	Republic of Zambia	166	144	17	3	2	57	29	11	38%	1		1	13	14		61%
42	Republic of Iraq	66	47	9	7	3	41	23	7	30%		1	2	13	7		55%
43	Republic of Latvia	29	25		4		10	6	6	100%					5	1	80%
44	Republic of Kosovo	65	43	17	3	2	42	28	15	54%		1		9	17	1	66%
45	Tuvalu	17	4	13			4	2	1	50%			2				27%
46	Republic of Estonia	9	8		1		1	1	1	100%					1		76%
47	Republic of Djibouti	68	45	18	3	2	33	16	5	31%				5	10	1	70%
48	Republic of Chile	102	93	5	2	2	29	16	6	38%				5	11		68%
49	Republic of Colombia	301	258	20	13	10	98	61	30	49%	1	2	2	8	46	2	68%
50	Brazil	548	467	43	28	10	197	125	49	39%	1	13	15	45	47	4	54%
51	Kingdom of Morocco	239	201	23	11	4	72	49	30	61%	1	1	2	22	22	1	60%
52	Mekong	2	2				2	1	0	0%				1			52%
53	Kingdom of Cambodia	103	62	26	14	1	50	30	6	20%		3	2	16	9		52%
54	Republic of Benin	138	110	19	6	3	57	38	16	42%			5	8	24	1	65%
55	Jordan	144	111	23	10		42	23	13	57%	1		5	9	8		52%
56	Republic of Cote d'Ivoire	182	138	31	7	6	36	17	10	59%		1	1	6	8	1	61%
57	Mongolia	96	69	19	8		57	25	5	20%		1	2	8	12	2	63%
58	Nigeria	253	191	49	7	6	86	42	15	36%		4	7	16	13	2	53%
59	Republic of Armenia	129	97	25	6	1	75	48	19	40%			1	10	36	1	70%
60	Guinea-Bissau	64	50	10	3	1	26	14	6	43%		1	4	2	7		53%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
61	Republic of Lithuania	19	19				7	4	2	50%			1	1	2		58%
62	Timor-Leste	53	43	7	2	1	42	29	8	28%		1	5	8	15		58%
63	Uruguay	96	81	7	7	1	35	22	9	41%			1	6	14	1	68%
64	Republic of Ghana	265	212	40	8	5	86	46	20	43%		2	5	19	20		57%
65	Lebanese Republic	83	50	13	14	6	33	17	5	29%		3	1	7	5	1	52%
66	Dominican Republic	85	65	9	7	4	32	18	6	33%			2	7	9		61%
67	Republic of Burundi	111	95	14	1	1	46	26	13	50%			1	13	12		62%
68	Islamic Republic of Iran	58	52	1	5		12	9	6	67%		4	2	2	1		27%
69	Bosnia and Herzegovina	109	87	11	7	4	55	37	11	30%		1	4	11	20	1	62%
70	Mauritania	117	93	16	4	4	37	21	5	24%		2	6	4	7	2	53%
71	Republic of Honduras	146	126	15	4	1	58	22	8	36%		1	1	15	5		54%
72	Republic of Cameroon	152	120	22	5	5	38	24	6	25%		5	6	6	7		42%
73	Vietnam	291	205	59	14	13	170	94	45	48%		2	4	47	36	5	61%
74	Algeria	86	76		10		14	10	3	30%	1	1	2	2	4		46%
75	Bolivia	148	128	13	5	2	41	24	9	38%		4	4	11	5		44%
76	Republic of Costa Rica	70	59	4	5	2	19	9	3	33%				3	5	1	70%
77	Kyrgyz Republic	130	98	28	3	1	80	42	12	29%		1	3	13	21	4	65%
78	Kingdom of Lesotho	74	54	13	6	1	22	16	3	19%			1	12	3		55%
79	Republic of Indonesia	599	504	46	31	18	203	87	36	41%		4	13	32	37	1	57%
80	Republic of Sri Lan	189	152	24	12	1	60	35	16	46%		2	5	11	16	1	58%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome HU	Outcome U	Outcome MU	Outcome MS	Outcome S	Outcome HS	Outcome Rate
81	Republic of Ecuador	140	105	15	15	5	31	13	5	38%	1	1	1	2	8		57%
82	Republic of Angola	48	24	14	5	5	15	10	2	20%		1	1	3	4	1	59%
83	Macedonia	79	60	11	6	2	40	29	13	45%				10	16	3	70%
84	Grenada	25	19	5		1	17	10	2	20%			1	5	4		59%
85	Republic of Croatia	81	66	7	5	3	44	31	14	45%		1	6	12	11	1	55%
86	Sao Tome and Prin	42	30	8	3	1	21	7	1	14%		1		4	2		52%
87	Republic of Guatemala	86	72	4	4	6	36	18	9	50%			1	11	6		58%
88	Nepal	202	142	43	13	4	68	32	14	44%		1	5	12	14		57%
89	Republic of Cabo Verde	54	41	11		2	24	14	6	43%			2	8	3	1	57%
90	Lao People's Democratic	141	91	35	7	8	62	40	16	40%		1	3	14	20	2	63%
91	Republic of Mozambique	180	127	45	2	6	87	54	22	41%		2	5	22	25		59%
92	Republic of Uganda	243	192	31	11	9	87	46	18	39%		1	5	21	19		58%
93	Republic of Sierra Leone	141	104	27	5	5	68	33	11	33%			4	15	14		59%
94	Republic of Malawi	187	147	25	12	3	57	30	13	43%		3	3	11	11	2	56%
95	Republic of Senegal	207	168	33	3	3	62	47	19	40%		5	6	18	13	5	55%
96	State of Eritrea	23	18		5		13	8	2	25%		1	1	3	3		52%
97	Republic of Rwanda	156	115	33	2	6	62	40	25	63%				3	33	4	76%
98	Union of the Comoros	46	33	9	2	2	17	9	3	33%			1	2	6		65%
99	Republic of Madagascar	203	159	29	9	6	66	34	15	44%		2	8	12	12		52%
100	Republic of South Africa	39	29	5	1	4	12	6	1	17%				1	5		72%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
101	Africa	229	191	13	25		163	66	26	39%		2	19	22	22	1	52%
102	Republic of Seychelles	19	17	1		1	12	3	3	100%			1	1		1	60%
103	Congo	188	135	40	6	7	62	27	11	41%	1	3	4	9	10		50%
104	Republic of The Gambia	69	51	15	3		23	12	6	50%			2	6	4		56%
105	Republic of Niger	140	104	31	2	3	50	33	20	61%		1	5	12	14	1	58%
106	Central African Republic	81	59	18	2	2	86	42	15	36%		4	7	16	13	2	53%
107	Republic of Mauritius	56	53	1	2		15	11	9	82%				3	4	4	78%
108	Republic of Togo	109	84	14	8	3	36	15	8	53%		2	1	6	4	2	56%
109	Gabonese Republic	34	22	10	1	1	9	4	2	50%				4			52%
110	Republic of Namibia	9	8	1			8	4	1	25%				2	2		64%
111	Republic of Congo	72	46	19	3	4	22	12	2	17%		3	1	6	2		41%
112	Republic of Liberia	146	105	32	5	4	68	26	12	46%			3	12	11		59%
113	Southern Africa	13	3	8	1	1	3	1	0	0%					1		76%
114	Western Africa	107	33	53	10	11	26	17	7	41%		2		11	4		52%
115	Republic of the Sudan	102	88	11		3	31	14	2	14%			1	8	4	1	60%
116	Eastern Africa	72	9	54	2	7	8	1	1	100%						1	100%
117	Somali	95	65	23	3	4	15	4	3	75%				1	3		70%
118	Republic of South Sudan	44	32	7	4	1	31	21	3	14%			6	13	2		47%
119	Kingdom of Eswatini	31	21	4	4	2	6	1	0	0%					1		76%
120	Papua New Guine	92	68	13	5	6	25	12	3	25%			3	6	3		52%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
121	Philippines	330	265	29	25	11	98	45	12	27%	1	2	9	14	16	3	55%
122	Solomon Islands	48	25	18	2	3	15	5	1	20%				4	1		56%
123	Kingdom of Tonga	35	19	13	2	1	16	11	8	73%			1	2	8		67%
124	Marshall Islands	17	9	4	2	2	3	2	2	100%		1			1		39%
125	Micronesia	10	1	8		1	1	1	0	0%						1	100%
126	Russian Federation	118	73	5	40		33	19	6	32%		1	1	4	12	1	66%
127	Republic of Tajikistan	115	81	23	8	3	70	32	14	44%			2	5	25		69%
128	Slovak Republic	14	11		3		9	5	3	60%			2	1	1	1	56%
129	Republic of Moldova	109	90	16	1	2	72	33	16	48%	1	1	3	10	17	1	60%
130	Republic of Slovenia	10	10				2	1	1	100%					1		76%
131	Republic of Serbia	85	57	19	7	2	57	38	7	18%	1		2	6	26	3	69%
132	Montenegro	34	23	7	4		23	14	5	36%		1	1	3	8	1	64%
133	Western Balkans	10	7	3			5	3	2	67%			2	1			35%
134	Republic of Peru	203	167	19	11	6	74	47	20	43%		2	5	11	25	4	64%
135	United Mexican States	339	289	17	24	9	97	70	42	60%		4	5	13	45	3	65%
136	Republic of Paraguay	79	64	8	6	1	20	9	4	44%			2	3	4		57%
137	Republic of Nicaragua	141	119	11	5	6	56	30	8	27%		2		9	17	2	65%
138	Venezuela	53	47		6		4	3	1	33%			1		2		60%
139	Republic of El Salvador	72	59	5	5	3	23	11	5	45%		1	1	3	6		58%
140	St. Vincent	17	9	4	3	1	7	5	3	60%				1	4		71%

Appendix III (continued).
Country projects statistics of research dataset (Last update: 10/06/2020)

No.	Country	Total Project	Closed Projects	Active Projects	Dropped	Pipeline	Closed after 2000	# final Report	# On-time completion	% On-time completion	Outcome						Outcome Rate
											HU	U	MU	MS	S	HS	
141	St. Lucia	28	18	6	1	3	12	8	4	50%		1		2	5		61%
142	Caribbean	30	22	6	1	1	13	6	2	33%				2	3	1	72%
143	Co-operative Republic of Guyana	68	56	6	3	3	15	10	4	40%				3	7		68%
144	St. Kitts and Nevis	5	5				3	3	2	67%				2	1		60%
145	Commonwealth of Dominica	17	8	8		1	3	3	3	100%				1	2		68%
146	Republic of Tunisia	207	171	21	11	4	53	34	12	35%		2	5	16	10	1	54%
147	West Bank and Gaza	141	96	37	6	2	76	41	19	46%	1		1	16	22	1	64%
148	Islamic Republic of Pakistan	460	333	73	38	16	122	76	36	47%		4	11	17	39	5	61%
149	Kingdom of Bhutan	57	42	9	3	3	30	12	8	67%			1	1	10		70%

HU= Highly Unsatisfactory U= Unsatisfactory MU= Moderately Unsatisfactory MS= Moderately Satisfactory S= Satisfactory HS= Highly Satisfactory

Appendix IV. Key factors affecting the project outcomes (keywords extraction)

High performance projects

Factors	**Design**	**Implementation**	**Post completion**
Political	inconsistency (.001), instability (.006), political interference (.002), lack of political willingness (.001), political commitment (.002), political environment (.003), political crises (.001), political context (.002), central government (.003), local government (.002), level of government (.004), control of government (.001), government's commitment (.026), government system (.002), authority (.004), administration (.010), regime (.001), campaign (.011), president (.008), minister (.010), conflict (.012), ministry (.042), political (.046), national (.132), local (.074)	instability (.002), revolution (.003), political environment (.004), political stability (.004), political crises (.006), political support (.006), political context (.002), central government (.005), local government (.007), level of government (.005), control of government (.022), government's commitment (.014), authority (.006), administration (.032), regime (.002), campaign (.007), president (.022), minister (.031), conflict (.015), ministry (.069), political (.057), national (.161), local (.055)	political crisis (.002), political turmoil (.001), local government (.003), level of government (.001), government's commitment (.001), administration (.001), president (.001), minister (.001), ministry (.010), political (.006), national (.052), local (.036)
Legal	legal amendments (.001), court (.001), justice (.007), Law (.004), legal covenant (.001), legal and regulatory framework (.006), legal obligation (.001), legal agreement (.006), regulation (.001)	legal amendments (.001), court (.003), justice (.004), Law (.013), legal and regulatory framework (.009), insecure legal status (.001), legal agreement (.003), regulation (.005)	Law (.002), legal and regulatory framework (.001), regulation (.002)
Cultural	Culture (.002), history (.002), socio-cultural (.001), cultural context (.001), cultural diversity (.001), cultural concern (.001), cultural resource (.001), cultural Institution (.001)	Culture (.005), history (.002), belief (.001), values (.005), cultural aspect (.001), cultural Institution (.001)	cultural appropriateness (.001),
Technical	technical specifications (.001), technical assistance (.035), standard (.007), technology (.004), technical design (.005), technical support (.010), technical staff (.003), technical advice (.002), technical review (.001), technical capacity (.001), technical quality (.002), technical capability (.002),	technical assistance (.032), technical department (.001), standard (.007), technology (.006), technical support (.012), technical oversight (.003), technical staff (.002), technical advice (.003), technical capacity (.004), technical quality (.002), technical capability (.002), technical (.138), data (.059), information (.071)	technical assistance (.002), technical content (.001), technology (.001), technical support (.002), technical capacity (.001), technical quality (.001), technical capability (.001), technical (.021), data

	technical (.126), data (.043), information (.032)		(.012), information (.004)
Managerial/ organisational	processes (.023), resources (.062), implementation approach (.029), project planning (.002), departments (.008), administration (.010), organizational change (.001), organizational framework (.001), centralization (.001), decentralization (.017), coordination (.063), communication (.007), consultant (.004), project management (.017), relationship (.008), meeting (.022), management (.170), quality (.166), plan (.088), strategy (.074), restructuring (.011), supervision (.033), Leadership (.016)	processes (.027), resources (.088), implementation approach (.010), project planning (.001), departments (.011), organizational structure (.001), administration (.032), manager (.006), decentralization (.012), coordination (.075), communication (.022), consultant (.008), project management (.042), relationship (.014), meeting (.018), management (.220), quality (.103), plan (.091), strategy (.046), restructuring (.061), supervision (.100), Leadership (.044)	processes (.002), resources (.026), implementation approach (.004), administration (.001), organizational capacity (.001), managerial capacity (.001), decentralization (.004), coordination (.010), communication (.004), project management (.004), meeting (.001), management (.049), quality (.041), plan (.015), strategy (.020), restructuring (.003), supervision (.005), Leadership (.007)
Economic	economic conditions (.001), competition (.003), political economy (.003), currency (.002), import duty (.009), economic recession (.001), economic growth (.007), economic development (.002), economic vulnerabilities (.001), socio-economic (.002), economic crisis (.002), economic analysis (.003), economic research (.001), economy (.007), inflation (.007)	economic conditions (.001), competition (.002), political economy (.002), currency (.004), import duty (.002), economic recession (.002), economic growth (.002), socio-economic (.003), economic inequality (.001), economic crisis (.006), economy (.009), inflation (.003)	political economy (.001), economic growth (.001), economic development (.001), economic crisis (.004), economy (.002)
Environmental	Water (.017), climate (.004), waste (.010), energy (.001), food (.038), environmental aspects (.001), environmental concerns (.001)	Pollution (.009), air (.014), Water (.023), climate (.003), weather (.001), waste (.021), emission (.001), energy (.001), food (.022), environmental concerns (.002)	Pollution (.001), Water (.006), weather (.001), waste (.003), food (.011),
Social	ethnic (.005), norms (.008), social mobilization (.001), social protection (.006), social safeguard (.001), community (.092), social (.055), Socio (.003),	ethnic (.001), norms (.006), social mobilization (.001), social protection (.019), social safeguard (.002), community (.083), social (.071), Socio (.003)	ethnic (.003), norms (.002), social mobilization (.001), social protection (.006), social safeguard (.002), community (.021),

			social (.029), Socio (.001)
Corruption	Transparency (.008), corruption (.017), fraud (.001)	Transparency (.003), corruption (.016), fraud (.002)	Transparency (.002)
Governance	Control (.080), relationship (.008), steering groups (.010), roles and responsibilities (.016), governance (.041), Policy (.090), transparency (.008), accountability (.021), meeting (.022), audit (.007), participatory processes (.032), contracting processes (.016), trust (.004)	Control (.114), relationship (.014), steering groups (.006), roles and responsibilities (.024), governance (.014), Policy (.109), transparency (.003), accountability (.019), meeting (.018), audit (.010), participatory processes (.010), contracting processes (.018), trust (.014)	Control (.020), roles and responsibilities (.002), governance (.014), Policy (.036), transparency (.002), accountability (.007), meeting (.001), audit (.003), contracting processes (.003), trust (.004)
Financial	Budget (.084), fund disbursement (.069), money (.003), interest (.009), finance (.031), financing (.109), financial (.113), funding (.059), loan (.026)	Budget (.075), fund disbursement (.116), money (.003), interest (.010), finance (.025), financing (.129), financial (.109), funding (.082), loan (.057)	Budget (.036), fund disbursement (.017), interest (.002), finance (.018), financing (.046), financial (.031), funding (.022), loan (.008)
Collaboration/ Partnership	Communication (.007), team (.179), committee (.025), partner (.081), collaboration (.030), coordination (.063), support (.184), aligned efforts (.005), commitment (.078), agencies (.042), government (.314), bank (.317), fiduciary (.047)	Communication (.022), team (.240), committee (.015), partner (.065), collaboration (.028), coordination (.075), support (.219), aligned efforts (.006), commitment (.077), agencies (.060), government (.363), bank (.352), fiduciary (.047)	Communication (.004), team (.009), partner (.026), collaboration (.003), coordination (.010), support (.100), aligned efforts (.001), commitment (.016), agencies (.008), government (.094), bank (.067), fiduciary (.002)
Safety and security	uncontrollable circumstances (.001), security (.011),	War (.005), security (.009)	War (.001), security (.003)
Human resource	Knowledge (.028), staff (.061), skills (.013), training (.050), experts (.018), human resource (.019)	Capability (.001), Knowledge (.017), competency (.001), staff (.138), skills (.019), training (.111), qualifications (.001), experts (.026), human resource (.023)	Capability (.001), Knowledge (.005), staff (.020), skills (.003), training (.024), human resource (.005)
Procedural	arrangements (.101), supply chain (.001), procedure (.034), instruction (.001), agreements (.041), process (.064), contract (.011),	arrangements (.059), supply chain (.002), tendering (.002), procedure (.040), instruction (.001), agreements (.067), process (.096), contract	arrangements (.021), supply chain (.002), procedure (.004), agreements (.007),

	interventions (.078), procurement (.098)	(.021), interventions (.044), procurement (.204)	process (.009), contract (.003), interventions (.020), procurement (.006)

Appendix IV (Continued). Key factors affecting the project outcomes (keywords extraction)

Moderate performance projects

Factors	**Design**	**Implementation**	**Post completion**
Political	inconsistency (.001), instability (.003), revolution (.001), lack of political willingness (.001), political commitment (.005), political opposition (.003), political environment (.007), political stability (.002), political crises (.001), political turmoil (.002), political support (.003), political context (.001), central government (.006), local government (.008), level of government (.005), control of government (.001), government's commitment (.055), government system (.001), authority (.011), administration (.025), campaign (.008), president (.010), minister (.019), conflict (.027), ministry (.067), political (.083), national (.242), local (.121)	inconsistency (.001), instability (.009), revolution (.009), political interference (.002), political commitment (.007), political environment (.006), political change (.002), political stability (.003), political crises (.002), political turmoil (.003), political support (.009), political context (.007), central government (.007), local government (.006), level of government (.005), control of government (.032), government's commitment (.023), government system (.001), authority (.015), administration (.051), regime (.004), campaign (.007), president (.041), minister (.076), conflict (.040), ministry (.125), political (.133), national (.290), local (.114)	instability (.001), political commitment (.001), political support (.003), central government (.001), local government (.003), government's commitment (.003), administration (.008), campaign (.002), president (.003), minister (.008), conflict (.004), ministry (.029), political (.022), national (.116), local (.030)
Legal	legal amendments (.001), jurisdiction (.001), justice (.002), Law (.019), legal covenant (.001), legal and regulatory framework (.008), legal agreement (.007), regulation (.005)	legal amendments (.003), court (.006), justice (.004), Law (.026), legal covenant (.002), legal and regulatory framework (.015), insecure legal status (.001), legal obligation (.001), legal agreement (.004), regulation (.012)	Justice (.002), Law (.009), legal and regulatory framework (.001), insecure legal status (.001), regulation (.005)
Cultural	Culture (.002), history (.004), values (.008), socio-cultural (.002), cultural adaptation (.001), cultural environment (.001), cultural aspect (.002), cultural Institution (.001), cultural factor	Culture (.008), history (.004), values (.003), cultural adaptation (.001), cultural context (.001), cultural shift (.001), cultural aspect (.001), cultural concern (.001), cultural sensitivity (.002)	Culture (.001), cultural appropriateness (.001), beliefs (.001)

	(.001), cultural appropriateness (.001), cultural connotation (.001)		
Technical	technical specifications (.004), technical assistance (.077), technical content (.001), technical areas (.001), standard (.028), technology (.003), technical design (.009), technical support (.012), technical oversight (.002), technical staff (.004), technical review (.001), technical capacity (.009), technical quality (.003), technical capability (.003), technical (.223), data (.063), information (.083)	technical assistance (.077), technical resources (.001), technical areas (.001), standard (.008), technology (.009), technical design (.001), technical support (.023), technical oversight (.004), technical staff (.010), technical advice (.001), technical review (.002), technical capacity (.008), technical quality (.001), technical capability (.001), technical (.276), data (.121), information (.104)	technical assistance (.007), technical content (.001), technical areas (.001), standard (.009), technology (.004), technical support (.002), technical capacity (.003), technical quality (.001), technical capability (.001), technical (.044), data (.014), information (.017)
Managerial/ organisational	processes (.061), resources (.113), implementation approach (.056), project planning (.002), departments (.024), organizational structure (.001), administration (.025), manager (.003), organizational capacity (.002), managerial autonomy (.001), managerial capacity (.002), decentralization (.047), coordination (.129), communication (.013), consultant (.014), project management (.042), relationship (.013), meeting (.047), management (.311), quality (.288), plan (.170), strategy (.139), restructuring (.039), supervision (.059), Leadership (.040)	management style (.003), processes (.070), resources (.151), implementation approach (.044), departments (.019), organizational structure (.003), administration (.051), manager (.020), organizational capacity (.002), organizational reform (.001), managerial autonomy (.001), managerial capacity (.002), decentralization (.031), coordination (.196), communication (.041), consultant (.023), project management (.087), relationship (.018), meeting (.020), management (.493), quality (.215), plan (.155), strategy (.083), restructuring (.197), supervision (.146), Leadership (.116)	processes (.001), resources (.067), implementation approach (.005), departments (.006), administration (.008), organizational capacity (.001), managerial capacity (.001), centralization (.002), decentralization (.003), coordination (.026), communication (.004), consultant (.003), project management (.002), relationship (.002), meeting (.001), management (.086), quality (.089), plan (.059), strategy (.051), restructuring (.014), supervision (.005), Leadership (.007)
Economic	competition (.002), political economy (.007), currency (.004), economical particularities (.001), economic growth (.003), economic development	economic conditions (.002), competition (.010), political economy (.002), currency (.010), import duty (.002), import restriction (.002), economic recession (.004),	competition (.001), economic growth (.003), economic development (.002), economic crisis (.004), economic

	(.004), socio-economic (.008), economic crisis (.004), economic cost (.001), economic affairs (.002), economic analysis (.006), economic research (.001), economy (.013),	economic growth (.007), economic development (.003), socio-economic (.002), economic crisis (.015), economic affairs (.003), economic analysis (.002), economy (.007), inflation (.006)	analysis (.001), economy (.002)
Environmental	Pollution (.002), air (.002), Water (.008), natural disasters (.004), climate (.005), waste (.025), food (.013), environmental aspects (.001), environmental concerns (.003)	Pollution (.011), air (.016), Water (.036), local environment (.001), natural disasters (.001), climate (.007), weather (.002), waste (.021), emission (.001), energy (.001), food (.015), environmental concerns (.002)	air (.002), Water (.004), natural disasters (.001), waste (.001), food (.004),
Social	social values (.001), Socio (.011), ethnic (.006), norms (.006), social protection (.027), social safeguard (.002), community (.108), social (.150)	Socio (.004), ethnic (.007), norms (.008), social mobilization (.003), social protection (.022), social safeguard (.003), community (.086), social (.129)	ethnic (.003), norms (.001), social protection (.010), social safeguard (.001), community (.035), social (.063)
Corruption	Transparency (.006), corruption (.012), fraud (.003)	Transparency (.007), corruption (.024), fraud (.008)	Transparency (.004)
Governance	Control (.096), relationship (.013), fairness and ethical conduct (.002), steering groups (.011), roles and responsibilities (.025), governance (.051), Policy (.182), transparency (.006), accountability (.033), level of hierarchy (.003), meeting (.047), audit (.023), participatory processes (.048), contracting processes (.041), trust (.024)	Control (.181), relationship (.018), steering groups (.010), roles and responsibilities (.048), governance (.033), Policy (.191), transparency (.007), accountability (.030), meeting (.020), audit (.025), participatory processes (.008), contracting processes (.076), trust (.034)	Control (.020), relationship (.002), steering groups (.001), roles and responsibilities (.003), governance (.021), Policy (.049), transparency (.004), accountability (.008), meeting (.001), audit (.006), contracting processes (.017), trust (.011)
Financial	Budget (.086), fund disbursement (.109), money (.003), interest (.017), finance (.054), financing (.233), financial (.193), funding (.099), loan (.078)	Budget (.144), fund disbursement (.226), money (.008), interest (.016), finance (.075), financing (.257), financial (.219), funding (.132), loan (.118)	Budget (.059), fund disbursement (.044), money (.003), interest (.008), finance (.034), financing (.128), financial (.068), funding (.071), loan (.016)
Collaboration/ Partnership	Communication (.013), team (.266), committee (.036), partner (.110),	Communication (.041), team (.329), committee (.038), partner (.100), collaboration	Communication (.004), team (.021), committee

	collaboration (.037), coordination (.129), support (.324), aligned efforts (.010), commitment (.141), agencies (.059), government (.501), bank (.646), fiduciary (.076)	(.041), coordination (.196), support (.387), aligned efforts (.015), commitment (.130), agencies (.095), government (.617), bank (.732), fiduciary (.092)	(.004), partner (.029), collaboration (.012), coordination (.026), support (.208), aligned efforts (.001), commitment (.031), agencies (.016), government (.206), bank (.174), fiduciary (.011)
Safety and security	War (.004), security (.034)	War (.005), coup (.001), terrorism (.001), security (.036)	War (.001), security (.006)
Human resource	Capability (.001), Knowledge (.043), staff (.115), skills (.021), training (.086), qualifications (.001), experts (.024), human resource (.033)	Capability (.002), Knowledge (.034), competency (.002), staff (.341), skills (.030), training (.182), qualifications (.001), experts (.026), human resource (.046)	Capability (.002), Knowledge (.011), competency (.001), staff (.048), skills (.004), training (.048), qualifications (.001), experts (.001), human resource (.015)
Procedural	arrangements (.181), supply chain (.008), tendering (.002), procedure (.066), bureaucracy (.001), instruction (.001), agreements (.086), process (.117), contract (.026), interventions (.110), procurement (.214)	arrangements (.133), supply chain (.010), tendering (.005), procedure (.114), bureaucracy (.001), agreements (.126), process (.126), contract (.078), interventions (.078), procurement (.469)	arrangements (.074), supply chain (.013), procedure (.011), agreements (.011), process (.018), contract (.004), interventions (.031), procurement (.035)

Appendix IV (Continued). Key factors affecting the project outcomes (keywords extraction)

Low performance projects

Factors	**Design**	**Implementation**	**Post completion**
Political	instability (.003), lack of political willingness (.001), political commitment (.003), uncertain political climate (.001), political support (.002), political context (.003), political turnover (.001), central government (.003), local government (.005), level of government (.006), control of government (.001), government's commitment (.024), government resistance (.001), government system (.001), authority (.004), administration (.004), campaign (.003), president (.006), minister (.021), conflict (.010), ministry (.028), political (.034), national (.087), local (.041)	instability (.011), revolution (.003), political interference (.002), political commitment (.002), political opposition (.001), political environment (.003), political stability (.002), political crises (.002), political turmoil (.001), political advocacy role (.001), political tension (.001), political support (.001), political context (.004), political turnover (.001), central government (.002), local government (.001), level of government (.001), government's commitment (.003), government system (.001), authority (.006), administration (.018), regime (.001), campaign (.008), president (.008), minister (.026), conflict (.007), ministry (.054), political (.047), national (.083), local (.029)	central government (.001), local government (.001), government's commitment (.001), authority (.008), administration (.001), regime (.001), president (.004), minister (.002), ministry (.009), political (.003), national (.043), local (.008)
Legal	legal amendments (.002), jurisdiction (.001), court (.001), regulatory capacity (.002), Law (.009), legal and regulatory framework (.002), legal obligation (.001), regulation (.002)	Jurisdiction (.001), court (.002), Law (.006), legal and regulatory framework (.003), regulation (.005)	Law (.003), insecure legal status (.001)
Cultural	Culture (.002), socio-cultural (.001), cultural challenge (.001)	Culture (.002)	cultural norms (.001)
Technical	technical assistance (.012), technical content (.001), technical areas (.002), standard (.006), technology (.001), technical design (.003), technical support (.005), technical advice (.001), technical review (.001), technical capacity (.004), technical quality	technical assistance (.007), technical areas (.001), standard (.006), technology (.004), technical support (.001), technical staff (.002), technical review (.002), technical evaluation (.004), technical capacity (.002), technical (.070), data (.033), information (.028)	technical assistance (.006), standard (.001), technology (.001), technical support (.004), technical (.018), data (.012), information (.002)

	(.001), technical capability (.001), technical (.059), data (.023), information (.034)		
Managerial/ organisational	management style (.001), processes (.013), resources (.038), implementation approach (.027), departments (.009), organizational structure (.001), administration (.004), organizational capacity (.002), organizational framework (.001), decentralization (.029), coordination (.047), communication (.002), consultant (.006), project management (.010), relationship (.005), meeting (.016), management (.104), quality (.071), plan (.028), strategy (.038), restructuring (.014), supervision (.020), Leadership (.028)	management style (.001), processes (.021), resources (.061), implementation approach (.013), departments (.015), administration (.018), manager (.012), organizational capacity (.002), decentralization (.013), coordination (.066), communication (.020), consultant (.010), project management (.031), relationship (.006), meeting (.004), management (.161), quality (.039), plan (.035), strategy (.026), restructuring (.100), supervision (.038), Leadership (.033)	resources (.016), administration (.001), manager (.001), decentralization (.007), coordination (.012), management (.034), quality (.018), plan (.021), strategy (.019), restructuring (.002), supervision (.004), Leadership (.003)
Economic	competition (.002), political economy (.004), economic growth (.001), economic development (.001), socio-economic (.001), economic transition (.001), economic context (.001), economic analysis (.001), economy (.006),	competition (.001), political economy (.003), currency (.001), economic growth (.001), economic crisis (.002), economic research (.002), economy (.006), inflation (.001)	economic crisis (.002), economic affairs (.001), economy (.001),
Environmental	Water (.007), climate (.002), waste (.003), food (.022)	Pollution (.001), Water (.008), natural disasters (.001), climate (.009), waste (.001), flood (.002), food (.018)	Water (.001), food (.006)
Social	Socio (.003), ethnic (.001), social protection (.003), community (.043), social (.030)	social protection (.004), social safeguard (.001), community (.025), social (.030)	norms (.001), social mobilization (.001), social protection (.003), community (.011), social (.009)
Corruption	Transparency (.003), corruption (.002), fraud (.002)	Transparency (.003), corruption (.009), fraud (.002)	Transparency (.001), corruption (.001)
Governance	Control (.029), relationship (.005), steering groups (.010), roles and	Control (.034), relationship (.006), steering groups (.009), roles and responsibilities (.022),	Control (.006), steering groups (.003), roles and

	responsibilities (.033), governance (.027), Policy (.054), transparency (.003), accountability (.014), meeting (.016), audit (.003), participatory processes (.015), contracting processes (.024), trust (.002)	governance (.008), Policy (.044), transparency (.003), accountability (.007), meeting (.004), audit (.016), participatory processes (.004), contracting processes (.021), trust (.001)	responsibilities (.002), governance (.003), Policy (.011), transparency (.001), accountability (.006), audit (.003), participatory processes (.003), contracting processes (.004), trust (.001)
Financial	Budget (.016), fund disbursement (.041), money (.002), interest (.006), finance (.022), financing (.081), financial (.061), funding (.020), loan (.016)	Budget (.033), fund disbursement (.095), money (.003), interest (.013), finance (.036), financing (.094), financial (.064), funding (.046), loan (.034)	Budget (.017), fund disbursement (.012), money (.001), interest (.001), finance (.006), financing (.044), financial (.012), funding (.022)
Collaboration/ Partnership	Communication (.002), team (.072), committee (.016), partner (.042), collaboration (.011), coordination (.047), support (.123), aligned efforts (.002), commitment (.065), agencies (.043), government (.191), bank (.179), fiduciary (.019)	Communication (.020), team (.075), committee (.020), partner (.016), collaboration (.011), coordination (.066), support (.109), aligned efforts (.002), commitment (.032), agencies (.049), government (.161), bank (.232), fiduciary (.020)	team (.008), committee (.005), partner (.015), collaboration (.005), coordination (.012), support (.055), commitment (.007), agencies (.010), government (.042), bank (.058), fiduciary (.005)
Safety and security	security (.010),	coup (.004), security (.018),	coup (.001), security (.002),
Human resource	Knowledge (.010), staff (.051), skills (.007), training (.021), experts (.005), human resource (.010)	Knowledge (.005), competency (.002), staff (.122), skills (.003), training (.032), experts (.005), human resource (.020)	Capability (.001), Knowledge (.002), staff (.013), training (.005), experts (.003), human resource (.005)
Procedural	arrangements (.075), supply chain (.003), procedure (.016), agreements (.022), process (.046), contract (.002), interventions (.032), procurement (.060)	arrangements (.038), tendering (.003), procedure (.028), bureaucracy (.004), instruction (.001), agreements (.039), process (.072), contract (.036), interventions (.029), procurement (.159)	arrangements (.017), procedure (.003), bureaucracy (.001), agreements (.012), process (.007), contract (.002), interventions (.012), procurement (.012)